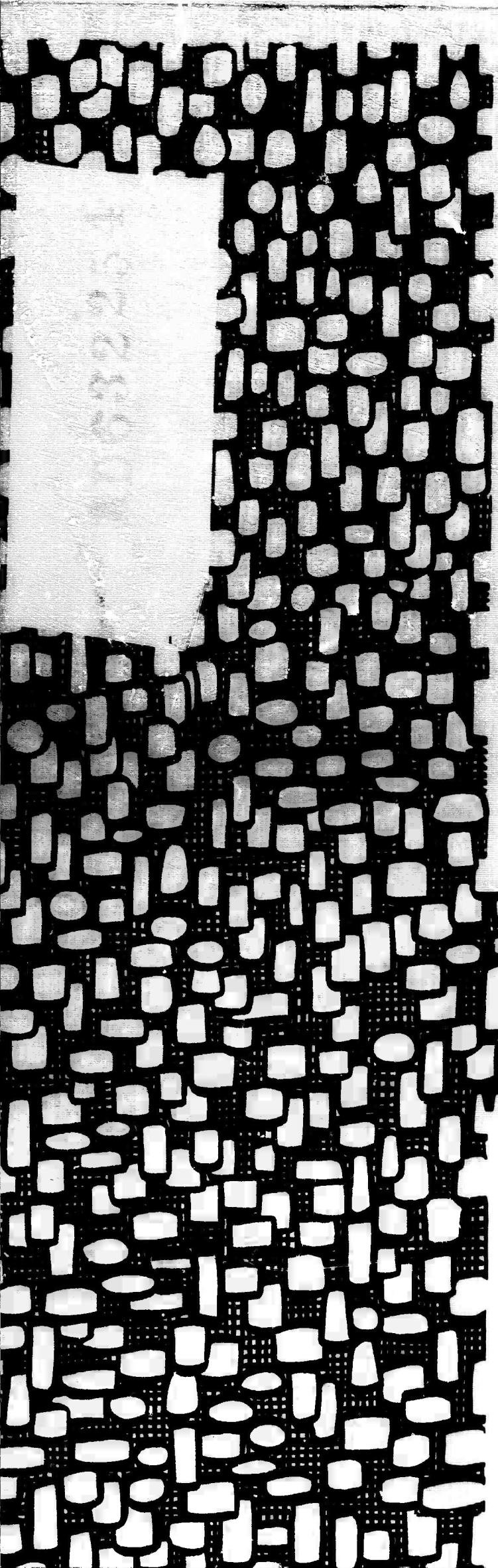

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paraphysical variables in weapon system analysis

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PARAPHYSICAL VARIABLES IN WEAPON SYSTEM ANALYSIS

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SUMMARY

The effectiveness of a weapon system is dependent not only upon its physical characteristics but also upon the social characteristics of the enemy. The reaction of enemy combatants to attack is a function of personality, culture, and social organization. In order to obtain from a weapon system the results theoretically possible, these paraphysical variables must be considered.

If the paraphysical effects of weapons are to be exploited, they must be expressed in a form which is usable in weapon system analysis. To accomplish this objective, it is proposed that the concept of modal personality be employed as a construct in the study of overt combat behavior to generate the basic data needed.

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PARAPHYSICAL VARIABLES IN WEAPON SYSTEM ANALYSIS

I. INTRODUCTION

Behavior under fire is determined by a long list of antecedent variables, but the dominant determinant is the physical characteristics—qualitative and quantitative—of a weapon to which a combatant is subjected. These physical characteristics result in both direct and indirect effects on the physical behavior of the combatant. Certain of the indirect effects involve the personality of the combatant and his perception of the weapon. In this ANSER Report, these effects are called "paraphysical" to emphasize the dominance of the physical characteristics of the weapon.

Every weapon is limited in its purely physical effects. When the physical effectiveness of a given weapon has been maximized, the only way it can be made more effective is by changing the physical characteristics or method of employment to affect human behavior in such a way that it decreases the effectiveness of the enemy under fire.

Decreased enemy effectiveness is induced not only by physically affecting a person, but also by affecting his perception of a weapon and evaluation of its effects. The perceived weapon physical effects typically do not bear a one-to-one relationship to actual effects. Perception of weapon effects is a function of three classes of variables: culture, personality, and situation. Each of these classes includes a configuration of subvariables.

The purpose of this report is to identify and describe paraphysical variables that contribute to the effectiveness of certain types of non-nuclear weapons and to assess the practicality of taking such variables into account in weapon system analysis. Section II presents conclusions based upon previous studies and the application of behavioral science concepts to weapon system analysis. Section III discusses representative studies of paraphysical variables in weapon effects, the process of weapon effects, and a suggestion of

variables to be used in weapon system analysis. The appendix discusses the design of experiments and applications of experimental results to weapon system analysis.

Since the purpose of citing data from previous research was not to test hypotheses, the limitations of the studies stated by the respective researchers have not been described.

II. CONCLUSIONS

The conclusions set forth in the report and listed below are based upon a review and analysis of completed studies of paraphysical weapon effects. These conclusions are essentially hypotheses for further investigation because only a small number of studies of the problem has been made.

-1 Fear and anxiety are inadequate variables for weapon system analysis. Much past research has investigated these variables without considering the usefulness of the resulting data in weapon system analysis.

-2 Since behavior, in contrast with fear, is observable and can be described objectively, it is a more useful variable for weapon system analysis.

-3 There is evidence that combat behavior is related to culture.

-4 There is evidence that combat behavior is related to personality.

-5 There is evidence that combat behavior is related to the specific classes of weapons to which combatants are exposed.

-6 Since personality results, in part, from exposure to culture, and there are identifiable differences in culture, differences in personality among persons brought up in different cultures may be identified.

-7 Configurations of personality characteristics resulting from culture experience may be classified. A convenient method of classification is the modal personality based upon configuration of most frequently appearing personality traits. There may be one or more modal personalities in a culture.

-8 The concept of modal personality may offer a useful construct for analysis of weapon effects on the behavior of combatants.

-9 Results of the study are inconclusive concerning the value of future research on paraphysical effects of weapons; however, if research on paraphysical effects is continued, increased attention should be devoted to collecting data on combat behavior rather than on combat fear and anxiety.

III. DISCUSSION

Variables identified in previous research are introduced in this section, and a model of the weapon-effects process is proposed. This section also discusses the design of experiments to test hypotheses concerned with the paraphysical effects of weapons.

Subsection A offers a brief consideration of the use of fear as a variable for analysis of completed research and for application in future research. In subsection B, general fear and specific fear in battle are considered on the basis of earlier studies. The effect of weapons on behavior is offered in subsection C as an alternative to fear as a variable in weapon system analysis. Ethnic differences are considered as hypotheses to explain some of the differences in reaction to weapons among combatants. Subsection D suggests some of the difficulties in the use of data collected for earlier studies in testing new hypotheses. Subsection E. offers a model for analysis of weapon effects.

A. Fear and Anxiety

Fear is an intervening variable between a stimulus and some form of reaction (response). The reaction may be physiological (increase in heartbeat, trembling) or behavioral—e.g., running away from the stimulus source. Fear itself is not observable, but observable changes in a person exposed to stimuli indicate existence of a psychic pattern that is sometimes called fear; at other times, anxiety.

1. Studies on Fear and Anxiety

Mowrer, one of the leaders in the stimulus-response school of learning, uses the terms fear and anxiety as synonymous (as cited in Reference 1: p. 104). In contrast, Grinker and Spiegel conceive of fear as a response to a present real stimulus; anxiety as a response to anticipated stimuli:

> "Fear is an emotion in response to a stimulus in reality that either threatens the individual at the moment or portends actual danger.

