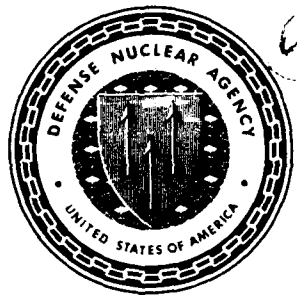
Defense Nuclear Agency
Alexandria, VA 22310-3398



DNA-TR-90-112

Soldiers' Psychological Responses to Tactical Nuclear Warfare

Joseph A. Conroy, et al.
Science Applications International Corporation
P.O. Box 1303
McLean, VA 22102

February 1992

Technical Report

CONTRACT No. DNA 001-86-C-0295

Approved for public release;
distribution is unlimited.

Destroy this report when it is no longer needed. Do not return to sender.

PLEASE NOTIFY THE DEFENSE NUCLEAR AGENCY, ATTN: CSTI, 6801 TELEGRAPH ROAD, ALEXANDRIA, VA 22310-3398, IF YOUR ADDRESS IS INCORRECT, IF YOU WISH IT DELETED FROM THE DISTRIBUTION LIST, OR IF THE ADDRESSEE IS NO LONGER EMPLOYED BY YOUR ORGANIZATION.

DISTRIBUTION LIST UPDATE

This mailer is provided to enable DNA to maintain current distribution lists for reports. We would appreciate your providing the requested information.

☐ Add the individual listed to your distribution list.

☐ Delete the cited organization/individual.

☐ Change of address.

NOTE:
Please return the mailing label from the document so that any additions, changes, corrections or deletions can be made more easily.

NAME: _____

ORGANIZATION: _____

OLD ADDRESS	CURRENT ADDRESS
_____	_____
_____	_____
_____	_____

TELEPHONE NUMBER: ( ) _____

SUBJECT AREA(s) OF INTEREST:

_____	_____
_____	_____
_____	_____

DNA OR OTHER GOVERNMENT CONTRACT NUMBER: _____

CERTIFICATION OF NEED-TO-KNOW BY GOVERNMENT SPONSOR (if other than DNA):

SPONSORING ORGANIZATION: _____

CONTRACTING OFFICER OR REPRESENTATIVE: _____

SIGNATURE: _____

Director
Defense Nuclear Agency
ATTN: TITL
Washington, DC 20305-1000

Director
Defense Nuclear Agency
ATTN: TITL
Washington, DC 20305-1000

REPORT DOCUMENTATION PAGE

Form Approved OMB No. 0704-0188

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	920201	Technical 860926 - 900920

4. TITLE AND SUBTITLE

Soldiers' Psychological Responses to Tactical Nuclear Warfare

5. FUNDING NUMBERS

C - DNA 001-86-C-0295
PE - 62715H
PR - RM
TA - RH
WU - DH012770

6. AUTHOR(S)

Joseph A. Conroy, Stephen P. Masterson, Michael L. Fineberg
Reuven Gal

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

Science Applications International Corporation
P.O. Box 1303
McLean, VA 22102

8. PERFORMING ORGANIZATION REPORT NUMBER

SAIC-89-1506

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

Defense Nuclear Agency
6801 Telegraph Road
Alexandria, VA 22310-3398
RARP/Young

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

DNA-TR-90-112

11. SUPPLEMENTARY NOTES

This work was sponsored by the Defense Nuclear Agency under RDT&E RMC Code B4662D RM RH 00025 STBE 3500A 25904D.

12a. DISTRIBUTION/AVAILABILITY STATEMENT

Approved for public release; distribution is unlimited.

12b. DISTRIBUTION CODE

13. ABSTRACT *(Maximum 200 words)*

This report describes the conduct and results of the Psychological Response Study, the purpose of which was to further the understanding of the likely responses of troops involved in a tactical nuclear war (TNW). The goals of the study were to estimate the most likely types of psychological responses to a TNW and the relationship between various psychological responses and performance in combat in terms of battlefield fatigue casualties (BFC). Subjects of this study were three hundred fifty-nine US Army troops who received one of six treatments (battlefield scenarios) in which three types of combat were crossed with two distances to the battle. Data were collected immediately from the subjects after they were read a description of one of the six battlefield scenarios and asked to visualize themselves in the described battlefield. Also collected were data from 11 "experts" in the field of TNW, again using a questionnaire. Results from the troops indicate that there was an interaction between Type of Combat and Soldier Type (infantry vs. armor). Infantrymen in the TNW scenario were significantly more extreme in their expectations about the behavior and performance of themselves and their compatriots. Also, unit and soldier-related variables such as cohesion and commitment were found to be significantly related to performance. Results of analyses of experts' data

14. SUBJECT TERMS			15. NUMBER OF PAGES
Nuclear Warfare	Psychological Reaction	Military Training	128
Military Doctrine	Combat Effectiveness	Nuclear Battlefield	16. PRICE CODE
Casualty Rates	Human Performance Stress		

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	SAR

ASSIFIED BY:

N/A since Unclassified

ECLASSIFY ON:

N/A since Unclassified

13. ABSTRACT (Continued)

indicate that unit cohesion and a warning about a nuclear blast will significantly mitigate the psychological effects of TNW.

EXECUTIVE SUMMARY

The purpose of this study was to further the understanding of some of the most likely responses of troops involved in a tactical nuclear war (TNW). The goals of the study were to estimate the most likely types of psychological responses to a TNW and the relationship between probable psychological responses and performance. Also of interest were the expected rates of battlefield fatigue casualties (BFC). The dependent variables of psychological Responses, Expected Behavior, Performance and BFC also were examined for effects due to Soldier Variables (e.g., knowledge, commitment), Unit Variables (e.g., cohesion), and several others including Type of Combat (e.g., TNW vs. chemical vs. conventional), Distance and Soldier Type (Armor vs. Infantry).

Data were collected in 1988 from three hundred fifty-nine subjects who were US Army combat troops stationed very near East Germany. The troops were randomly assigned to one of six experimental conditions in which Type of Combat and distance to the focus of the combat were crossed. The troops in each condition were treated together in a single group. The administration of the experimental conditions consisted of reading to the soldiers (and having them read along) a description of one of six, very graphically detailed battlefield scenarios and asking the soldiers to draw and imagine the sights and sounds of such a situation. Then they were asked to visualize themselves in the described battlefield. Immediately thereafter the soldiers were administered a questionnaire that assessed their expected performance and the reactions of themselves and the soldiers in their company.

In a second approach to answering the study's questions, data were collected from nine experts in field of TNW. The nine were presented TNW scenarios similar to those presented to the 359 troops. The experts were asked to estimate BFC in each scenario for units that varied in Cohesion (high and low) and whether they had been warned of the nuclear blast. The experts provided two sets of estimates. The variability of the first set was reduced by using a variation of the DELPHI Technique.

Results of analyses of data obtained from the troops indicate that there was an interaction effect between Type of Combat and Soldier Type on Performance and Behavior, but no effect for Distance. The effect of Type of Combat was limited to Infantry. The TNW condition was perceived as having the worst effect on the troops, conventional warfare the next worst effect and chemical the least effect. As for the psychological responses exhibited, only six of 35 discriminate the TNW troops from the troops in the other types of combat. In addition, for Infantry only, some of the Responses mitigate the effect of Type of Combat.

As expected, a significant relationship was found between both the Unit and Soldier variables (e.g., Cohesion and Commitment) on one hand, and expected Performance and Behavior on the other. However, contrary to predictions, the effects of Unit and Soldier variables were not strong enough to moderate the effect of Type of Combat on Performance or on Behavior.

Results of analyses of the experts' data indicate that Cohesion and being warned about a nuclear blast had an effect on expected BFC. The trend was in the expected direction. Distance from the blast also had expected effects on the experts' estimates. Moreover, they estimated that BFC would occur at distances so removed from the blast that no physical effects could occur.

The conclusions of the study were that TNW is perceived as significantly different from conventional and chemical combat, especially by Infantry, who expect to react and perform significantly worse than armor troops. Additional conclusions involved the absence of an effect for Distance in the data obtained from the troops. The data indicate that troops 30 km from the blast expect to perform and behave as well as do those 5 km from the blast. Clearly those 5 km from a 10 kt blast will not receive any significant exposure to radiation and thus should not expect to perform any worse than those at 30 km. Because the experts' distance conditions involved those between 1 km and approximately 15 km, it is really no surprise that they predicted an effect for Distance.

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF TABLES

SECTION 1

INTRODUCTION

The study described in this report was the result of continuing research in the Defense Nuclear Agency's (DNA) Human Response Program. That Program has defined and assessed the effects of prompt and protracted nuclear weapons' effects that soldiers could be subject to in a tactical nuclear war (TNW). Various levels and durations of radiation have been investigated for their effects on the combat performance capability and medical status of individual soldiers, crews and combat units. The Program has heretofor focused on how radiation induced physiological degradation would affect performance. A logical extension of the Program is to identify how the psychological effects of experiencing or expecting to experience prompt or protracted nuclear weapons' effects would influence performance. The study described in this report, the "Psychological Effects Study", attempted to identify how the psychological effects of being in a TNW would affect soldiers' jobs and mission related performance.

1.1 BACKGROUND.

There is a relatively large and reliable body of knowledge and set of data on the responses of humans to prompt and protracted nuclear weapons' effects (e.g., Solomon and Marston, 1986; Anno et al., 1982; and Glasstone and Dolan, 1977). Moreover, there is little controversy about the effects documented in the literature that describe the mechanical, physical or medical effects of nuclear weapons (Gal, 1987). However, few studies have developed any data from which to determine what the psychological effects on military troops might be from participating in a TNW. This study focused on a TNW rather than a major nuclear holocaust. One reason for that is the greater likelihood of a TNW. Another reason is the likelihood that a major nuclear holocaust would be so physically devastating as to make the psychological effects on performance trivial or impossible to measure for most soldiers.

Even though there are no data that have been collected from troops actually involved TNW, the dearth of literature discussing the topic is remarkable. Only five major reviews have analyzed the anticipated responses of soldiers to a TNW. The reviews are those of Logan and Killian (1953), Glass (1956), the Desert-Rock Studies (e.g. HumRRO, 1953), Vineberg (1965), and the recent review by Sessions (1987).

The major conclusion derived from the four earliest works is explicitly reflected in the official doctrine of the United States Military and the NATO forces. According to this doctrine, "Soldiers facing nuclear combat can be expected to behave essentially as they would under other severe combat and stress situations" (U.S. Army FM 101-21-1, p.8). Likewise, the U.S. Army Technical Manual 8-215, *Nuclear Handbook for Medical Service Personnel* (1969), and the *NATO Handbook on the Medical Aspects of NBC Defense Operations* (1973), both use the same statement to describe the expected responses of soldiers:

> It is generally felt that the acute psychological problems which would occur in such circumstances would be essentially the same as those seen in other combat situations, and that the treatment methods which have been developed as a result of experience in past wars would be appropriate" (p. 48).

This expectation is derived from many studies, accumulated over the years, which focused on the behavior of individuals under extreme stress. Included were investigations of the responses of civilians and soldiers during natural and man-made disasters, accidents involving many people, various stressful events in wars, and observations of troops participating in exercises involving atomic-bomb explosions. A source of information for one of the studies was the survivors of the Hiroshima and Nagasaki nuclear events.

The investigators in all four studies noted the threats to the validity of their generalizations, nevertheless they all agreed, directly or indirectly, that the nuclear battlefield will not generate any unpredictable change in soldiers' behavior. Furthermore, it was generally argued that the impact of a blast will not introduce reactions that differ qualitatively from those evoked in a conventional battlefield. Indeed, twenty years after his original review, Vineberg has recently reconfirmed his initial conclusion that "While nuclear combat would be intrinsically more stressful than conventional combat, there would not likely be a sharp qualitative change in man's <u>performance</u> to such increase in stress" (Vineberg, 1987; underlining by the author).

Vineberg's use of the term "qualitative" is indicative of a recurring and basic question about the expected behaviors of soldiers in a TNW. It is also indicative of a basic question which is posed as the "qualitative versus quantitative" question - will the responses of the soldiers be merely quantitatively different from their responses in a conventional war or will they be qualitatively different. Quantitatively different means a difference in magnitude but not in the type of responses, whereas qualitatively different means there will be types of behaviors exhibited in TNW that would not be exhibited in

a conventional war. For example, a quantitative difference would be a much degraded accuracy for the delivery of indirect fires with an M109. On the other hand, a qualitative difference would be the exhibition of a behavior that is (or is practically) non-existent in conventional war, such as mass and obvious disobedience of orders.

Only recently have investigators begun to question the earlier and almost universal bottom-line conclusion that soldiers would behave very similarly in both high-intensity conventional (HIC) combat and TNW. One such investigator is Sessions (1987), who produced one of the five major reviews in this area.

Sessions takes a flexible position with regard to the qualitative differences between HIC and TNW. Sessions states that soldiers' reactions to a TNW will include some behaviors that are qualitatively different from those that occur in HIC and other behaviors that are quantitatively different. Sessions' position on the neuropsychiatric (NP) casualties and other impairments resulting from a TNW are best summarized in his own words:

> A straight-forward recognition of the fact that intensity of combat directly correlates with NP casualty rates leads to the conclusion that casualties due to emotional breakdown will be higher in combat involving nuclear weapons than any previous conflicts involving conventional weapons alone. Estimates of neuropsychiatric casualty rates based on ratios referenced to killed or wounded-in-action are likely to be misleading, due to the fact that much higher physical casualty rates will be expected from the employment of tactical nuclear weapons. [However,] the greatest impact on residual combat capability in tactical nuclear combat may be expected to derive not from neuropsychiatric casualty rates, but from emotional disruptions which are debilitating from a performance point of view but not severe enough to produce the classical picture of emotional breakdown represented in the neuropsychiatric casualty (p.9-39).

The last part of Sessions statement introduces another question that has rarely been addressed in analyses of the expected responses of soldiers to a TNW: How much will task performance be degraded? Most previous analyses had asked simply whether soldiers' performance would be drastically affected. Other than the studies of reactions to a nuclear blast that were held at Desert Rock (e.g., HumRRO, 1953), few analyses acknowledge that a nuclear blast may not totally incapacitate the soldiers but may impair their performance of many tasks in varying degrees.

The diversity of conclusions about the expected performance and responses of soldiers in a TNW was part of the impetus for a DNA sponsored conference on the psychological effects of TNW on soldiers (see Young, 1986). That conference and a follow-up symposium (Young and Drum, 1987) highlighted the growing controversy about the expected responses and performance of soldiers in a TNW. It is not surprising that the symposium reached no consensus, for the participants had no data from a TNW from which to generalize. Instead, they had only the data that the five major reviews relied upon. Those data include some derived from natural disasters (Logan and Killan, 1953), World War II (WW II) (Vineberg, 1965; Glass, 1956), the Desert Rock tests (e.g., HumRRO, 1953) in which soldiers witnessed a blast and then proceeded to the blast site to perform tasks, and data from the survivors of the Hiroshima and Nagasaki blasts (Sessions, 1987; Vineberg, 1965).

The threats to the validity of generalizations based on the natural disasters and WW II data are many and include the fact that those data were derived from situations that were very different from a TNW. As for the data collected at the Desert Rock tests, even the investigators acknowledged that: "The simulated, friendly, controlled, single atomic detonation, with severe safety regulations imposed at the Nevada Desert site, obviously could not be representative of a real enemy attack, using several nuclear weapons at various points along a continuous war confrontation." Finally, the data collected in Japan at the WW II atomic blast sites were those based on civilians who were not being asked to perform tasks that would further threaten their lives.

Whether or not the data and conclusions of the five reviews and other literature are valid and generalizable, it is clear that none of that literature posits clear and specific estimates as to the degree soldiers will be affected by a TNW. Moreover, the one study (Sessions) that posits the possibility of qualitatively different responses does not detail which responses will be most likely.

1.2 PURPOSE AND OBJECTIVES.

There is a growing body of literature, much of it based on empirical data, which indicates that NP casualty rates will be very high in a TNW (Sessions, 1987; Gal, 1985; Vineberg, 1965). However, there is still controversy about this gross type of soldier response as the data on which it is based are not those of a TNW. Similarly, as previously noted, there is a long-standing controversy about the types of responses soldiers will exhibit in a TNW (i.e., the quantitative versus qualitative debate). Furthermore, even if NP casualties are

no greater in a TNW than in HIC, the degree to which soldier performance would be degraded in a TNW is unknown.

Resolving these questions and controversies involving the psychological responses of troops to a TNW was the purpose of the Psychological Response Study. More specifically, the study was to identify the most likely psychological responses of troops to a TNW and the effect those responses and the stressors of such a war will have on the performance of troops.

Seven objectives were established for the project. The first was to develop a baseline of the expected psychological responses to HIC. The baseline was to be used to make comparisons to the predicted responses to a TNW. In order to better understand the psychosocial responses of troops in a TNW, the study also focused on the responses of troops to combat involving chemical weapons (CHEM). The idea was that locating the responses to TNW in relation to those of the other types of combat would allow a better understanding of the type and severity of responses to TNW. The baseline was to be developed through a thorough review of the NP literature on combat and to identify the characteristics of combat stressors which produce NP casualties in addition to the rates at which NP casualties are produced by HIC. Also, the review was to identify how the rates vary as a function of psychological reinforcement factors (e.g., leadership, training, unit cohesion, health, rest, nutrition, etc.). It has long been noted that variables such as leadership and unit cohesion have an effect on NP casualties (Gal, 1985).

The second objective of the study was to identify from the literature, the NP stressors to which TNW combatants will be exposed. This objective was to help identify the causes of NP casualties and thus to better understand NP casualties in TNW.

The third, fourth and fifth objectives embody the most important questions and goals of the project. They are to:

- Assess the differences or similarities of predicted NP casualty rates for TNW, HIC and CHEM;
- "Characterize" TNW-induced NP casualties among US ground forces; and,
- Predict TNW induced NP casualty rates within US ground forces, as a function of TNW stressors, including radiation exposure and/or sickness, and the presence or absence of reinforcement factors

(e.g., leadership, training, unit cohesion, health, rest, nutrition, etc.).

Two more objectives of the project were designed to make use of the results of completing the third, fourth and fifth objectives. One was to develop a NP casualty model which can be directly integrated into other active US Army unit effectiveness models. The other was to develop techniques which could be employed by US ground forces to minimize NP casualty rates.

1.3 SPECIFIC FOCUSES (VARIABLES) OF THE STUDY.

The first objective of the study, to develop the baseline of HIC related NP casualty rates and behaviors, was accomplished and reported on in the study's first Interim Report (Drum, et al., 1987). That report also identified several variables that appear to influence NP casualty rates and the behavior of troops in combat. Some of those variables, shown to influence behavior in HIC, were included in this study of responses to TNW because it was not clear that the variables would have any effects on behavior in TNW. It appeared that the effects of TNW might completely overshadow the effects of other variables such as morale, unit cohesion, leadership and well being.

In the empirical data collection phase of this study, it was possible to examine the effects of a limited number of variables. The variables identified in the Drum et al. report that were included in the rest of the study are described in the following paragraphs.

1.3.1 Soldier Variables.

One class of variables that appeared capable of influencing behavior in combat were called Soldier Variables. For this study there were four such variables, all a function of an individual soldier. One of the four variables is the soldier's Role in Combat which appears to have an important influence on his appraisal of the situation and thus on his responses. This was evident during the 1973 Arab-Israeli War, when Israeli commanders where under the greatest combat danger, being in the forefront of the engagement. Despite the high degree of battle stress, it was found that the rate of psychiatric breakdown among officers was five times less than that of enlisted men (Levav et al., 1979). On the other pole of battlefield performance, that of bravery, the number of Israeli combat officers awarded medals for extraordinary acts of bravery was much higher (64 percent of the total) than for enlisted men who were not in leadership roles (Gal, 1986). When noncommissioned officers (NCOs) are included

with commissioned officers, the percentage of medals for bravery rises to 88 percent awarded to persons in leadership roles.

Another Soldier Variable shown to influence NP casualty rates is an individual soldier's Personal Well Being. It was shown that the subjective perception of one's relationships with one's close environment (i.e., home, family, work, community) may directly affect combat behavior. A World War II study (Brill and Beebe, 1955) reported striking differences between soldiers who became psychiatric casualties and a non-afflicted comparison group. Soldiers with impairments in family, school, work, social, recreational, and community adjustments were found to have a four times greater chance of breaking down. The Israeli experience of the 1973 Yom Kippur War revealed very similar findings (Noy, 1978).

The third Soldier Variable is the level of Combat Readiness. Elite units with superior levels of training and combat readiness usually have lower rates of NP casualties (Marlowe, 1983). While this might be partially the result of better morale, superior knowledge and combat readiness certainly play a role in minimizing NP casualties (Gal, 1987).

A fourth Soldier Variable is the soldier's broad classification within the Army (e.g., infantryman). The various categories of this classification appear to be related to responses to combat. For example, data from the 1973 Israeli War show that NP casualties as a percentage of wounded in action, are much higher for tank crews than for infantrymen (Drum et al.) The reason for this difference is not clear. Obviously it could be related to training, perceptions, or type of combat experienced.

In summary, it appears that the more one's Role in Combat is that of leadership, the more one has a high degree of Well Being, superior Combat Readiness, in addition to being in the Infantry, the better one will perform and the less likely one will be to experience negative psychological responses to combat, all other influences being equal. Consequently, this study predicted that the following would positively influence behavior, performance and psychological responses to combat, including responses to TNW:

- Perceiving one's Role in Combat to be that of a leader versus being a follower;
- Having a high degree of Well Being;
- Having a high degree of Combat Readiness; and

- o Being an infantryman versus being part of the crew of an armored system.

1.3.2 Unit Variables.

A second set of variables that can affect NP casualty rates were described in Drum et al. as Unit Variables. For this study three Unit Variables, all a function of a unit's collective status, appear relevant and able to moderate the effect of stress in combat. One of the Unit Variables identified was Cohesion. Unit cohesion has repeatedly been found important for unit performance in wartime (Gal, 1986; Stouffer, et al., 1949). The absence or inadequacy of such a sustaining influence has been found to be directly correlated with psychiatric breakdowns in battle (Glass, 1973).

Another Unit Variable is Morale. As with commitment or cohesion, unit morale has been shown to be related to the performance of the unit in combat (Gal 1986). Also, unit morale has been found to be related to the number of NP casualties in a unit (Steiner and Neumann, 1978).

A third Unit Variable is the degree to which soldiers Believe in Their Leadership. Numerous studies have confirmed the crucial role of unit commanders in preparing troops for combat, enhancing troop morale, and leading them courageously in battle (Gal, 1986). Furthermore, a soldier's confidence in his commander is critical in protecting the soldier from overwhelming battle stress. In the case of a nuclear attack, the presence of leadership and confidence in that leadership may play a crucial role in a soldier's capability to cope with the unprecedented psychological impact of nuclear detonation.

In summary it appears that the better a unit's Cohesion, Morale and Leadership, all other influences being equal, the better the unit will perform. Consequently, this study predicted that high levels of these three variables would have positive influences on the behavior, performance and psychological responses of the troops to combat, including TNW.

1.3.3 Stressors.

It has been shown in the studies of many conflicts, that several "environmental" characteristics appear to influence NP rates (Gal, 1987). The characteristics include one's distance to the center of the conflict, weather, the duration of the conflict, and several others (Gal, 1987). These and others were identified by Drum et al., in response to the first two objectives of this study, as possible "stressors" that might influence TNW induced NP casualty rates.

Distance to the center of the conflict has special significance to this study because for TNW, unlike HIC, there can actually be a "center of the conflict" for many of the troops (i.e., ground zero). Also, it appeared from the literature that the impact of a nuclear attack might be disastrous on rear, as well as on front units. The Technical Report by the University of Oklahoma Research Institute (1952) on pre-atomic military disasters clearly indicates that:

> The experience in the Bulge suggests that withdrawal, sometimes changing into panic flight, is most likely to occur among rear echelon troops who are not in contact with the enemy but are on the periphery of the threatened area. Their normal movement to and from the rear, their legitimate displacement to the rear, their lack of knowledge of the situation to the front, and the effect of stragglers or retreating front-line units, all may contribute to the fast, confused withdrawal of these troops to avoid contact with enemy ground forces.

Because of the unique geographic characteristics of TNW in comparison to HIC, and because of the potential influence of distance to the conflict on performance and psychological responses, Distance was included as a variable for study. Also, because it appears that the influence of TNW might be experienced at significant distances from the blast, it was predicted that there would be no difference between the performance and responses of troops close to the blast in comparison to troops located significantly further from the blast.

1.3.4 Responses (Dependent Variables).

Another important goal of the study is embodied in its fourth objective -- the "Characterization of nuclear-warfare-induced NP casualties." Implicit in that objective is a determination of whether the TNW induced NP casualties are different from those induced by HIC or CHEM. The focus of such a

characterization would be the ways in which the TNW induced NP casualties might behave that would differentiate them from the NP casualties of other types of war. Thus there might be performance, motivational or perceptual differences between the NP casualties produced by the various types of war. For example, the NP casualties of HIC might prove incompetent because of extreme anxiety in spite of their high motivation to perform well. On the other hand, the NP casualties of TNW might be much more hopeless and without much motivation to perform.

