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ABSTRACT

The purpose of this study is to identify objective relationships between small arms weapons characteristics and effectiveness in suppressive fire. In addition, this study provides a methodology through which the suppressive capabilities of various small arms weapons may be assessed.

An initial suppression data base is developed as the result of an extensive review of the available literature. This data base provides both an indication of suppression factors and an enumeration of gaps in our knowledge about suppression. To verify the suppression factors and to attempt to fill the data gaps, a new data collection program was employed. The first efforts in this program included the collection of up-to-date information through the use of structured interviews, rating scales, and questionnaires administered to U.S. military personnel with recent combat experience and to others undergoing military training within CONUS. In addition, interviews and questionnaires were administered to U.S. and Australian forces, Hoi Chanh, and POW personnel in Vietnam.

A series of five field experiments are described in which an attempt was made to quantify relationships between small arms characteristics and suppression. Several of these experiments employed live-fire events in combination with situational variables as the basis for subjective judgments regarding suppression. Two of the experiments also included physiological measurement as a dependent variable related to suppression.

The principle findings derived from the data collection efforts described in this report are as follows:

- The major factors producing suppression are the loudness of passing rounds, the proximity and number

of passing rounds, and the signatures associated with rounds impacting.

- Within the limits of the distances employed in this study, suppression is shown to decrease in a linear fashion with increasing lateral miss distances at incoming projectiles.

- Within the limits of the number of rounds employed in this study, suppression was shown to increase linearly with increases in volume of fire.

- Within the limits of the projectiles employed in this study, suppression is shown to increase in a linear fashion with increases in the perceived loudness of passing projectiles.

- Within the limits of this study, a combination of auditory and visual signatures from near misses is found to be more suppressive than auditory signature alone.

Finally, a set of recommendations is suggested for design considerations which may enhance the suppressive capability of small arms weapons.

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1.0 INTRODUCTION

This report presents a review of the research conducted by the Mellonics Defense Sciences Laboratories (DSL) to identify objective relationships between small arms characteristics and effectiveness in suppressive fire. A description of each of the major data collection efforts within the program is provided, along with the results and conclusions derived from these efforts. This study was sponsored by the Advanced Research Projects Agency in September of 1970, and has been monitored throughout the 17-month effort by the U. S. Army Small Arms Systems Agency.

1.1 BACKGROUND

The continuing interest in improving the quality and effectiveness of small arms systems has generated such study efforts and developmental programs as the Small Arms Weapons Study (SAWS), Infantry Rifle Unit Study (IRUS), and the Special Purpose Individual Weapons (XM19) Development Program. In addition, a great amount of effort has been expended in the development of ammunition for small arms. In the main, these studies have concentrated on such physical factors as hit probabilities, lethality, casualty production, and optimum weapons mix. The SAWS and IRUS studies, along with a number of war gaming and firepower modeling efforts, have included a suppression factor in determining the outcomes of live-fire weapon comparisons and computer simulations of combat. However, these efforts have had to employ hypothetical values for the suppression phenomenon, and, in many cases, the parameters of suppression varied from one research effort to the next. Despite this lack of uniformity, these efforts do agree that suppressive capability must be considered as part of the overall effectiveness of a weapon system. This acknowledgment

accentuated the need for a comprehensive study of the phenomenon. In response to this need, the present contract was awarded.

1.2 PURPOSE OF STUDY

The purpose of this study was to identify objective relationships between small arms characteristics and effectiveness in suppressive fire. In addition, the study was to provide a methodology (model) through which the differential suppressive capabilities of various small arms weapons could be assessed.

1.3 SCOPE OF STUDY

This study comprised an investigation of suppression through review and analysis of available literature, and the generation of new data by means of interviews, questionnaires, and field experiments.

On the basis of the literature review, a preliminary model of the relationship between small arms characteristics and effectiveness in suppressive fire was developed. The factors to be entered into the model were further defined through the analysis of questionnaire and interview data. Field experiments were conducted to provide information on the form of the relationship between weapons characteristics, situational variables, and individual subject variables and suppression. Field experimentation data were also used in determining the parameters of the model itself. An attempt was made to use the model to assess the differential suppressiveness of a number of small arms weapons.

On the basis of the analysis of all of the data collected in this study, a set of recommendations was advanced for modifications of small arms which, in the estimation of DSL,

increases the suppressive capability of the weapon. Recommendations were also made concerning the ways in which the modeling effort undertaken in this study could be improved, thereby increasing the predictive validity of the model.

1.4 ORGANIZATION OF THE REPORT

This report is organized along task lines, with eight major sections. Section 2.0 presents the review and analysis of the literature. Section 3.0 describes the CONUS data collection program and recapitulates the results obtained with each CONUS data collection instrument. Section 4.0 provides descriptions and results of the Vietnam data collection effort. Section 5.0 provides a detailed description of the field experimentation portion of the study. It also includes a presentation of the results of these field experiments. Section 6.0 summarizes the major findings of each of the data collection efforts. Section 7.0 presents the recommendations advanced by DSL for potential modifications to small arms weapons for enhancement of their suppressive capability. Section 8.0 offers a concluding statement. Three report annexes are provided and include: Annex A, Bibliography; Annex B, Data Collection Instruments; and Annex C, Statistical Summaries.

2.0 LITERATURE ANALYSIS

(U) There was reason to believe that published reports and other technical literature, including film reports, contained a large amount of information at least peripherally relevant to the purposes of this project. An appreciably smaller amount of material bearing directly and substantially on the project was expected. The basis for both of these expectations lay in the personal experience of DSL staff members with research and development of small arms weapons systems. Both expectations were borne out.