> The signal of fear is experienced consciously by the organisms. Anxiety is an anticipation of danger." (Reference 2: p. 120)

This clear distinction is generally accepted, according to May:

> "It is agreed by students of anxiety—French, Goldstein, Horney, to mention only three—that anxiety is diffuse apprehension, and that the central difference between fear and anxiety is that fear is a reaction to a specific danger while anxiety is unspecific, 'vague,' 'objectless'...." (Reference 1: p. 190)

May goes on to say, in discussing maturation in relation to fear and anxiety, that:

> "In combat, after the first reflexive protective reactors, there emerge the diffuse, undifferentiated emotional responses to threat, namely anxiety; the last to emerge in maturation are differentiated emotional responses to specific, localized dangers, namely fears." (Reference 1: p. 203)

May's statement appears to provide a clear distinction that would be useful in analysis of psychic reactions in warfare. However, in a footnote to the above quotation, the distinction becomes blurred:

> "This order is also discernible in an adult's reaction to a danger stimulus, let us say, to the sudden hearing of a gunshot. First, the adult responds with startle. Secondly, as he becomes aware of the threat but is unable to localize the source of the shooting or to tell whether it is aimed at him, he is in the state of anxiety. Third, he is able to spot the source of the gunshot and to take steps to get out of the way, he is in the state of fear." (Reference 1: p. 203)

The value of the distinction between fear and anxiety deteriorates when the two concepts become so closely associated in time. Thus, the distinction may be ignored in this report.*

Assumption of the existence of fear and anxiety as realities raises questions as to the origin of these emotions. Watson proposed that there are only two innate fears—fear of loud, banging noises and fear of sudden loss of support. (Reference 3) All other fears are learned responses. The stimulus-response school of learning, represented by Mowrer (Reference 4) and Miller and Dollard (Reference 5), supports the concept of fear as a learned response. In contrast, the followers of Cannon (Reference 6) emphasize the physiological source of emotion. May hedges the question by stating:

> "It is here suggested that the capacity for anxiety is not learned, but the quantities and forms of anxiety in a given individual are learned. This means that normal anxiety is a function of the organism qua organism; every human being would experience anxiety in situations of threat to his vital values. But <u>what</u> the individual regards as a situation of threat to vital values is largely due to learning. Particular fears and foci of anxiety are the expression of patterns which develop out of the interrelation of the individual's capacities for reacting to threat with his environment and conditioning. The matrix in which the patterns develop, i.e., in which the conditioning

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*However, the distinction is significant in therapy. For example, Wolf and Wolf point out that in gastric functions, the effect of fear is to decrease gastric activity, and the effect of anxiety is to increase gastric activity. (S. Wolf and H. G. Wolf, <u>Human Gastric Functions</u>, Oxford University Press, New York, 1947, cited in May, Reference 1.)

> occurs, is the family situation in particular which, in turn, is part of the larger general culture in which the individual lives." (Reference 1: p. 208)

While there are many approaches to the study of fear, May's statement would be generally accepted by those active in the field. The last sentence in the quotation is of significance for this report. If man learns to fear certain objects and conditions in his environment, he learns them in a culture. Further, since culture varies, fears will vary with culture.

May further states:

> "The anxiety of a given individual is conditioned by the fact that he lives in a given culture at a particular point in the historical development of that culture. Though the majority of writers on anxiety would agree with this statement in some measure, there are wide divergencies in the literature with respect to the relative emphasis placed on culture and how culture is treated. In general, those who have viewed the problem of anxiety in terms of the expression of indigenous individual drives have tended to omit cultural factors (like the early Freud) or to treat culture negatively (like the later Freud). On the other hand, those who see personality development as occurring at every moment within a social matrix have emphasized that the problem of anxiety must always be viewed in the context of the interrelation of the individual with his culture.... It is fair to say that there has been in recent years a considerable trend in the latter direction, with an emergence only lately of an endeavor to trace the historical backgrounds of cultural patterns." (Reference 1: p. 215)

2. Recapitulation of Fear and Anxiety

Fear is an intervening variable between an observable stimulus and an observable response. Fear is an emotional response to present perceived threat; anxiety is an emotional response to a perceived future threat. In cases such as combat, the distinction is not significant, and the terms are used synonymously by many writers. Stimuli which arouse emotions of fear and anxiety are conditioned by culture, as are the forms of response.

B. Fear in Battle

In this section, studies of the fear reaction of men under fire are considered. Fear may be diffuse (general) or specific; i.e., oriented toward a specific weapon or specific characteristics of weapons. During World War II, civilians as well as military populations were subjected to bombing. The effects of bombing on civilian populations are also considered in this section. Later subsections consider the effect of experience upon reaction to attack and evaluate the usefulness of fear as a variable in weapon system analysis.

1. General Fears in Battle

The common reaction to battle is fear. Even though a military man is prepared for his experience in battle by precombat training, the combat environment is not (and perhaps cannot be) completely simulated. Regardless of preparation, the first exposure to enemy fire is traumatic. Fear is aroused when there is the possibility of loss of something valued by a person. In battle this may be a fear of bodily harm, death, or status (through failure in battle, or cowardice).

Data from a study by Dollard (Reference 7: p. 29), of 300 combat veterans of the Abraham Lincoln Brigade of the Spanish Civil War, show that the most frequently expressed fear experienced in the first combat action was fear of being a coward (Table 1).

TABLE 1

FEARS EXPERIENCED IN FIRST COMBAT ACTION
(Sample Expressing Fear)

Fear	Percent
Cowardice	36
Crippled or disfigured for life	25
Killed	25
Captured and tortured	8
Painful wounds	6

It is not clear from Dollard's report whether the fear expressed was while under attack or before battle. Further, the interviews took place at least 2 years after the veterans had returned to the United States. In Dollard's sample, 24 percent of the respondents indicated that they were not afraid in combat. (Reference 7: p. 13)

Janis (Reference 8: p. 202) reports a survey, made in Italy in April 1945, of 1,766 World War II combat veterans. The question was: "When you were in combat, did you worry about your chances of becoming a casualty?" The response is indicated in Table 2.

The question asked by Dollard was more general than the question asked by Janis; but even to the more general question, the number who expressed no fear was 24 percent in contrast with 7 percent in answer to the specific question asked by Janis.

The reason for this difference is not apparent. They were, of course, different wars and respondents were from different sampling universes. The Abraham Lincoln Brigade was made up predominately of men who were from large (over

TABLE 2

WORRY ABOUT BECOMING A CASUALTY

	Percent
Worried about it a lot	36
Worried about it some, but not a lot	31
Didn't worry much about it	15
Hardly worried about it at all	7
Never worried about it	7
No answer	4

100,000 population) American cities and who had strong emotional identification with the Loyalist cause. The Janis sample was probably a representation of the American population that served in World War II. Further, the American Army in World War II had a permissive attitude toward fear. Soldiers "...were taught from basic training on, that they need not be ashamed of feeling afraid in danger situations, that fear reactions are normal and are shared by everyone exposed to combat conditions." (Reference 8: p. 196)

2. Fear of Specific Weapons

A person's fears are based on his individual experience, culture, and perception of potential danger and do not always appear rational to an observer.

Dollard, in his study of veterans of the Spanish Civil War, asked the question "Were there certain weapons or projectiles that you had special fear of being wounded by?" (Reference 7: p. 23) The answers are indicated in Table 3.

TABLE 3

WEAPONS FEARED
(Sample: Approximately 300)

Weapon or Projectile	Percent*
Bomb shrapnel	36
Mortar	22
Artillery	18
Bayonet and knife	16
Expanding bullets	16
Grenades	6
Other (strafing, machine guns, bullets, tanks)	13

*"The total percentage is greater than 100% since several men mentioned more than one weapon." Dollard.

Janis (Reference 8: p. 232) reports a study of approximately 700 American enlisted men who were evacuated from North Africa in 1943 during World War II because of wounds and were asked: "What enemy weapon used against you seemed most frightening to you?" Table 4 indicates the response. Janis notes that the table is to be read:

> "Of all men exposed to the 88 mm gun, 48 percent rated it as the most frightening weapon, etc. Those exposed to the 88 mm gun were not in all cases the same men as those exposed to the dive bomber. Since each percentage shown in the chart is calculated from a different

TABLE 4

PERCENT OF MEN EXPOSED TO EACH WEAPON
WHO RATED IT MOST FRIGHTENING

Weapon	Percent
88-millimeter gun	48
Dive bomber	20
Mortar	13
Horizontal bomber	12
Light machine gun	7
Strafing	5
Land mines	2
Rifle fire	0
Miscellaneous (booby traps, tank attack, heavy machine gun, et cetera)	4

base, depending upon the number of men exposed to the weapon, they do not total exactly 100 percent." (Reference 8: p. 232)

During the Korean War, Goldhamer (Reference 9: p. 9) and his associates at The RAND Corporation studied the opinions of Chinese Communist Forces (CCF) and North Korean Army (NKA) prisoners of war (POW's). The order of fears did not vary between the two groups. (Table 5)

Among air weapons, also, the order of fear is the same for CCF and NKA. (Table 6—Reference 9: p. 22)

TABLE 5

CLASS OF WEAPONS MOST FEARED BY COMBAT POW's
WHILE IN FRONTLINE POSITION

	Chinese Communist Forces	North Korean Army
Air weapons	29	28
Artillery	26	26
Infantry weapons	6	19
TOTAL	61	73

TABLE 6

AIR WEAPONS MOST FEARED BY COMBAT POW's

	Chinese Communist Forces	North Korean Army
Napalm	37	36
Strafing	14	13
Rockets	8	6
Bombs	2	6
TOTAL	61	61

The significance of the data in Table 6 is in the order rather than the ratio of fear of one weapon to another. Goldhamer points out, in respect to this:

> "It is apparent that napalm has a very decisive lead as the most feared weapon. It should not, however, be inferred from the above that napalm is considered about three times more fearful than strafing, or six times more fearful than rockets."