In order to study this question empirically, a review of the literature (Gal, 1987) was performed to identify the potential categories of responses relevant to all combat induced NP casualties. Gal identified five broad classes of responses.

Physical. These responses include autonomic changes (tachycardia, vasoconstriction, sweating, increased gastro-intestinal motility), musculo-skeletal (increased tonicity and perfusion of blood to muscle) and glandular changes (release of medullary and cortical hormones from the adrenal glands producing many of the foregoing effects). In addition to these non-specific stress reactions, combatants in TNW will suffer from various degrees of radiation symptoms (headaches, nausea and vomiting), depending on the amount of ionizing radiation to which they are exposed.

Emotional. These responses will be expressed in a variety of affective reactions varying from apprehensive fear, anxiety or depression, to complete bewilderment and shock.

Cognitive. Various degrees of confusion and disorientation, distortion of perception with narrowing of attention span hyperalertness to certain stimuli and increased utilization of automatic or overlearned responses.

Social. Increased dependency on leadership and need of affiliation, sometimes expressed by seeking reassurance and physical clustering. Negative aspects may be an increased tendency to make demands and irritability.

These five classes of responses were used to examine the potential differences between the responses of those involved in the three types of war (TNW, HIC and CHEM). Also, potential differences in behaviors and job performance were of great interest. Thus, these two focuses were included with the psychological responses as dependent variables.

The following two sections of this report describe the methodologies and results that were used and obtained for the third, fourth fifth and sixth

objectives -- those asking for a comparison, characterization, prediction and modelling of NP casualty rates in TNW and HIC. The last section of the report, the discussion section, addresses the seventh objective -- techniques that could minimize TNW induced NP casualties.

SECTION 2

METHOD

Two approaches were used to obtain data from which to estimate the effects of TNW on the psychological responses of soldiers. One of the approaches involved the experimental study of U.S. Army combat soldiers stationed very near East Germany in 1988. The soldiers, although not experienced in combat, were very likely to be involved in combat should it occur in Europe. Moreover, if combat with Warsaw Pact Forces had occurred in Europe, it would have very likely included TNW in addition to HIC. Also, since the subject soldiers were trained for both HIC and TNW and were aware of the likelihood of their being involved in HIC and TNW, they were viewed as a potential source of valid data. It was assumed that they would be able to estimate the effects of TNW on the psychological responses of soldiers in their unit.

The other approach involved a panel of experts who were asked for their estimates of battlefield fatigue casualties (BFC) for a variety of TNW scenarios. The methodology and results of that approach are described in detail in another report completed for the Psychological Response Study (Levin, 1990). The results of the expert-panel-based approach are discussed in Section IV.

For the soldier-based-approach, subject soldiers were asked to listen to taped recordings of combat scenarios, read the text of the taped recordings, and imagine participating in one of three Types of Combat: HIC, CHEM, or TNW. Each scenario was the same except for descriptors involving both Type of Combat and distance to the battlefield (Distance). Both armor and mechanized infantry soldiers were described in the scenarios as "on the move" and providing reinforcements to other troops. Armor personnel rode in M1 tanks and the mechanized infantry rode in Bradleys.

The use of combat scenarios and guided mental imagery in a controlled experimental setting allowed for Type of Combat and Distance to to be manipulated as treatment conditions. The different types of soldiers, Armor vs. Infantry, were randomly assigned to each treatment condition. Thus this approach allowed for the attribution of differential responses to differences in treatment conditions and Soldier Type.

The treatments and Soldier Types resulted in a hierarchically ordered experimental design, consisting of three Types of Combat (HIC, CHEM, or TNW) two Distances conditions (5-15km. vs. 30-50km), and two Soldier Types (Armor and Infantry). Hence, it was a 3X2X2, or 12 between groups design (see Figure 1).

SUBJECTS — 359 COMBAT SOLDIERS, 2ND BDE, 3RD ARMOR DIVISION, COLEMAN KASERNE

DESIGN — 3x2x2

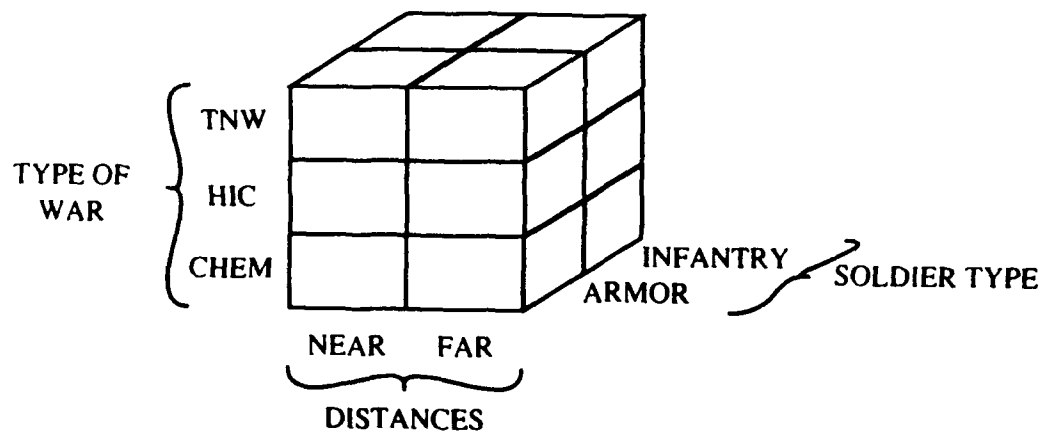


Figure 1. Experimental design.

2.1 SUBJECTS.

A sample of 359 combat soldiers of the 2nd Brigade, 3rd Armored Division, stationed at Coleman Kaserne in Germany, served as subjects. The sample of both infantry and armor personnel were selected because they were stationed less than 50 miles from Fulda, Germany. Their overall mission in time of war would be to immediately reinforce the troops guarding one of the most likely places for a Warsaw Pact attack, the Fulda Gap. Each group of subjects was ramdomly sampled from each company within the Brigade. They were assigned to treatments such that each company was equally represented in all treatment groups (see table 3). The last group had one missing subject, hence the total sample was 359.

2.2 MATERIALS.

2.2.1 Scenarios.

Treatments were effected by subjecting the soldiers to one of six scenarios (see Appendix A for complete version of all six). The scenarios were descriptions of combat that the subjects were to imagine themselves being a part of. The scenarios were tape recorded and played to the subjects over a tape recording system with small stereo speakers. Also, subjects read printed versions of the scenarios.

The recorded versions of the scenarios described the situations with a tone of solemn detail. Each described experiences involving all relevant (e.g., sights, sounds, smells). Also, all six contained several common elements which include:

- o It is 1995, and Warsaw Pact Forces are in W. Germany;
- o The Warsaw Pact Forces are three divisions, two rifle and one tank;
- o Own forces are a heavy tank task force of an armor division;
- o Beginning in reserve, 10 or 40 km from lines (for near or far);
- o 1st BDE attacked at 0530, there were sounds of artillery (faint or loud);
- o At 1430 your BDE is ordered to reinforce the 1st BDE; and,
- o Armor in tanks, infantry in Bradleys.

Thus, there was a great deal of commonality among the six scenarios. The differences among them involved the Type of Combat (HIC, TNW or CHEM) and Distance to the front (5 to 15 km vs. 30 to 50 km). These conditions were varied with minimal wording differences. The differences are depicted in Table 1.

Table 1. Differences between scenarios.

	NEAR		FAR
TNW	Blinding light Lose Comm Vehicle vibrates violently See downed vehicles Cloud 7 km		Sky lights up Hear several detonations Vehicle shakes See clouds in distance Know its nuclear
HIC	Moves out Vehicle hit/stops		Moves out
CHEM	See other NBC See mist 2 km Chem alarm		Told BDE in Chem attach (30 km)
	5 km	Distance to E Lines	30 km
	Intense	Noise	N/A
	Yes	Incoming vibration	N/A
	Yes	Incoming barrage	N/A

2.2.2 Questionnaire.

A self-report questionnaire was used to obtain soldier responses to the scenarios. The validity of the self-report technique has been supported in the literature. London (1989) found self ratings to be significantly related to

other types of subjective ratings (supervisor and peer ratings) and to predict objective measures of performance. In addition, Mumford (1983), found when using social comparisons in self assessment, self-report responses were highly correlated with actual performance. Finally, self-report has been found to be most valid when raters are told that the ratings are anonymous and will remain confidential (Mabe and West, 1982) as was done with the questionnaire in this study. Thus it was concluded that the self-report questionnaire would be a valid predictor of actual responses and performance.

The questionnaire also relied on the use of social comparisons. Specifically, subjects used social comparison to rate how "soldiers in your unit" would respond, behave, and perform.

The questionnaire was composed of ten sections (see Appendix B for a complete questionnaire). The following are brief descriptions of each section.

A. Background - Questions asking for biographical and demographic information, such as years in the Army and family status. Demographic data were categorical in nature and scored accordingly.

B. You and Your Unit - Twenty-four questions concerning perceived cohesion, commitment, leadership (Unit Variables), and role in combat, personal well being (Soldier Variables). Soldiers responses were indicated on a scale ranging from a high of "all the time" (7) to a low of "hardly ever" (1) with five unanchored marks in between. Soldiers made a check mark on one of the seven lines and their marks were scored from one to seven, a seven being given to those on the line closest to "all the time." For both Unit and Soldier Variables as well as the items pertaining to responses, behaviors, and performance, soldiers were asked to indicate how fellow soldiers in their unit would behave.

C. Scenario - Each questionnaire contained a printed description of one of six scenarios that were presented via tape recording.

D. Perceptions of the Scenario - Subjects were requested to "please close your eyes and take a minute to create a mental picture of you and your unit in this scenario. Use all your senses to see, hear, smell, and feel what would be going on around you as you hear the scenario again. Then use the space below to write down notes, draw a map or sketch or do whatever you need to do to make the scenario clear to you."

On the next page subjects were instructed as follows:

"....the space provided below, please describe in your own words how you would feel and what you believe would happen to you and the soldiers around you if the scenario you just read about actually occurred. Use whatever words that come to your mind and don't worry about spelling or punctuation but do try to write clearly so that we can read your responses. Please put each of your thoughts on a separate line, and write down as many as you can."

E. Responses - Thirty-five items asking for perceived symptoms of stress including physical, behavioral, emotional, cognitive, and social items. Soldiers' responses indicating perceived symptoms of stress were scored on a scale ranging from "very likely" to "very unlikely" with seven unanchored marks in-between. Soldiers made a check mark on one of the seven lines and their marks were scored from one to seven, a seven usually being given to those on the lines closest to "very likely." However, the anchors corresponding to the scores of 7 and 1 were occasionally reversed. For instance, for the response "be able to handle pressure and stress" a score of 1 was associated with "very likely" while a score of 7 corresponded to "very unlikely." Therefore, while the values of 7 and 1 had different verbal anchors for different items, high scores always reflected a high degree of combat stress and vice versa.

F. Behavior - One item with eight alternatives was used to represent a range of possible behaviors fellow soldiers in your unit would take in the context of the scenario. Magnitude scaling was used to validate the a priori ordinal ranking of both the alternatives on this and the next item - Performance. Further, magnitude scaling provided the values for each of the alternatives.

The scale values for each of the Behavior alternatives are shown in the following Figure 2 (as are those for the Performance Item).

VALUE	ALTERNATIVE OF BEHAVIOR
64.36	Show willingness and readiness to carry on no matter what.
60.60	Show iniative, take action and even assume leadership (if necessary).
59.43	Continue to carry on the task or mission to the best of their capability.
44.50	Show willingness to go on, as long as there is leadership, orders, and unit framework.

Figure 2. Values for the alternatives of the behavior and performance items.

VALUE	ALTERNATIVE OF BEHAVIOR
24.08	Pray for help and/or strength.
18.63	Do all they can to save their own lives regardless of anything else.
8.28	Break down, hide, runs away.
1.67	Give up totally, lose all sense of hope.

VALUE	ALTERNATIVE OF PERFORMANCE
54.10	Their performance will improve.
53.27	Their performance will remain normal, then go up.
44.66	Their performance will not change at all.
44.50	Their performance will first go down, and then get better.
36.66	Their performance will do down just a little bit.
31.25	Their performance will first remain normal, then go down.
16.22	Their performance will down quite alot.
5.73	Their performance will go down to nothing.

Figure 2. Values for the alternatives of the behavior and performance items (continued).

Subjects for the magnitude scaling consisted of 20 Army personnel who were comparable to the subjects in Germany in terms of distribution or rank, time in service, and background.

G. Performance - One item with eight alternatives to describe the most probable performance fellow soldiers in your unit would take in the context of the scenario. Magnitude scaling provided values for performance.

H. General Knowledge - Twenty-five items asking the soldiers about the physical aspects of nuclear blasts and TNW.

The questionnaire was pilot-tested using a sample of ten subjects similar to those used for the magnitude scaling. The questionnaire was administered under conditions very similar to conditions in Germany. The soldier's comments and suggestions regarding wording and phrasing were incorporated into the final draft of the questionnaire.

Given Soldier Types, the scenarios, and the variables measured with the questionnaire, the following Table summarizes all the variables to be analyzed.

Table 2. Study variables.

ASSIGNED VARIABLES	IVs	DVs
Soldier VAR	**Type of Combat**	**Responses**
o Role in Combat	o HIC	o Physical
o Personal well being	o CHEM	o Emotional
o Gen. Knowl.	o TNW	o Cognitive
		o Social
		o Behavioral
Unit VAR	**Distance**	
o Leadership	o Near	
o Commitment	o Far	
o Cohesion		
	Soldier Type	
	o Armor	
	o Infantry	

2.2.3 Procedures.

Twelve experimental sessions were held so that the sample of 359 could be dealt with in manageable sized groups. Each session consisted of one Type of Combat (HIC, CHEM, TNW), one Distance (near, far), and one Soldier Type (armor, infantry). In each session, thirty soldiers from three companies (ten per company) within the each battalion of the brigade were treated.

Subjects were assigned to treatment groups such that Type of Combat (HIC = Red, CHEM = Blue, and TNW = White) and Distance were (Near = 1 and Far = 2) varied across the time of day. The method of assignment controlled for potential interactions between Type of Combat, Distance, and time of day. Order effects were controlled for since independent groups were used.

Three administrations were scheduled per day. On Wednesday, October 19, 1988 and Thursday, October 20, data were gathered from armor personnel. No data were collected on Friday to prevent any potential response biases related to a pre-occupation with plans for the coming weekend. On Monday, October 24 and Tuesday, October 25, data were gathered from infantry personnel. The short time between administrations to the armor and infantry groups was thought to reduce the probability of the two groups talking to one another.

Table 3. Survey administration schedule.

Session	Armor (3/8 Cav)				Infantry (1/48 INF)				TOTAL
	19 Oct 88		20 Oct 88		24 Oct 88		25 Oct 88		
	Scenario Red-1		Scenario Blue-2		Scenario Red-1		Scenario Blue-2		
	Co	#S	Co	#S	Co	#S	Co	#S	
1 0800-1000	A	10	B	10	A	10	A	10	120
	C	10	D	10	B	10	B	10	
	HHC	10	HHC	10	C	10	C	10	
	Scenario White-2		Scenario Blue-1		Scenario White-2		Scenario Blue-1		
	Co	#S	Co	#S	Co	#S	Co	#S	
2 1000-1200	B	10	A	10	A	10	A	10	120
	D	10	C	10	B	10	B	10	
	HHC	10	HHC	10	C	10	C	10	
	Scenario White-1		Scenario Red-2		Scenario White-1		Scenario Red-2		
	Co	#S	Co	#S	Co	#S	Co	#S	
3 1400-1600	A	10	B	10	A	10	A	10	120
	C	10	D	10	B	10	B	10	
	HHC	10	HHC	10	C	10	C	10	
TOTAL		90		90		90		90	360

Each session was standardized by using the same physical setting, test materials, directions, and time limits. Each of the twelve sessions was conducted in the same location on the designated days at 0800, 1000, and 1400 hours. Most of the soldiers showed up on time. No session started later than 30 minutes after the appointed time.

Each session was called to order by the Army's liaison officer. He welcomed the participants, stressed the importance of the study, discussed the logistical details of the session, distributed the materials, instructed the soldiers not to talk to each other, and introduced the study investigators. The same procedures were followed for each session.

Instructions for the administration of the questionnaire were read aloud by the principal investigator from a prepared script. To assure strict compliance with complex instructions, the subjects were "walked through" each section of

the questionnaire. This included reading aloud the instructions for each section of the questionnaire to the soldiers while they read them silently. Also, they were provided examples and their questions were answered. Although the subjects could take as long as they wanted to complete the questionnaire, it was important to complete it in a timely fashion. Therefore, the questionnaire was administered section-by-section, one section at a time, and the next section not begun until all had completed the previous section. The soldiers completed the demographic and biographic information section first, and then the soldier status section. Next, the scenario, which provided the treatment condition, was presented. The subjects were first told that a military situation would be presented which they must keep in mind, since the rest of their responses would relate to it. The tape containing the scenario description was played using a micro-cassette tape recorder and two small detachable speakers. The volume and clarity of the tape was sufficient to allow each soldier to hear the scenarios clearly while they read along.

Upon completion of the their hearing and reading of the scenario, the soldiers were immediately instructed to close their eyes and take a minute to create a mental picture of "you and your unit in this situation." They were told to use all their senses to see, hear, and feel what would be going on around them if they were in the type of battle just described. Then the tape was played again while the soldiers listened with eyes closed. After the replay, they were asked to write some notes and draw a picture or a map depicting the scenario just heard.

The rest of the questionnaire was presented by the principal investigator reading the instructions included at the beginning of each section of the questionnaire. The mean time of the duration required to complete the questionnaire across all twelve sessions was 67 minutes. This time was adequate for all soldiers to respond fully to the questionnaire and yet not so long as to bore them. These observations were borne out by inspection of the questionnaire booklets and debriefings following the last of the 12 sessions with representatives from each of the groups.

SECTION 3

RESULTS

After developing a data base from all subjects' questionnaire, the data of all variables was examined for accuracy and missing entries. Accuracy was determined in two steps. First, the range of values for each variable was examined to determine if any value was outside of the theoretically possible range for each variable. Only five such values were found and they were corrected by substituting the correct values found in the questionnaires. Then, each value of each variable was compared to the original scores on the questionnaires. Corrections were made where necessary. Less than 1% of the data required corrections.

There were a total of 81 missing values which is less than 1% of the data. Group means were used to replace missing data. The missing data were distributed evenly across all twelve groups. Subjects with more than 5% missing data were deleted from the study. Six such subjects were deleted. One group had two deleted subjects and four other groups each had one subject deleted from them.

The variables were examined for skewness and for outliers. Some of the variables' distributions were significantly skewed (alpha .05) but the sample size was large enough to assume that group means were normally distributed. Boxplots were examined to determine if outliers were present and this revealed that only one response variable (BEH-4) had significant outliers (alpha .001). These were made non-outliers by applying a log transformation to all the data of the variable.

The remainder of the results section consists of three parts each one describing the results of the analyses of: the Performance and Behavior items; the 35 Response items; and last, the open-ended question answers.

Appendix C describes the results of a factor analysis of the 35 Responses. The factor analysis is an attempt to determine if the five theoretically derived categories (physical, social, behavioral, emotional and cognitive) of Responses are empirically valid and independent dimensions of responses to combat.

3.1 EFFECTS ON BEHAVIOR AND PERFORMANCE.

An analysis of variance was used to investigate the relationship between Type of Combat and both Behavior and Performance. It was hypothesized that soldiers would report the Behavior and Performance of soldiers in their unit to

be the highest in HIC, lowest in TNW and intermediate in CHEM. A significant effect for Type of Combat was found for Performance, (F (2, 350) = 4.88, p = .01, R^2 = .025) and for Behavior, (F (2, 350) = 9.14, p = .01, R^2 = .045). However, interpretation of this main effect was difficult because of a significant interaction between Type of Combat and Soldier Type for both Performance, (F (2, 350) = 5.28, p < .01) and Behavior (F (2, 350) = 12.29, p < .01). For infantry personnel, there was a significant relationship between Type of Combat and both Performance (F (2, 172) = 7.61, p < .01, R^2 = .08) and Behavior (F (2, 172) = 17.83, p < .01, R^2 = .17). However, for Armor no significant relationship appeared between Type of Combat and Performance (F (2, 175) = .05, R^2 = .00) or Behavior (F (2, 175) = .91, p = .01, R^2 = .01).

For infantry personnel, the hypothesized trend was confirmed (see Figure 3). The mean values for Performance (x = 45.24) and for Behavior (x = 54.96) were the highest under the HIC and lowest (Performance x = 36.77 and Behavior x = 37.95) under the TNW. For the CHEM, Performance (x = 43.03) and Behavior (x = 52.69) fell in between that of HIC and TNW. Moreover, the mean differences between HIC and TNW for infantry were significant for both Performance (t (347) = 2.36, p < .01) and Behavior (t (347) = 4.20, p < .01). In addition, differences between CHEM and TNW also were significant for both Performance (t (347) = 2.40, p < .01) and Behavior (t (347) = 3.60, p < .01). On the other hand, differences between HIC and CHEM for Infantry were not significant for Performance (t (347) = .58, p = .42) or Behavior (t (347) = .51, p = .47).

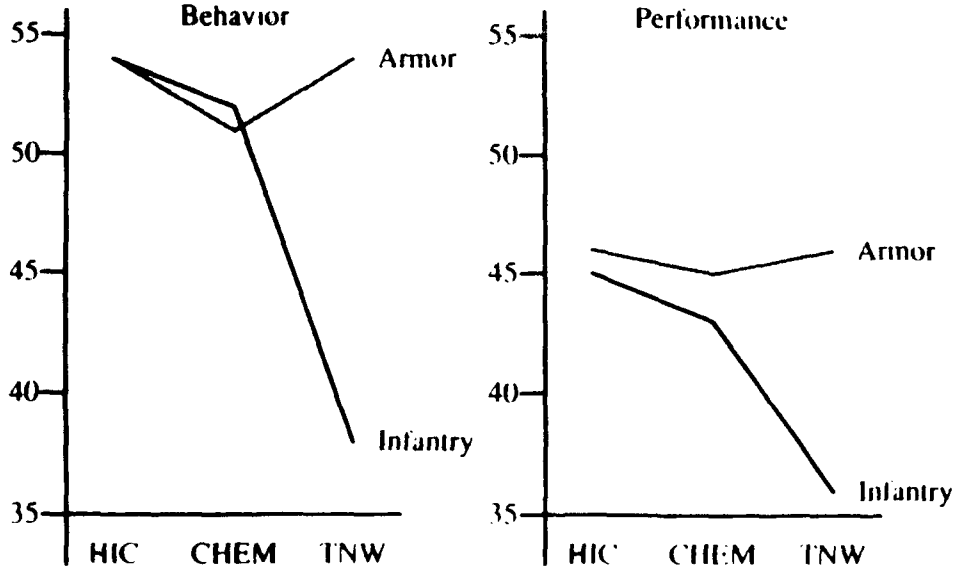


Figure 3. Interaction of soldier type and type of combat.

When comparing Infantry to Armor, analyses revealed significant differences in both Performance (t (347) = 3.29, p < .01) and Behavior (t (347) = 3.97, p < .01), for the TNW groups. For HIC, no such differences between Soldier Type were found for Performance (t (347) = .26, p = .71), or for Behavior (t (347) = .30, p = .67). Nor were differences between Soldier Type found under CHEM for Performance (t (347) = .16, p = .82), or for Behaviors (t (347) = .84, p = .15).

It was hypothesized that Performance and Behavior in TNW would be no worse for soldiers closer to the battlefield. As predicted, there were no significant differences in Performance (F (1, 352) = 2.54, p = .11) or in Behavior (F (1, 352) = 2.04, p = .13). The mean values for Performance were lower (x = 40) when far from the battlefield and higher (x = 51) when nearer the battlefield. The same held true for Behavior = 42) when far (x = 40) and when near (x = 50) the battlefield.

3.1.1 Moderation of Effects by Psychological Responses.

It was hypothesized that Responses would moderate the relationships between Type of Combat and Performance as well as between Type of Combat and Behavior. For Infantry, an analysis of covariance (ANCOVA) revealed that the strength of the relationship between Type of Combat and Performance (F (2, 171) = 7.61, p < .01) was reduced to (F (2, 171) = 3.26, p < .05) when two response variables, unlikely to be able to handle pressure and stress, as well as likely to feel hopeless, were removed. The ANCOVA revealed that these two variables, among all 35 Responses, had the greatest moderating effects on the relationship between Type of Combat and Performance.

Similarly, using ANCOVA, the relationship between Type of Combat and Behavior (F (2, 171) = 17.43, p < .01) also was reduced (F (2, 171) = 11.39, p < .01) when shared variance of the three strongest covariates was removed from the relationship ("likely to experience illusions and hallucinations", "likely to be self seeking - everyone for themselves", and "unlikely to stick to original missions").

3.1.2 Moderation of Effects by Unit and Soldier Variables.

It was hypothesized that the relationship between Performance and Behavior on the one hand and Type of Combat on the other would be moderated by Unit (i.e., Cohesion, Commitment, and Leadership) and Soldier Variables (i.e., role in Combat, Well Being, and Knowledge). It was speculated that high levels of these variables would lessen the effect of Type of Combat. Another ANCOVA was carried

out and neither Soldier nor Unit variables, when covaried from this relationship, reduced the F ratio for either Performance (F (2, 171) = 7.29, $p < .01$) or for Behavior (F (2, 171) = 17.53, $p < .01$). Hence, it appears that neither Soldier nor Unit Variables moderate the relationship Performance and Behavior to Type of Combat.