2.1 LITERATURE SEARCH

(U) At the outset of the literature search it was necessary to decide what weapons would be considered to be small arms. For this purpose, the following definition was adopted: small arms are defined as a family of hand-carried weapons, including automatic weapons, designed to deliver in either a mounted or dismounted mode accurate and discriminatory fire against enemy targets (stationary or moving) either independently or in conjunction with supporting weapons.

(U) In the broadest terms, the literature was searched for information bearing on the following questions. What is suppression? What affects suppression? What does suppression affect? How had suppression been introduced as a factor in simulations and evaluations? Thus, interest was focused on the descriptive characteristics of suppression and means for its quantification; on weapon, situational, and human variables associated with the production and maintenance of suppression; on the operational significance of suppression; and on the ways in which suppression has been treated in analytical modeling, field experimentation, and weapons systems evaluations.

(U) In the course of this literature search, more than 2000 documents (reports, articles, and books) were identified as having possible relevance to the project. Review of these documents served to identify 600 which were considered as appropriate background material for the purposes of this program. These 600 documents fell into such categories as reports of weapons developments and weapons employment, technical data on weapons characteristics, experimental studies of psychological effects of weapons, after-action reports, studies of stress in combat, and prior studies in the area of suppression. A bibliography containing these 600 titles is included in this report as Annex A.

(U) Two hundred thirty-four abstracts were prepared from reviewed documents, on the basis that their contents were initially considered to provide important background material. These abstracts served the interim purpose of presenting in condensed form a sampling of the relevant literature which was found to be useful for orientation and planning purposes.

(U) The review of the literature indicated that the main body of documentation in the area of small arms suppression is of an anecdotal, journalistic, or opinionative nature, the bulk of this documentation being observational and nonquantifiable descriptive survey data coming out of World War II, Korea, and Vietnam. Only a few experimental studies are cited in the literature bearing directly on the topic of suppression. There is, to be sure, a good deal of experimental evidence on stress, panic, and fear which exists in the literature of the behavioral disciplines. However, little of this literature is directly concerned with, or has addressed itself to, suppression in combat.

(U) Forty-nine combat films were reviewed, the majority of which were historical accounts and after-action reports of major combat operations. The film sequences of combat engagements in these films have been of little value for this

project in that they concentrate heavily on tactics, combat support operations, and after-action results. Filmed sequences of small unit engagements under heavy small arms fire were found to be difficult to assess in terms of weapons effects. Cameraman location and camera angles under these conditions could not give a complete picture of the action. As a result, one could not see the target or the effects of delivered or received fire. Further, the final version of the film has been edited to appeal to other than scientific audiences.

(U) The most important aim of the literature search and analysis was to determine those areas concerning suppression in which the literature was notably absent, that is, to identify the data gaps. As a means of ensuring that the literature search would be directed toward this end, a matrix method of analysis was developed through which the data from the literature could be tabulated. The resulting frequency distribution of entries within the cells of each matrix provided an indication of the relative coverage of the various pertinent topics in the literature. Those matrix cells containing relatively few entries were tagged as gaps in our knowledge of suppression. Five major subject areas were covered in this matrix approach, namely, weapon characteristics, weapon employment, weapon effects, suppression factors, and effectiveness criteria.

2.2 SUPPRESSION IN COMBAT

(U) No doubt suppression appeared the first time one caveman threw rocks at another. Nor is there any doubt that the number of military engagements in which suppression has been manifested is just about equal to the number of military engagements that have taken place. Even if it were possible to recapitulate all the documented instances of suppression in military history, it is doubtful that such an exhaustive treatment would be very valuable or even desirable. It may be instructive, however, to review briefly a few such instances.

(U) Marshall describes [illegible]nces of American soldiers receiving intense German defe[illegible] fire at Omaha Beach on D-Day as follows:

> "They lay there motionless and staring into space. They were so thoroughly shocked that they had no consciousness of what went on. Many had forgotten they had firearms to use. Others who had lost their firearms didn't seem to know that there were weapons lying all around them. Some could not hold a weapon after it was forced into their hands... Their nerves were spent and nothing could be done about them" (200).*

Many of these soldiers were completely in the open and made no effort to seek cover even when it existed only a few feet away. If this is not suppression at its most extreme, it must be close to it.

(C) A sample of descriptions of other combat actions in which suppressive behavior is mentioned are given below. These descriptions have been abstracted from "lessons learned" and other operational reports from Vietnam.

- A (friendly) infantry company was attacked repeatedly at night while in prepared defensive positions. In all cases, the final rush was directly preceded by a heavy mortar and grenade barrage which suppressed friendly troops. Many cases were reported of troops being held in their positions by grazing fire and being kept pinned down to the extent that it was not possible to return fire. This grazing fire was noted as being produced largely by machineguns (376).

*Bibliographic references in this section are identified by numbers assigned to them in Annex A, Bibliography.

- Operation involved ARVN troops with U.S. advisers. Dismounted troops, accompanied by M113s attacking through rice paddies, were 50 meters from a tree line when they came under a "tremendous" volume of automatic, small arms, and rifle grenade fire; they were "pinned down." The M113s fired back with .50- and .30-caliber machineguns; the volume of VC fire did not diminish. (It is not stated how many vehicles were involved in this action.) The VC broke off the engagement at their initiative and withdrew successfully (337).

- The VC position was prepared with "firing ports" cleared through the underbrush, so that "it was impossible to see the muzzle flash unless the weapon was aimed directly at the observer."