There appears to be a difference between the CCF and the NKA response to rockets and bombs, but the sample probably is too small to provide statistical significance.

3. Weapon Characteristics Which Elicit Fear

The weapon that men under fire fear most is the weapon that they believe to be most effective in doing physical harm to them. The psychic effect is associated with the perceived physical characteristics of the weapon and is dependent upon the perceived potential of the weapon for inflicting physical effects.

That casualties are a prime reason for fearing classes of weapons is apparent from a study by Lessing Kahn of Chinese Communist and North Korean soldiers during the Korean War. (Based on Table 7—Reference 10: p. 21.)

Janis reports (Reference 8: p. 234) that three reasons for fear (accuracy, lack of warning, and "rapid rate of fire") are associated with casualty-producing effects. Other reasons (associated with air weapons) are "...the dive bomber because of its 'siren effect' and its 'terrible shrieking noise'...and...the horizontal bomber...because of its noise (21 percent) and the fact that it leaves many men with a 'feeling of helplessness—you can't fight back at it.'" (Reference 8: p. 234) These two reasons are equivalent to "noise" and "invulnerability" reported in Kahn's study (Table 7).

James C. Naylor (Reference 11: p. 9), in a paper presented at the First Symposium on the Psychological Effects

TABLE 7

STATED REASONS FOR FEARING CLASSES OF WEAPONS

Reason	CCF (Sample: 350)	NKA (Sample: 69)
Casualties	166	66
Noise	10	2
Efficiency of action	79	0
Burning	0	0
Restriction of activities	34	0
Invulnerability	8	0
Miscellaneous effects	53	1

of Nonnuclear Weapons (Eglin Air Force Base, 1964), offers additional data from World War II studies on fears of specific weapons. Naylor's table is reproduced in Table 8.

Here, again, it is primarily the perceived physical casualty that provides the basis of fear. The dive bomber, however, is an exception. Here noise (the only variable in the list not directly related to physical harm to the person) is expressed as the source of fear more than any other single characteristic. The Germans predicted this effect of the aircraft. In a study of German psychological warfare prepared in 1941 for the Committee for National Morale (United States), the author states:

> "The artillery drumfire of the last war, which the Germans now describe as useless,

TABLE 8

PERCENT OF MEN GIVING PARTICULAR REASONS
FOR THEIR FEAR OF VARIOUS WEAPONS

Reason	Mortar	88's	MG	Dive Bomber	High Level Bomber
Accuracy of fire	37	31	16	11	23
Lack of warning	19	11	15	5	11
Rapidity of fire	8	7	42	0	1
Noise of weapon	11	19	6	48	21
No defense	1	2	0	4	14
Other	24	3	21	32	30

> has been replaced by aerial artillery and tank cannon. Its aim is not so much material destruction as the rapid disintegration of enemy morale through acoustic effects (screaming Stukas, bombs with sirens attached) and the tremendous terroristic impact of mass bombardment." (Reference 12: p. 117)

The effect of sight and sound on troops in combat was indicated in Dollard's study. Dollard observes that: "When danger is near, the sights and sounds connected with it arouse fear." (Reference 7: p. 24) In Dollard's study,

the sounds were more "terrifying" than the visual characteristics.* This is shown in Table 9.

TABLE 9

VISUAL AND AUDITORY SOURCES OF FEAR

Characteristics of Aerial Weapons	Percent of Sample Stating Characteristic Most Fearful
Sound of bomb falling	38
Sound and concussion of exploding bomb	33
Sound of planes	11
Sight of bomb falling	5
Sight of bomb damage	3
No difference	10

Janis concludes, in respect to fear of air weapons, that:

> "The reasons most often given for fearing air attack had little or no relationship

*Cf. Naylor's statement (Reference 11: p. 3) "It is safe to conclude that every physical weapon has potential psychological side effects associated with it. The simple fact that the 'threat of', as opposed to the 'use of' a physical device can accomplish a behavioral change indicates a cognitive stress—usually fear—that accomplishes the desired goals."

> to the ...[actual]...casualty inflicting characteristics of these weapons, but appear to have been of a purely psychological character." (Reference 8: p. 234)

The same conclusion was reached by Dollard in his earlier study of veterans of the Spanish Civil War. (Reference 7: p. 121)

Goldhamer developed a fear-casualty ratio which he defined as:

> "If the F-C (Fear-Casualty) Ratio of a weapon class is 1.00, this means that the proportion of judgment assigning it as the most feared weapon is identical with the proportion of judgments assigning it as the weapon inflicting the most casualties. If the F-C Ratio is greater than 1.00, this means that it received more 'votes' as the most feared weapon than it did as the weapon inflicting the greatest number of casualties. Conversely, if the F-C Ratio is less than 1.00, this means that it received more 'votes' as the highest casualty inflicting weapon than it did as the most feared weapon." (Reference 9: p. 19)

Table 10 (Reference 9: p. 20) indicates the ratios for three classes of weapons for a sample including combat and medical prisoners of war. The weighted average is also shown.

In his discussion of the data, Goldhamer observes:

> "It might be supposed that soldiers' fear of weapons should be proportional to the casualty inflicting power of the weapons. The supposition, however, ignores psychological factors which prevent the intensity of fear from being a simple function of the casualty inflicting power of weapons." (Reference 9: p. 21)

In all of the studies considered above, it is apparent that there is not a one-to-one relation between fear and

TABLE 10

FEAR-CASUALTY RATIOS FOR MAJOR WEAPON CLASSES

	Combat POW's	Medical POW's	Weighted Average
Air weapons	1.11	1.57	1.22
Artillery	0.95	0.78	0.91
Infantry weapons	0.95	0.50	0.74

perceived casualty capability. From this, existence of variables other than perceived casualty effects is deduced.

4. Types of Wounds Feared

The greatest cause of fear is the casualty-producing effect of weapons, but the degree of fear does not bear a direct relationship to the lethality of the weapon or the degree of anatomical injury. Dollard asked the question "Did you have a fear of wounds in certain parts of the body?" Table 11 indicates the response. (Reference 9: p. 21)

The table includes answers by some respondents who mentioned more than one part of the body. Twenty-two percent of the respondents did not fear one wound more than another.

The significance of the data is difficult to deduce, since the combinations of fear are not known. About all that can be said with confidence is that wounds to various parts of the body are not equally feared.

TABLE 11

PERCENT OF MEN INDICATING FEAR OF WOUNDS TO SPECIFIED PARTS OF THE BODY

Part of Body	Percent
Abdomen	29
Eyes	27
Brain	22
Genitals	20
Legs	12
Hands and arms	12
Face	7
Torso (includes chest, heart, and lungs)	6

5. Effects of Bombing on Civilian Population

Thus far only combatants have been considered in the discussion of fear. Civilian populations, especially in England, Germany, and Japan, were subjected to intensive attack from the air during World War II.

After World War II, survey teams studied the reactions of civilians in Germany and Japan to bombing attack. Two of the studies were concerned with the emotional reactions to bombs of foreign forced laborers in German cities. Table 12 (Reference 13: p. 20) shows that a large percent were not frightened at all. Possibly one of the reasons for this is that these workers were virtually prisoners and perhaps enjoyed seeing their captors suffer.

TABLE 12

FEAR RESPONSES OF NATIONAL GROUPS
(Percent)

	Italian	French	Russian
Not frightened at all	15	22	33
Frightened a little	40	50	25
Frightened much	45	28	42

The same national groups were asked the type of bomb most dreaded. (Table 13—Reference 13: p. 25)

TABLE 13

TYPES OF BOMBS REPORTED AS MOST DREADED
(Rank Order)

	Italian	French	Russian
Air [dropped] mines	1	1	2
Large bombs	2	3	1
Phosphorous	3	2	3
Delayed action	4	4	4
Incendiary	5	5	5

When the two tables are considered, it appears that while there is a difference among the groups as to whether or not they fear weapons, there is little difference as to the specific type of weapon feared.

The incendiary was listed last by all groups. In the United States Strategic Bombing Survey report of strategic bombing of Japan, the data (shown in Table 14—Reference 14: p. 28) indicate a similar attitude in response to the question "What kind of bomb do you think is worse—incendiary or explosive?"

TABLE 14

HIGH-EXPLOSIVE VERSUS INCENDIARY BOMBS

	Percent
High explosive worse	63
One as bad as the other	17
Incendiary worse	15
No answer	5

If the neutral responses in Table 15 (Reference 14: p. 35) are added, 32 percent of the sample shows little or no emotional response to bombing. This is in the range of the "Not frightened at all" group of the study of foreign workers made in Germany (shown in Table 12).