Some Unit and Soldier Variables accounted for some of the variance of Type of Combat Behavior and Performance (refer to Figure 4). The results of multiple regression analyses found that for Armor, two Unit Variables and one Soldier Variable were significantly (F (2, 177) = 3.64, $p < .02$, R^2 =.06) related to Type of Combat. Similarly, for Infantry, one Unit Variable and two Soldier Variables were significantly (F (2, 174) = 3.57, $p < .02$, R^2 =.06) related to Type of Combat.

It was hypothesized that there would be a positive relationship between Performance and both Unit and Soldier Variables as well as between Behavior and both Unit and Soldier Variables. For some Unit Variables the hypothesis was confirmed. A multiple regression was used to determine which set of Unit and Soldier Variables best predicted both Performance and Behavior. Separate analyses were conducted for both Armor and Infantry. For Armor, two Unit Variables were significantly related to Performance, F (2, 177) = 12.86 $p < .01$, R^2 = .13. For infantry, three Unit Variables were significantly related to Performance, F (2, 174) = 9.38 $p < .01$, R^2 = .10.

Similarly, the Unit Variable of leadership was related to Behavior for Armor, F (2, 177) = 17.15 ($p < .01$, R^2 = .16). For Infantry, only one Unit variable was significantly related to Behavior, F (2, 174) = 9.13 $p < .01$, R^2 = .05.

3.1.3 Summary of Effects on Performance and Behavior.

For Infantry, perceived Performance and Behavior was affected by the Type of Combat. Both Performance and Behavior significantly decreased from HIC to CHEM, down to a low for TNW. Armor personnel demonstrated no such trend for either variable. Both Performance and Behavior were significantly worse for TNW than for either HIC or CHEM. Infantry was lower on both these variables when compared to Armor, but only for TNW. Similar trends were found for Behavior.

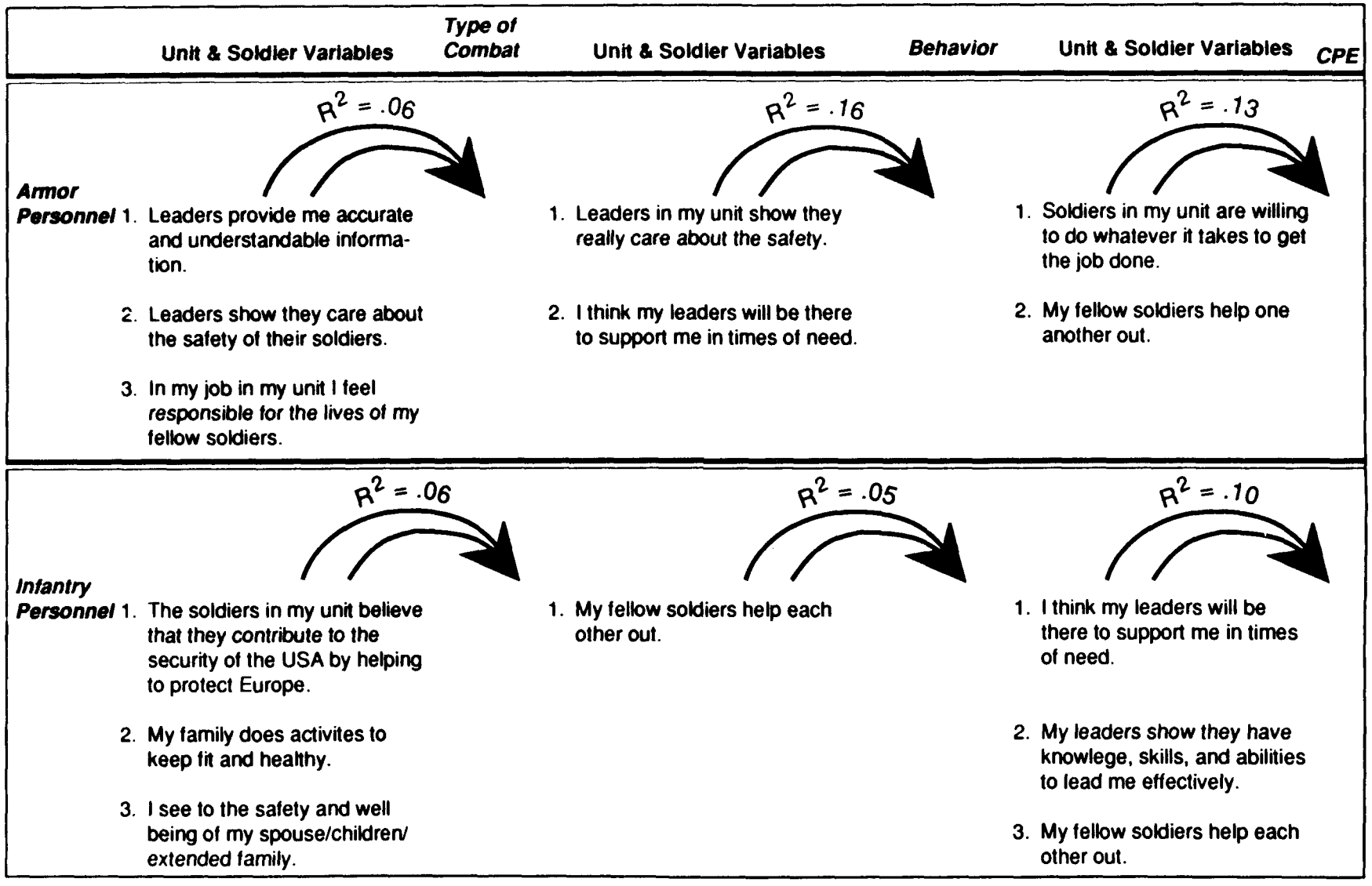


Figure 4. Relationships Between Unit and Soldier Variables and Type of Combat, Behaviors, and CPE.

The effects on Performance and Behavior were moderated by some response variables. However, Unit and Soldier Variables did not moderate the relationship between Type of Combat and Performance or Behavior. On the other hand, significant relationships were found between some Unit and Soldier variables and Type of Combat, Behavior, and Performance.

3.2 EFFECTS ON RESPONSES.

3.2.1 Type of Combat.

A discriminant function analysis was performed to determine which responses predicted TNW when compared to HIC and CHEM pooled together and labeled as non-TNW. The 35 Responses were used as predictors of membership in either the pooled non-TNW or TNW. Results indicated only six responses significantly separate the TNW group from the pooled non-TNW group, F (35, 317) = 2.13 $p < .01$. The proportion of variance in the predictor variables explained by group membership (eta) is 19%. The six responses are:

shiver
feeling helpless
feeling hopeless
unlikely to perform assigned duties
be self seeking, everyone for themselves
feel loss of self-confidence

3.2.2 Quantitative Versus Qualitative Differences in Type of Combat.

Addressing the issue in the literature about TNW being qualitatively or quantitatively different from HIC and CHEM, it was hypothesized that there would be a qualitative difference in responses to TNW when compared to HIC and CHEM. Sessions defined a qualitative difference as one in which soldiers would exhibit behaviors that they would not exhibit in other forms of combat. On the other hand, he defined a quantitative difference as one in which soldiers would exhibit the same behaviors, but the degree to which the behaviors were exhibited would differ.

One approach used to address this issue was to determine the number of discriminant functions underlying the discriminating Responses. A multiple discriminant function analysis was used to do that. All 35 Responses were used as predictors of group membership using all three groups (TNW, HIC, and CHEM).

Only one significant discriminant function (composite) was found F (70, 632) = 1.6 $p < .01$. The function correlated .50 with the group variables (Type of Combat). The function maximally separated the TNW group from both the HIC and CHEM groups ($p < .01$). Separation of the TNW group from the others was great (see Figure 5). The HIC and the CHEM groups were not significantly different from each other ($p = .41$). The proportion of variance in the predictor variables explained by group membership (eta) was 19%.

Figure 5. Discriminate function in terms of type of combat.

Interpretation of the Canonical Discriminant Function

Since a single statistical method of choosing variables to interpret a discriminant function has limitations, three methods were employed to interpret the discriminant function. The methods include examining univariate F-values, canonical correlations (loadings), and partial F-values as derived through a stepwise analysis. A complete matrix of candidate response variables based upon these values was examined to derive the best set of variables to describe the discriminant function (see Table 4). If the univariate F-value, the response variable loading, and the partial F-value were all significant, the variable was used to interpret the discriminant function.

Six Responses were consistently significant under most criteria. The emotional Responses included; "feeling helpless", "depressed", and "anger & rage". The Response - "shiver" - was the most important variable in separating the TNW group from the other two. A cognitive type of Response predictor was "unlikely to know exactly what to do". Obviously, this response profile is representative of what would be exhibited by an individual experiencing extreme battlefield stress.

Optimal Set of Response Variables

Another discriminant function analysis was performed using the set of six optimal predictor Responses. The discriminant function's F-value improved from F (70, 632) = 1.60, $p < .01$ to F (14, 688) = 3.76, $p < .01$. The canonical correlation for the function based on only the eight variables was .33 compared

Table 4. Discriminant function loading of response variables based on maximizing HIC, CHEM and TNW differences.

Variable	Univariate F Value	Total Canonical Structure Loadings	Partial F-Value
"Unlikely to know what to to do"	5.94 (3)	.33 (5)	3.36 (5)
"Feel Helpless"	5.26 (4)	.36 (4)	3.51 (4)
"Shiver"	8.27 (1)	.47 (1)	8.27 (1)
"Unlikely to perform assigned duties"	2.43 (6)	.12 (6)	5.16 (2)
"Feel depressed"	6.70 (2)	.41 (3)	2.99 (6)
"Feel Anger and Rage"	3.17 (5)	.47 (1)	3.65 (3)

to the original .44 using 35 predictors. The proportion of variance in the six predictor variables explained by group membership (eta) is 11% compared to 19% using all 35 responses. Hence, the six predictor variables represent an optimal set to maximize the variance between the TNW group and both the HIC and the CHEM groups.

Plots

Plots of standardized class means were made in order to visually inspect the relationship between the six response variables whose univariate F-values, loadings and Partial F-value both were significant (see Table 4). Visual inspection supports the statistical analysis that - shiver - separates the TNW group from the CHEM group more than does any other variable.

Soldiers in the HIC responded in a little less extreme manner than soldiers in the CHEM group. However, TNW group responded in a much more extreme manner than the HIC or the CHEM group. This same response pattern holds true for "feeling helpless", "very unlikely to perform assigned duties", and "feeling depressed".

For the response variable "feeling rage and anger", a different pattern emerged in which the HIC group felt this response the least, those in the TNW group the most.

Finally, for soldiers who indicated that the men in their unit would be "very unlikely to know what to do even after a good briefing", another response pattern was exhibited. Soldiers in the TNW and CHEM groups were more extreme in this Response than the HIC group. Further, soldiers' responses indicate that they would know what to do more often in the TNW than in the CHEM group.

In summary, six responses comprise one discriminant function which is related to group membership. Differences between HIC, CHEM and TNW group were maximized on this single discriminant function. The TNW group was characterized by more extreme Responses on this continuum than either HIC or the CHEM groups. Further, when the TNW group was compared to the non-TNW group, a similar discriminant function maximally separated these two groups. Hence, the majority of the between group variance is attributed to the TNW group.

The results of the discriminant analysis indicate that the six responses are much more likely in TNW than HIC or CHEM. One could argue that such results seem to favor the qualitative side of the quantitative verses qualitative argument about TNW. However, other approaches to answering the question might yield different results.

Discriminant Function with Three Groups	Discriminant Function with Two Groups
HIC, chemical, tactical nuclear	Tactical, Non-tactical
1. shiver	1. shiver
2. feeling helpless	2. feeling helpless
3. feel depressed	3. feel hopeless
4. feel rage and anger	4. unlikely to perform assigned duties
5. unlikely to perform assigned duties	5. be self-seeking, everyone for themselves
6. unlikely to know what to do even after a good briefing	6. loss of self-confidence for themselves

3.2.3 Type of Combat X Soldier Type.

It was hypothesized that Armor personnel will feel more protected than Infantry personnel and hence perceive that their expected performance and

behavior would be more positive. To test this hypothesis, a factorial discriminant function analysis was performed using the 35 Response variables as predictors of membership in the six scenario groups (HIC, CHEM, TNW by Soldier Type). Two significant discriminant functions were found. The first, F (175, 1577) = 1.53 < .01, was correlated .50 with the six scenario groups. The proportion of variance in the groups accounted for by the discriminant function (eta) was 26%. The function maximally separates the TNW Infantry personnel from the other groups. Infantry's Responses to the TNW were significantly different ($p < .01$) than their Responses under either the CHEM or the HIC scenarios. Armor personnel did not respond in a significantly different manner under the TNW when compared to CHEM ($p = .35$) or to HIC ($p = .14$). In fact, Infantry responses were more extreme than Armor responses in the TNW condition ($p < 01$). There were no significant differences between Soldier Type under the CHEM scenario ($p = .32$).

Interpreting the Canonical Discriminant Function

Again, three methods were used to determine those response variables which best characterize the first discriminant function which separates TNW Infantry from the remaining five groups. Significant univariate F-values, canonical strucature loadings, and partial F-values (see Table 5) resulted in the selection of eight variables.

These Response variables characterize the first discriminant function. Of these, feeling hopeless most distinguishes infantry in the tactical nuclear scenario from all other groups.

Optimal Set of Response Variables

Using the set of eight optimal response variables, another discriminant function was derived. The discriminant function's F-value improved from F (175, 1577) = 1.53 to F (40, 1484) = 3.10 $p < .01$. The canonical correlation for this function using only these seven Response variables was .44 compared to the original .51 using 35 predictor variables. The proportion of variance in these eight predictor variables explained by group membership (eta) is 20% compared with an eta of 26% using all 35 predictor response variables. Hence, these eight predictor Response variables represent an optimal set of responses to maximize the variance between the infantry soldier in a tactical nuclear battlefield from all the other five groups.

Table 5. Discriminant function loading of response variables based on maximizing soldier type differences by type of combat.

Variable	Univariate F Value	Total Canonical Structure Loadings	Partial F Value
Unlikely to know what to to do	4.17 (7)	.36 (6)	1.94 (7)
Feel Helpless	5.23 (5)	.51 (4)	1.79 (8)
Be out of breath	3.68 (8)	.36 (6)	3.01 (4)
Shiver	6.47 (3)	.52 (3)	2.61 (5)
Feel hopeless	9.53 (1)	.66 (1)	9.53 (1)
Unlikely to perform assigned duties	9.48 (2)	.64 (2)	4.62 (2)
Feel depressed	6.01 (4)	.50 (5)	3.74 (3)
Unlikely to stick to original missions	4.29 (6)	.35 (8)	2.04 (6)

Plots

The eight Response variables selected to characterize the first discriminant function were plotted using total-sample class means according to Type of Combat and Soldier Type. Visual inspection (see Figure 6) supports the statistical analysis that feeling hopeless most distinguishes the tactical nuclear scenario for infantry from the other groups. Infantry personnel exhibited more extreme behavioral responses in the tactical nuclear battlefield scenario.

Under the TNW scenario, Infantry were unlikely to follow assigned duties, and unlikely to stick to the original mission when compared to armor personnel. Less extreme differences between Infantry and Armor were observed under HIC and CHEM scenarios. A similar pattern under the tactical nuclear scenario was observed for emotional responses in that infantry personnel felt more helpless, hopeless, and depressed than did armor personnel. Physical Responses, out of breath and shivering, also were more extreme for infantry when compared to Armor

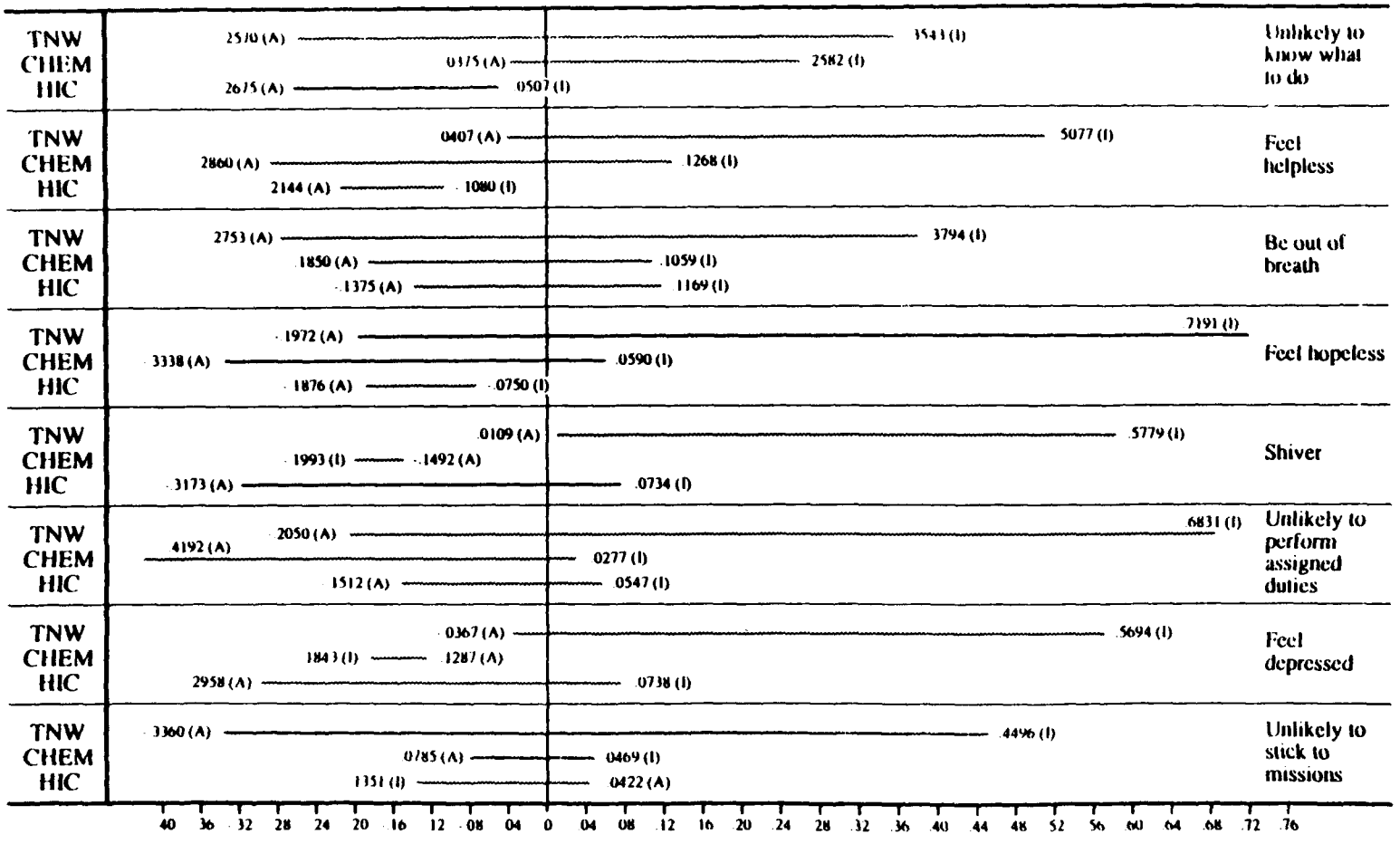


Figure 6. First discriminant function effects of type of combat and soldier type on responses.

under the same TNW scenario. Finally, Infantry were more unlikely to know what to do even after a good briefing in both the TNW and the CHEM scenarios.

A second discriminant function was found with a canonical correlation of .40 and an eta of 15%. This function maximally separated Infantry from Armor under the HIC scenario ($p < .05$).

The three response variables selected (see Table 6) to characterize the second discriminant function were also plotted using total-sample class means. Visual inspection (see Figure 7) supports the statistical analysis that unlikely to trust officers most distinguishes the HIC scenario for both Armor and Infantry.

Table 6. Second discriminant function effects of type of combat and soldier type on responses.

Variable	Univariate F Value	Total Canonical Structure Loadings	Partial F-Value
Cry over dead buddies	2.67 (3)	.44 (1)	3.75 (1)
Be irriatable and touchy	3.90 (2)	.42 (3)	.58 (2)
Unlikely to trust our officers	4.14 (1)	.43 (2)	.52 (3)

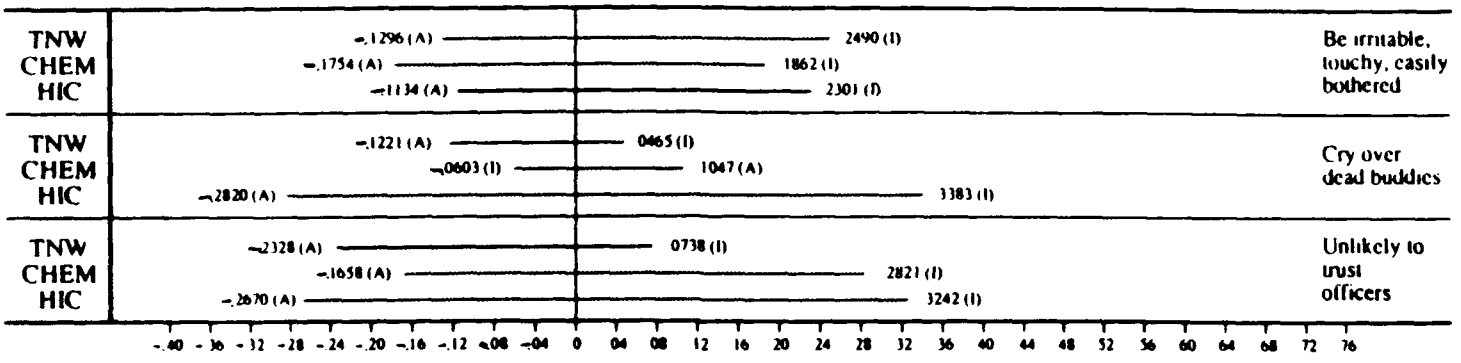


Figure 7. Second discriminant function effects of soldier type and type of combat on responses.

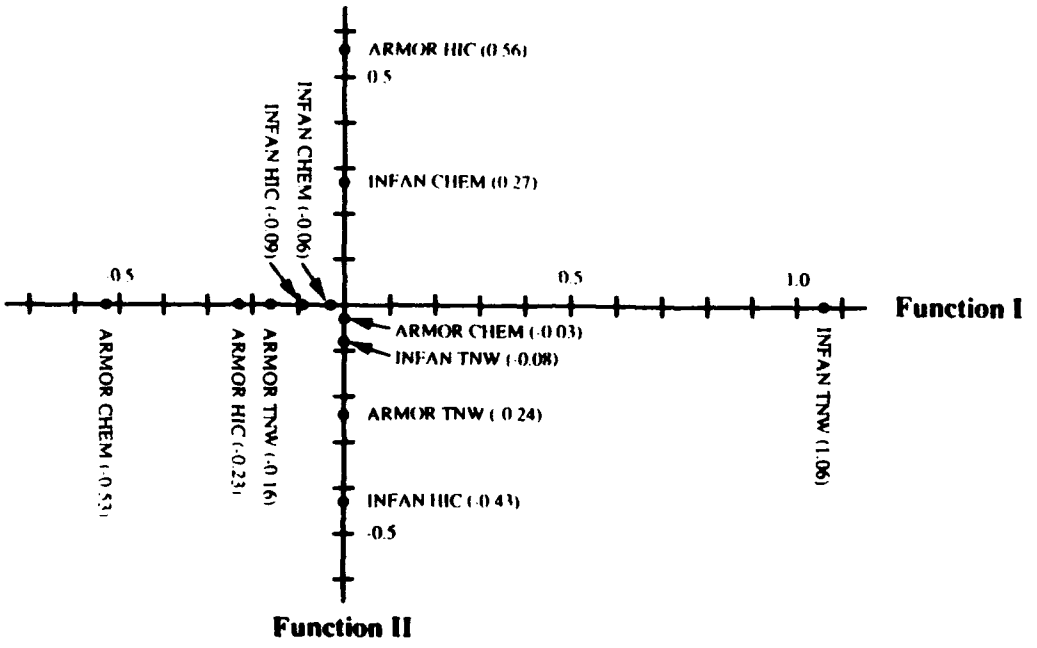


Figure 8. Discriminant function analysis in terms of soldier type and type of combat.

Under the HIC scenario, Infantry were likely to be irritable, touchy, and easily bothered and cry over dead buddies. Further, Infantry were unlikely to trust officers (see Figure 8).

In performing the discriminant function analyses, the relationship between Responses and Type of Combat was determined. It was found that some Response variables were able to account for some of the variance in Type of War. It was also hypothesized that there would be a positive relationship between Responses and both Performance and Behavior. For some responses the hypothesis was confirmed. A stepwise multiple regression was used to determine which set Responses best predicted both Performance and Behavior. Separate analyses were conducted for both Armor and Infantry. For Armor, three responses were significantly related to Performance, F (3, 177) = 12.86 ($p < .01$, $R^2 = .13$). For Infantry, four responses were significantly related to Performance, F (4, 174) = 9.38, $p < .01$, $R^2 = .10$.