- C Company was air landed at a position some 800 meters from a committed unit with a mission to attack the enemy flank. The jungle was so dense it took some 2-1/2 hours to reach the VC positions, and an assault against a bunkered enemy at 1745 was replused with seven men killed. Even though C Company was only 100 meters from its friendly unit, suppressive fire prevented their linkup. The battalion commander was killed trying to effect the linkup. Two attempts to retrieve his body failed (375).

- "Lessons learned" from a night ambush. Once the target (in this case sampans) is located, it must be fired on instantaneously by the maximum portion of the ambush to produce a heavy concentration of unrelenting fire in order to preclude enemy reaction. Sporadic firing or interrupted firing subjects the ambush site to possible retaliatory enemy fire (374).

- Daylight patrol, 1130 hours. Platoon, taken under fire by automatic/semiautomatic weapons and mortars, jumped into craters and a stream bed. VC continuously raked the area with heavy automatic weapon fire. Platoon tried to return fire but this was "ineffective" because they were "pinned down." At 1200 hours, gunships arrived and "suppressed" VC fire to the point that the platoon was able to gain fire superiority and disengage at 1400 hours. VC were firing from prepared bunkers.

(U) One other instance will be mentioned here, principally because it demonstrates the way in which suppressive effectiveness of a weapons threat can be dramatically increased by another factor (illumination) which, in itself, is harmless. Marshall, basing his account on personal observation, examination of pertinent documents, and after-action interviews with American participants, describes the following episode during the Korean War. A UN (American-Turk) attack on a hill strongly defended by Chinese Communist Forces (CCF) was temporarily stalled short of the objective. When night came on, the CCF counterattacked (370, pp. 26-27):

> "The attack continued as a steady squeeze by grenadiers who had closed to within 15 yards of Abrahams' riflemen, but were still invisible because of the dark and their expert use of the abundant natural cover. Glunt began to hear from Abrahams that his losses were mounting critically, mostly from grenade fragments... . As he personally saw things, artillery help could do little to ease the immediate pressure on his line, the Chinese being in much too close. But he felt that ... if he could get an illuminating shell over his own front, his firers might be able to spot the main avenues along which the assault was

being pressed... . When the first flares from the 155s broke above the mountain, illuminating the scene for miles around, there was, as the men themselves expressed it, a 100-percent increase in the morale of the defenders and a proportionate lowering of the Chinese agressiveness. For the first time Glunt's people could see the gulleys and shelves which the enemy was using to make the sneak approach; they were delineated by the bodies of Chinese strung out along each allev. While the light lasted, no enemy stirred and it was impossible to distinguish the dead from the pretenders. But all hands now knew toward which points they should concentrate their fire. That was a main gain. In addition, for the moment, the enemy pulled back and Glunt's men rested."

(U) The importance of suppression as a factor in the combat operations described above is evident. The American soldiers who froze on Omaha Beach (200) probably represented a weapons effect almost as valuable, to the Germans, as physical casualties. The ARVN troops, even though supported by M113s, lost and never regained the initiative because of the very suppressive fire they received from the VC (337). The effectiveness of suppressive fire in preventing the linkup of two attacking companies (375) undoubtedly contributed to the breakdown of an important operation.

(C) Reference 306, a "lessons learned" report, criticizes the common failure to employ fire and maneuver properly. All too often, according to this report, (friendly) attacking forces alternately fire and maneuver, thus wasting much of the advantage to be gained from the suppressive effects of the fire. Reference 101 recognizes the importance of suppression as one effect of counter-ambush systems, but states

(without offering evidence) that "the casualty production capability of the (counter-ambush) device is also an indication of its relative suppressive fire capability if the fire is continual during the entire period. A reasonable comparison based on this measure is applicable, since the guerilla, in order to avoid casualties, will take cover and thereby reduce his ability to deliver effective fire" (306, p. 6). Thus we might infer that, for evaluating the relative effectiveness of counter-ambush systems, it is only necessary to measure their relative merits in producing casualties, since their merits in producing neutralization will be in the same order.

(C) References 40 and 271 both hypothesize that the predominant use of fire is for suppressive purposes. Reference 40 gives no basis for the hypothesis. Reference 271 notes that the experienced ratio of number of small arms casualties to number of rounds fired is less, by a factor of about 1000, than the analytically derived hit probabilities for aimed fire, and suggests that one reason for the disparity may be the employment of these weapons in suppressive fire.

2.3 DETERMINANTS OF SUPPRESSION

(U) Much of the literature which purports to identify factors which cause or influence suppression does so on speculative or inferential grounds, and this leads to some inconsistency. Reference 403 maintains that the psychological laws underlying response to weapons systems are by no means established and that it does not appear that they can be established on the basis of past literature, if for no other reason than that the existing literature is not in sufficient agreement. This same lack of agreement as to other (than psychological) determinants of suppression was noticed in the present review, although probably not so markedly as one would expect from

reference 403. Much of this disagreement centers on the relative importance attributed to certain variables as opposed to others. There does seem to be general agreement that situation and methods of weapons employment, weapons characteristics, and psychological variables are important.

(C) It is held in reference 343, a staff study, that there is little conclusive information relating effectiveness in suppression to tactical situations, nor is there any objective basis for deciding on the best ways to employ suppressive fire.

(C) According to this same reference, fire placed on an attacker at long range is merely harassing fire and does not contribute materially to a successful defense. A successful defense depends primarily on the incapacitating capability of small arms weapons. On the other hand, fire placed on the defender is considered neutralization fire (synonymous with suppressive fire, according to the reference) and contributes primarily to accomplishment of the (attack) mission. Reference 343 offers no basis for these statements.