The civilians subjected to attack in both theaters were obviously a less selective group than the military. Whether the elimination by the military of those with histories of mental illness affected the reaction to attack is unknown. However, P. E. Vernon, who studied the effects of air raids on a sample of Britons, suggests that "...many rather timid and neurotically inclined persons seem to have become better adjusted and more confident as a result of war and stand up very well to raids." (Reference 15: p. 473)

TABLE 15

EMOTIONAL REACTIONS TO BOMBING

Emotional Response	Percent
Fright and terror	39
Fear that respondent and family would be killed	18
Other responses indicating fear	8
Confusion, paralyzed action and thinking	10
Excitement at time of raid	9
No fright at time of raid	4
Belief that he and/or family would not be injured	3
Other responses indicating composure	2
No answer; no emotional reactions indicated	23

6. The Effect of Experience upon Reaction to Attack

There is a consensus that fear is reduced through exposure to combat. Dollard asked "Do men become more afraid or less afraid the more times they go into action?" (Reference 7: p. 33) The response was:

	Percent
Less afraid	64
More afraid	14
No difference	22

The majority, in answer to this question, is less afraid. However, when the fear of being a coward is eliminated and specific fears are considered, fear remains about the same for being killed and increases for other fears. (Table 16—Reference 7: p. 29)

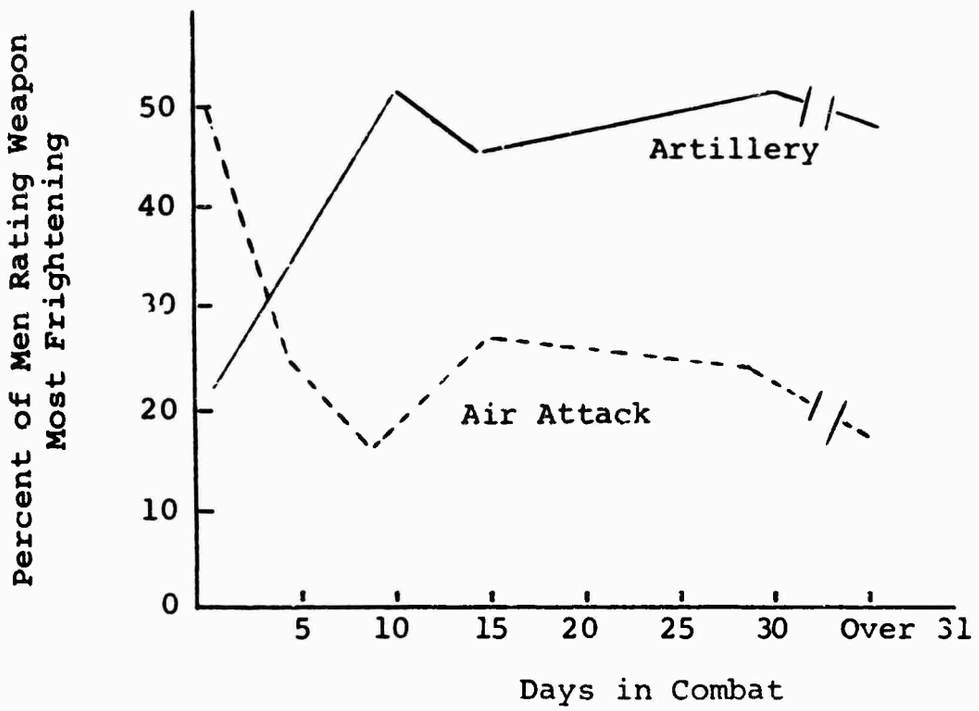
TABLE 16

FEARS EXPERIENCED IN FIRST AND SUBSEQUENT ACTION
(Percent)

	Coward	Crippled	Killed	Captured and Tortured	Painful Wounds
First action	36	25	25	8	6
Veteran	8	39	24	19	10

Janis suggests the hypothesis that men become more realistic in their fear of weapons through experience and presents the following figure (taken from Reference 8: p. 236) as indicative of changes in perception as a result of combat experience. He provides further evidence of a realistic evaluation of the casualty effectiveness of two ground weapons in Tables 17, 18, and 19. (Reference 8: p. 240)

Table 17 shows that—in a sample of about 1,200 wounded U.S. soldiers in the European Theater in World War II—the fraction wounded by 88-millimeter guns was smaller for soldiers with longer times in combat than for those with shorter times in combat, whereas the fraction wounded by mortars was larger for men who had been in combat for 60 or more days than for those who had been in combat less than 30 days. Table 18 shows that the changes in reaction to



RATINGS OF THE FEARFULNESS OF TWO ENEMY WEAPONS
IN RELATION TO LENGTH OF TIME IN COMBAT

88-millimeter guns reflect the changes in casualty-producing effectiveness. The reaction to mortars, as shown in Table 19, also reflects changes in casualty-producing effectiveness, but not so markedly.

TABLE 17

PERCENT WOUNDED BY WEAPON IN COMBAT

Time in Combat (days)	Percent Wounded by	
	88 Millimeter	Mortar
60 or over	19	16
30 to 59	22	21
Under 30	35	12

TABLE 18

CHANGES IN REACTION TO 88-MILLIMETER GUNS WITH INCREASED EXPOSURE TO COMBAT

Actual Combat (days)	Percent Who Say It Causes More Casualties than Any Other Weapon	Percent Who Say It Is the Weapon They Fear Most
60 and over	38	46
30 to 59	39	53
0 to 29	50	59

TABLE 19

CHANGES IN REACTION TO MORTAR
WITH INCREASED EXPOSURE TO COMBAT

Actual Combat (days)	Percent Who Say It Causes More Casualties than Any Other Weapon	Percent Who Say It Is the Enemy Weapon They Fear Most
60 and over	40	23
30 to 59	31	20
0 to 29	40	15

The United States Strategic Bombing Survey report of Japanese subjected to bomb attack indicates that, as a result of repeated exposure to attack, fear increases for some and decreases for others (see Table 20—Reference 14: p. 37). The percent who became less afraid is equal to the percent of those who became more afraid. The data in Table 20 (taken from Reference 14: p. 37) suggest that for this sample a generalization as to increase or decrease in fear cannot be made. The change appears to be due to individual differences.

7. Significance of Fear as a Variable in the Study of Men Under Attack

In the studies considered above, fear is treated as a reality and a subject for study, per se. There are difficulties with this approach to the study of men under attack. Fear is an intervening variable and, thus, is not subject to direct observation. Since it cannot be observed, the presence of fear is established by: asking a person if he is or was afraid, observing physiological changes, or observing behavioral changes. Most of the studies of fear in combat or fear under bombing attack have resorted to the method

TABLE 20

ADAPTATION TO CONTINUED RAIDS

Adaptation	Percent
Became better adapted as—raids continued, fears decreased; became used to it	41
Did not fear raids at beginning or end	1
Feared raids at beginning, and feared them just as much as raids went on	4
Adaptation variable (in fearing) decreased or increased according to circumstances	5
Became less adapted—fears increased as raids continued	41
No answer—didn't know	8

of asking persons whether they were afraid. This method assumes that a person knows how he felt and that he accurately reports this feeling. It is obvious that some persons do not know how they feel or felt; and further that, if they do, they do not report the true dimensions of their feelings.

A more serious problem in fear is the evaluation of the significance of a statement of fear. When one person says he is very much afraid, there is no assurance that the measure of his fear is the same as that of another person who makes the same statement. Further (as in the United States Strategic Bombing Survey), when Italians, French, and Russians say that they are "frightened a little," does it mean the same, or are there ethnic differences in the

perception of being frightened a little? Some of Vernon's informants "expressed doubts as to the usefulness of the term, fear, since it does not seem to cover any recognizable utility." (Reference 15: p. 473; cf. Naylor, Reference 11: p. 10) "...I would contend that the fear response is too gross a criterion measure to work with.") Perhaps, however, the greatest difficulty with the use of fear as a variable is that it often does not result in deviant behavior. Dollard observes that "Fear, though a strong response, need not determine behavior. Eighty-five percent...[of his sample]...said that there was an occasion when they were scared but went ahead anyhow." (Reference 7: p. 12) Fear, in itself, is not significant. If fear results in deviant action, where deviant action is that which reduces the effectiveness of the combatant vis-a-vis the enemy, it then becomes significant. Behavior, therefore, is the significant variable rather than fear.

8. Recapitulation of Fear in Battle

Experience in combat results in a change in perception of weapon effects. With experience in combat, perception of casualty-producing effectiveness of weapons comes closer to actual effectiveness. Further, there is evidence that fear decreases with combat experience. However, there is also evidence that civilians who have been exposed to bombing display no pattern of reaction with continued exposure. For some civilians, fear increases; for others, fear decreases. Fear is significant only if it results in deviant action. Therefore, behavior is the significant variable.

C. Behavior and Ethnic Differences

In Section E, the behavioral effects of weapons are considered. A brief review of earlier studies of the behavioral effects is given in this section.

Many studies of the effects of weapons refer to ethnic differences and in some cases have established ethnic categories for data collection, but none has abstracted and evaluated the ethnological data.