Similarly, five Responses were significantly related to Behavior for Armor F (5, 177) = 17.15 ($p < .01$, $R^2 = .16$). For Infantry, three responses were significantly related to Behavior, F (2, 174) = 9.13, $p < .01$, $R^2 = .05$.

SECTION 4

DISCUSSION

4.1 SUMMARY OF RESULTS OF SOLDIER-BASED APPROACH.

The most recurring and prominent result of the analyses was the finding of an interaction effect between Type of Combat and Soldier Type. Individual comparisons showed that most of this effect was due to the relatively extreme scores of the Infantry responding to the TNW scenario. The relatively extreme nature of their scores was evident in the data on Behavior, Performance, seven of the Responses, and in some of the analyses of the open-ended question.

Another surprising finding regarding Performance and Behavior is that Distance had no significant effect on those scores. Similarly, even though a moderate relationship was found between some of the Unit and Soldier Variables on the one hand, and Behavior and Performance on the other, the Unit and Soldier Variables (including Cohesion, Morale and Knowledge) did not moderate the effect of Type of War. This was the case for both Infantry and Armor.

The group of eight Responses that the TNW Infantry indicated they were much more likely to exhibit, were in general, those reflecting a combination of hopelessness and helplessness in addition to poor performance. Soldiers' indications on three other Responses were discriminators among groups. The three Responses were related to trust, irritability and grieving. However, the data for the three Responses comprised a second function that maximally separated Infantry from Armor for the HIC condition.

Answers to the open-ended question did not have a great deal of commonality. Only five of the categories used in the content analyses of the answers applied to the answers of more than 30 percent of the subjects. Moreover, the categories were developed from the content of the answers. Analyses of the five categories indicated that there were differences between groups for three types of categories: motivation; mission accomplishment; and performance of procedures. Generally, the TNW Infantry group indicated more negative responses.

4.2 SUMMARY OF EXPERT-PANEL-BASED APPROACH.

As mentioned in the Introduction to this report, two approaches were used to collect data for the Study. One of them was termed the expert-panel-based approach. That approach relied upon estimates of BFC and wounded-in-action (WIA) made by nine experts in response to scenarios involving TNW and HIC. The experts

were active and retired Army officers, ranging from Colonel to General, all of whom had combat experience. The DELPHI technique was used to decrease the range of the experts' estimates.

The experts gave estimates for ten scenarios, all of which involved a mechanized Division of 17,000 men. Some of the scenarios had the Division being warned about the nuclear detonations, others did not. Estimates were made for four concentric zones surrounding a ten kiloton blast. Also, estimates were made for units whose level of cohesion was described as either high, medium or low.

Since the resulting data were based on the estimates of only nine subjects, only medians were calculated and no significance tests were done. Nevertheless, it appeared that the experts believed that distance from the blast would make a significant difference. Their estimates showed decreasing BFC from one zone to the next further zone. For both "warned" and "unwarned" troops, the medians for zone 3 are approximately three times greater than for zone 2, and almost four times greater for zone 3. Zones included the following distances from ground zero:

1	< 1,000 m
2	1,000 - 1,500 m
3	1,500 - 2,530 m
4	2,530 - 15,000 m.

The medians also appear to indicate that the subjects believed cohesion would have a significant effect on BFC. For example, the low cohesion units were estimated to have approximately three times the BFC as the high cohesion units for all zones and for both the "warned" and the "unwarned" troops.

The experts estimated that "warned" troops would have many fewer BFC than would "unwarned" troops. Also, they believed that HIC would produce many more BFC if it followed TNW rather than preceded TNW.

In addition, the percentage of BFC that will result from a TNW was estimated to be five percent of the combat ready troops (those not killed or wounded from the blast). This is a small percentage because most of the troops in zones 1 and 2 will not be combat ready. Thus the BFC will come almost exclusively from zones 3 and 4 which are far enough away from the blast that the experts believed few of the combat ready soldiers would become BFC.

4.3 DISCUSSION.

The most prominent and strongly supported finding of the study is the interaction effect between TNW and Type of Combat which was evidenced in four different forms of data: the Performance, Behavior, Responses and open-ended data. Thus, this effect appears to be reliable and not limited to a single type of behavior or response.

The effect also appears to be a very strong one. As an indication of how extreme the differences were between the TNW Infantry and others, such as the TNW Armor, consider the verbal anchors associated with the means for the groups. The TNW Infantry had a mean Performance value of 36.77 which is close to the value for the alternative stating "their performance will go down just a little bit" (see Figure 2 in the METHOD section).

On the other hand, the mean value for TNW Armor was 45.91 which is close to the value for the alternative stating "their performance will improve." Similar differences exist between the groups in their Behavior scores.

The interaction effect was primarily the result of the responses of the TNW Infantry's scores. While all of the scenarios had both types of soldiers riding in enclosed vehicles, the tank is a much heavier, more sturdy and more heavily armored vehicle. The tank will be much more effective in retarding the transmission of radiation to those inside than would the Bradley. It is possible the troops are aware of these differences and that their knowledge of those facts influenced their perceptions.

However, the distances of all the scenarios of the soldier-based-approach were so great that there would be no immediate transmission of radiation. Thus the tank's greater ability to retard the transmission of radiation would not be a physical advantage for the armor troops. Nevertheless, it is possible that the Infantry generalized their perceived greater vulnerability at very close distances to distances at which their lesser armor protection makes no physical difference.

The soldier-based-approach did not support the contention that distance from the blast would have a significant effect on Responses, Behavior or Performance. On the other hand, the experts estimated that there would be significantly higher BFC in closer zones. However, the two approaches used very different distances. The expert-panel-based approach had the first two zones within 1,500 m of the blast, the third in the next 1,000 m and the fourth from 2,530 to 15,000 m. These did not overlap much with the near distance of the

soldier-based-approach which was from 5,000 to 15,000 m. Moreover, the far distance of the soldier-based approach was from 30,000 to 50,000 m. Thus, the two approaches used very different distances and both of the distances of the soldier-based-approach were so great that the troops may not have perceived them as significantly different.

In addition, the experts knew that the physical differences between both zones one and two versus those of three and four would be significant. It is possible such differences encouraged them to estimate that there would be differences in BFC rates.

There was another apparent incongruity between the results of the two approaches. The experts estimated that the level of Cohesion of the troops would make a difference in the BFC of the unit. However, Cohesion did not decrease the effect of Type of Combat on Performance or Behavior. Thus it may appear these two sets of results are contradictory. Moreover, the results of the soldier-based-approach appear to contradict those of many other studies (e.g., Marlowe, 1983) which have shown Cohesion to be related to unit performance and BFC.

However, the data of the soldier-based-approach indicate that there was a significant correlation between Cohesion and both Performance and Behavior. Nevertheless, that relationship did not involve enough shared variance to be able to reduce the effect of Type of Combat on either Performance or Behavior when the shared variance was controlled for with ANOCOVA.

The qualitative versus quantitative issue, described in the Introduction Section, is one that has been discussed in several of the major papers on the psychological effects of TNW. The issue is whether troops in a TNW will exhibit more extreme versions of the same behaviors troops will exhibit in HIC; or whether troops in a TNW will exhibit behaviors not exhibited in HIC (Sessions, 1987).

Two portions of questionnaire administered to the troops allowed them to indicate the likelihood of their comrades exhibiting certain behaviors: the section asking for estimates of the likelihood of the troops exhibiting 35 Responses; and the open-ended question. The results of analyzing the answers to the open-ended question do not help resolve the issue. That is because there were only five themes in the answers of the troops, that were themes included by at least 30 percent of the troops. Of the five themes, one is not a behavior (death), and three are common behaviors that will be exhibited in all forms of combat (e.g., following orders). The fifth theme was fear, which was mentioned

equally by those in the TNW and HIC scenarios. Thus the results of the analysis of the open-ended question hardly demonstrates anything conclusive.

Of the 35 Responses, troops' indications on eight of them allowed for significant discriminations between the TNW Infantry and all other groups. In fact, for all eight Responses, the standardized means for the TNW Infantry were vastly different from all the rest. The troops were indicating that those eight Responses are much more likely to be exhibited by Infantry in TNW, compared to those in HIC and even Armor Troops in TNW. Indeed, the means for the HIC group for all eight. Responses are much more near the "Unlikely" end of each scale than are the Responses for the TNW group. In general the means for the TNW Infantry group are four to six times as large as those of the HIC groups. Thus, in terms of Sessions (1987) definition of a qualitative difference, one could argue that the troops expect the Responses of their Infantry comrades in a TNW to be qualitatively different from those in an HIC. However, it would not be as prudent to argue for a qualitative difference for Armor Troops.

4.4 RECOMMENDATIONS.

The finding that cohesion will make a difference in the number of BFC a unit experiences certainly argues for maintaining a high level of cohesion. Of course, this has been believed for some time and incorporated into unit practices in a variety of both formal and informal ways. The results of this study argue for the continuation of any practices that promote high unit cohesion.

Another finding of the study was that being warned of an impending nuclear attack will reduce the number of BFC a unit will experience. The Army may want to utilize such findings by two approaches. One could be a greater emphasis on determining if a nuclear blast is imminent. This study is showing that expending more effort in making such a determination may pay off handsomely. In addition, it is possible that more effort invested in disseminating a warning may prove useful. Inevitably, some percentage of all units usually never receive such a warning in a timely fashion. Thus, greater effort in making sure all are warned could prove an effective safeguard.

The major finding of the study also seems to have some instructive value. It was noted that the interaction effect between Type of Combat and Soldier Type was mostly the result of the TNW Infantry scores. Also, it was noted that Distance had no effect on those troops' scores. Thus, it may be that those troops generalize the perception of greater vulnerability (compared to the Armor troops) to distances at which they are indeed not more vulnerable.

One remedy to this could be an increase in the factual training given to infantry troops about the physical effects of a nuclear blast. They should be made to realize that at distances of 5,000 m and greater, they will receive no immediate radiation that should influence their reactions to TNW. On the other hand, it is possible that the TNW Infantry had more extreme scores because they anticipate that they will eventually not only move to a distance very close to ground zero (i.e., much closer than the 5 km of the close Distance), but also have to leave their Bradleys and engage in dismounted combat.

SECTION 5

BIBLIOGRAPHY

Adams, W.C., Smith, D.J., Salzman, A., Crossen, R., Heiber, S., Naccarato, T., Vantine, W., & Weisbroth, N. (1986). Before and after "The Day After": The unexpected results of a televised drama. Political Communication and Persuasion, 3, 1-36.

Allen, B.P. (1985). After the missiles: Sociopsychogical effects of nuclear war. American Psychologist, 40, 927-937.

Anno, G.H., Brode, H.L., & Washton-Brown, R. (1982). Initial human response to nuclear radiation (Contract DNA001-81-C-0067). Los Angeles, CA: Pacific Sierra Research Corporation.

Appel, J.W. (1973). Preventive psychiatry. In W.S. Mullins and A.J. Glass (Eds.), Neuropsychiatry in World War II Vol. I, Zone of the Interior. Washington, DC: Office of the Surgeon General, Department of the Army.

Appel, J.W., & Beebe, G.W. (1946). Preventive psychiatry. The Journal of the American Medical Association, 131(18), 1469-1475.

Baker, S.L. (1975). Military psychiatry. In: A.M. Freedman, H.I. Kaplan, & B.J. Sadock (Eds.), Comprehensive textbook of psychiatry-II (pp. 2355- 2367). Baltimore: Williams & Wilkins.

Barber, H., & Kaplan, I. (1979). Battalion command and group performance in simulated combat (Technical Paper 353). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences.

Barnet, R.J. (1982). Fantasy, reality, and the arms race: Dilemmas of national security and human survival. American Journal of Orthopsychiatry, 52, 582-589.

Bartemeier, L.A., Kubie, L.S., Menninger, K.A., Romano, J., & Whitehorn, J.C. (1946). Combat exhaustion. Journal of Nervous and Mental Disease, 104.

Beebe, G.W., & Appel, J.W. (1958). Variation in psychological tolerance to ground combat in World War II (Final Report, Contract DA-49-007-MD-172). Washington, DC: Department of the Army.

Beebe, G.W., & Debaky, M.E. (1952). Battle casualties. Springfield IL: Thomas.Belenky, G.L., Tyner, C.F., & Sodetz, F.J. (1983). Israeli battle shock casualties 1973 and 1982 (WRAIR Report NP 83-4). Washington, DC: Walter Reed Army Institute of Research.

Blight, J.G. (1987). Towards a policy-relevant psychology of avoiding nuclear war. American Psychologist, 42, 12-29.

Bordes, P., et al. (1953, February). DESERT ROCK I: A psychological study of troop reactions to an Atomic explosion (Technical Report 1). Washington, DC: Motivation, Morale, and Leadership Division, Human Resources Research Office.

Bourne, P.G. (1970). Men, stress and Vietnam. Boston: Little Brown and Comp.

Brill, N.Q., & Beebe, G.W. (1955). A follow-up study of war neuroses. Washington, DC: U.S. Government Printing Office.

Carroll, J.S. (1978). The effects of imagining an event on expectations for the event: An interpretation on terms of the availability heuristic. Journal of Experimental Social Psychology, 14, 88-96.

Chavez, E.L., Hamilton, S.B., & Keilin, W.G. (1986). "The Day After": A preliminary report on its effects on children [Comment]. American Psychoqist, 41, 722-723.

Cimbala, S.J. (1985). Forever mad: Essence and attributes. Armed Forces and Society, 12, 95-107.

Conroy, J., Fineberg, M.L., Archer, M.A., & Potter, P.G. (1985). Potential predictors of battalion task force performance effectiveness at the national training center. McLean, VA: Science Applications International Corporation.

Courtney, D., et al. (1952, July). Adjustment of troops of atomic explosives (Technical Report, Series 1952, Institute Report No. 7). Institute for Research in Human Relations, prepared for Office of Naval Research, U.S. Navy.

Curran, P.M., & Wherry, R.J. (1975). Measure of susceptibility to psychological stress. Aerospace Medicine, 36, 929-933.

DeRivera, J. (1982). Afterword: The tension between "value free" and "value laden" teaching in addressing the issues of nuclear war. In Proceedings of the Symposium on the Role of the Academy in Addressing the Issues of Nuclear War (pp. 129-132). Geneva, NY: Hobart and William Smith Colleges.

Douglas, J.D. Jr. (1976). The Soviet nuclear offensive. Washington, DC: U.S. Government Printing Office.

Drum, B.H., Gal, R., Levin, S.G., Fineberg, M.L. (1987). Psychological Response Study Annual Report. McLean, VA: Science Applications International Corporation

Dupuy, T.N. Hammerman, G.M., Smith, C.R., & Bader, B. (1984). Human impact of technological innovations on the battlefield (Tech. Report No. H3433). U.S. Army Medical Research and Development Command.

East Anglia Regional Health Authority. (1981, April 24). War Plan, quoted in New Statesman.

Escalona, S.K. (1982). Growing up with the threat of nuclear war: Some indirect effects on personality development. American Journal of Orthopsychiatry, 52, 600-607.

Feldman, S., & Sigelman, L. (1985). The political impact of primetime television: "The Day After". Journal of Politics, 47, 556-578.

Feshbach, S. (Section Ed.) (1986). Changing war-related attitudes. In R.K. White (Ed.), Psychology and the prevention of nuclear war (pp. 511-532). New York: New York University Press.

Fischer, G.W. (1983). Conceptual models, judgments, and the treatment of uncertainty in nuclear threat assessment. Journal of Social Issues, 39, 87-116.

Fiske, S.T. (1987). People's reactions to nuclear war: Implications for psychologists. American Psychologist, 42, 207-217.

Fiske, S.T., Pratto, F., & Pavelchak, M.A. (1983). Citizens' images of nuclear war: Contents and consequences. Journal of Social Issues, 39, 41-65.

Frank, J.D. (1982). Prenuclear-age leaders and the nuclear arms race. American Journal of Orthopsychiatry, 52, 630-637.

Frankl, V.E. (1963). Man's search for meaning. New York: Washington Square Press.

Fritz, C.E. (1961). Disaster. In R. Merton & R. Nisbet (Eds.), Contemporary social problems. New York: Harcourt.

Fritz, C.E., & Marks, E.S. (1954). The NORC studies of human behavior in disaster. Journal of Social Issues, 10, 26-41.

Gal, R. (1986). A portrait of the Israeli soldier. Westport, CT: Greenwood Press.

Gal, R. (1987). Yesterday's conventional warfare - tomorrow's nuclear warfare? Lessons from the Israeli experience. In R.H. Young & B.H. Drum (Eds.), Proceedings of the Defense Nuclear Agency Symposium/Workshop on the Psychological Effects of Tactical Nuclear Warfare. McLean, VA: Sciences Applications International Corporation.

Gal, R., & Jones, F.D. (1985). Psychological aspects of combat stress: A model derived from Israeli and other combat experiences.

Glass, A.J. (1949). An attempt to predict probable combat effectiveness by brief psychiatric examination. The American Journal of Psychiatry, 81- 90.

Glass, A.J. (1951). Combat Exhausiton. U.S. Armed Forces Medical Journal, 2, 1471-1478.

Glass, A.J. (1953). Psychiatry in the Korean campaign - A historical review. U.S. Armed Forces Medical Journal, 4(10), 1387-1401.

Glass, A.J. (1953). Psychiatry in the Korean campaign - A historical review. U.S. Armed Forces Medical Journal, 4(11), 1563-1583.

Glass, A.J. (1956). Psychological considerations in atomic warfare. U.S. Armed Forces Medical Journal, 7(5), 625-639.

Glass, A.J. (1957, April). Observations on the epidemiology of mental illness in troops during warfare. Paper presented at the Symposium on Preventive and Social Psychiatry, Walter Reed Army Institute of Research.

Glass, A.J. (1966). Lessons learned. In A.J. Glass (Ed.), Neuropsychiatry in World War II, Vol. I: Zones of interior (pp. 735-759). Washington, DC: Office of Surgeon General.

Glass, A.J. (1973). Lessons learned. In A.J. Glass (Ed.), Neuropsychiatry in World War II, Vol. II: Overseas Theaters. Washington, DC: U.S. Government Printing Office.

Glasstone, S., & Dolan, P.J. (Eds). (1977). The effects of nuclear weapons (3rd Ed.). Washington, DC: U.S. Department of Defense & U.S. Department of Energy.

Goldman, D.S., & Greenberg, W.M. (1982). Preparing for nuclear war: The psychological effects. American Journal of Orthopsychiatry, 52, 580-581.

Goodacre, D.M. (1951). The use of a sociometric test as a predictor of combat unit effectiveness. Sociometry, 14, 148-152.

Goodacre, D.M. (1953). Group characteristics of good and poor performing combat units. Sociometry, 16, 168-179.

Goodman, L.A., Mack, J.E., Beardslee, W.R., & Snow, R.M. (1983). The threat of nuclear war and the nuclear arms race: Adolescent experience and perceptions. Political Psychology, 4, 501-530.

Greene, T.L. (1987). Description of a nuclear battlefield. In R.H. Young & B.H. Drum (Eds.), Proceedings of the Defense Nuclear Agency Symposium/Workshop on the Psychological Effects of Tactical Nuclear Warfare. McLean, VA: Science Applications International Corporation.

Grinker, R.R., & Spiegel, J.P. (1945). Men under stress. New York: McGraw-Hill.

Hallam, F.T. (1953). War neuroses. In W.S. Mullins and A.J. Glass (Eds.), Neuropsychiatry in World War II, Vol. II, Overseas Theatres. Washington, DC: Office of the Surgeon General, Department of the Army.

Hammerman, G. (1987). The psychological impact of chemical weapons on combat troops in World War I. In R.H. Young & B.H. Drum (Eds.), Proceedings of the Defense Nuclear Agency Symposium/Workshop on the Psychological Effects of Tactical Nuclear Warfare. McLean, VA: Science Applications International Corporation.

Hamilton, D.L. (1981) Cognitive processes in stereotyping and intergroup behavior. Hillsdale, N.J.: Erlbaum.

Hamilton, S.B., Chavez, E.L., Keilin, W.G. (1986). Thoughts of Armageddon: The relationships between nuclear threat attitudes and cognitive/emotional responses. International Journal of Mental Health, 15, 189-207.

Hamilton, S.B., Keilin, W.G., & Knox, T.A. (1987/88). Thinking about the unthinkable: The relationship between death anxiety and cognitive/emotional response to the threat of nuclear war. Omega, 18, 53-61.

Hamilton, S.B., Knox, T.A., & Keilin, W.G. (1986). The nuclear family: Correspondence in cognitive and affective reactions to the threat of nuclear war among older adolescents and their parents. Journal of Youth and Adolescence, 15, 133-145.

Hansrath, A.H., Billingsley, S.G., Davis, S.W., Griggs, H.P., & Trefetben, E.N. (1952). Troop performane on training maneuver involving the use of atomic weapons. (Technical Memorandum ORO-T-170). Chevy Chase, MD: Operation Research Office, The John Hopkins University.

Home Office. (1976a). Energy supplies in war. Circular ES5/76, Unpublished. Cited in: Churcher, J., & Leiven, E.V.M. (1983). Images of nuclear war and the public in British Civil Defense planning documents. Journal of Social Issues, 39, 117-132.

Home Office. (1976b). Water services in war. Circular ES6/76, Unpublished. Cited in: Churcher, J., & Leiven, E.V.M. (1983). Images of nuclear war and the public in British Civil Defense planning documents. Journal of Social Issues, 39, 117-132.

Human Resources Research Office. (1953). Desert Rock IV: Reactions of an armored infantry battalion to an atomic attack maneuver (Tech. Report 2). Alexandria, VA.

Janis, I.L. (1951). Air war and emotional stress. New York: McGraw-Hill.

Kahn, H. (1984). Thinking about the unthinkable in the 1980s. New York: Simon and Schuster.

Kellet, A. (1982). Combat motivation: The behavior of soldiers in battle. Boston: Kluwer-Nijhoff Publishing.

Kiesler, C.A., Nisbett, R.E., & Zanna, M.P. (1969). On inferring one's beliefs from one's behavior. Journal of Personality and Social Psychology, 11, 321-327.

King, J.C. (1985, August). The impact of "The Day After" on anti-nuclear war behavior. Paper presented at the 93rd annual meeting of the American Psychological Association, Los Angeles.

Kinston, W., & Rosser, R. (1974). Disaster: Effects on mental and physical state. Journal of Psychosomatic Research, 18, 437-456.

Klineberg, O. (1984). Public opinion and nuclear war. American Psychologist, 39, 1245-1253.

Krammer, B.M., Kalick, S.M., & Milburn, M.A. (1983). Attitudes toward nuclear weapons and nuclear war: 1945-1982. Journal of Social Issues, 39, 7-24.

Kubala, A.L., & Warnick, W.L. (1979). A review of selected literature on stresses affecting soldiers in combat (TR-79-A14, contract DAHC 19-75-C- 0025). Alexandria, VA: Human Resources Research Organization.

Lazarus, R.S., & Folkman, S. (1984). Stress, appraisal and coping. New York: Springer Publishing Co.

Lazarus, R.S., Averill, J.R., & Opton, E.M. (1974). The psychology of coping: Issues of research and assessment. In G.V. Coelho, J.E. Adams and D.A. Hamburg (Eds.), Coping and adaptation. New York: Basic Books.

Levav, I., Greenfeld, H., & Baruch, E. (1979). Psychiatric combat reactions during the Yom Kippur War. American Journal of Psychiatry, 136(5), 637- 641.

Levin, S.G. (1986). Mathematical models for prediction of neuropsychiatric and other non-battle casualties in high intensity conventional combat (Report No. BRL-CR-556). Aberdeen Proving Ground, MD: Ballistic Research Laboratory.

Levin, S.G. (1986, March). Prediction of neuropsychiatric casualties in the nuclear battlefield. Paper presented at the Defense Nuclear Agency's Symposium/Workshop on the Psychological Effects of Tactical Nuclear Warfare, Bethesda, MD.

Lidz, T. (1946). Psychiatric casualties from Guadalcanal - A study of reactions to extreme stress. Psychiatry, 9, 193-213.

Lifton, R.J. (1967). Death in life: Survivors of Hiroshima. New York: Random House.

Lifton, R.J. (1982a). Psychological effects of the Atomic bombing. In E. Chivian, R.J. Lifton, and J.E. Mack (Eds.), The Medical dimension of nuclear war. New York: W.H. Freeman & Comp.

Lifton, R.J. (1982b). Beyond psychic numbing: A call for awareness. American Journal of Orthopsychiatry, 52, 619-629.

Logan, L., & Killian, L.M. (1953). Troops reactions to atomic attack: A preview (Technical Memorandum ORO-T-205). Chevy Chase, MD: Operations Research Office.

Logue, J.N., Melick, M.E., & Hansen, H. (1981). Disaster epidemiology: Research issues and directions. Epidemiological Reviews, 3, 140-162.

Mack, J.E. (1982). The perception of U.S. - Soviet intentions and other psychological dimensions of the nuclear arms race. American Journal of Orthopsychiatry, 52, 590-599.