(U) From a questionnaire study of combat veterans, it was concluded that a weapon considered highly dangerous to assaulting troops may not be so considered for troops in prepared defensive positions. This 1957 study further concluded that the weapon which was optimum for producing adverse psychological effects in both situations was the light machinegun (424).

(U) Reference 403, a survey of available literature, concludes that dug-in troops fear the mortar most, while attacking troops regard the machinegun and the automatic rifle as more fearful than the mortar. The relative ability to protect one's self from direct versus indirect fire varies with these two situations and produces the resulting change in attitude.

(U) In experimental situations representing both assault and defense, it was found that the effectiveness of the M1 rifle decreased as concealment of the targets increased (217).

(U) Not surprisingly, a high volume of fire is generally considered to be more suppressive than a lower volume (111, 202, 265, and 418, for instance); however, Marshall (96), on the basis of personal observation and interviews and speaking of operations in Korea, says there was no evidence that a high volume of automatic carbine fire would deter aggressiveness (of the target troops). Reference 418, which is a report of field experimentation, goes on to say that when volume and distance of fire are varied together, there are clear patterns of differences in judged dangerousness for corresponding actual differences in volume-distance combinations, both for semiautomatic and automatic rifles. The combination of volume and distance fire cues is said to show that volume of fire has a greater effect than distance in determining dangerousness judgments for automatic rifle fire.

(U) U.S. Marine Corps doctrine recognizes the importance of volume of fire as a way of initiating suppression; it also recognizes that once troops are suppressed by a high volume of fire, they can be kept down by a reduced volume (328).

(U) Reference 423, which is a report of experimentation, considers automatic weapon fire and how the size of bursts and their spacing in time affect target exposure time and ammunition expenditure relationships. Among the findings are:

- The maximum psychological effects can be produced with minimum ammunition expenditure through the use of repeated short bursts.

- A random pattern of bursts has the same psychological effect as a systematic pattern, but produces more kills.

- The average target exposure time does not vary significantly with the number of rounds per burst when these vary from one to six.

- The average target exposure time decreases with increasing number of bursts per minute when these vary from one to 12 per minute.

- The average target exposure time increases as a function of increasing miss distance of overhead fire.

- Firing four bursts per minute, randomly, decreases target exposure time when compared with firing the same number of bursts per minute on a systematic schedule. When the number of bursts per minute is increased to six, the difference (in target exposure time) between random and systematic patterns disappears.

(U) According to one "lessons learned" report from Vietnam (304), sniper fire, which is typically low-volume, high-accuracy rifle fire, has been recognized as being highly suppressive in all wars, and the Vietnam experience is no different in this respect.

(U) Reference 515, quoting a report of a questionnaire study, says (without qualification) that experienced personnel will take cover when machinegun fire comes within 25 yards.

(C) Without identifying the source or basis, reference 274 says that in Korea, attacking Chinese almost always used

marching fire. U.S. troops suffered few losses from it, and it did not pin them down to the point that it checked their fire.

(U) Perhaps the best consensus as to what characteristics of fire promote suppression can be found in reference 111, which states the assumption that the more rounds that are delivered close to the target, the more evenly they are spread, and the faster they are delivered, the more likely the enemy is to remain under cover.

(C) The importance of weapon characteristics in producing suppression is particularly moot in the literature. On the one hand, for example, reference 40 says that there is little conclusive information relating effectiveness in suppression to specific characteristics of weapons. On the other hand, reference 392, without giving any basis, claims that the dominant determinant of behavior under fire is the physical characteristics of the weapons to which one is exposed. A study which employed content and factor analysis of questionnaire data obtained from Vietnam combat veterans indicates that culture is not a particularly important variable affecting fear of weapons. Physical characteristics of weapons seem predominant, according to this study (427).

(U) Needless to say, there is a school of thought that emphasizes other than the physical characteristics of weapons in producing the suppression phenomenon. This school, as represented by reference 392, holds that the perception of weapon effects is a function of culture, personality, and situation. In support of this position, reference 392 concludes on the basis of questionnaire and interview studies that different cultural groups have different constellations of weapon-type fears. Unfortunately, from the standpoint

of the confidence to be placed in such conclusions, the results are inextricably confounded with other variables such as: winning -- losing; being captured -- not being captured; being exposed to "our" weapons -- being exposed to "their" weapons; and other similarly unbalancing factors.

(C) It is reported, based on interviews with American participants, that the Chinese Communist Forces in Korea were more afraid of WP grenades than fragmentation grenades (568). Chinese and North Korean troops were said, on the basis of questionnaires and interviews administered to them, to have high fear of air weapons, artillery, and napalm; of ground weapons, the machinegun was more highly feared than the rifle (401). An analysis of historical accounts of Soviet defections on the Soviet-German front in World War II was said to have shown that grenade throwers, dive bombers, and artillery were particularly feared (497).

(U) According to reference 410 (quoting a secondary source), interviews with 264 British wounded from North Africa showed that fragmenting, shell-throwing weapon systems were more feared (by 90 percent) than small arms. Quoting another secondary source, reference 410 reports that a study of 300 veterans of the Spanish Civil War showed that bomb shrapnel was most feared; grenades, strafing, machineguns, and tanks were least feared; and trench mortars, artillery, bayonets, and expanding bullets fell somewhere in between. Reference 410 also says that interviews with German POWs revealed that WP grenades, bombs, and flame throwers were the most terrifying Allied weapons.