Kahn, et al., report (Reference 16) a study of the relation between the performance of Chinese and North Korean soldier POW;s and their exposure to various United Nations (UN) weapons. Interviews were conducted with 393 Chinese Communist Forces (CCF) soldiers and 463 North Korean Army (NKA) soldiers. The critical incident technique was utilized to obtain information on performance of enemy soldiers. Kahn, et al., describe the technique as:

> "Essentially, this technique directs the attention of the interviewee to recent acts or behavior patterns that were either very effective or ineffective in specific situations. The technique tends to discourage extraneous remarks and rationalizations about why an individual acted as he did and to confine answers to relatively concise descriptions of what was done or seen to take place. It is assumed that such answers describe what almost any observer would have seen if he had been in the situation in place of the individual being interviewed."

Six categories of ineffective performance were established:

> "Ineffective in routine assignment; ineffective under UN fire; feigned illness; deserted; temporarily left post; circumstances prevented good performance." (Reference 16: p. 28)

The statistical significance of the relation of ineffective performance and exposure to weapons is indicated in Table 21, based on Kahn, et al. (Reference 16: p. 23). A .05 level of significance indicates that in 5 out of 100 cases the difference could be due to chance. A .01 level of significance indicates that in 1 out of 100 cases the difference could be due to chance.

Kahn, et al., further compare the relation between exposure to various types of weapons and two patterns of behavior—ineffective performance and capture—for CCF and NKA (Table 22—Reference 16: p. 36).

TABLE 21

CONTINGENCY TESTS ON OCCURRENCE OF INEFFECTIVE PERFORMANCE AMONG CCF AND NKA SOLDIERS AND THEIR EXPOSURE TO UNITED NATIONS WEAPONS FIRE

Weapon	Statistical Measure of Distribution (X^2)	
	CCF	NKA
Rifle	0.3901*	1.6603*
Machine gun	0.3801*	0.2424*
Grenade	2.3811*	0.0550
Mine	0.0042*	0.1736*
Mortar	1.0379*	0.5669
Artillery	2.6478	3.8864†
Tanks	1.0498*	3.7252*
Air bomb	5.9258†	6.0872†
Air rocket	2.5519	2.9746
Air napalm	1.0186	5.4766†
Air strafing	4.3243†	7.5901‡

*Negative relation.
†Significant at .05 level.
‡Significant at .01 level.

TABLE 22

SIGNIFICANT ASSOCIATIONS BETWEEN EXPOSURE TO FIRE FROM UNITED NATIONS WEAPONS AND OCCURRENCES OF INEFFECTIVE PERFORMANCE AND CAPTURE

United Nations Weapon	Level of Significance			
	Ineffective Performance		Capture	
	CCF	NKA	CCF	NKA
Rifle	-	-	.01	.01
Machine gun	-	-	.01	.01
Grenades	-	-	-	.01
Mines	-	-	-	-
Mortar	-	-	.01	.01
Artillery	-	.05	.01	-
Tanks	-	-	.01	.01
Air bombs	.05	.05	-	-
Air rockets	-	-	.01	-
Air napalm	-	.05	.05	.01
Air strafing	.05	.01	.01	.01

It is safe to assume that, in both the CCF and NKA, capture, itself, is deviant in most cases. In most armies, the norms prescribe that a soldier resist capture until all alternatives except death have been exhausted.

The data in Table 22 indicate that, in all cases except mines, there is a relation between exposure to weapons and ineffective performance, per se, or capture. The differences between the CCF and NKA are discussed in the remainder of Section C.

Grinker and Spiegel (Reference 2: p. 136), speaking of U.S. Army Air Force crewmen in the European theater during World War II, state:

> "Many, if not most, combat crewmen go through their combat tours with varying amounts of free anxiety [not oriented toward a specific object]. It may well be that, in soldiers of other nations, the dynamic equilibrium is such that anxiety does not develop when the ego learns how dependent and unprotected it is in combat; but, with American troops, anxiety is the usual outcome." (Cf. R. A. Terry, Reference 17: p. 33f, who includes "cultural determinants" as a variable classed as "psychosocial" in his proposed Psychological Index.)

Grinker and Spiegel were aware, also, of ethnic differences within the American forces. Toward the end of the report of their studies, they described a typical American crewman. In discussions of this hypothetical crewman, they state:

> "If such a symbol...[the typical crewman]... should prove on closer examination to be inaccurate and unrealistic, especially for certain minority groups, this would merely point up sharply some of the culturally determined fissures in the psychological armour with which the soldier faces strains of combat." (Reference 2: p. 444f)

However, they apparently did not consider the variable in their study of men in the combat theater nor in therapy within the zone of interior.

Grinker and Spiegel are speaking of a typical American crewman, indoctrinated and trained by the American Army, and serving in a close-knit military unit; yet they propose that ethnic differences among Americans affect the emotional reactions to combat. If this is true, the differences between soldiers of completely different cultures would be greater than within groups of Americans (while there are subcultures within the United States, there is an American culture which is shared by people living in the United States).

In Kahn's study of reasons for fear of classes of weapons, there is homogeneity of response by the North Koreans in contrast to the heterogeneous response of the Chinese (Table 23—Reference 10: p. 21).

TABLE 23

STATED REASONS FOR FEARING CLASSES OF WEAPONS

Reason	CCF (Sample: 350)	NKA* (Sample: 69)
Casualties	166	69
Noise	10	2
Efficiency of action	79	0
Restriction of activities	34	0
Invulnerability	8	0
Miscellaneous effects	53	1

*The number of reasons given exceeds the number of respondents because of multiple responses.

In a discussion of the above table, Kahn states, "The number of reasons given exceeds the number of respondents because of multiple responses." (Reference 10) The data suggest two possible ethnic hypotheses. First: if the Chinese and Koreans come from two distinct cultures, the differences in stated reasons for fearing classes of weapons are due to the distribution of fears in one culture and not in the other. A more likely possibility is that the Korean sample was culturally homogeneous and that the Chinese sample was representative of several cultures within the political boundaries of Communist China.

In a comparison by Kahn of North Korean and Chinese Communist Forces fear of air weapons, there is a coefficient of rank correlation of +.20. (Reference 10: p. 26) This indicates that order of fear is quite different for the two samples (Table 24—Reference 10: p. 27). Kahn suggests (without offering any evidence) that the differences "...may be attributed to...the extent of combat experience." It is possible, also, that it could be attributed to other group differences; e.g., cultural.

TABLE 24

KINDS OF AIR WEAPONS FEARED

Weapon	CCF (Sample: 297)		NKA (Sample: 62)	
	Number	Percent	Number	Percent
Machine gun	54	18.0	27	43.5
High explosive	52	17.5	6	9.5
White phosphorous	58	19.5	1	0.5
Napalm	106	36.0	23	37.0
Rockets	27	9.0	5	9.5

A study of United Nations psychological warfare during the Korean War was conducted by International Public Opinion Research, Inc., and the results were revised by Willmore Kendall of the Operations Research Office, Johns Hopkins University. (Reference 18: p. 71) The study is concerned principally with the effects of leaflets upon Communist Chinese Forces and the North Korean Army. However, some data are offered in Table 25—copied from Reference 18: pp. 70-71—on weapons feared by the CCF and NKA. These data indicate that "The Chinese had feared airplanes more than any other weapon, just as had the North Koreans. Planes, strafing, bombing, or napalm were named as most fearful by seven out of ten prisoners in both populations." (Reference 18: pp. 70-71) While the total percent of both groups who fear the airplane is about the same (68 percent and 72 percent), there is a considerable difference in the specific airborne weapons feared.

The same study indicates a greater fear of artillery among the Chinese than the North Koreans (50 percent and 38 percent) and relates this difference to the variances in appraisal of the casualty effect by the two groups. (Reference 18: p. 71)

Kahn (Reference 17), discussing the data in Table 25, states:

> "Until additional research data are available, it must remain a matter of conjecture as to why exposure to certain kinds of weapons fire was more closely associated with ineffective performance among the North Koreans than among the Chinese. It might be found, for example, that U.N. forces facing the CCF during the time these data were collected used certain types of weapons much more frequently than other U.N. forces who were facing the NKA. A second possible hypothesis might be constructed about differences in personality or temperament among Chinese and North Korean soldiers. A third explanation might be found in the different proportion of combat-experienced soldiers serving in the two armies."

TABLE 25

UNITED NATIONS WEAPONS MOST FEARED

Weapons	Percent	
	Chinese	North Koreans
Airplane	52	28
Strafing	16	27
Bombing	7	19
Napalm	3	13
Total airplane (one or more of the above)	68	72
Artillery	50	38
Machine guns	5	3
Tanks	4	1
Tank guns	4	2
Rifle (including automatic and carbine)	5	1
Other	1	2
Don't know	1	--*
TOTAL NUMBER OF PRISONERS	238	305

*Less than 0.5 of 1.0 percent.