Marlowe, D.H. (1983). Cohesion, anticipated breakdown and endurance in battle: Considerations for severe and high intensity combat. Unpublished manuscript, Walter Reed Institute of Research, Washington, DC.

Marlowe, D.H. (1987). Human endurance on the nuclear battlefield: Thoughts on prediction and prophecy. In R.H. Young & B.H. Drum (Eds.), Proceedings of the Defense Nuclear Agency Symposium/Workshop on the Psychological Effects of Tactical Nuclear Warfare. McLean, VA: Science Applications International Corporation.

Marshall, S.L.A. (1947). Men against fire (pp. 56-63). New York: William Morrow.

McClenney, J.T., & Allbright, L. (1985). Psychological responses to the threat of nuclear war: Structural modeling of the relationship between attitudes and behaviors. Unpublished manuscript, University of Connecticut, Storrs, CT.

Morawski, J.D., & Goldstein, S.E. (1985). Psychology and nuclear war: A chapter in our legacy of social responsibility. American Psychologist, 40, 276-284.

Mullins, W.S., & Glass, A.J. (1973). Neuropsychiatry in World War II, Vol. II: Overseas theaters. Washington, DC: Office of the Surgeon General.

Nelson, A. (1985). Psychological equivalence: Awareness and responsibility in our nuclear age. American Psychologist, 40, 549-556.

Newcombe, M.D. (1986). Nuclear attitudes and reactions: Association with depression, drug use, and quality of life. Journal of Personality and Social Psychology, 50, 906-920.

Nimmo, D., & Savage, R.L. (1976) Candidates and their images. Pacific Palisades, CA: Goodyear.

Noy, S. (1978). Stress and personality as factors in the causality and prognosis of combat reaction. Paper presented at the Second International Conference on Psychological Stress and Adjustment in Time of War and Peace, Jerusalem, Israel.

Oskamp, S., King, J.C., Burn, S.M., Konard, A.M., Pollard, J.A., & White, M.A. (1985). The media and the nuclear war: Fallout from TV's "The Day After". In S. Oskamp (Ed.), Applied Social Psychology Annual, Vol, 6. International conflict and national public policy issues. Beverly Hills, CA: Sage.

Quarantelli, E.L. (1954). The nature and conditions of panic. The American Journal of Sociology. 60, 267-275.

Radomski, M.W.,, & Defayolle, M.A.J. (1981). Physiological, psychological, and biochemical aspects of daily sustained submaximal exercise. Franco- Canadian, Theme 8 - Volume II.

Ranson, S. (1949). The normal battle reaction: Its relation to the pathologic reaction. Bulletin of the U.S. Army Medical Department, 9, 3- 11.

Reset, J.P. (1984, October). Thinking the unthinkable: Impact of the film "The Day After" on the imageability of a nuclear holocaust. Unpublished manuscript, James Cook University of North Queensland, Queensland, Australia.

Rogers, R.R. (1980). On emotional responses to nuclear issues and terrorism. The Psychiatric Journal of the University of Ottawa, 5, 147- 152.

Rommo, J.M., & Schneider, R.J. (1982). Disaster, psychiatric casualties and implications for future war. Journal of the Royal Army Medical Corps, 128, 93-99.

Salmon, T. (1919). The war neuroses and their lesson. New York State Journal of Medicine, 59, 933-944.

Sarkesian, S.C. (Ed.). (1980). Combat effectiveness, cohesion, stress and the volunteer military. Beverly Hills, CA: Sage.

Schofield, J., & Pavelchak, M.A. (1985). "The Day After": The impact of a media event. American Psychologist, 40, 542-548.

Schwartz, S., & Winograd, B. (1954). Preparation of soldiers for atomic maneuvers. Journal of Social Issues, 10, 42-52.

Schwebel, M. (1982). Effects of the nuclear war threat on children and teenagers: Implications for professionals. American Journal of Orthopsychiatry, 52, 608-618.

Schwebel, M. (Ed.). (1986). Mental health implications of life in the nuclear age. A special issue of International Journal of Mental Health, 15 (1-3).

Sessions, R. (1987). Human emotional responses in tactical nuclear warfare: Literature review and current consideration. In R.H. Young & B.H. Drum (Eds.), Proceedings of the Defense Nuclear Agency Symposium/Workshop on the Psychological Effects of Tactical Nuclear Warfare. McLean, VA: Science Applications International Corporation.

Sidorenko, A.A. (1973). The offensive: A Soviet view. Moscow: Military Publishing House. (1970) (Translated for the U.S. Air Force, Washington, DC: U.S. Government Printing Office).

Snow, D.M. (1983). The nuclear future. Tuscaloosa, AL: University of Alabama Press.

Solomon, F., & Marston, R.Q. (Eds.). (1986). The medical implications of nuclear war. Washington, DC: National Academy Press.

Spendlove, C.J., Smith, R., & Thomas, M. (1985). Assessment of unit operational capability following large scale biological warfare attacks against U.S. forces. Tehnical Study for Dugway Proving Ground, U.S. Army.

Star, S. (1949). Neuropsychiatric symptoms in the Army. In S.A. Stouffer, et al. (Eds.), The American soldier: Combat and its aftermath Vol. II. Princeton, NJ: Princeton University Press.

Steiner, M., & Neumann, M. (1978). Traumatic neurosis and social support in the Yom Kippur War. Military Medicine, 143 (12), 866-868.

Stouffer, S.A., deVinney, L.C., Star, S.A., & Williams, R.M. (1949). Studies in social psychology in Word War II. Vol. 2. The Americn Soldier: Combat and its aftermath. Princeton, NJ: Princeton University Press.

Swank, R.L. (1949). Combat exhaustion. Journal of Nervous and Mental Disease. 109, 475-508.

Taylor, S.E. (1983). Adjustment to threatening events: A theory of cognitive adaptation. American Psychologist, 38, 1161-1173.

Thompson, J.A. (1985). Psychological aspects of nuclear war. New York: BPS & Wiley.

University of Oklahoma Research Institute. (1952-c). Disaster in battle: Two pre-atomic military disasters (Technical Momorandum ORO-T-202). Chevy Chase, MD: Operation Research Office, The John Hopkins University.

U.S. Department of the Army. (1969). Nuclear handbook for medical service personnel (TM 8-215). Washington, DC: U.S. Government Printing Office.

U.S. Department of the Army. (1973). NATO handbook on the medical aspects of NBC defensive operations. A MedP-6 (FM 8-9). Washington, DC: U.S. Government Printing Office.

U.S. Department of the Army. (1977). Staff officers' Field Manual: Nuclear weapons employment doctrine and procedures (FM 101-31-1). Washington, DC: U.S. Government Printing Office.

U.S. Department of Defense. (1952, February). A study of soldier attitudes and knowledge about atomic effects - Exercise DESERT ROCK. Joint Report of Attitude Research Branch, Armed Forces

Information and Education Division, Department of Defense, and the Attitude Assessment Branch, Troop Information and Education Division, Department of the Army. Washington, DC.

Van Creveld, M. (1982). Fighting power: German and U.S. army performance, 1939-1945. Westport, CT: Greenwood Press.

Vineberg, R. (1965). Human factors in tactical nuclear combat (Tech. Report No. 65-2). Alexandria, VA: Human Resources Research Organization.

Vineberg, R. (1987). A perliminary model for predicting probable effects of stress on performance on the tactical nuclear battlefield. In R.H. Young & B.H. Drum (Eds.), Proceedings of the Defense Nuclear Agency Symposium/Workshop on the Psychological Effects of Tactical Nuclear Warfare. McLean, VA: Science Applications International Corporation.

Wagner, R.V. (1985). Psychology and the threat of nuclear war. American Psychologist, 40, 531-535.

Wallace, A.F.C. (1956). Tornado in Worchester: An explanatory study of individual and community behavior in an extreme situation (National Research Council publication no. 392). Washington, DC: National Academy of Sciences.

Weinstein, E.A., & Drayer, C.S. (1949). A dynamic approach to the problem of combat induced anxiety. Bulletin of the U.S. Army Medical Department, 9, 12-25.

Weinstein, E.A. (1973). The Fifth U.S. Army Neuropsychiatric Center, 601st. In W.S. Mullins and A.J. Glass (Eds.), Neuropsychiatry in World War II, Vol. II, Overseas Theatres. Washington, DC: Office of the Surgeon General, Department of the Army.

Young, R.W., Drum, B.H. (1987) Proceedings of the Defense Nuclear Agency Symposium/Workshop on the Psychological Effects of Tactical Nuclear Warfare. (Report No. DNA-TR-87-209) Defense Nuclear Agency, Washington, D.C.

APPENDIX A

SOLDIERS' SCENARIOS

SITUATION 1 - (CONVENTIONAL, 5-15 KILOMETERS)

The year is 1995 and the Warsaw Pact forces have invaded West Germany. You are a member of a tank-heavy battalion task force assigned to an armored division which has been ordered to seize three key terrain objectives. Your task force is part of the division reserve and is located 10 kilometers behind the forward edge of the battle area (FEBA). The mission of your task force is to be prepared to reinforce the 1st brigade which is making the main attack.

Intelligence reports indicate that your division is opposed by a red combined arms army (CAA) consisting of two motorized rifle divisions and one tank division. The CAA and its elements have been in their defensive positions for the past 36 hours.

The terrain in your division's zone is generally open and rolling. Small rivers, streams, and some forests are dispersed throughout the area. Temperatures during the day have been about 50°F with evening temperatures dropping to around 35°F. Daytime visibility has been good.

1st Brigade attacked at 0530. Since that time, you have been very aware of loud battlefield noises, such as the constant flow of helicopters and fighter aircraft that fly over your position. Artillery has been firing throughout the day and you hear and feel the ground shake from the impact of the counterfires and rolling barrages from the opposing red force artillery. The division is on the move and there has been a lot of activity and movement in the area. At 1430, your task force receives a warning order to reinforce the 1st Brigade because

this main attack has bogged down and they are in danger of being overrun.

It is now 1530 and you receive the order to move out! As you enter the 1st Brigade's area, battlefield noise increases drastically. The enemy lines are now only 5 kilometers away. Although your vehicle is buttoned up, you hear intense artillery fire and feel the impact of the incoming rounds. It seems that your vehicle is caught in an artillery barrage, but you keep moving. Main guns are firing and your vehicle comes under heavy small caliber fire. Machine guns respond. Suddenly, you feel an impact. Your vehicle is hit! It stops moving and you are forced to dismount.

SITUATION 2 - (CONVENTIONAL, 30-50 KILOMETERS)

The year is 1995 and the Warsaw Pact forces have invaded West Germany. You are a member of a tank-heavy battalion task force assigned to an armored division which has been ordered to seize three key terrain objectives. Your task force is part of the division reserve and is located 40 kilometers behind the forward edge of the battle area (FEBA). THe mission of the division reserve is to be prepared to reinforce the 1st Brigade which is making the main attack.

Intelligence reports indicate that the division is opposed by a red combined arms army (CAA) consisting of two motorized rifle divisions and one tank division. The CAA and its elements have been in their defensive positions for the past 36 hours.

The terrain in your division's zone is generally open and rolling. Small rivers, streams, and some forests are dispersed throughout the area. Temperatures throughout the day have been about 50°F with evening temperatures dropping to around 35°F. Daytime visibility has been good.

The 1st Bridage attacked at 0530. You have just become aware of faint battlefield noises, such as the occasional helicopters and fighter aircraft that fly over your position. Artillery has been firing throughout the day and you sometimes hear the counterfires and rolling barrages from the opposing red force artillery. The division is on the move nad there has been a lot of activity and movement in the area. At 1430, you task force receives a warning order to reinforce the 1st Brigade because this main attack has bogged down and they are

in danger of being overrun.

It is now 1530 and you receive the order to move out! Your location at the moment is still about 30 kilometers away from the enemy lines. Your task force crosses the line of departure in bounding overwatch and races toward the 1st Brigade area.

SITUATION 3 - (NUCLEAR, 5-15 KILOMETERS)

The year is 1995 and the Warsaw Pact forces have invaded West Germany. You are a member of a tank-heavy battalion task force assigned to an armored division which has been ordered to seize three key terrain objectives. Your task force is part of the division reserve and is located 10 kilometers behind the forward edge of the battle area (FEBA). The mission of your task force is to be prepared to reinforce the 1st Brigade which is making the main attack.

Intelligence reports indicate that the division is opposed by a red combined arms army (CAA) consisting of two motorized rifle divisions and one tank division. There are also warnings that the enemy may resort to a limited use of tactical nuclear weapons.

The terrain in your division's zone is generally open and rolling. Small rivers, streams, and some forests are dispersed throughout the area. Temperatures during the day have been about 50°F with evening temperatures dropping to around 35°F. Daytime visibility has been good.

The 1st Brigade attacked at 0530. Since that time, you have been very aware of loud battlefied noises, such as artillery firing and the constant flow of helicopters and fighter aircraft that fly over your position. At 1430, your task force recieves a warning order to prepare to reinforce the 1st Brigade because their main attack has bogged down and they are in danger of being overrun.

IT is now 1530 and you receive the order to move out! As you enter the 1st Brigade's area, battlefield noise increases drastically. The enemy lines are now only 5 Kilometers away. Although your vehicle is buttoned up, you hear intense artillery fire and feel the impact of the incoming rounds. It seems that your vehicle is caught in an artillery barrage, but you keep moving. As you look for enemy tanks, your eyes are suddenly dazzled by a blinding flash of light and you lose all communications. You vehicle vibrates violently and you brace yourself. You realize that this was a nuclear detonation. When your vision comes back, you look out and see a lot of smoke and dust. You also see some overturned vehicles on fire, scattered equipment, and trees blown down in a wooded area. Suddenly, the vehicle commander shouts that a mushroom-shaped cloud is forming about 7 Kilometers to the left front and he activates the vehicle's nuclear, biological, and chemical collective protection system.

SITUATION 4 - (NUCLEAR, 30-50 KILOMETERS)

The year is 1995 and the Warsaw Pact forces have invaded West Germany. You are a member of a tank-heavy battalion task force assigned to an armored division which has been ordered to seize three key terrain objectives. Your task force is part of the division reserve and is located 40 kilometers behind the forward edge of the battle area (FEBA). The mission of your task force is to be prepared to reinforce the 1st Brigade which is making the main attack.

Intelligence reports indicate that the division is opposed by a red combined arms army (CAA) consisting of two motorized rifle divisions and one tank division. There are also warnings that the enemy may resort to a limited use of tactical nuclear weapons.

The terrain in your division's zone is generally open and rolling. Small rivers, streams, and some forests are dispersed throughout the area. Temperatures during the day have been about 50°F with evening temperatures dropping to around 35°F. Daytime visibility has been good.

The 1st Brigade attacked at 0530. You have just become aware of faint battlefied noises, such as distant artillery and occasional helicopters and fighter aircraft that fly over your position. Artillery has been firing throughout the day and you sometimes hear the counterfires and rolling barrages from the opposing red force artillery. The division is on the move and there has been a lot of activity and movement in the area. At 1430, your task force receives a warning order to reinforce the 1st Brigade because their main attack has bogged down and they are in danger of being overrun.

Suddenly, the sky lights up and you are dazzled by the brightness. You hear several large detonations and your vehicle vibrates as the earth shakes slightly. Something you have not experienced before. Off in the distance, about 30 kilometers to the north, you notice a haze in the air and large clouds forming in the shape of mushrooms. The clouds appear to be in the 1st Brigade's area and moving in your direction. You realize that this was a nuclear detonation.

It is now 1530 and you receive the order to move out! Your vehicle crosses the line of departure in bounding overwatch and buttoned up. Your vehicle commander activates the vehicle's nuclear, biological, and chemical collective protection system as you race to the 1st Brigade's area.

SITUATION 5 - (CHEMICAL, 5-15 KILOMETERS)

The year is 1995 and the Warsaw Pact forces have invaded West Germany. You are a member of a tank-heavy battalion task force assigned to an armored division which has been ordered to seize three key terrain objectives. Your task force is part of the division reserve and is located 10 kilometers behind the forward edge of the battle area (FEBA). The mission of your task force is to be prepared to reinforce the 1st Brigade which is making the main attack.

Intelligence reports indicate that the division is opposed by a red combined arms army (CAA) consisting of two motorized rifle divisions and one tank division. There are also warnings that the enemy may resort to the use of chemical weapons.

The terrain in your division's zone is generally open and rolling. Small rivers, streams, and some forests are dispersed throughout the area. Temperatures during the day have been about 50°F with evening temperatures dropping to around 35°F. Daytime visibility has been good.

The 1st Brigade attacked at 0530. Since that time you have been very aware of loud battlefied noises, such as artillery firing and the constant flow of helicopters and fighter aircraft that fly over your position. At 1430, your task force receives a warning order to prepare to reinforce the 1st brigade because their main attack has bogged down and they are in danger of being overrun.

It is now 1530 and you receive the order to move out! As you enter the

1st Brigade's area, battlefield noise increases drastically. The enemy lines are now only 5 Kilometers away. Although your vehicle is buttoned up, you hear intense artillery fire and feel the impact of the incoming rounds. It seems that your vehicle is caught in an artillery barrage, but you keep moving. Then you sense that the incoming artillery is slowing down because the explosions seem muffled. While looking for enemy tanks, you see some burning vehicles and scattered equipment. You also see some personnel masking and putting on gloves. Now you notice a large cloud of mist forming at about 2 Kilometers to the vehicle's left front. The chemical detector-alarm goes off and the vehicle's nuclear, biological, and chemicl collective protection system is turned on. Over the headset the vehicle's commander tells you that the 1st Brigade is under attack.

SITUATION 6 - (CHEMICAL, 30-50 KILOMETERS)

The year is 1995 and the Warsaw Pact forces have invaded West Germany. You are a member of a tank-heavy battalion task force assigned to an armored division which has been ordered to seize three key terrain objectives. Your task force is part of the division reserve and is located 40 kilometers behind the forward edge of the battle area (FEBA). The mission of your task force is to be prepared to reinforce the 1st Brigade which is making the main attack.

Intelligence reports indicate that the division is opposed by a red combined arms army (CAA) consisting of two motorized rifle divisions and one tank division. There are also warnings that the enemy may resort to the use of chemical weapons.

The terrain in your division's zone is generally open and rolling. Small rivers, streams, and some forests are dispersed throughout the area. Temperatures during the day have been about 50°F with evening temperatures dropping to around 35°F. Daytime visibility has been good.

The 1st Brigade attacked at 0530. You have just become aware of faint battlefield noises, such as distant artillery and occasional helicopters and fighter aircraft that fly over your position. At 1430, your task force receives a warning order to prepare to reinforce the 1st Brigade because their main attack has bogged down and they are in danger of being overrun.

It is now 1530 and you receive the order to move out! Your vehicle crosses the line of departure in bounding overwatch and buttoned up. Suddenly, over the headset the commander tells you that the 1st Brigade is under chemical attack. He activates the vehicle's nuclear, biological, and chemical collective protection system as you approach to within 30 Kilometers of the enemy lines.

APPENDIX B

SOLDIER QUESTIONNAIRE

Approval Authority USA Soldier Support Center - NCR
Survey Control Number ATNC-AO-88-53
RCS: MILPC-3

SOLDIER READINESS QUESTIONNAIRE

OCTOBER 1988

SPONSORED BY THE:

Defense Nuclear Agency

US Army Nuclear and Chemical Agency

SOLDIER READINESS SURVEY

The purpose of this survey is to find out about the knowledge and beliefs of soldiers under various conditions of combat. Knowing what you know and what you believe about combat is important to achieving a complete and accurate picture of readiness.

The questionnaire that follows is divided into several sections. The first section asks for background information. The second section asks about you and your unit. After that we will read you some additional information and then ask you to complete the rest of the questionnaire. If you need help at any time, raise your hand and one of us will come around to help you. Please do not call out your question.

All your responses will be strictly confidential. We do not ask you to give your name or ID. No one will be able to connect your responses to you. Reports of the results will only be in terms of averages and trends, not individual responses, and they will be used only for research purposes.

Thank you for your time and cooperation.

A. BACKGROUND

1. Age: _____ Years _____ Months

2. Where were you raised? (Check one)
   - The City ( )
   - The Suburbs ( )
   - The Country ( )

3. What region of the U.S.A. do you call home? (Check one)
   - Northeast ( )
   - Mid Atlantic ( )
   - South ( )
   - Midwest ( )
   - Northwest ( )
   - Southwest ( )

4. What educational degree did you complete? (Check one)
   - Non High School ( )
   - GED ( )
   - High School ( )
   - Associates ( )
   - B.A. ( )
   - Higher ( )

5. Are you married? Yes ( ) No ( )
   If yes, where is your spouse located?

6. Do you have any children? Yes ( ) No ( )
   If yes, how many? _____
   If yes, how old is your youngest child? _____ Years
   Where are your children located? U.S. ( ) Europe ( )

7. Time in military service: _____ Years _____ Months

8. Rank:
   - E1 ( )
   - E2 ( )
   - E3 ( )
   - E4 ( )
   - E5 ( )
   - E6 ( )
   - E7 ( )
   - E8 ( )
   - E9 ( )
   - 01/02 ( )

9. Company and Battalion _____

10. Time in Company: _____ Years _____ Months

11. Type of Unit: Armor ( ) Infantry ( )

12. PRIMARY MOS/DUTY MOS: _____ _____

13. Time in Germany: _____ Years _____ Months

14. Have you had actual combat experience? Yes ( ) No ( )
If yes, please describe briefly: _____
_____
_____

15. Have you been in a life-threatening situation before? That is, a situation (like traffic accident, etc.) where you could have been severely injured?
Yes ( ) No ( )

If yes, please describe it briefly: _____
_____
_____

B. You and Your Unit

In this section you'll be presented with 25 items about yourself and the other soldiers in your unit. Read each carefully and when you've decided on an answer, put an X on the line that best describes your thoughts or feelings. For example:

EX. I often have free time to do what I like.

Your booklet will have a row of seven lines under each item like the one below.

			Sometimes				
EX. Hardly ever	___	X	___	___	___	___	___ all the time

If you put an X on the second line as we have, this indicates that you rarely receive a weekend pass. If you had put an X on line number six (6), it would indicate that you get weekend leave almost all the time. Please mark your response to each item in the same way, being sure to put an X on only one line in each row.

Just for this questionnaire, I'd like you to imagine that you have all the equipment that you need, that it all does just what it was designed for and that each piece of equipment works.

WHEN YOU FULLY UNDERSTAND THESE INSTRUCTIONS, PLEASE GO ON TO THE NEXT PAGE. IF YOU NEED FURTHER EXPLANATION RAISE YOUR HAND.

1. The leaders of my unit provide me with accurate and understandable information.

Hardly ever ___ ___ ___ ___ ___ ___ ___ all the time

2. I feel "stressed out" from the pressures of being a soldier.

Hardly ever ___ ___ ___ ___ ___ ___ ___ all the time

3. The soldiers in my unit disobey the Uniform Code of Military Justice (UCMJ).

Hardly ever ___ ___ ___ ___ ___ ___ ___ all the time

4. In my job in my unit, I feel responsible for the lives of my fellow soldiers.

Hardly ever ___ ___ ___ ___ ___ ___ ___ all the time

5. The leaders of my unit show that they really care about the safety of their soldiers.

Hardly ever ___ ___ ___ ___ ___ ___ ___ all the time

6. The soldiers in my unit believe that they contribute to the security of the USA by helping to protect Europe.

Hardly ever ___ ___ ___ ___ ___ ___ ___ all the time

7. The soldiers in my unit show pride in their performance, appearance and the history of the unit.

Hardly ever ___ ___ ___ ___ ___ ___ ___ all the time

8. My family does activities to keep fit and healthy.

Hardly ever ___ ___ ___ ___ ___ ___ ___ all the time

9. I have control over my day to day activities.

Hardly ever ___ ___ ___ ___ ___ ___ ___ all the time

10. I think my leaders will be there to support me in times of need.

Hardly ever ___ ___ ___ ___ ___ ___ ___ all the time

PLEASE GO ON TO THE NEXT PAGE

11. The soldiers in my unit talk about their part in accomplishing the mission of the unit.

Hardly ever ___ ___ ___ ___ ___ ___ ___ all the time

12. The soldiers in my unit have a good time together during off duty hours.

Hardly ever ___ ___ ___ ___ ___ ___ ___ all the time

13. My leaders show that they are reliable, that I can count on what they say to be true.

Hardly ever ___ ___ ___ ___ ___ ___ ___ all the time

14. The soldiers in my unit show that they are willing to do whatever it takes to get the job done.

Hardly ever ___ ___ ___ ___ ___ ___ ___ all the time

15. My leaders show that they have the knowledge, skills and abilities to lead me effectively.

Hardly ever ___ ___ ___ ___ ___ ___ ___ all the time

16. I am o.k. physically and emotionally.

Hardly ever ___ ___ ___ ___ ___ ___ ___ all the time

17. Although this is often a dull and thankless job, my duties can be interesting/challenging.

Hardly ever ___ ___ ___ ___ ___ ___ ___ all the time

18. My family shows love and affection for each other and for me.

Hardly ever ___ ___ ___ ___ ___ ___ ___ all the time

19. My fellow soldiers and I are involved in activities (training or exercises) which are essential to the success of our unit in combat.