(U) A study employing interviews and critical incident techniques with Korean War participants, including Chinese and North Korean POWs and U.S. troops, reached the conclusion that artillery, bombs, napalm, and air stafing produced the

most ineffective behavior of enemy troops, while mortars and automatic weapons were most effective against American soldiers (518). Marshall (96, 370) concludes, on the basis of personal observation and interviews, that in Korea, the quad .50 caliber had superior suppressive and demoralizing effects against Communist forces.

(U) Also in Korea, U.S. troops, questioned as to which enemy weapons they feared most, named the 120MM mortar most frequently, followed in order by the "burp gun," artillery, land mines, machineguns, and (tied for last place) the Bren gun and grenades (568). Two other reports bear interesting relations to this report. Reference 511, which is based entirely on a review of documentary evidence, reports that the "burp gun" was apparently not held in high regard by the North Korean troops, since it was abandoned by these troops in a much higher proportion that any other small arms. The second of these reports (370) describes (among other actions) a night attack on U.S. troops by Chinese Communist Forces. Even though the U.S. troops took most of their casualties from grenade fragments, the grenades failed to suppress U.S. defensive fire.

(U) In World War II, interviews with 842 American troops serving in France indicated (12) that they feared the German 88 "twice as much as the mortar," even though the mortar inflicted about as many causalties as the 88.

(U) According to reference 568, which is based on interviews with U.S. troops, tracers were little used in Korea. If true, this would suggest that the message of reference 111 was not to be taken too generally; this reference (111), which draws on other surveys of the literature, concludes that tracers may impose additional fear in enemy troops, thereby demoralizing them. German prisons at the siege of Bastogne are

said in reference 111 to have reported that the additional illumination provided by tracers at night made them feel more likely to be spotted and, further, that they felt that each tracer round was coming directly at them.

(C) Individuals controlling targets for SALVO tests commented that the psychological effect of the triplex round was much greater than that of the standard or duplex round. It was as though (according to them) several people were shooting at them at once; they had an "unreasoning" compulsion to seek cover even though they were already well covered (109).

(C) Reference 343 states, without empirical documentation, that the weapons characteristics contributing to suppressive effectiveness are: lethality, penetration, accuracy, projectile signature, projectile sonic crack, and trajectory. Reference 427, which describes an approach based on a factor analysis of questionnaire data obtained from Vietnam veterans, concludes that the weapon dimensions most likely to produce strong fear reactions are: "burn," "air delivered," and "explosive projectile."

(C) Reference 156, basing its conclusions on a study of the causative agents of battle casualties, offers some predictions which are suprising at first sight, but which make sense, at least as hypotheses, on closer examination. These predictions are:

- An increase in volume of small arms fire may actually decrease the relative percentage of small arms casualties.

- An increase in artillery firepower will be associated with a relative decrease in percentage of casualties due to artillery.

(C) The rationale for the first prediction, according to the authors, is that increased small arms fire will drive target personnel to seek the best immediately available cover, where, in many cases, they will still be vulnerable to the air-burst and indirect fire capabilities of artillery. The rationale for the second prediction is that increased artillery fire will also drive target personnel to cover, in this case allowing the infantry to close and inflict more casualties at short range.

(U) More emphasis or attention can be placed on the psychological factors involved, but not necessarily with any great enlightenment. Reference 403, based on a survey of available literature, claims that the combination of stimulus variables (speaking of weapons) which will produce the greatest psychological effect in the most people over the widest range of situations is either not known or only vaguely known.

(U) The question of how the physical effectiveness of weapons is related to their psychological effectiveness is addressed frequently in the literature. According to Stouffer (12), who based his conclusions on a study in which questionnaires were administered to more than 700 wounded veterans of the North African campaign, weapons most feared are not necessarily the most dangerous. A weapon may be high on the list of feared weapons either because it is especially common and dangerous, as perhaps in the case of artillery shells, or because something about it arouses irrational fear, as perhaps in the case of air bombing. The machinegun should probably be high on the list because it is actually dangerous, but the man may feel that, though dangerous, it is in the realm of the familiar and that he knows how to cope with it. With more combat experience, fear of really dangerous weapons increases, while it decreases for the objectively less dangerous weapons.

(C) Reference 91 supports this point of view, at least in part, by saying, on the basis of interviews with U.S. veterans of Vietnam, that unless a weapon is truly effective as a casualty producer under combat conditions, experience with it (i.e., exposure to it) will diminish initial fear. The greater the perceived effectiveness, the greater the fear-inducing potential of a weapon.

(U) Other reports which consider this problem include: (202) much of the frightening effect of a weapon is due to its ability to hurt (evidence not stated); (403) people will fear most the weapon that, in their personal experience, has been the most destructive; reference 392 concludes from a review of other studies employing questionnaires and interviews that the perceived physical effects of a given weapon do not bear a one-to-one relationship to the weapon's actual effects; (401) the experience of being fired on by a weapon is not necessarily related to fear of that weapon (according to Chinese and North Korean prisoners), rather, the soldier's expectation of casualties the weapon may produce is the prime determinant; (403) the more intense the destructive force of a weapon, the more psychological stress and social disorganization results; an inefficient weapon that produces impressive cues (visual, auditory, or other) may be highly fear producing on initial contact, but fear will diminish with repeated contact. This is not so when the weapon itself is efficient. It is suggested, therefore, in reference 403 which reports a survey of the literature, that while visual and auditory cues of weapon action cannot normally be used to increase significantly the efficiency of a weapon, they can improve the psychological effectiveness of an already efficient weapon by enlarging the perceived magnitude of the attack, the believed proximity of the target area, and other aspects of the threat.