A corollary to Kahn's second hypothesis might be that the differences in personality and temperament are explainable by the cultural differences between the CCF and the NKA.

The Strategic Bombing Survey study of the effects of bombing on foreign workers in Germany offers data on the fear responses of Italian, French, and Russian workers. The question asked was "Did the first raid frighten you little, much, or not at all?" The responses in Table 26 (Reference 13: p. 20) indicated considerable differences among nationalities.

TABLE 26

FEAR RESPONSES OF THE NATIONAL GROUPS
(Percent)

	Italian	French	Russian	Russian Male
Not at all frightened	15	22	33	38
Frightened a little	40	50	25	27
Frightened much	45	28	42	35

Another question asked was "With the continuance of the raids, did you become more frightened or did you become used to them?" The number of Italians indicating continued fear was greatest, and the number of French was greater than the number of Russian males. (Table 27—Reference 13: p. 20)

TABLE 27

FEAR RESPONSES OF NATIONAL GROUPS TO CONTINUED RAIDS
(Percent)

	Italian	French	Russian	Russian Male
Continued to fear	35	28	28	18
Became habituated to raids	65	72	72	82

There was a difference in the reaction of the Italians from that of the other two nationalities in response to the question "During the raids, did you think that the raids would speed up your liberation or were you uneasy because your life was in danger?" It is possible that the difference was due to cultural factors associated with the national groups (Table 28—Reference 13: p. 20).

Goldhamer offers two tables, reproduced below as Tables 29 and 30 (Reference 9: p. 9), which provide data on Communist Chinese Forces (CCF) and North Korean Peoples Army (NKA or PA) soldiers.

In discussing the data, Goldhamer writes, "Both tables [Tables 29 and 30] indicate that the CCF POW's may have a greater fear of artillery, relative to other weapons, than do the PA POW's. The data of the present study suggest no explanation of this difference." (Reference 9: p. 10) In part II of the same report, Goldhamer states, "Both Chinese and North Korean POW's were interrogated, but since they gave substantially the same results, their answers have

TABLE 28

PRIMARY REACTION TO RAIDS
(Percent)

	Italian	French	Russian
Saw liberation value of raids	77	90	90
Uneasy about own danger	2	2	3
Thought of both things	21	8	6

TABLE 29

CLASS OF WEAPONS MOST FEARED BY
COMBAT POW's WHILE IN FRONTLINE POSITIONS

	CCF POW's	PA POW's	Total	
	Number	Number	Number	Percent
Air weapons	29	28	57	42
Artillery	26	26	52	39
Infantry weapons	6	19	25	19
TOTAL	61	73	134	100

TABLE 30

CLASS OF WEAPONS MOST FEARED BY TROOPS
AS REPORTED BY CCF AND PA MEDICAL PERSONNEL

	CCF POW's	PA POW's	Total	
	Number	Number	Number	Percent
Air weapons	6	24	30	52
Artillery	8	15	23	40
Infantry weapons	1	4	5	8
TOTAL	15	43	58	100

not been differentiated in the following report." (Reference 9: p. 28) However, he offers no data which would indicate what he means by "substantially the same results."

In every study in which ethnic variables are reported, there is evidence of ethnic differences in reaction to weapons. The single exception is Goldhamer—and he does not provide data in support of a finding opposed to the existence of ethnic variables.

Although the evidence of ethnic differences in reaction to attack is inconclusive, it is strong enough to suggest that such a hypothesis would be appropriate.

D. Use of Data from Previous Studies

Data are almost always collected to test some explicit or implicit hypothesis. The form of the question, the sample,

the interviewing techniques, or the methodology of a research plan, must be appropriate for the specific hypothesis to be tested. Reworking the data to support other hypotheses is of dubious value, but it may provide sufficient insight into the possible validity of new hypotheses to justify further research.

Data and conclusions of previous research are considered in this report to suggest the importance of including ethnic variables in weapon system analysis and the possible merits of using abstractions such as national character and modal personality as conceptual devices in such analysis.

In a study of paraphysical weapon effects, the problem of selecting variables becomes acute. The combat milieu is made up of so many interacting variables that isolation and analysis of simple components appear to be barren exercises for the paraphysical weapon-effects analyst. Page, et al. (Reference 19: p. 20), identify some 45 interrelated variables for determination of the psychological effects of weapons (including group identification, involvement, individual parameters, and predisposition). This list is not exhaustive since, in some cases, the variables are classes of variables which in turn could be reduced to individual variables. Abstraction of individual variables—even if reliable data were available—is of questionable value for weapon-effectiveness studies, since a single variable is not determinant.

Obtaining reliable data is a major—if not the major—difficulty in the study of weapon effectiveness. In U.S. society, there are moral constraints on controlled data collection. Humans cannot be subjected to stress that is equivalent to combat to obtain data indicative of behavior in combat. The essence of human reaction to combat is the jeopardy of the person; for this reason, valid data cannot be obtained in the laboratory. In combat itself, control groups cannot be used for the purpose of obtaining valid data. These problems exist for collection of data on combatants of the United States and its allies. Collection of valid data regarding enemy behavior is even more difficult.

Data on enemy behavior under stress in combat cannot be obtained directly. Observation, at best, is made from a distance; and there is no way of discerning the motive for the overt behavior that is observed. The best source of data is perhaps interviewing prisoners, but there are obvious questions of reliability of data as a basis for generalization. Prisoners—captured or surrendered—are a special class of enemy, by definition. There is a further difficulty of the lapse of time after exposure to fire and inadequacy of the present state-of-the-art of interviewing under these conditions.

The difficulties prompt a search for a level of abstraction more amenable to the constraints of available data and behavioral science methodology. As discussed later in the report, an abstraction that offers plausible utility is the modal personality. Modal personality is a construct which incorporates the most frequently appearing configuration of personality traits existing in and derived from experience in a culture. The relation of the construct to the weapon-effects process is identified in Section E.

E. Weapon-Effects Process

For the purposes of this report, a weapon is defined as an entity which is perceived by persons subjected to its effects as a casualty-producing force or as associated with such force. Included in this definition would be casualty-producing weapons such as fragmentation bombs, napalm, or guns, and noncasualty-producing devices such as flares (used in conjunction with physical weapons). Purely psychological warfare media, such as leaflets, loud speakers, or radio programs directed toward the enemy, are excluded.

1. Weapon Effects as a Stimulus

A stimulus is a physical change in the environment which is perceived by a person and results in an act (change in behavior). This somewhat restricted definition of stimulus eliminates the purely psychic source of stimulus and psychic effects of stimuli not resulting in observable behavior changes. An operational definition, as posed here, avoids the morass associated with psychological definitions.

Men under attack may not perceive the presence of a specific weapon because of the nature of the weapon; e.g., certain weapons in the arsenal provide no warning of their presence until the casualty-producing agent has been released. It is also possible (though improbable) that, because of the presence of other stimuli in the environment, a person might not be aware of the existence of weapons whose physical properties are such that they normally would be perceived.

Even if the presence of the weapon is perceived, other stimuli may so dominate a combatant's attention that he will not react to the weapon. In other words, the presence of the weapon is observed but the stimulus is not sufficiently high in the hierarchy of stimuli to result in a reaction. Thus, by the above definition of stimulus, such weapons do not function as stimulus-producing agencies.

2. Weapons as a Source of Casualties

The primary (and often the only) function of a weapon is to produce physical casualties in an opposing force. An exception is the independent use of devices which are normally associated with a physical casualty-producing agent; e.g., flares used independently of a casualty-producing agent for the purpose of harassment. However, in time, casualty-producing weapons must be used if the flares are to be effective.

Insofar as an individual is concerned, his death as a result of attack obviously terminates the effectiveness of the weapon. However, the death of another individual and the presence of his cadaver can function as a delayed stimulus for secondary weapon effects. These effects are discussed below in the consideration of culture, personality, and situation.

Wounds resulting from attack vary in their effect upon an individual's immediate and subsequent behavior. If the result of a wound is immediate loss of consciousness, there is no other immediate change in behavior. If amnesia results, there may be no immediate or behavioral change. If an individual is made immobile by a wound but remains

conscious, his behavior is limited to oral expression. The behavior of both conscious and unconscious immobilized combatants constitutes a physical change in the environment and thus provides stimuli for behavioral changes in others.

3. Situation

The concept of "field" developed by Lewin (Reference 20) provides a useful frame of reference for examination of weapon effects. The field is the total milieu perceived by a person at a given point in time. The total process from the stimulus input to the end of the process may include a succession of "fields." Three classes of variables may be abstracted: culture, personality, and situation. The interpretation of the field by a person (and his behavior in response) is a function of these variables.

The "field," as conceived in this report, is made up of physical and social entities which affect the perception and behavior of a person. (This is an extension of Lewin's concept of field to include physical variables.) The physical characteristics, as perceived by a person, function as forces which make up elements which condition his behavior.