Hardly ever ___ ___ ___ ___ ___ ___ ___ all the time

20. I wish that I had some other job in my unit.

Hardly ever ___ ___ ___ ___ ___ ___ ___ all the time

PLEASE GO ON TO THE NEXT PAGE

21. The soldiers in my unit show trust in each other.

Hardly ever ___ ___ ___ ___ ___ ___ ___ all the time

22. I receive respect from my fellow soldiers because of my job in the unit.

Hardly ever ___ ___ ___ ___ ___ ___ ___ all the time

23. My fellow soldiers help each other out.

Hardly ever ___ ___ ___ ___ ___ ___ ___ all the time

25. I see to the safety and well-being of my spouse/children/extended family

Hardly ever ___ ___ ___ ___ ___ ___ ___ all the time

PLEASE STOP AND WAIT
FOR FURTHER INSTRUCTIONS

C. TACTICAL CONFLICT SCENARIO

We will now present a situation for you to keep in mind when answering the questions in the following sections.

When you are told, please turn the page and follow along while I read the material to you. Please, do not try to "rush" ahead of me, just read it slowly and silently with me.

Do not turn the page yet.

SITUATION 5 - (CHEMICAL, 5-15 KILOMETERS)

The year is 1995 and the Warsaw Pact forces have invaded West Germany. You are a member of a tank-heavy battalion task force assigned to an armored division which has been ordered to seize three key terrain objectives. Your task force is part of the division reserve and is located 10 kilometers behind the forward edge of the battle area (FEBA). The mission of your task force is to be prepared to reinforce the 1st Brigade which is making the main attack.

Intelligence reports indicate that your division is opposed by a red combined arms army (CAA) consisting of two motorized rifle divisions and one tank division which have been in their defensive positions for the past 36 hours. There are also warnings that the enemy may resort to a limited use of chemical weapons.

The terrain in your division's zone is generally open and rolling. Small rivers, streams, and some forests are dispersed throughout the area. Temperatures during the day have been about 50°F with evening temperatures dropping to around 35°F. Daytime visibility has been good.

The 1st Brigade attacked the enemy at 0530. Since that time you have been very aware of loud battlefield noises, such as the constant flow of helicopters and fighter aircraft that fly over your position. You hear your own artillery firing throughout the day and you feel the ground shake from the impact of enemy artillery barrages. Your whole division is on the move and there has been constant activity in your area. At 1430, your task force receives a warning

order to reinforce the 1st brigade because its main attack has bogged down and your fellow soldiers are in danger of being overrun.

It is now 1530 and you receive the order to move out! As you enter the 1st Brigade's area, battlefield noise increases drastically. The enemy lines are now only 5 Kilometers away. Although your vehicle is buttoned up, you hear intense artillery fire and feel the impact of the incoming rounds. Your vehicle is caught in an artillery barrage, but you keep moving. You suddenly notice that the incoming artillery is slowing down and that the explosions seem to be muffled and have less impact than before. While looking for the enemy, you see some burning vehicles and scattered equipment. You can smell the odor of high explosives. You also see some personnel masking and putting on gloves. Suddenly the vehicle commander shouts that a large cloud of mist is forming at about 5 Kilometers to the vehicle's left front. The vehicle commander shouts that this is a chemical attack and activates the vehicle's nuclear, biological, and chemical collective protection system. You continue to move toward the battle area.

PLEASE GO ON TO THE NEXT PAGE

Now, please close your eyes and take a minute to create a mental picture of you and your unit in this scenario. Use all your senses to see, hear, smell and feel what would be going on around you as you hear the scenario again. Then use the space below to write down notes, draw a map or sketch or do whatever you need to make the scenario clear to you.

WHEN YOU FINISH PLEASE STOP
AND WAIT FOR FURTHER
INSTRUCTIONS

D. PERCEPTIONS OF THE SCENARIO

In the space provided below, please describe in your own words how you would feel and what you believe would happen to you and to the soldiers around you if the scenario you just read about actually occurred. Use whatever words that come to your mind and don't worry about spelling or punctuation but do try to write clearly so that we can read your responses. Please put each of your thoughts on a separate line and write down as many as you can.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____
17. _____
18. _____
19. _____
20. _____

PLEASE STOP AND WAIT FOR FURTHER INSTRUCTIONS

E. YOU AND YOUR UNIT

Please indicate on the scale under each question the likelihood of the following statements if the scenario just described to you actually occurred.

1. The leaders of my unit will provide me with accurate and understandable information.

   Very likely ___ ___ ___ ___ ___ ___ ___ Very unlikely

2. In my job in my unit, I will feel responsible for the lives of my fellow soldiers.

   Very likely ___ ___ ___ ___ ___ ___ ___ Very unlikely

3. The leaders of my unit will show that they really care about the safety of their soldiers.

   Very likely ___ ___ ___ ___ ___ ___ ___ Very unlikely

4. The soldiers in my unit will continue to believe that they contribute to the security of the USA by helping to protect Europe.

   Very likely ___ ___ ___ ___ ___ ___ ___ Very unlikely

5. The soldiers in my unit will continue to show pride in their performance, appearance and the history of the unit.

   Very likely ___ ___ ___ ___ ___ ___ ___ Very unlikely

6. The soldiers in my unit will show their willingness to do whatever it takes to get the job done.

   Very likely ___ ___ ___ ___ ___ ___ ___ Very unlikely

7. I will be o.k. physically and emotionally.

   Very likely ___ ___ ___ ___ ___ ___ ___ Very unlikely

8. I will see to the safety and well being of my spouse/children/extended family.

   Very likely ___ ___ ___ ___ ___ ___ ___ Very unlikely

9. My fellow soldiers will help each other out.

   Very likely ___ ___ ___ ___ ___ ___ ___ Very unlikely

10. I will wish that I had some other job in my unit.

    Very likely ___ ___ ___ ___ ___ ___ ___ Very unlikely

PLEASE STOP AND WAIT FOR
FOR FURTHER INSTRUCTIONS

F. ATTITUDES AND PERCEPTIONS

The following items represent various attitudes or ways that you might look at the scenario we have just read together. For each item, mark the space between each set of words which you think describes best your perception of, or attitude about the scenario.

For example:

Interesting X ___ ___ ___ ___ ___ ___ Dull

If you have marked your response this way, it shows that you consider the scenario as a very interesting one.

If, on the other hand, you have marked it like this:

Interesting ___ ___ ___ ___ ___ X ___ Dull

that means that you would find it quite dull.

Mark all the following items according to the way you see, or (how you feel about) the scenario just described.

"THE SCENARIO JUST DESCRIBED IS....."

1.	"Not all that bad"	___ ___ ___ ___ ___ ___ ___	"The worst I can imagine"
2.	Depressing	___ ___ ___ ___ ___ ___ ___	Exhilarating
3.	Exciting	___ ___ ___ ___ ___ ___ ___	Boring
4.	Scary	___ ___ ___ ___ ___ ___ ___	Unfrightening
5.	Hopeless	___ ___ ___ ___ ___ ___ ___	Hopeful
6.	Optimistic	___ ___ ___ ___ ___ ___ ___	Pessimistic
7.	Discouraging	___ ___ ___ ___ ___ ___ ___	Encouraging
8.	Challenging	___ ___ ___ ___ ___ ___ ___	Overwhelming
9.	Calming	___ ___ ___ ___ ___ ___ ___	Arousing
10.	Threatening	___ ___ ___ ___ ___ ___ ___	Routine

PLEASE STOP AND WAIT FOR FURTHER INSTRUCTIONS

G. RESPONSES

The following series of items asks about various responses and actions that soldiers in your unit may show as a result of the combat scenario we have just read. Please indicate in the appropriate space below, how likely it is that the soldiers in your unit would react to the scenario in the way indicated by the item. For example:

Depressed. Very likely ___ ___ ___ ___ X ___ ___ Very unlikely

If you put the X in this space on your answer sheet, this means that it is somewhat unlikely that most soldiers in your unit would feel depressed in this scenario.

"IN THE SCENARIO JUST DESCRIBED, THE MAJORITY OF SOLDIERS IN MY UNIT WILL..."

1.	Feel extreme anxiety	Very likely ___ ___ ___ ___ ___ ___ ___	Very Unlikely
2.	Trust our officers	Very likely ___ ___ ___ ___ ___ ___ ___	Very Unlikely
3.	Get an upset stomach	Very likely ___ ___ ___ ___ ___ ___ ___	Very Unlikely
4.	Trust their fellow soldiers	Very likely ___ ___ ___ ___ ___ ___ ___	Very Unlikely
5.	Feel unable to think	Very likely ___ ___ ___ ___ ___ ___ ___	Very Unlikely
6.	Trust our NCO's	Very likely ___ ___ ___ ___ ___ ___ ___	Very Unlikely
7.	Be over-alert	Very likely ___ ___ ___ ___ ___ ___ ___	Very Unlikely
8.	Stick to their original missions	Very likely ___ ___ ___ ___ ___ ___ ___	Very Unlikely
9.	Be panicky	Very likely ___ ___ ___ ___ ___ ___ ___	Very Unlikely
10.	Be able to handle the pressure and stress	Very likely ___ ___ ___ ___ ___ ___ ___	Very Unlikely
11.	Feel depression	Very likely ___ ___ ___ ___ ___ ___ ___	Very Unlikely
12.	Be unable to make any decision	Very likely ___ ___ ___ ___ ___ ___ ___	Very Unlikely
13.	Cry over dead or wounded buddies	Very likely ___ ___ ___ ___ ___ ___ ___	Very Unlikely
14.	Feel helpless	Very likely ___ ___ ___ ___ ___ ___ ___	Very Unlikely

PLEASE GO ON TO THE NEXT PAGE

15.	Perform their assigned duties	Very likely	___	___	___	___	___	___	___	Very Unlikely
16.	Show dependency, need for others	Very likely	___	___	___	___	___	___	___	Very Unlikely
17.	Be irritable, "touchy", easily bothered	Very likely	___	___	___	___	___	___	___	Very Unlikely
18.	Feel confused even after a good briefing	Very likely	___	___	___	___	___	___	___	Very Unlikely
19.	Feel anger & rage	Very likely	___	___	___	___	___	___	___	Very Unlikely
20.	Faint (pass out)	Very likely	___	___	___	___	___	___	___	Very Unlikely
21.	Have a pounding heart	Very likely	___	___	___	___	___	___	___	Very Unlikely
22.	Look for leadership	Very likely	___	___	___	___	___	___	___	Very Unlikely
23.	Show difficulty in paying attention	Very likely	___	___	___	___	___	___	___	Very Unlikely
24.	Shiver	Very likely	___	___	___	___	___	___	___	Very Unlikely
25.	Feel hopeless	Very likely	___	___	___	___	___	___	___	Very Unlikely
26.	Experience illusions and hallucinations	Very likely	___	___	___	___	___	___	___	Very Unlikely
27.	Know exactly what to do after a good briefing	Very likely	___	___	___	___	___	___	___	Very Unlikely
28.	Make automatic reactions without thinking	Very likely	___	___	___	___	___	___	___	Very Unlikely
29.	Feel loss of self confidence	Very likely	___	___	___	___	___	___	___	Very Unlikely
30.	Be self-seeking, "every one for himself"	Very likely	___	___	___	___	___	___	___	Very Unlikely
31.	Be out of breath	Very likely	___	___	___	___	___	___	___	Very Unlikely
32.	Show concern for the other men	Very likely	___	___	___	___	___	___	___	Very Unlikely

33.	Be paralyzed	Very likely ___ ___ ___ ___ ___ ___ ___	Very Unlikely
34.	Be fatigued (drained)	Very likely ___ ___ ___ ___ ___ ___ ___	Very Unlikely
35.	Feel excitement	Very likely ___ ___ ___ ___ ___ ___ ___	Very Unlikely

PLEASE STOP AND WAIT FOR
FURTHER INSTRUCTIONS

H. BEHAVIORS

Based on how well you know the soldiers in your unit, please check the space next to the one description below that best predicts their behavior if the scenario were to actually happen.

First read all the items, then put an X in the space which represents the one option you believe is the most accurate.

1. Give up totally, lose all sense of hope: ( )
2. Show willingness to go on, as long as there is leadership, orders, and unit framework: ( )
3. Show willingness and readiness to carry on - no matter what: ( )
4. Continue to carry on their task or mission to the best of their capability: ( )
5. Do all they can to save their own life regardless of anything else: ( )
6. Show initiative, take action and even assume leadership (if necessary): ( )
7. Pray for help and/or strength: ( )
8. Break-down, hide, run away: ( )

PLEASE STOP AND WAIT
FOR FURTHER INSTRUCTIONS

I. PERFORMANCE

Based on how well you know the men in your unit, what do you think will happen to the effectiveness of their performance, in this scenario. In other words, how do you think this situation will affect the combat performance level of most soldiers in your unit?

First read all the options; then put an X in the space which represents the one option you believe is most accurate.

1. Their performance will not change at all. ( )
2. Their performance will go down just a little bit. ( )
3. Their performance will go down quite a lot. ( )
4. Their performance will go down to nothing. ( )
5. Their performance will first go down, and then get better. ( )
6. Their performance will first remain normal, then go down. ( )
7. Their performance will improve. ( )
8. Their performance will first remain normal, then go up. ( )

PLEASE STOP AND WAIT
FOR FURTHER INSTRUCTIONS

J. GENERAL KNOWLEDGE

The next 25 questions ask about your knowledge of tactics, doctrine, equipment and training related to different types of tactical warfare. For each item, please circle or check the best answer.

1. To counter enemy artillery, tankers and APC drivers should:

   (a) Button up
   (b) Move along covered and concealed routes
   (c) Shift to alternate firing positions
   (d) All of the above

2. Which of the following is <u>not</u> a typical activity in an assembly area:

   (a) Establishing local security
   (b) Maintaining equipment
   (c) Assigning sectors of observation and fire
   (d) Planning for final protective fires

3. What does MOPP stand for? (What are the exact words of this abbreviation?)

   ( ) _____

4. You can totally protect yourself against chemical agents by using your mask and protective clothing.

   True ( ) False ( )

5. Soldiers located 10 KILOMETERS away from a ten Kiloton nuclear explosion (GZ), will:

   (a) Be affected by blast
   (b) Be affected by heat
   (c) Be affected by ionizing radiation
   (d) None of the above

6. A preferred firing position for a tank in an overwatch position is:

   (a) Defilade
   (b) Hull-down
   (c) Turret-down
   (d) Hide

PLEASE GO ON TO THE NEXT PAGE

7. The use of Collective Chemical Protection System in your vehicle can eliminate the need to wear MOPP gear while inside.

True ( ) False ( )

8. Of soldiers receiving a total radiation dosage of 300 RADs, 50% will die after four weeks.

True ( ) False ( )

9. Chemical agents can only cause you breathing troubles (choking).

True ( ) False ( )

10. Following an enemy nuclear attack, you will be able to eat the food you're given without getting sick.

True ( ) False ( )

11. All chemical agents can be either seen or smelled.

True ( ) False ( )

12. Which of the following is <u>not</u> a movement technique:

(a) Bounding
(b) Traveling
(c) Bounding overwatch
(d) Traveling overwatch

13. The four required elements of an initial fire command are:

(a) Alert; ammunition, weapon or search light; target description; and execution
(b) Alert: direction; range; and execution
(c) Alert; weapon; ammunition; and range
(d) Alert; weapon; ammunition; and execution

PLEASE GO ON TO THE NEXT PAGE

14. Which of the following are primary causes of injury to personnel and destruction of material resulting from a nuclear detonation?

(a) Radiation
(b) Clouds
(c) Blast
(d) None of the above.

15. Which of the following responses should be taken to protect yourself when an enemy nuclear attack takes place?

(a) Stay down and/or under cover until the debris stops falling
(b) Put out fires before they spread
(c) Put on your MOPP gear
(d) Leave the area as fast as you can
(e) Open fire against any enemy target you see

16. Communication systems will work properly after an enemy nuclear attack.

True ( ) False ( )

17. The crew member with primary responsibility as airguard is the:

(a) Tank commander
(b) Gunner
(c) Loader
(d) Driver

18. How long after the explosion are you still at risk from the radiation?

(a) not more than the first 2 seconds
(b) not more than the first 10 minutes
(c) not more than the first 24 hours
(d) not more than the first 3 days

19. An enemy nuclear attack will probably come with plenty of warning, and, thus, there will be more than enough time to take protective actions.

True ( ) False ( )

20. The enemy thinks of chemical weapons as conventional weapons and is more willing to use them than we are.

True ( ) False ( )

PLEASE GO ON TO THE NEXT PAGE

21. Chemical agents may be delivered as

(a) Gas
(b) Liquid
(c) Aerosol
(d) None of the above
(e) All of the above

22. Chemical agents are not effective on rainy days.

True ( ) False ( )

23. Most chemical agents are no longer effective after:

(a) 30 seconds
(b) 5 minutes
(c) 1/2 hour
(d) 12 hours
(e) 48 hours

24. Both male and female soldiers receiving low doses of radiation (150 RAD's) will have trouble having kids later on.

True ( ) False ( )

25. Chemical agents only bother, they don't kill.

True ( ) False ( )

THANKS FOR ALL YOUR HELP!

PLEASE TURN IN YOUR BOOKLET AT THE FRONT DESK.

APPENDIX C

CHARACTERIZATION OF BATTELFIELD FATIGUE CASUALTIES

APPENDIX C

CHARACTERIZATION OF BATTLEFIELD FATIGUE CASUALTIES

The questionnaire used to collect data from the soldiers contained five categories of Responses: behavioral; social; cognitive; physical; and emotional. These categories were based on a review of the literature on nuclear-warfare-induced combat responses. The literature characterized the responses among US ground forces as HIC warfare-induced BFC. However, the categorization was not quantitatively derived. Hence, the validity of the categorization was unknown.

In order to better understand the responses to nuclear war, a factor analysis (FA) was performed to determine the empirically derived structure underlying these response categories. The FA was performed on soldier's questionnaire responses under HIC, CHEM and TNW. Thus, the FA characterization of the responses generalizes across three battlefield scenarios. Prior to performing the FA the following multivariate assumptions were checked.

Multicolinearity and Singularity

A Principal Components Analysis (PCA) of the responses to the items revealed that the smallest eigenvalue (the one for the 35th factor) of the eigenvalue matrix, is .26 (see Table 9). This is not dangerously close to zero. Therefore, multicolinearity is not a problem with this data set.

Table 9. Principal components by eigenvalue matrix.

	Eigenvalue	Proportion	Cumulative
PRIN1	8.58973	0.245421	0.24542
PRIN2	2.99001	0.085429	0.33085
PRIN3	1.74519	0.049863	0.38071
PRIN4	1.29018	0.036862	0.41757
PRIN5	1.15143	0.032898	0.45047
PRIN6	1.09126	0.031179	0.48165
PRIN7	1.07841	0.030812	0.51246
PRIN8	1.01815	0.029090	0.54155
PRIN9	0.97665	0.027904	0.56946
PRIN10	0.94364	0.026961	0.59642
PRIN11	0.89424	0.025550	0.62197
PRIN12	0.88841	0.025383	0.64735
PRIN13	0.86792	0.024798	0.67215
PRIN14	0.80143	0.022898	0.69505
PRIN15	0.76566	0.021876	0.71692
PRIN16	0.72558	0.020731	0.73765
PRIN17	0.70677	0.020193	0.75785
PRIN18	0.68079	0.019451	0.77730
PRIN19	0.64498	0.018428	0.79573
PRIN20	0.63508	0.018145	0.81387
PRIN21	0.60630	0.017323	0.83119
PRIN22	0.59867	0.017105	0.84830
PRIN23	0.55447	0.015842	0.86414
PRIN24	0.53160	0.015189	0.87933
PRIN25	0.50387	0.014396	0.89373
PRIN26	0.47768	0.013648	0.90737
PRIN27	0.45377	0.012965	0.92034
PRIN28	0.40969	0.011706	0.93204
PRIN29	0.40378	0.011536	0.94358
PRIN30	0.37927	0.010836	0.95442
PRIN31	0.36175	0.010336	0.96475
PRIN32	0.35639	0.010183	0.97494
PRIN33	0.31611	0.009032	0.98397
PRIN34	0.29242	0.008355	0.99232
PRIN35	0.26870	0.007677	1.00000

Subsequently, the assumption of non-singularity was investigated. Final estimates of commonality are also Squared Multiple Correlations (SMCs), but now between each variable as DV and the principal components as IVs. Final commonality values represent the proportion of variance in a variable that is predictable from the component underlying it, the largest SMC among variables .60, did not approach 1. Therefore, singularity is not a threat in this data set (see Table 10).

Table 10. Commonality estimates.

Final Communality Estimates: Total = 11.476146

EMO1	SOC1	PHY1	SOC2	COG1	SOC3	COG2
0.191516	0.283621	0.260782	0.294522	0.424638	0.412912	0.158014
BEH1	**BEH2**	**BEH3**	**EMO2**	**COG3**	**SOC4**	**EMO3**
0.274339	0.477789	0.319818	0.278154	0.210048	0.326196	0.428609
BEH4	**SOC5**	**BEH5**	**COG4**	**EMO4**	**PHY2**	**PHY3**
0.397926	0.167304	0.473690	0.433847	0.306521	0.543782	0.265390
SOC6	**COG5**	**PHY4**	**EMO5**	**COG6**	**COG7**	**BEH6**
0.232714	0.308961	0.357829	0.518453	0.436235	0.351494	0.174969
EMO6	**BEH7**	**PHY5**	**SOC7**	**PHY6**	**PHY7**	**EMO7**
0.295085	0.383290	0.226598	0.377334	0.378999	0.282494	0.222273

Table 11. Correlation matrix of responses.

	EMO1	SOC1	PHY1	SOC2	COG1	SOC3	COG2	BEH1	BEH2
EMO1	1.0000	-.0208	0.2122	-.0433	0.1765	0.0879	0.1815	0.0027	0.2022
SOC1	-.0208	1.0000	0.1606	0.2508	0.2082	0.3424	0.0066	0.2595	0.1953
PHY1	0.2122	0.1606	1.0000	0.1611	0.4066	0.0726	0.2100	0.1418	0.3862
SOC2	-.0433	0.2508	0.1611	1.0000	0.2100	0.3649	-.0425	0.2880	0.2371
COG1	0.1765	0.2082	0.4066	0.2100	1.0000	0.1440	0.2092	0.2131	0.4558
SOC3	0.0879	0.3424	0.0726	0.3649	0.1440	1.0000	0.0021	0.2818	0.2020
COG2	0.1815	0.0066	0.2100	-.0425	0.2092	0.0021	1.0000	0.0493	0.2090
BEH1	0.0027	0.2595	0.1418	0.2880	0.2131	0.2818	0.0493	1.0000	0.1554
BEH2	0.2022	0.1953	0.3862	0.2371	0.4558	0.2020	0.2090	0.1554	1.0000
BEH3	0.0117	0.2566	0.1437	0.2486	0.3459	0.2609	0.0875	0.3234	0.2928
EMO2	0.1006	0.1153	0.2641	0.1940	0.3093	0.2751	0.1814	0.1641	0.4323
COG3	0.0375	0.1384	0.1747	0.1907	0.3315	0.1719	0.0080	0.1352	0.3366
SOC4	0.1227	0.0931	0.2760	-.0003	0.3128	-.0041	0.1189	0.1061	0.2895
EMO3	0.0440	0.2145	0.2581	0.2488	0.4358	0.3227	0.1239	0.3241	0.4090
BEH4	0.0494	0.2410	0.2326	0.3340	0.3021	0.4158	0.0590	0.3960	0.2856
SOC5	0.1273	-.0481	0.1490	-.0867	0.1209	-.0922	0.1095	-.0400	0.2865
BEH5	0.2517	0.1951	0.2708	0.1604	0.3208	0.1836	0.2031	0.1241	0.3952
COG4	0.1367	0.3207	0.2945	0.1849	0.3954	0.2342	0.0749	0.2073	0.4884
EMO4	0.1627	0.0868	0.1985	-.0495	0.2076	0.0541	0.2405	0.0635	0.2452
PHY2	-.0221	0.0494	0.2914	0.2311	0.3661	0.1171	-.0077	0.2105	0.3675
PHY3	0.1670	0.0686	0.2327	0.0358	0.1875	0.1049	0.1868	0.0470	0.3257
SOC6	0.2477	-.1543	0.0658	-.0874	0.0980	-.1394	0.1392	-.1124	0.1913
COG5	0.0222	0.2567	0.2919	0.1781	0.3551	0.2280	0.1120	0.2562	0.3008
PHY4	0.0834	0.0765	0.3158	0.1719	0.3550	0.1735	0.0969	0.2292	0.4223
EMO5	0.0869	0.2723	0.3231	0.3082	0.4064	0.3654	0.1016	0.3795	0.4272
COG6	0.0636	0.1502	0.2544	0.1558	0.3466	0.2175	-.0297	0.1443	0.3183
COG7	-.0421	0.2721	0.1779	0.2674	0.2404	0.3358	-.0576	0.3057	0.2828
BEH6	0.1189	-.1165	-.0912	-.2101	-.1195	-.1277	0.1351	-.1598	-.0534
EMO6	0.1038	0.1597	0.1937	0.1973	0.4417	0.1962	0.1545	0.1855	0.3180
BEH7	0.0673	0.3227	0.2168	0.3517	0.3346	0.3179	0.1050	0.3381	0.3243
PHY5	0.0754	0.0946	0.2418	0.1728	0.3279	0.1945	0.0860	0.1447	0.2868
SOC7	-.1029	0.2671	0.1208	0.2955	0.2105	0.4444	-.0522	0.2304	0.1538
PHY6	0.0258	0.0412	0.1918	0.2346	0.3506	0.2096	0.0028	0.2298	0.2536
PHY7	0.1509	0.1956	0.2165	0.1805	0.2432	0.2163	0.1112	0.1789	0.3011
EMO7	0.2090	-.1257	-.0791	-.2637	-.1933	-.1259	0.0322	-.1987	-.1269

Table 12. Correlation matrix of responses.