(U) Based on personal observation and interviews conducted with Eighth Army personnel during the winter of 1950-1951, Marshall (96) concludes that except for some initial suppressive effects when sounds and visual effects of weapons were unfamiliar, our troops in Korea were suppressed only when the enemy threat was real.

(U) Reference 202 also cites unpublished World War II data which show that there is a correlation of +0.64 between weapons most "disliked" and those causing most casualties. The subject sample for this study included hospitalized German and British veterans of North Africa.

(U) Fifty to 75 percent of Chinese and North Korean prisoners interviewed gave expectation of casualties as the prime reason for their fear of a weapon (401). Noise and efficiency of action were also mentioned, but much less often.

(U) Reference 403 reports from the literature that near-miss experiences produce the most extreme psychological responses to weapons; reference 410, without identifying the source as other than "psychiatric reports," says that the battle incident most apt to "break" a soldier is the explosion of a shell in the immediate vicinity.

(U) Reference 471 discusses the use of weapons to produce a psychological "shock" effect on enemy troops. The effect is characterized by a reduction in the enemy's will to fight. It may produce mass retreat, surrender, or suppression. According to the author, its cause is the sudden, unexpected employment of weapons which either demonstrate a capacity for high lethality, or appear to have that lethality. He considers tanks, flame throwers, bayonets, grenades, and assault full-automatic fire to be "shock" weapons.

(U) One interesting observation is that suppression is, in a sense, a phenomenon of social contagion; that is, it can spread from individual to individual (229) and from unit to unit (390).

(U) The impression gathered from the literature is that a very large number of factors have been hypothesized to be determinants of suppression, but that the great majority of these fall into one or another of four categories: weapons characteristics, weapon employment, situational variables, and individual psychological factors.

2.4 SUPPRESSION AS A VARIABLE

2.4.1 General

(U) If suppression is an important factor in combat, it follows necessarily that being able to identify its appearance and to gauge its intensity must also be important. If a valid, conceptual, quantitative model of combat is to be possible, there must be a valid, quantitative, concept of suppression. If the theory (model) is to be known to be valid for combat itself, there must be some valid, quantitative means for introducing suppression into the exercise of the model, whether the exercise be rational (mathematical) or empirical (field experimental).

2.4.2 Effectiveness Criteria

(U) The analysis of the literature yielded a number of criteria on which to measure the effectiveness of weapons systems in producing suppression. It should be noted, however, that there is no consensus in the literature regarding the most appropriate criteria.

(U) Among those mentioned in the literature are:

1. Reduction in the exposure time of a target.

2. Reduction in firepower potential of an enemy force.

3. Reduction in ability of a force to accomplish the mission.

4. Prevention of movement in an enemy force, i.e., pinning down the enemy.

(U) It was the opinion of the Litton analysts that all of the criteria for suppression mentioned in the literature had three basic elements in common. These common elements were:

1. Reduction in the ability to fire effectively.
2. Reduction in ability to maneuver.
3. Reduction in ability to observe the enemy.

(U) It was also apparent that a distinction is drawn in the literature between reducing these abilities through casualty production and reduction through suppression of the individual. Thus a preliminary definition of suppression for this program was stated as the reduction in an individual's or unit's ability to fire, maneuver, and observe the enemy as a consequence of the psychological effects of incoming weapons fire. These psychological effects may be in part produced by the individual's perception of the lethality of the immediate incoming fire, but are not produced through actual wounding of the individual by this fire.

2.4.3 The Quantification of Suppression

(U) It was thought that the literature would reflect these considerations and that there would be a large body of discussion, with appropriate conclusions, in the matter of

quantifying the suppression phenomenon. In actual fact, this is not the case. The literature reviewed revealed no effort to measure or scale suppression in combat, unless one is willing to accept actuarial and other data as to the incidence of neuropsychiatric casualties (571, 86, 87, 88, 89, 93) as a measurement of suppression.

(U) Several authors do, however, discuss measures of effectiveness of suppression and postulate quantitative values for the phenomenon. Among these is Bossler (172), who proposes a measure of effectiveness for suppressive fire (and, therefore, in some sense a measure of suppression) delivered from aircraft. Bossler proposes:

> "...that the measure of effectiveness for comparison of suppressive fire aircraft weapon systems be the product of two factors: (a) the area on the ground over which the weapon system is able to deliver a high (5%, 10%) probability of kill against a standing gunner in eight seconds in the direct reaction mode, (b) the length of the time that an enemy car be kept under fire (or threatened fire) by one aircraft, out of the required operational period (100-200 seconds, for example). The dimensions of the measure are area (e.g., square meters) multiplied by time (seconds)."

(C) Caprino (343) defines suppressive fire as neutralization fire, and states (p. 2-b-1) that "...degree of suppression or the number of rounds required to suppress are immeasurable values because of the psychological factors involved." In contrast, reference 515 assumes that when a target (person) comes under direct fire, he will reduce his exposure to the minimum level. In the context, this means that the person fired on takes the best cover the terrain provides as quickly as he can. In other words, according to reference 515, coming

under fire is the necessary and sufficient condition for a target's being suppressed, and, not only that, but also for the target's being suppressed to the maximum degree allowed by his protective surroundings. Therefore, according to this reference, there is no graduation of suppression, at least in theory: it is "all" or "none."