The presence of casualties may be one of the characteristics of a field. The dead and wounded in the field probably provide a psychological force which inhibits the movement of some and excites others to increased activity and movement.

Availability of cover, or physical protection against the casualty effects of a weapon, is of prime consideration in the behavior of a person. If a person perceives the cover as providing protection, and taking cover is within the permissive range of activity within the group, he will take cover.

The distance from a physical event providing a stimulus affects perception of the situation. The closer an event appears to be, the more a person will evaluate the total situation (the more he will perceive the condition and the need to act). The more a person has been exposed to a

weapon, the more accurate his recognition of the lethal range of the weapon becomes. However, introduction of new sounds associated with a weapon (new or old) will alter the variable of familiarity.

Time is a further variable in perception of the situation. The same stimulus will have different effects upon perception at night than it will have during the day. This difference is clearly indicated in the United States Strategic Bombing Survey of Germany, wherein the fear of night raids among populations bombed was greater even when the tonnage of bombs was constant. (Reference 13: p. 13)

In combat, the difference between attack at night and attack during the day is further influenced by the social context of the situation. In ground combat, a soldier is often isolated from other members of his group. Physical isolation is accentuated by the reduced visibility at night. Isolation of an individual from other members of his group affects his perception of the situation and, thereby, his behavior. Isolation may be not only physical but, also, social. A membership group is a component of the situation in the field. A person may identify with a group (with norms and values), or he may merely conform. If he retains membership but does not identify, he is a social isolate and may be at the same time physically isolated.

Identification may be conceived as a continuum from complete isolation to complete identification. Obviously, the extremes are never exemplified, but they are approached. Not only individuals may be placed on such a continuum but also groups within a given national military organization. Members of certain units in the armed forces tend to identify more than members of other units. (The term "morale" is used to describe this identification.) Further, there are national (cultural) differences in the degree of identification.

Group norms and values are culturally determined. The nation from which a military group derives establishes the major patterns of acceptable behavior and values (that which is good or bad). Other values and norms are a part of the subcultures (group or other social entities) within the military.

Group norms may be (and frequently are) in conflict with group goals. The goals of a military group are prescribed, typically, by the state. In combat, the group goal may be to attack or defend to death; but the group norms may permit surrender or submission to capture under certain conditions. (Reference 21: pp. 633-650*) Deviation from both group norms and behavior directed toward attainment of group goals is controlled by the membership group and then, formally, by the organization.

The effectiveness of social control is a significant element in a person's perception of a situation. A group enforces its norms through typical expressions of control—jeering, name-calling, ostracism. An established cohesive group can be expected to exert pressure effectively for conformity of its members. A person perceives and evaluates the effectiveness of informal social control in his membership group.

Formal controls are exerted by the organization. Military law prescribes punishment for deviance from acceptable behavior that ranges from minor punishment to death. A person is aware of the law and the possibility of punishment.

4. Recapitulation of Situation

An individual combatant is constantly subject to various forces which he perceives and which influence his behavior positively or negatively. A situation is made up of physical objects and conditions (cover, distance from stimulus, mobility, and familiarity) and social conditions (identification with group, group cohesion, group goals, group norms, social isolation, and social control). A combatant's perception of the situation influences his selection of behavioral alternatives.

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*The contrast in national norms is startling in light of Russia's policy of sentencing to death prisoners returned after the Finnish War, and the U.S. policy of rewarding prisoners (by promotion) captured by the Japanese following the fall of the Philippines during World War II.

5. Personality

Personality is a construct abstracted from the person. A person is a human biological entity who has been influenced by the social, physical, and biological environment.

A child is normally taught the ways of his culture by his parents (typical in our culture) or by surrogates prescribed by his culture. A child first internalizes the culturally defined behavior and later the values and norms of the society in which he is raised. Still later, unique experience modifies, changes, or introduces new values, norms, and patterns of behavior. The result of total experience is to produce a person who is unique and a person who, as a result of common experience, shares characteristics with others in the membership society. Murray and Kluckhohn (Reference 21: p. 49) conclude a long discourse on personality with this summary:

> "Personality is the continuity of functional forms and forces manifested through sequences of organized regnant processes and overt behaviors from birth to death. The functions of personality are: to allow for the periodic regeneration of energies by sleep; to exercise its processes; to express its feelings and valuations; to reduce successive need-tensions; to design serial programs for the attainments of distant goals; to reduce conflicts between needs by following schedules which result in an harmonious way of life; to rid itself of certain persisting tensions by restricting the number and lowering the levels of goals to be attained; and, finally, to reduce conflicts between personal dispositions and social sanctions, between the vagaries of antisocial impulses and the dictates of the superego by successive compromise formations, the trend of which is toward a wholehearted emotional identification with both the conserving and creative forces of society."

The above may appear to be a digression from our concern with a person under attack, but it is not. The personality of a combatant determines his interpretation of the combat situation and the integration of that interpretation with past experience. The personality of a combatant further determines how he reduces the conflict between the biological need of self-preservation and the social need for identification with the group. This concept of personality obviously is of little use unless a classification of personality is developed that will contribute to generalizations of behavior under fire.

The concept of modal (most frequently appearing) personality configuration offers a possible generalization. In a given culture, children share common experiences which tend to produce similar personalities. In a nation, there may be many modal personality configurations because of subcultures within the principal culture. The concept of modal personality has advantages over national character as a generalization in that, within larger nations (such as the United States), a number of subcultures are associated with region, ethnic group, and social class.

National character does provide a possible generalization, but modal personality would seem to be more fruitful in developing cultural variables for weapon system analysis. (Reference 21)

National character is closely related to modal personality. The study of national character describes the values and norms of a society (nation) at a given time. As in the study of modal personality, the shared experiences of persons brought up in a society result in a dominant pattern of values, norms, and behavior. From this, it is deduced that a sample of persons who share a national character will display characteristics of the society. The concept of national character was applied by Benedict and others to the study of Japan during World War II. (Reference 25) Gorer, a leader in the study of national character, points out that "if the hypothesis...[the existence of national character]...about the main share of motives is correct, it should be possible to predict how a group—never,

it must be emphasized, specific individuals—will respond to a new situation." (Reference 26) This is exactly what is desired: to predict how groups will behave under fire in combat.

The Germans studied national character (they referred to the study as comparative national psychology) extensively before World War II. A. Blau, a German geopolitician, is quoted as saying that the variables of national character must "determine the weapons and how to deploy and use them in influencing and destroying all opposing morale forces." (Reference 12: p. 157)

6. Recapitulation of Personality

Personality is a construct abstracted from the totality of a person. Personality is the result of experience in a culture from birth to death. The unique characteristics of personality have little practical value in the analysis of weapon effects. A generalization may provide a variable useful for analysis. Since persons raised in a culture share experiences, a configuration of values, norms, and patterns of behavior would be expected. Two generalized configurations are proposed; namely, modal personality and national character.

7. Culture

Culture is an abstraction which describes the shared pattern of thought or action learned from other members of society. Major cultures are usually associated with a large geographical area. Other cultures within the areas are referred to as subcultures; e.g., the family subculture, the teenage subculture, and the military subculture.

In combat, three significant cultures are recognizable—national culture, military subculture, and unit subculture. Most of the associated values tend to become a part of the personality. However, others are cultural traits and complexes that are evaluated by a person as a part of his environment and, thus, influence his behavior.

Configurations of cultural traits and complexes led to the "culture area" concept of Clark Wissler. (Reference 29) Wissler identified 15 areas of North and South American indigenous culture. Later anthropologists extended the classification of cultural areas to a worldwide system. The cultural-area concept appears to offer a classification system useful for analysis of paraphysical variables in weapon systems, but close investigation of the concept as now developed suggests caution in its use. Up to this time, field work associated with the culture-area concept, for various reasons, has concentrated on nonindustrial cultures. Without discounting the concept's intrinsic value, its current value in weapon system analysis is limited because of the lack of data on potential areas of Air Force activities.

In developing nations, there is rapid cultural change which affects the cultural areas defined by earlier ethnographers. Further, there are inherent differences within each culture area; e.g., the fringes of a cultural area differ from its center.

Within urban, industrialized societies the culture of class, age grouping, rural areas, and urban areas may overlap and may cross other areas within the society defined by other variables.

8. Recapitulation of Culture

Culture is an abstraction which describes shared values, norms, and behavioral patterns. A number of subcultures frequently exist within a culture. The cultural-area concept offers a classification possibly useful in weapon system analysis; but there are practical limitations to its use—namely, lack of sufficient data, cultural variation within an area, and existence of significant subcultures within each cultural area. At this point it appears that culture has been rejected as a significant variable in weapon system analysis because the only approach, the cultural-area concept, has marked limitations. Despite the limitations, culture has offered insight useful to a military decision maker (Reference 28: passim), and with more field work can be useful in the future.