	BEH3	EMO2	COG3	SOC4	EMO3	BEH4	SOC5	BEH5	COG4
EMO1	0.0117	0.1006	0.0375	0.1227	0.0440	0.0494	0.1273	0.2517	0.1367
SOC1	0.2566	0.1153	0.1384	0.0931	0.2145	0.2410	-.0481	0.1951	0.3207
PHY1	0.1437	0.2641	0.1747	0.2760	0.2581	0.2326	0.1490	0.2708	0.2945
SOC2	0.2486	0.1940	0.1907	-.0003	0.2488	0.3340	-.0867	0.1604	0.1849
COG1	0.3459	0.3093	0.3315	0.3128	0.4358	0.3021	0.1209	0.3208	0.3954
SOC3	0.2609	0.2751	0.1719	-.0041	0.3227	0.4158	-.0922	0.1836	0.2342
COG2	0.0875	0.1814	0.0080	0.1189	0.1239	0.0590	0.1095	0.2031	0.0749
BEH1	0.3234	0.1641	0.1352	0.1061	0.3241	0.3960	-.0400	0.1241	0.2073
BEH2	0.2928	0.4323	0.3366	0.2895	0.4090	0.2856	0.2865	0.3952	0.4884
BEH3	1.0000	0.2028	0.2372	0.2114	0.3981	0.3766	-.0270	0.2019	0.2794
EMO2	0.2028	1.0000	0.2199	0.2273	0.3658	0.2478	0.1243	0.2500	0.2867
COG3	0.2372	0.2199	1.0000	0.3024	0.2980	0.1956	0.0784	0.1527	0.2497
SOC4	0.2114	0.2273	0.3024	1.0000	0.3782	0.1318	0.2097	0.2827	0.2859
EMO3	0.3981	0.3658	0.2980	0.3782	1.0000	0.3559	0.1524	0.3285	0.3745
BEH4	0.3766	0.2478	0.1956	0.1318	0.3559	1.0000	-.0411	0.1857	0.2142
SOC5	-.0270	0.1243	0.0784	0.2097	0.1524	-.0411	1.0000	0.1833	0.1910
BEH5	0.2019	0.2500	0.1527	0.2827	0.3285	0.1857	0.1833	1.0000	0.5288
COG4	0.2794	0.2867	0.2497	0.2859	0.3745	0.2142	0.1910	0.5288	1.0000
EMO4	0.1240	0.2314	0.0613	0.1659	0.1220	0.0746	0.0760	0.4441	0.2291
PHY2	0.3414	0.3223	0.3387	0.3524	0.3485	0.2576	0.1188	0.2292	0.3557
PHY3	0.1340	0.1697	0.0672	0.1389	0.1584	0.0824	0.1664	0.3175	0.2741
SOC6	-.0625	0.0336	0.0475	0.1525	0.0717	-.1033	0.2241	0.1807	0.1255
COG5	0.2006	0.2822	0.2751	0.1886	0.3207	0.3251	0.0031	0.3024	0.3962
PHY4	0.2609	0.3184	0.2009	0.2809	0.2869	0.2485	0.1531	0.2779	0.3433
EMO5	0.4068	0.3758	0.2510	0.2355	0.6209	0.3813	0.0835	0.3130	0.4311
COG6	0.3254	0.2693	0.2469	0.3098	0.3577	0.2972	0.1051	0.1907	0.3331
COG7	0.3310	0.2057	0.1736	0.0922	0.2592	0.4270	-.0064	0.2169	0.4048
BEH6	-.1581	-.0534	-.1488	0.0747	-.0520	-.1618	0.0682	0.0852	-.0790
EMO6	0.3582	0.2721	0.1782	0.2004	0.3665	0.3208	0.1638	0.2537	0.3140
BEH7	0.2601	0.3000	0.2114	0.0817	0.3053	0.3667	0.0499	0.3371	0.3664
PHY5	0.1809	0.2510	0.1087	0.1693	0.1358	0.1993	0.0865	0.2757	0.2834
SOC7	0.3003	0.1533	0.2103	-.0463	0.2917	0.3331	-.0878	0.0759	0.2617
PHY6	0.2704	0.2809	0.2600	0.2756	0.2942	0.3254	0.0302	0.1932	0.2746
PHY7	0.2245	0.2672	0.1065	0.2166	0.3073	0.1965	0.0607	0.3781	0.3042
EMO7	-.2514	-.2145	-.0943	-.0880	-.3098	-.2329	-.0237	-.0218	-.1621

Table 13. Correlation matrix of responses.

	EMO4	PHY2	PHY3	SOC6	COG5	PHY4	EMO5	COG6	COG7
EMO1	0.1627	-.0221	0.1670	0.2477	0.0222	0.0834	0.0869	0.0636	-.0421
SOC1	0.0868	0.0494	0.0686	-.1543	0.2567	0.0765	0.2723	0.1502	0.2721
PHY1	0.1985	0.2914	0.2327	0.0658	0.2919	0.3158	0.3231	0.2544	0.1779
SOC2	-.0495	0.2311	0.0358	-.0874	0.1781	0.1719	0.3082	0.1558	0.2674
COG1	0.2076	0.3661	0.1875	0.0980	0.3551	0.3550	0.4064	0.3466	0.2404
SOC3	0.0541	0.1171	0.1049	-.1394	0.2280	0.1735	0.3654	0.2175	0.3358
COG2	0.2405	-.0077	0.1868	0.1392	0.1120	0.0969	0.1016	-.0297	-.0576
BEH1	0.0635	0.2105	0.0470	-.1124	0.2562	0.2292	0.3795	0.1443	0.3057
BEH2	0.2452	0.3675	0.3257	0.1913	0.3008	0.4223	0.4272	0.3183	0.2828
BEH3	0.1240	0.3414	0.1340	-.0625	0.2006	0.2609	0.4068	0.3254	0.3310
EMO2	0.2314	0.3223	0.1697	0.0336	0.2822	0.3184	0.3758	0.2693	0.2057
COG3	0.0613	0.3387	0.0672	0.0475	0.2751	0.2009	0.2510	0.2469	0.1736
SOC4	0.1659	0.3524	0.1389	0.1525	0.1886	0.2809	0.2355	0.3098	0.0922
EMO3	0.1220	0.3485	0.1584	0.0717	0.3207	0.2869	0.6209	0.3577	0.2592
BEH4	0.0746	0.2576	0.0824	-.1033	0.3251	0.2485	0.3813	0.2972	0.4270
SOC5	0.0760	0.1188	0.1664	0.2241	0.0031	0.1531	0.0835	0.1051	-.0064
BEH5	0.4441	0.2292	0.3175	0.1807	0.3024	0.2779	0.3130	0.1907	0.2169
COG4	0.2291	0.3557	0.2741	0.1255	0.3962	0.3433	0.4311	0.3331	0.4048
EMO4	1.0000	0.1005	0.2402	0.1785	0.1705	0.2148	0.2353	0.0458	0.0796
PHY2	0.1005	1.0000	0.1050	0.0359	0.2922	0.4018	0.3651	0.5537	0.2730
PHY3	0.2402	0.1050	1.0000	0.2701	0.1817	0.3129	0.2609	0.0859	0.1062
SOC6	0.1785	0.0359	0.2701	1.0000	0.0555	0.0896	0.0672	0.0201	-.1173
COG5	0.1705	0.2922	0.1817	0.0555	1.0000	0.2937	0.3904	0.2454	0.2429
PHY4	0.2148	0.4018	0.3129	0.0896	0.2937	1.0000	0.4037	0.3690	0.2347
EMO5	0.2353	0.3651	0.2609	0.0672	0.3904	0.4037	1.0000	0.3951	0.3439
COG6	0.0458	0.5537	0.0859	0.0201	0.2454	0.3690	0.3951	1.0000	0.2218
COG7	0.0796	0.2730	0.1062	-.1173	0.2429	0.2347	0.3439	0.2218	1.0000
BEH6	0.0981	-.2175	0.0433	0.1245	-.0891	-.0669	-.1442	-.1157	-.3130
EMO6	0.1210	0.2802	0.1409	0.0606	0.3636	0.2233	0.4103	0.3159	0.2881
BEH7	0.1908	0.3095	0.1644	-.0469	0.4094	0.2776	0.4076	0.2924	0.2277
PHY5	0.2140	0.2133	0.3751	0.0903	0.2018	0.3414	0.2788	0.3027	0.1929
SOC7	-.0551	0.2791	-.0508	-.1705	0.2209	0.0672	0.2961	0.2415	0.3446
PHY6	0.1028	0.4809	0.1893	0.0647	0.3018	0.3783	0.3417	0.4439	0.1398
PHY7	0.3256	0.2240	0.1815	0.1027	0.3043	0.3368	0.3627	0.2045	0.2591
EMO7	0.0926	-.2363	0.0209	0.0461	-.2275	-.1746	-.2594	-.2201	-.2592

Table 14. Correlation matrix of responses.

	BEH6	EMO6	BEH7	PHY5	SOC7	PHY6	PHY7	EMO7
EMO1	0.1189	0.1038	0.0673	0.0754	-.1029	0.0258	0.1509	0.2090
SOC1	-.1165	0.1597	0.3227	0.0946	0.2671	0.0412	0.1956	-.1257
PHY1	-.0912	0.1937	0.2168	0.2418	0.1208	0.1918	0.2165	-.0791
SOC2	-.2101	0.1973	0.3517	0.1728	0.2955	0.2346	0.1805	-.2637
COG1	-.1195	0.4417	0.3346	0.3279	0.2105	0.3506	0.2432	-.1933
SOC3	-.1277	0.1962	0.3179	0.1945	0.4444	0.2096	0.2163	-.1259
COG2	0.1351	0.1545	0.1050	0.0860	-.0522	0.0028	0.1112	0.0322
BEH1	-.1598	0.1855	0.3381	0.1447	0.2304	0.2298	0.1789	-.1987
BEH2	-.0534	0.3180	0.3243	0.2868	0.1538	0.2536	0.3011	-.1269
BEH3	-.1581	0.3582	0.2601	0.1809	0.3003	0.2704	0.2245	-.2514
EMO2	-.0534	0.2721	0.3000	0.2510	0.1533	0.2809	0.2672	-.2145
COG3	-.1488	0.1782	0.2114	0.1087	0.2103	0.2600	0.1065	-.0943
SOC4	0.0747	0.2004	0.0817	0.1693	-.0463	0.2756	0.2166	-.0880
EMO3	-.0520	0.3665	0.3053	0.1358	0.2917	0.2942	0.3073	-.3098
BEH4	-.1618	0.3208	0.3667	0.1993	0.3331	0.3254	0.1965	-.2329
SOC5	0.0682	0.1638	0.0499	0.0865	-.0878	0.0302	0.0607	-.0237
BEH5	0.0852	0.2537	0.3371	0.2757	0.0759	0.1932	0.3781	-.0218
COG4	-.0790	0.3140	0.3664	0.2834	0.2617	0.2746	0.3042	-.1621
EMO4	0.0981	0.1210	0.1908	0.2140	-.0551	0.1028	0.3256	0.0926
PHY2	-.2175	0.2802	0.3095	0.2133	0.2791	0.4809	0.2240	-.2363
PHY3	0.0433	0.1409	0.1644	0.3751	-.0508	0.1893	0.1815	0.0209
SOC6	0.1245	0.0606	-.0469	0.0903	-.1705	0.0647	0.1027	0.0461
COG5	-.0891	0.3636	0.4094	0.2018	0.2209	0.3018	0.3043	-.2275
PHY4	-.0669	0.2233	0.2776	0.3414	0.0672	0.3783	0.3368	-.1746
EMO5	-.1442	0.4103	0.4076	0.2788	0.2961	0.3417	0.3627	-.2594
COG6	-.1157	0.3159	0.2924	0.3027	0.2415	0.4439	0.2045	-.2201
COG7	-.3130	0.2881	0.2277	0.1929	0.3446	0.1398	0.2591	-.2592
BEH6	1.0000	-.1487	-.0737	-.0614	-.2526	-.1054	-.0339	0.1704
EMO6	-.1487	1.0000	0.4000	0.2131	0.2205	0.3048	0.1883	-.1617
BEH7	-.0737	0.4000	1.0000	0.2864	0.2396	0.3638	0.3198	-.1525
PHY5	-.0614	0.2131	0.2864	1.0000	0.1199	0.3891	0.2588	-.0633
SOC7	-.2526	0.2205	0.2396	0.1199	1.0000	0.2643	0.0992	-.2282
PHY6	-.1054	0.3048	0.3638	0.3891	0.2643	1.0000	0.2861	-.2034
PHY7	-.0339	0.1883	0.3198	0.2588	0.0992	0.2861	1.0000	-.0629
EMO7	0.1704	-.1617	-.1525	-.0633	-.2282	-.2034	-.0629	1.0000

Factorability of the Correlation Matrix

Correlation matrices among the 35 response variables produced by the SAS FACTOR program revealed numerous correlations in excess of .30 and some considerably higher. Patterns in responses across variables were therefore anticipated. Unfortunately, the intra-correlations among the items within each of the five sets of categorical responses (i.e., physical, social, emotional, cognitive, and behavioral) were low (refer to Table 11 through 14). The low intra-correlations within each response category give cause to question whether each variable in each response category measures the same construct and was fully and uniquely represented in the questionnaire. Indeed, the inter-correlations between the items across response categories were often as large or larger than the intra-correlations of items within response categories see (Table 15 through 17). Therefore, levels of commonality (i.e., percent of variance in a variable that overlaps variance in the underlying factors) is expected to be, and was found to be low. Commonality is dependent upon high "common" variance shared among the five response categories.

Table 15. Inter-item correlations.

CORRELATION MATRIX FOR RESPONSE CATEGORY SOCIAL

	SOC1	SOC2	SOC3	SOC4	SOC5	SOC6	SOC7
SOC1		0.2508	0.3424	0.0931	-0.0481	-0.1543	0.2671
SOC2			0.3649	-0.0003	-0.0867	-0.0874	0.2955
SOC3				-0.0041	-0.0922	-0.1394	0.4444
SOC4					0.2097	0.1525	-0.0463
SOC5						-.2241	-0.0878
SOC6							-0.1705
SOC7							

CORRELATION MATRIX FOR RESPONSE FOR CATEGORY PHYSICAL

	PHY1	PHY2	PHY3	PHY4	PHY5	PHY6	PHY7
PHY1		0.2914	0.2327	0.3158	0.2418	0.1918	0.2165
PHY2			0.1050	0.4018	0.2133	0.4809	0.2240
PHY3				0.3129	0.3751	0.1893	0.1815
PHY4					0.3414	0.3783	0.3368
PHY5						0.3891	0.2588
PHY6							0.2861
PHY7							

Table 16. Inter-item correlations.

CORRELATION MATRIX FOR RESPONSE CATEGORY EMOTIONAL

	EMO1	EMO2	EMO3	EMO4	EMO5	EMO6	EMO7
EMO1		0.1006	0.0440	0.1627	0.0869	0.1038	0.2090
EMO2			0.3658	0.2314	0.3758	0.2721	-0.2145
EMO3				0.1220	0.6209	0.3665	-0.3098
EMO4					0.2353	0.1210	0.0926
EMO5						0.4103	-0.2594
EMO6							-0.1617
EMO7							

Table 17. Inter-item correlations.

CORRELATION MATRIX FOR RESPONSE CATEGORY COGNITIVE

	COG1	COG2	COG3	COG4	COG5	COG6	COG7
COG1		0.2092	0.3315	0.3954	0.3551	0.3466	0.2404
COG2			0.0080	0.0749	0.1120	-0.0297	-0.0576
COG3				0.2497	0.2751	0.2469	0.1736
COG4					0.3962	0.3331	0.4048
COG5						0.2454	0.2429
COG6							0.2218
COG7							

CORRELATION MATRIX FOR RESPONSE CATEGORY BEHAVIORAL

	BEH1	BEH2	BEH3	BEH4	BEH5	BEH6	BEH7
BEH1		0.1554	0.3234	0.4107	0.1241	-0.1598	0.3381
BEH2			0.2928	0.2788	0.3952	-0.0534	0.3243
BEH3				0.3667	0.2019	-0.1581	0.2601
BEH4					0.1783	-0.1603	0.3936
BEH5						0.0852	0.3371
BEH6							-0.0737
BEH7							

Outliers Among Variables

The following five variables did not significantly load on any factor: (see Table 18) get an upset stomach; be out of breath; show dependency, need for others, difficulty paying attention; reacts without thinking. These five variables had very low SMCs (less than .35) with all other variables and low correlations (less than .35) (see Table 10) with the three components discussed in the following section. Based on these two criteria, these five variables were deemed outliers among the set of 35 response variables.

Only three response variables, feel confused, be panicky, feel helpless, are considered complex (loading on more than one component).

Principal Components Extraction

The first FA extraction method used was a principal components analysis (PCA) because it reveals a good deal about the probable number and nature of the factors which are direct linear combinations of the original variables. PCA resulted in three interpretable and reliable components. The number of components were selected on the basis of the Scree Test. A varimax (orthogonal) rotation was used to facilitate the interpretation of the components. A promax (oblique) rotation yielded results which closely resemble those varimax rotation. Thus we relied on the varimax rotation because the components are orthogonal and easily interpretable.

The PCA yeilded components whose names and interpretations were based upon the variables which loaded most highly on them. More significantly, a variable with a loading between .40 to .68 on a component was used to define that component. Twenty-six of 35 variables loaded highly on one of the three components (see Table 18).

Table 18 Rotated factor pattern.

	HELPLESSNESS	COMPETENCE	DISTRESS
EMO1	-0.00244	-0.07545	0.52139
SOC1	-0.03331	0.59510	0.15121
PHY1	0.38932	0.13135	0.35396
SOC2	0.17414	0.56360	-0.05704
COG1	0.55702	0.24232	0.29366
SOC3	0.02867	0.69155	0.09541
COG2	0.00654	-0.01809	0.48998
BEH1	0.16272	0.54989	0.03043
BEH2	0.51194	0.20376	0.45137
BEH3	0.38824	0.44844	0.03799
EMO2	0.41458	0.24424	0.27518
COG3	0.49457	0.14705	0.00175
SOC4	0.58064	-0.12850	0.23013
EMO3	0.52513	0.36901	0.18583
BEH4	0.27493	0.60264	0.04471
SOC5	0.32190	-0.27661	0.27198
BEH5	0.21678	0.22404	0.65341
COG4	0.41665	0.34022	0.40347
EMO4	0.04016	0.07433	0.63085
PHY2	0.76393	0.14063	-0.05714
PHY3	0.17919	0.02507	0.54221
SOC6	0.18818	-0.35266	0.40845
COG5	0.34733	0.39196	0.24994
PHY4	0.54631	0.14290	0.28048
EMO5	0.47012	0.49162	0.27179
COG6	0.68478	0.16736	-0.02678
COG7	0.23380	0.57871	0.01691
BEH6	-0.20098	-0.31621	0.32423
EMO6	0.42391	0.32054	0.19158
BEH7	0.26275	0.52946	0.27513
PHY5	0.33327	0.18403	0.32726
SOC7	0.20808	0.59300	-0.20156
PHY6	0.61541	0.19923	0.03230
PHY7	0.21736	0.30596	0.43852
EMO7	-0.38502	-0.28632	0.26149

The first component was named "helplessness" and is primarily characterized by physical responses (faint, shiver, and paralyzed), cognitive responses (unable to think, unable to make a decision), and experience (illusions/hallucination), and emotional responses (feel depression, feel helpless, and make automatic reactions without thinking). An additional social response included crying over dead or wounded buddies. Therefore, the factor "helpless" connotes an inability to respond physically, cognitively or emotionally.

The second component was named "competence" and is primarily characterized by behavioral responses (stick to original mission, handle pressure & stress, perform assigned duties, and be self seeking) and social responses (trust our officers, trust fellow soldiers, trust NCOs and show concern for the other men). An additional cognitive response (know exactly what to do) also loaded on this component. The component "competent" conveys not only the soldier's confidence in himself, but also the confidence he has in those around him.

The third component was named "distress" and is characterized by physical responses (have a pounding heart, be fatigued/ drained), cognitive responses (be over-alert), behavioral responses (be irritable, "touchy," easily bothered), emotional responses (feel extreme anxiety, anger & rage), and social responses (look for leadership). The factor "distress" indicates a high degree of stress and doubt as to which response to make.

Common Factor Analysis

To characterize BFC, only the variance shared by the response variables is required. So, a common factor analysis (CFA) was used to remove unique and error variance from each variable. The number and nature of the factors are comparable to the

components found using the PCA extraction technique (see Table 19). The results of the CFA indicate that the three factors account for 87% of the total common variance shared by all responses variables. Loadings of variables on factors, communalities, and percents of variance and covariance are shown in Table 20.

Table 19. PCA-CFA loading matrix.

	HELPLESSNESS		COMPETENCE		DISTRESS	
	PCA	CFA	PCA	CFA	PCA	CFA
EMO1	-0.00244	0.00249	-0.07545	-0.06292	0.52139	0.43307
SOC1	-0.03331	-0.00084	0.59510	0.51945	0.15121	0.11744
PHY1	0.38932	0.34105	0.13135	0.15111	0.35396	0.34876
SOC2	0.17414	0.17536	0.56360	0.51206	-0.05704	-0.03960
COG1	0.55702	0.50290	0.24232	0.26305	0.29366	0.32021
SOC3	0.02867	0.04425	0.69155	0.63720	0.09541	0.07026
COG2	0.00654	0.01909	-0.01809	-0.01490	0.48998	0.39677
BEH1	0.16272	0.17119	0.54989	0.49407	0.03043	0.03048
BEH2	0.51194	0.45035	0.20376	0.23097	0.45137	0.47078
BEH3	0.38824	0.35977	0.44844	0.43149	0.03799	0.06484
EMO2	0.41458	0.36572	0.24424	0.25507	0.27518	0.28167
COG3	0.49457	0.41633	0.14705	0.18056	0.00175	0.06416
SOC4	0.58064	0.49781	-0.12850	-0.06424	0.23013	0.27249
EMO3	0.52513	0.48072	0.36901	0.38719	0.18583	0.21816
BEH4	0.27493	0.26591	0.60264	0.56974	0.04471	0.05112
SOC5	0.32190	0.23348	-0.27661	-0.18590	0.27198	0.27970
BEH5	0.21678	0.17878	0.22404	0.22815	0.65341	0.62424
COG4	0.41665	0.36394	0.34022	0.35366	0.40347	0.41990
EMO4	0.04016	0.04146	0.07433	0.06794	0.63085	0.54789
PHY2	0.76393	0.71677	0.14063	0.17282	-0.05714	0.01274
PHY3	0.17919	0.15062	0.02507	0.04326	0.54221	0.49075
SOC6	0.18818	0.13115	-0.35266	-0.27356	0.40845	0.37507
COG5	0.34733	0.31442	0.39196	0.38183	0.24994	0.25359
PHY4	0.54631	0.48425	0.14290	0.17208	0.28048	0.30614
EMO5	0.47012	0.43119	0.49162	0.49864	0.27179	0.28143
COG6	0.68478	0.62879	0.16736	0.19869	-0.02678	0.03722
COG7	0.23380	0.21631	0.57871	0.55095	0.01691	0.03418
BEH6	-0.20098	-0.17642	-0.31621	-0.28987	0.32423	0.24458
EMO6	0.42391	0.37906	0.32054	0.32750	0.19158	0.21010
BEH7	0.26275	0.24912	0.52946	0.50236	0.27513	0.26242
PHY5	0.33327	0.29832	0.18403	0.19078	0.32726	0.31813
SOC7	0.20808	0.20672	0.59300	0.55255	-0.20156	-0.17115
PHY6	0.61541	0.56897	0.19923	0.22078	0.03230	0.08078
PHY7	0.21736	0.20427	0.30596	0.28794	0.43852	0.39732
EMO7	-0.38502	-0.32862	-0.28632	-0.28996	0.26149	0.17379

Table 20. Summary information: three-dimension common factor analysis.