2.4.4 Suppression in Simulations

(C) Suppression has been recognized as a necessary variable in a number of modeling and quasi-modeling efforts. For instance, references 112 and 199 treat suppression formally as a part of larger models. References 366 and 515 derive models or, at least, equations for predicting suppression itself. Reference 343 offers a formula for a "relative neutralization index between weapons or weapons systems," which contains a "suppressive index" term. Reference 156 presents a multiple correlation method for predicting casualties as a function of friendly and enemy artillery and small arms fire. Suppression is considered to be important here because, as mentioned above, the derived relationships predict a decreased percentage of friendly casualties due to increased enemy small arms fire, with a concomitant increase in percent casualties due to enemy artillery. This is interpreted as being due to enemy small arms fire causing friendly forces to take precautions, refrain from direct contact with enemy, and avoid exposure to enemy line of fire. Hence, according to these authors, the simultaneous use of artillery will result in a relatively higher percentage of casualties due to artillery than to enemy small arms fire. The actual number of small arms casualties may increase with increased enemy small arms fire, but the relative percentage will be decreased. However, empirical validation of these models is lacking.

(U) In military field experimentation, the need to plan suppressions has been recognized. An experiment conducted to determine the relative merits of two differently sized small groups of infantrymen armed with various mixes of weapons against an instrumented target range (581) introduced "suppression" into the target exposure program by the following algorithm: if two bullets pass within 2 meters of a single target in 0.04 minutes (and the target is not hit in this period), the target will fall and remain down for 0.06 minutes. If the same stimulus (i.e., two bullets within 2 meters in 0.04 minutes) is repeated while the target is down, the target's downtime will be extended by 0.01 minutes.

(U) The main IRUS experiment, conducted by CDCEC, programmed the targets according to a somewhat similar plan; that is, the stimulus of two rifle rounds (or fragments) within 2 meters in 0.04 minutes caused the target to drop for 0.06 minutes. However, one grenade near miss within 5 meters also caused suppression for 0.06 minutes. Each additional near miss (rifle or grenade) caused the target to remain suppressed for an additional 0.01 minutes (263). The XM148/M79 Basis of Issue experiment (600) used the same program.

(U) the SAWS experiments conducted by CDCEC (484, 485) took near misses into account in comparing the effectiveness of the small arms systems studied, but targets were not programmed to fall as a result of near misses.

2.5 SUMMARY OF THE LITERATURE REVIEW

2.5.1 General

(U) Review of accounts of combat actions show that suppression has played an effective role in aborting, stalling, or otherwise degrading attack; in reducing reactive fire and otherwise degrading defense; in preventing withdrawal or disengagement by the suppressed force; in facilitating and protecting

disengagement by the suppressing force; in preventing linkup of units; and in holding (pinning down) troops until supporting fire can be brought to bear. Although suppressive fire is much used, its potential tactical value has not always been fully exploited.

(C) A number of studies attempted to discover which types of weapons are most feared (and/or least feared). The results of some of these studies are tabulated in Table 2-1.

(U) A large number of factors related to the production of suppression were identified in the literature review and analysis. These factors can be grouped into four major categories as follows:

1. Weapon characteristics.
2. Weapon employment.
3. Situational variables.
4. Individual psychological factors.

(U) Within the weapon characteristics category are such factors as type of weapon, projectile signature, cyclic rate of weapon, angle of fire, and lethality of weapon.

(U) In the weapon employment category are such variables as accuracy, rate, volume, and pattern of fire; proximity of fire to the target; and weapons mix. Perhaps the best summarizing statment of the characteristics of fire which promote suppression is contained in the assumption of reference 111 that the more rounds that are delivered close to the target, the more evenly they are spread, and the faster they are delivered, the more likely the enemy is to remain under cover.

(U) Situational variables mentioned in the literature included such factors as relative firepower potentials of opposing forces, terrain, availability of cover, mission, and friendly casualties.

TABLE 2-1 (C) WEAPON TYPES FEARED

Military Population	War	Front or Theater	Weapon Types		Reference
			More/Most Feared	Less/Least Feared	
N/S*	Spanish Civil	-	Bomb Shrapnel	Grenades, Straffing, MG, Tanks	410
Soviets	WW II	Russian	Grenade Throwers, Dive Bombers, Artillery		497
British	WW II	N. African	Fragmenting, Shell Throwing	Small Arms	410
U.S.	WW II	N/S	German 88	Mortar	12
Germans	WW II	N/S	WP Grenades, Bombs, Flame Throwers		410
CCF	Korea	-	WP Grenades	Fragmentation Grenades	568
CCF/NKA	Korea	-	MG	Rifle	401
CCF/NKA	Korea	-	Air Weapons, Artillery, Napalm		401
CCF/NKA	Korea	-	Artillery, Bombs, Napalm, Air Staffing		518
Communist	Korea	-	Quad .50-cal MG		96, 370
U.S.	Korea	-	Mortars, Automatic Weapons		518
U.S.	Korea	-	120MM Mortar	Bren Gun, Grenades	568
Dug-In Troops	N/S	N/S	Mortar		403
Attacking Troops	N/S	N/S	MG, AR	Mortar	403

*Abbreviations used in table:

AR - Automatic Rifle
CCF - Chinese Communist Forces
MG - Machinegun
NKA - North Korean Army
N/S - Not Stated
WP - White Phosphorus

(U) Finally, individual psychological factors, such as prior combat experience, realistic appraisal of the threat, prior combat wounds, near-miss experiences, and general psychological makeup of the individual, were noted in the literature.

(U) The analysis of the literature yielded a number of criteria on which to measure the effectiveness of weapon systems in producing suppression. It should be noted, however, that there is no consensus in the literature regarding the most appropriate criteria.