9. Deviant Behavior

When a combatant observes the introduction of a given weapon into his environment, his behavior is influenced by his evaluation of the alternatives for action based upon culture, personality, and the situation. The behavior may be conforming or deviant.

In the context of this report, deviant behavior is behavior that reduces the effectiveness of a combatant vis-a-vis the enemy. Behavior may conform to the standards of a membership group and yet be deviant, as defined here.

Exposure to fire may result, in the extreme, in psychosis requiring withdrawal from combat. A group and organization may accept this as within the range of permissive behavior; i.e., no sanctions are applicable. Sanctions against a given act or behavior pattern may be prescribed by an organization, yet not applied. Military law may proscribe behavior in combat not directed toward defeat of the enemy and prescribe sanctions for this behavior. Yet, the sanctions may not be applied because of group norms. This type of behavior, as defined in this report, is deviant.

10. Summary of Weapon-Effects Process

Review and analysis of studies of civilian reactions to combat and to bombing suggest that behavior is the major variable in the study of paraphysical effects of weapons. Fear and anxiety are not significant, per se. It is only when fear and anxiety result in deviant behavior that they become important.

Personality is a major determinant of behavior under fire. Since personality derives from culture, configurations of personality can be abstracted from that culture. The term modal has been used to describe these configurations. This report suggests that the study of modal personality will be fruitful in the investigation of paraphysical variables in weapon system analysis.

APPENDIX

EXPERIMENTAL DESIGN AND APPLICATIONS

PARAPHYSICAL VARIABLES IN WEAPON SYSTEM ANALYSIS

APPENDIX

EXPERIMENTAL DESIGN AND APPLICATIONS

Previous sections indicate the possible influence of culture on the paraphysical effects of weapons on troops. This appendix discusses the problems of making a study of paraphysical weapon effects useful to weapon design and deployment. The first problem is choosing and quantifying the variables and designing the experiment to obtain meaningful results; the second problem is using these results in the design of weapons and their deployment against enemy troops. These two problems are very closely related, since the usefulness in weapon design and deployment of the results of the experiment depend strongly upon the choice of variables used in the experiment.

1. Choosing an Experiment

In choosing an appropriate experiment to furnish useful results as inputs to weapon analysis, the following must be considered:

-1 Choosing the variables of the experiment

-2 Defining the variables; i.e., choosing a scale with which to measure the variables

-3 Designing the experiment in a way that will yield statistically meaningful information.

a. Selecting Variables

When choosing the variables of the experiment, attention must be given to considerations affected by the choice of experimental variables. One such consideration, as previously stated, is the effect of the choice of variables on usefulness of the results in the weapon analysis. An example of the types of variables which are or are not useful should be illuminating. Fear has been the subject of many past studies,

mainly because of its ease of measurement. However, fear is very difficult to use because it does not necessarily govern behavior. An alternative might be to determine the behavior of a combatant subjected to the fire of different weapons, such as how machine-gun fire affects the combatant's willingness to move, willingness to use his weapons, or effectiveness when he does use his weapons. If knowledge of these variables were available, then which weapon to select to obtain a given effect, such as limiting mobility, would be known.

Another consideration in the choice of variables is the practicality of measurement. If the experiment is to be performed in a real combat situation, the practical problem of measuring behavior variables becomes severe. They may be measured indirectly by interviewing troops about their behavior in combat, although, as noted earlier, there are questions as to the validity of this approach.

Cultural variables are intervening variables. Furthermore, it is not obvious which ones have a causal relation to behavioral variables. There are reasons why many cultural variables should not be indiscriminately investigated. One obvious reason is the inconvenience and expense of dealing with large numbers of variables. A more basic problem is the statistical interpretation of the results. The larger the number of variables considered, the more chance there is that a variable actually uncorrelated with behavior will show up with a statistically significant correlation. Suppose, for example, that of 45 cultural variables investigated, 5 have a correlation with behavior variables but the others are not correlated. Depending on their degree of correlation and how large the sample is, the five correlated variables may or may not show up significantly. A large enough sample size can be chosen that they show up on any desired level of significance. Of the uncorrelated variables, two, on the average, would be expected to show a correlation on the .05 level and two additional ones on the .01 level,

for example. Since fewer uncorrelated variables show up as correlated at higher levels of significance and because higher levels of significance result from larger sample size, the use of larger samples will increase the probability both of identifying actual correlations and of decreasing the number of uncorrelated variables showing up as correlated. However, it appears far more economical and reasonable to use discretion in choosing cultural variables to be investigated.

b. Defining Variables

The second problem is that of defining the variables. There is no problem when dealing with variables, such as age, height, et cetera, which have numerical values. The only precaution is to use a measure refined enough to detect a difference; e.g., measuring age to the nearest year will not detect differences of a few months.

The primary problem comes when the variable does not take on numerical values. An example is willingness to move when under machine-gun fire. In such a case, arbitrary classes are set up, such as no movement, limited movement in immediate vicinity, or slowed movement. The choice of classes, in effect, defines the variable. This is particularly true in questionnaire studies, where the actual variable being measured depends largely, in some cases, upon the questions asked or how they are posed. A variable may or may not show up as significant depending upon the choice of the classes.

A helpful distinction between two common types of quantification is that between rank-ordering and multiple choice. For example, weapons may be listed in answer to two approaches:

-1 Rank-order weapons as to how they limit your ability to return fire.

-2 Which weapon most seriously limits your ability to return fire?

In choosing between two such methods, the question of how the results are to be used should be considered. If an ordering of the value of weapons is desired, then the first approach, rather than the second, should be used.

c. Statistical Design

The third problem is designing the experiment in a way that will yield statistically meaningful information. In behavioral studies of combatants, difficulties frequently are encountered in trying to conduct a controlled experiment. It is not possible, generally, to conduct a controlled experiment in a combat environment. The consequence is that, while a correlation between two variables frequently can be established, it is not possible to imply a cause and effect relation. Also, where two independent variables show high correlation, it may be impossible to determine which has a cause and effect relation to a third variable. For example, prisoners of war (POW's) from one culture group might be found to be significantly more fearful of napalm than those of another group. Upon closer examination it might be found that the POW's from each culture group were captured in different types of terrain. In this case, it would be difficult to infer from the data whether the difference in the fear of napalm was caused by cultural background or because it was used more frequently and/or more effectively in one type of terrain than another. In a controlled experiment, which is not possible here, the enemy troops from different cultural backgrounds would fight in the same terrain.

Use of a preliminary experiment is a very valuable technique in experimental design. First, it may identify significant variables not previously suspected and suggest hypotheses which can be examined in detail when the experiment is conducted. Second, it may identify peculiarities of the sample which can be corrected before conducting the experiment. Third, it may identify problems in the questionnaire, interviewing technique, or other methods of collecting data which should be corrected before the experiment is under way.

2. Applications to Weapon System Analysis

Very little application appears to have been made of the results of past studies of paraphysical weapon effects to the design and deployment of weapons. One reason for this is that the variables studied usually are not readily applicable in system analysis. This is not surprising, since the objective of most past studies has been simply to identify variables or obtain an insight into the problem and not to develop data for weapon system analysis. Another reason is that many of the variables necessary for system analysis studies are extremely difficult to measure in a combat environment; and, therefore, intermediate variables, such as fear, are frequently used.

Attempting to compare combat behavior with that in simulated combat is very difficult, since combat environment is not controlled and, in most instances, cannot even be measured. If, instead, two culture groups are subjected to the same combat experiences, the differences in casualties and deviant behavior can be compared. Here, no attempt is made to measure the effect of combat versus simulated combat, only the differences in behavior of two culture groups in the same combat environment. This scheme requires some experimental design in the sense that two samples from the two cultures must be chosen—ensuring that there is no essential difference in variables such as combat experience—and that, subsequently, arrangements must be made for the two groups to fight in the same combat environment.

Applying the results of paraphysical weapon-effects studies to system analysis is difficult and it is not clear, at this point, how feasible it is. There may be some inherent difficulties which cannot be overcome; but, on the basis of the possible significance of paraphysical effects on combat behavior, the problem certainly warrants serious consideration. Justification for studies of paraphysical weapon effects is the influence the results of the studies could have on decisions concerning the design or deployment of weapons. If it does not appear that a study could influence such a decision, the value of the study is questionable.

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13 ABSTRACT

The effectiveness of a weapon system is dependent not only upon its physical characteristics but also upon the social characteristics of the enemy. The reaction of enemy combatants to attack is a function of personality, culture, and social organization. In order to obtain from a weapon system the results theoretically possible, these paraphysical variables must be considered. (U)

If the paraphysical effects of weapons are to be exploited, they must be expressed in a form which is usable in weapon system analysis. To accomplish this objective, it is proposed that the concept of modal personality be employed as a construct in the study of overt combat behavior to generate the basic data needed. (U)

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