	FACTOR1	FACTOR2	FACTOR3	COMMONALITIES
EMO1	0.00249	-0.06292	0.43307	.1915
SOC1	-0.00084	0.51945	0.11744	.2836
PHY1	0.34105	0.15111	0.34876	.2607
SOC2	0.17536	0.51206	-0.03960	.2945
COG1	0.50290	0.26305	0.32021	.4246
SOC3	0.04425	0.63720	0.07026	.4129
COG2	0.01909	-0.01490	0.39677	.1580
BEH1	0.17119	0.49407	0.03048	.2744
BEH2	0.45035	0.23097	0.47078	.4798
BEH3	0.35977	0.43149	0.06948	.3198
EMO2	0.36572	0.25507	0.28167	.2782
COG3	0.41633	0.18056	0.06416	.2100
SOC4	0.49781	-0.06424	0.27249	.3262
EMO3	0.48072	0.38719	0.21816	.4286
BEH4	0.26591	0.56974	0.05112	.3979
SOC5	0.23348	-0.18590	0.27970	.1673
BEH5	0.17878	0.22815	0.62424	.4737
COG4	0.36394	0.35366	0.41990	.4338
EMO4	0.04146	0.06794	0.54789	.3065
PHY2	0.71677	0.17282	0.01274	.5438
PHY3	0.15062	0.04326	0.49075	.2654
SOC6	0.13115	-0.27356	0.37507	.2327
COG5	0.31442	0.38183	0.25359	.3089
PHY4	0.48425	0.17208	0.30617	.3578
EMO5	0.43119	0.49864	0.28963	.5185
COG6	0.62879	0.19869	0.03722	.4362
COG7	0.21631	0.5595	0.03410	.3515
BEH6	-0.17642	-0.28987	0.24458	.1750
EMO6	0.37906	0.32750	0.21010	.2951
BEH7	0.24912	0.50236	0.26242	.3833
PHY5	0.29832	0.19078	0.31813	.2266
SOC7	0.20672	0.55255	-0.17115	.3773
PHY6	0.56897	0.22078	0.08078	.3789
PHY7	0.20427	0.28794	0.39732	.2825
EMO7	-0.32862	-0.28996	0.17379	.2222
Eigenvalue	4.198337	4.185234	3.092578	
Co-variance	.37	.36	.27	
Squared Multiple Correlations (SMCS)	.7868	.8098	.7812	

As indicated by the SMCs (see Table 20) all three factors (comprised of common variance) were internally consistent and well defined by the variables; the lowest of the SMCs was .78. However,

the reverse was not true. Variables were, by and large, not well-defined by this factor solution. Commonality values, as seen in Table 20, tended to be low with 16 out of 35 falling below .30, indicating that nearly half of the variables have only marginal variance in common with the factors. Therefore, one is unable to accurately predict scores on many of the variables from scores on factors and the obtained factor solution.

There is indication of factor purity when the first factor, helplessness, is compared to the second factor, competence. Helplessness is comprised primarily of physical and cognitive responses while the second factor, competence is comprised of social and behavioral responses. The third factor, distress is heterogeneous; the emotional responses are split between this factor and the first. In summary, in this CFA, 24 out of 35 variables loaded on only one factor. Six variables did not load on any factor and were considered outliers, while three variables were complex. To have numerous variables load on only one factor reflects some homogeneity of variables in the response section of the questionnaire.

Correlations Between Factors and Demographic, Unit, and Soldier Variables

The three factors of helplessness, competence, and distress were found to be correlated with demographic, Unit, and Soldier variables. Such relationships add further to the characterization of BFC and are described in the following.

Table 21. Correlations between factors and unit & soldier variables.

Pearson Correlation Coefficients /Prob > |R| under Ho: Rho=0 /N = 353

	HELPLESSNESS	COMPETENCE	DISTRESS
LDR1 Leaders provide understandable information	-0.07905 0.1383	-0.2895 0.0001	-0.09285 0.0815
LDR2 Leaders really care soldiers	0.06724 0.2076	-0.42810 0.0001	-0.04359 0.4142
LDR3 Leaders will support me in times of need	0.08862 0.0964	-0.37898 0.0001	-0.14840 0.0052
LDR4 Leaders are reliable and can count on what they say to be true	-0.08373 0.1164	-0.44640 0.0001	-0.13926 0.0088
LDR5 Leaders show they have the skills & activities to lead me effectively	-0.05351 0.3161	-0.45111 0.0001	-0.19945 0.0002
COH1 Soldier's have a good time during off hours	-0.02600 0.6264	-0.14959 0.0049	0.09912 0.0628
COH2 Soldiers of my unit show they are willing to do whatever it takes to get the job done	-0.14134 0.0078	-0.46292 0.0001	-0.02993 0.5751
COH3 My fellow soldiers and I are involved in training and exercises essential to the success of our unit	-0.09618 0.0711	-0.36710 0.0001	-0.15874 0.0028
COH4 Soldiers in my unit trust each other	-0.19888 0.0002	-0.43560 0.0001	-0.02845 0.5942

Table 21. Correlations between factors and unit & soldiers variables (Continued).

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 353

	HELPLESSNESS	COMPETENCE	DISTRESS
COH5 My fellow soldiers and I help each other out	-0.21197 0.0001	-0.44049 0.0001	-0.01029 0.8473
COM1 Soldiers in my unit disobey MS 0.5355	-0.03309 0.0001	0.27064 0.0418	0.10840
COM2 Soldiers in my unit believe they contribute do the security of USA by helping to protect Europe	-0.07812 0.1430	-0.34387 0.0001	-0.07675 0.1502
COM3 Soldiers in my unit show pride in their performance appearance and history of their unit	-0.01587 0.7664	-0.43106 0.0001	-0.11246 0.0347
COM4 Talk about thier part on accomplishing the mission of their unit	-0.03616 0.4982	-0.35741 0.0001	-0.08276 0.1207
RIC1 I feel responsible for the lives of my fellow soldiers	0.03569 0.5038	-0.31106 0.0001	0.02037 0.7028
RIC2 I have control over my day today activities	-0.01995 0.7087	-0.16524 0.0018	-0.16804 0.0015
RIC3 Although this is often a dull & thankless job, my duties can be interesting/challenging	-0.04418 0.4079	-0.29871 0.0001	-0.16169 0.0023
RIC4 I wish I had some other job in my unit 0.0007	0.18009 0.0001	0.34324 0.0003	0.19157

Table 21. Correlations between factors and unit & soldier variables (Continued).

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 353

	HELPLESSNESS	COMPETENCE	DISTRESS
RIC5 I receive respect from from my fellow soldiers because of my job in the unit	0.07929 0.1371	-0.39422 0.0001	-0.00061 0.9909
PWB1 I feel stressed out from the pressure of being a soldier	0.16405 0.0020	0.14848 0.0052	0.02653 0.6194
PWB2 My family does activities to keep fit and healthy	0.09926 0.0625	-0.14171 0.0077	-0.02291 0.6680
PWB3 I'm OK physically and emotionally	-0.18950 0.0003	-0.23308 0.0001	-0.01670 0.7545
PWB4 My family shows love and affection for each other and for me	0.04123 0.4399	-0.11449 0.0315	0.05363 0.3150
PWB5 I see to the safety and well-being of my spouse/children/ extended family	0.02847 0.5940	-0.10091 0.0582	0.00732 0.8909
GENKNOW	-0.13345 0.0121	-0.01685 0.7524	0.11652 0.0286

Demographic Variables

The factor competence was significantly correlated with the demographical variables of age, marital status, time in the military service, experience, as well as time in Germany. Since responses were a measure of expected combat stress, the lower the score, the less stress was indicated. Therefore, negative correlations with age (-.21), experience (-.27), and time in military service (-.21) indicate less combat stress when these variables are high. These correlations are significant (r (353) $p < .01$).

Unit and Soldier Variables

The factor competence was significant by correlated (alpha < .01) with all of the Unit Variables to including leadership, cohesion, and commitment (see Table 21). The factor competence is characterized by low levels of combat stress, and was generally associated with high scores on leadership:

o Leadership:

LDR 1 - Leaders provide accurate and understandable information
LDR 2 - Leaders really care about safety of their soldiers
LDR 3 - Leaders will support me in time of need
LDR 4 - Leaders are reliable and can correct on what they say to be true
LDR 5 - Leaders show they have the skills and abilities to lead me effectively

o Cohesions:

COH 1 - Soldiers have a good time during off hours
COH 2 - Soldiers of my unit show they are willing to do whatever it takes to get the job done
COH 3 - My fellow soldiers and I are involved in training and exercise essential to the success of our unit

COH 4 - Soldiers in my unit trust each other
COH 5 - My fellow soldier's and I help each other out

o Commitment:
COM 1 - Soldiers in my unit disobey -----
COM 2 - Soldiers in my unit believe they contribute to the security of USA by helping to protect Europe
COM 3 - Soldiers in my unit show pride in their performance, appearance and history of their unit.
COM 4 - Talk about their part in accomplishing the mission of heir unit

Further, moderate (but still significant) relationships were found between the factor competence and soldier variables including role in combat and personal well being; I'm OK physically and mentally ($\underline{r}$ (353) = -.23, p <.01).

RIC 1 - I feel responsible for the lives of my fellow soldiers
RIC 2 - I have control over my day to day activities
RIC 3 - Although this is often a dull and thankless job, my duties can be interesting/challenging
RIC 4 - I wish I had some other job in my unit
RIC 5 - I receive respect from my fellow soldiers because of my job in the unit

General knowledge was correlated with both the helpless ($\underline{r}$ (353) = -.13, p < .01) and the distraught factors ($\underline{r}$ (353) = -.12, p < .03).

APPENDIX D

CONTENT CATEGORIZATION SCHEME

Coding Scheme for Categorizing Subjects' Spontaneous Responses

Subject Num. |_____| **Coder Num.** |____| **Num. of Statements** |_____|

Evaluation of Combat Readiness: [In the first two categories, mark only direct statements relating to EVALUATION and not to inferences based upon performance]

	positive	negative	questionable
Equipment			
Unit & Self			

Commanders

[In the next three sub-categories mark both direct statements of ealuation, and also inferences based inferences based upon the performance of these commanders]

	positive	negative
NCO		
Officers		
Leaders		

Affective Responses:

Despair	Panic	Fear	Rage	Frustration	Excitement

Cognitive Response:

Uncertainty of battlefield: |_____|
Thinking of home: |_____|

	positive	negative
Appraisal of situation:		

Motivation to Fight:

positive	negative

Activities:

	positive	negative
Actions of Mission Accomplishment		
Actions of SOP (methodolgy of fighting)		
Actions of self / protection		
Escape		
Prayers and fantasy		

Outcomes:

Survival |___| **Injury** |___| **Death** |___| **Equipment Damage** |___|

Victory |___| **Defeat** |___|

Coding Scheme for Categorizing Subjects' Spontaneous Responses

Subject Num. |_____| **Coder Num.** |____| **Num. of Statements** |_____|

Evaluation of Combat Readiness: [In the first two categories, mark only direct statements relating to EVALUATION and not to inferences based upon performance]

	positive	negative	questionable
Equipment			
Unit & Self			

Commanders

[In the next three sub-categories mark both direct statements of ealuation, and also inferences based inferences based upon the performance of these commanders]

	positive	negative
NCO		
Officers		
Leaders		

Affective Responses:

Despair	Panic	Fear	Rage	Frustration	Excitement

Cognitive Response:

Uncertainty of battlefield: |_____|
Thinking of home: |_____|

	positive	negative
Appraisal of situation:		

Motivation to Fight:

positive	negative

Activities:

	positive	negative
Actions of Mission Accomplishment		
Actions of SOP (methodolgy of fighting)		
Actions of self / protection		
Escape		
Prayers and fantasy		

Outcomes:

Survival |___| **Injury** |___| **Death** |___| **Equipment Damage** |___|

Victory |___| **Defeat** |___|

DISTRIBUTION LIST

DNA-TR-90-112

DEPARTMENT OF DEFENSE

ARMED FORCES RADIOBIOLOGY RSCH INST
ATTN: AFFRI-DEPT OF RAD BIOCHEMISTRY
ATTN: BHS
ATTN: DIRECTOR
ATTN: EXH
ATTN: MRA
ATTN: PHY
ATTN: RSD
ATTN: SCIENTIFIC DIRECTOR
ATTN: TECHNICAL LIBRARY

ASSISTANT SEC OF DEF (C3I)
ATTN: DIR (S&TNFC3)

ASSISTANT SECRETARY OF DEFENSE
INTERNATIONAL SECURITY POLICY
ATTN: NUC FORCES & ARMS CONTROL PLCY

ASSISTANT TO THE SECRETARY OF DEFENSE
ATTN: EXECUTIVE ASSISTANT
ATTN: MIL APPL
ATTN: MIL APPL C FIELD

DEFENSE INTELLIGENCE AGENCY
ATTN: DB
5 CYS ATTN: DB-4 RSCH RESOURCES DIV
ATTN: DB-5C
ATTN: DB-6
ATTN: DB-6B
ATTN: DB-6E
ATTN: DIA/VPA-2 (FED RES DIV)
ATTN: DN
ATTN: DT
ATTN: OFFICE OF SECURITY
ATTN: OS

DEFENSE INTELLIGENCE COLLEGE
ATTN: DIC/RTS-2
ATTN: DIC/2C

DEFENSE NUCLEAR AGENCY
ATTN: CID
ATTN: DFRA
ATTN: NANF
ATTN: NASF
ATTN: OPNA
ATTN: OPNS
ATTN: RAEE
20 CYS ATTN: RARP
2 CYS ATTN: TITL

DEFENSE TECHNICAL INFORMATION CENTER
2 CYS ATTN: DTIC/FDAB

FIELD COMMAND DEFENSE NUCLEAR AGENCY
ATTN: FCPR
ATTN: FCPRT
ATTN: NUC SECURITY

FIELD COMMAND DEFENSE NUCLEAR AGENCY
ATTN: FCNM
ATTN: FCTT W SUMMA

INTELLIGENCE CENTER, PACIFIC
ATTN: COMIPAC

INTERSERVICE NUCLEAR WEAPONS SCHOOL
ATTN: TTV
2 CYS ATTN: TTV 3416TH TTSQ

NATIONAL DEFENSE UNIVERSITY
ATTN: ICAF, TECH LIB
ATTN: NWCLB-CR
ATTN: LIBRARY
ATTN: STRAT CONCEPTS DIV CTR

NET ASSESSMENT
ATTN: DOCUMENT CONTROL

OFC OF MILITARY PERFORMANCE ASSESSMENT TECH
ATTN: F HEGGE

PROGRAM ANALYSIS & EVALUATION
ATTN: NAVAL FORCES
ATTN: STRATEGIC PROGRAMS & TNF

STRATEGIC AND THEATER NUCLEAR FORCES
ATTN: DR E SEVIN
ATTN: DR SCHNEITER

THE JOINT STAFF
ATTN: JKAC
ATTN: JKC (ATTN: DNA REP)
ATTN: JLT
ATTN: JPEP

THE JOINT STAFF
ATTN: ED30 (J-3 STRATEGIC OPS DIV)
ATTN: J-3 SPECIAL OPERATIONS
ATTN: J-8
ATTN: JAD/SFD
ATTN: JSOA

U S EUROPEAN COMMAND/ECJ-6-DT
ATTN: ECJ-6

U S EUROPEAN COMMAND/ECJ2-T
ATTN: ECJ2-T (TGTS DIV)

U S EUROPEAN COMMAND/ECJ3-CCD
ATTN: ECJ-3

U S EUROPEAN COMMAND/ECJ4-LW
ATTN: ECJ4-LW

U S EUROPEAN COMMAND/ECJ5-N
ATTN: ECJ5-N (NUC BRANCH)

U S EUROPEAN COMMAND/ECJ7/LW
ATTN: ECJ-7 LW

UNDER SEC OF DEFENSE FOR POLICY
ATTN: DUSP/P
ATTN: USD/P

DEPARTMENT OF THE ARMY

DEP CH OF STAFF FOR OPS & PLANS
ATTN: DAMO-FDQ

ATTN: DAMO-SWN
ATTN: DAMO-ZXA

HARRY DIAMOND LABORATORIES
ATTN: SLCH-NW-RS (JOSIP SOLN)
ATTN: SLCIS-IM-TL (TECH LIB)

JOINT SPECIAL OPERATIONS COMMAND
ATTN: J-2
ATTN: J-5

NUCLEAR EFFECTS DIVISION
ATTN: STEWS-NE-T

U S ARMY ARMOR SCHOOL
ATTN: ATSB-CTD
ATTN: TECH LIBRARY

U S ARMY BALLISTIC RESEARCH LAB
ATTN: SLCBR-D
ATTN: SLCBR-DD-T (TECH LIB)
ATTN: SLCBR-TB
ATTN: SLCBR-VL-I (DR KLOPCIC)
ATTN: SLCBR-VL-V

U S ARMY COMBAT SYSTEMS TEST ACTIVITY
ATTN: JOHN GERDES
ATTN: MIKE STANKA

U S ARMY COMD & GENERAL STAFF COLLEGE
ATTN: ATZL-SWJ-CA
ATTN: ATZL-SWT-A

U S ARMY CONCEPTS ANALYSIS AGENCY
ATTN: TECHNICAL LIBRARY

U S ARMY FORCES COMMAND
ATTN: AF-OPTS

U S ARMY FOREIGN SCIENCE & TECH CTR
ATTN: C WARD (AIFRTC)

U S ARMY INFANTRY CENTER
ATTN: ATSH-CD-CSO

U S ARMY ITAC
ATTN: IAX-Z

U S ARMY LABORATORY COMMAND
ATTN: DIRECTOR
ATTN: DR D HODGE

U S ARMY NUCLEAR & CHEMICAL AGENCY
ATTN: MONA-NU

U S ARMY TEST & EVALUATION COMMAND
ATTN: STECS-NE(70)

U S ARMY WAR COLLEGE
ATTN: LIBRARY
ATTN: STRATEGIC STUDIES INSTITUTE

U S MILITARY ACADEMY
ATTN: DEPT OF BEHAVOR SCI & LEADERSHIP
ATTN: DEPT OF PHYSICS COL J G CAMPBELL
ATTN: SCIENCE RESEARCH LAB

US ARMY MATERIEL SYS ANALYSIS ACTVY
ATTN: DRXSY-DS

USA SURVIVABILITY MANAGMENT OFFICE
ATTN: SLCSM-SE J BRAND

USACACDA
ATTN: ATZL-CAD-N

DEPARTMENT OF THE NAVY

MARINE CORPS
ATTN: CODE PPO
ATTN: PSI G/RASP

NAVAL AIR SYSTEMS COMMAND
ATTN: PMS-423
ATTN: SEA-06GN

NAVAL OCEAN SYSTEMS CENTER
ATTN: CODE 9642-B

NAVAL PERSONNEL RES & DEV CENTER
ATTN: CODE P302

NAVAL POSTGRADUATE SCHOOL
ATTN: CODE 1424 LIBRARY

NAVAL RESEARCH LABORATORY
ATTN: CODE 1240
ATTN: CODE 2627 (TECH LIB)

NAVAL SURFACE WARFARE CENTER
ATTN: CODE F-31
ATTN: G RIEL

NAVAL TECHNICAL INTELLIGENCE CTR
ATTN: NTIC-DA30

NAVAL WAR COLLEGE
ATTN: CODE E-11 TECH SVC
ATTN: CTR FOR NAV WARFARE STUDIES
ATTN: DOCUMENT CONTROL
ATTN: LIBRARY
ATTN: STRATEGY DEPT

NUCLEAR WEAPONS TNG GROUP, ATLANTIC
ATTN: CODE 222
ATTN: DOCUMENT CONTROL

NUCLEAR WEAPONS TNG GROUP, PACIFIC
ATTN: CODE 32

OFFICE OF CHIEF OF NAVAL OPERATIONS
ATTN: NIS-22
ATTN: NOP 06D
ATTN: NOP 403
ATTN: NOP 50 AVN PLNS & RQMNTS DEV
ATTN: NOP 60
ATTN: NOP 60D
ATTN: NOP 603
ATTN: NOP 91
ATTN: OP 654
ATTN: PMS/PMA-423

OPERATIONAL TEST & EVALUATION FORCE
ATTN: COMMANDER

PLANS, POLICY & OPERATIONS
ATTN: CODE-P
ATTN: CODE-POC-30

TACTICAL TRAINING GROUP, PACIFIC
ATTN: COMMANDER

DEPARTMENT OF THE AIR FORCE

ACADEMY LIBRARY DFSELD
ATTN: LIBRARY

AFIS/INT
ATTN: INT

AIR UNIVERSITY
ATTN: STRATEGIC STUDIES

AIR UNIVERSITY LIBRARY
ATTN: AUL-LSE
ATTN: LIBRARY

ASSISTANT CHIEF OF STAFF
2 CYS ATTN: AF/SAMI

ASSISTANT CHIEF OF THE AIR FORCE
ATTN: SAF/ALR

BALLISTIC MISSLE OFFICE/MY
ATTN: MCES (LT W MARK YEAGER)

DEPUTY CHIEF OF STAFF FOR PLANS & OPERS
ATTN: AFXOOSS

FOREIGN TECHNOLOGY DIVISION
ATTN: CCN
ATTN: SDA

PHILLIPS LABORATORY, WEAPONS DIVISION
ATTN: NTCA

STRATEGIC AIR COMMAND
ATTN: XRFS

STRATEGIC AIR COMMAND/SPD
ATTN: SPD

STRATEGIC AIR COMMAND/STIC
ATTN: 544 SIW/DI (STIC)

STRATEGIC AIR COMMAND/XOXO
ATTN: XOXO

STRATEGIC AIR COMMAND/XPX
ATTN: XPZ

TACTICAL AIR COMMAND/XPSC
ATTN: TAC/DOA

USAF SCHOOL OF AEROSPACE MEDICINE
ATTN: RADIATION SCIENCES DIV

DEPARTMENT OF ENERGY

DEPARTMENT OF ENERGY
ATTN: DR T JONES

LAWRENCE LIVERMORE NATIONAL LAB
ATTN: Z DIVISION LIBRARY

LOS ALAMOS NATIONAL LABORATORY
ATTN: D STROTTMAN
ATTN: REPORT LIBRARY

MARTIN MARIETTA ENERGY SYSTEMS INC
ATTN: B SANTORO
ATTN: G KERR
ATTN: J WHITE
ATTN: W RHOADES

SANDIA NATIONAL LABORATORIES
ATTN: TECH LIB 3141

OTHER GOVERNMENT

CENTRAL INTELLIGENCE AGENCY
ATTN: COUNTER-TERRORIST GROUP
ATTN: DIRECTOR OF SECURITY
ATTN: MEDICAL SERVICES
ATTN: NIO-T
ATTN: N10 - STRATEGIC SYS

FEDERAL BUREAU OF INVEST ACADEMY
ATTN: BEHAVIORAL RSCH UNIT
ATTN: LIBRARY

FEDERAL EMERGENCY MANAGEMENT AGENCY
ATTN: CIVIL SECURITY DIVISION
ATTN: G ORRELL NP-CP
ATTN: OFC OF CIVIL DEFENSE J F JACOBS

U S DEPARTMENT OF STATE
ATTN: PM/STM

U S NUCLEAR REGULATORY COMMISSION
ATTN: DIR DIV OF SAFEGUARDS
ATTN: S YANIV

DEPARTMENT OF DEFENSE CONTRACTORS

ARES CORP
ATTN: A DEVERILL

ENW INTERNATIONAL, LTD
ATTN: J CANE

HORIZONS TECHNOLOGY, INC
ATTN: F GREY

HORIZONS TECHNOLOGY, INC
ATTN: J MARSHALL-MISE

KAMAN SCIENCES CORP
ATTN: DASIAC

KAMAN SCIENCES CORPORATION
ATTN: R STOHLER

KAMAN SCIENCES CORPORATION
ATTN: DASIAC

LOCKHEED MISSILES & SPACE CO, INC
ATTN: WE-YOUNG WOO

LOGICON R & D ASSOCIATES
ATTN: DOCUMENT CONTROL
ATTN: DOUGLAS C YOON

MICRO ANALYSIS AND DESIGN
ATTN: R LAUGHERY

MISSION RESEARCH CORP
ATTN: DR NEIL GOLDMAN

PACIFIC-SIERRA RESEARCH CORP
2 CYS ATTN: G ANNO
ATTN: H BRODE

PACIFIC-SIERRA RESEARCH CORP
ATTN: D GORMLEY
2 CYS ATTN: G MCCLELLAN

SCIENCE APPLICATIONS INTL CORP
ATTN: D KAUL
ATTN: DOCUMENT CONTROL
ATTN: E SWICK, MS 33
ATTN: L HUNT
ATTN: R J BEYSTER
ATTN: W WOOLSON

SCIENCE APPLICATIONS INTL CORP
ATTN: B BENNETT
ATTN: D BAREIS
ATTN: DOCUMENT CONTROL
2 CYS ATTN: J CONROY
ATTN: J FOSTER
ATTN: J MCGAHAN
ATTN: J PETERS
ATTN: L GOURE
2 CYS ATTN: M FINEBERG
2 CYS ATTN: R GAL
2 CYS ATTN: R YOUNG
2 CYS ATTN: S MASTERSON
ATTN: W LAYSON

SCIENCE APPLICATIONS INTL CORP
ATTN: R CRAVER

SCIENCE APPLICATIONS INTL CORP
ATTN: JOHN A SHANNON

TECHNICO SOUTHWEST INC
ATTN: S LEVIN

TRW OGDEN ENGINEERING OPERATIONS
ATTN: D C RICH

TRW SPACE & DEFENSE SECTOR
ATTN: DR BRUCE WILSON

UNIVERSITY OF CINCINNATI MEDICAL CENTER
ATTN: E SILBERSTEIN