(U) Among those mentioned in the literature are:

1. Reduction in the exposure time of a target.

2. Reduction in firepower potential of an enemy force.

3. Reduction in the ability of a force to accomplish the mission.

4. Prevention of movement in an enemy force, i.e., pinning down the enemy.

2.5.2 Data Gaps

(U) The review and analysis of the literature resulted in the identification of a number of significant gaps in our knowledge of suppression. Of primary importance was the lack of quantitative data to support or refute the positions advanced in many anecdotal and descriptive accounts of suppression factors and criteria of effectiveness. Further, little experimental evidence was found to support hypothetical values ascribed to the phenomenon of suppression in various modeling efforts.

(U) The anecdotal evidence specifically indicates that auditory and visual characteristics of weapons firing, projectiles passing by, and projectiles impacting are important determinants of suppressive behavior. However, no quantitative data were uncovered relating the sound magnitude or other acoustic features of incoming small arms fire, either passing or impacting nearby, to the creation of suppression. Nor were there any data relating muzzle noise to suppression. Information bearing on the potential differential suppressive effects of such auditory cues under conditions of relative quiet and usual battle noise was also absent in the literature.

(U) Except for some perhaps overly generalized comments on the fear-inducing properties of tracer rounds, there is also little in the literature quantifying the suppressive effects of visual signatures of rounds passing or impacting, or visual signatures at the weapon muzzles. Quantitative data on the differential effectiveness of visual cues in conditions of light and darkness are similarly absent in the literature.

(U) Although some experimental data is presented in the literature relating pattern of fire and rate of fire to suppression, the evidence is not sufficient to allow generalization to newer weapons with higher cyclic rates and modified dispersion patterns.

(U) Similarly, no quantitative relationships between projectile size and suppressive capability were discovered in the literature, as such. Questions concerning the relative suppressiveness of the new, smaller caliber projectiles and flechettes (even with their greater lethalities as compared with the older, larger caliber projectiles) remain unanswered.

(U) Situational variables are alluded to in the literature as being mediators of the suppressive effects of weapons. However, quantitative documentation of these assumptions is notably absent. For instance, questions such as the following are relatively unexplored in the literature:

- How do mission requirements and the point within the mission at which fire is received affect the degree to which suppression is produced?

- How does the availability of acceptable cover effect the seeking of cover (a measure of suppression) when under enemy fire?

- What is the effect of friendly casualties on the degree of suppression manifested in the remaining members of a unit.

(U) The question of the psychological effects of casualties on remaining members of a unit raises the question of how can the casualty-producing capabilities of weapons be distinguished quantitatively from their suppressive capabilities? Although there are several references to the relationships between casualties and suppression, the literature is by no means in agreement as to the quantitative form of this relationship.

(U) In order to evaluate the suppressive capability of a weapon, an adequate criteria of effectiveness must be generated. Several measures of effectiveness (MOE) for suppression are proposed in the literature, but there is no systematic, rigorous study addressing the problem of what kinds of MOE would be most valuable for evaluating the suppressive effectiveness of small arms weapons systems.

(U) The preceding enumeration of significant data gaps yielded the conclusion that the gaps, at the least, were equal in magnitude to the actual state of knowledge concerning suppression. As such, the objectives for the major effort of this project become the design and implementation of a program to provide data in a number of the areas presently considered as data gaps.

2.6 PLAN TO FILL DATA GAPS

(U) It was apparent from the reports of previous efforts to document the phenomena of suppression that interview, questionnaire, rating scale, and field experimentation techniques are essential to the development of quantitative data to fill data gaps. It was also evident that even subjective data related to suppression must be updated to reflect current doctrine, training, and technological advances. Such an update of the subjective relationships between the various facets of combat and suppression could be obtained from individuals who had participated in recent combat by the application of questionnaire, interview, and rating scale techniques.

(U) These techniques for exploiting the combat experience of our soldiers were brought to bear on such questions as how features of mission affect the degree of suppression produced by small arms; how the availability of cover effects cover-seeking behavior; how the visual and acoustic features of small arms fire are related to suppression; and how some of the newer weapons compare in suppressive effectiveness with some of the older weapons which are still used in combat. Where deemed of importance, the same techniques were applied to trainees having no combat experience to provide control data for comparison purposes.

(U) Field experimentation techniques were employed to provide quantitative data on the objective relationships between weapons characteristics and suppressive effectiveness. In addition, field experimentation provided an objective data base for modeling suppression.

(U) The program actually developed to attempt to fill the data gaps was three phased. The first phase was composed of a program of structured interviews, rating scales, and questionnaires which were administered to U.S. Army and Marine Corp combat veterans and trainees in the Continental United States (CONUS). The purpose of this first effort was to acquire a large body of relatively current information on the effects of situational variables, modern weapons, and current doctrine and training on the production of suppression. The second purpose of this CONUS data collection effort was to provide information which would allow Litton to generate data collection instruments which could be employed at a later date in the Republic of Vietnam (RVN), so as to obtain first-hand information on pertinent suppression factors from soldiers immediately coming out of a combat engagement.

(U) The second phase of the program was composed of the actual employment of these data collection instruments in Vietnam.

(U) The third phase of the program involved the design and implementation of field experiments which would provide quantitative data relating various characteristics of weapons, and their employment, to the production of suppression.

3.0 CONUS DATA COLLECTION

The CONUS data collection took place over the periods of 15 February through 12 March 1971, and 11 April through 21 April 1971. The data comprised structured interviews, questionnaires, and rating scales and were collected at Fort Benning, Georgia (Army); Fort Bragg, North Carolina (Army); and Camp Pendleton, California (Marine Corps).

3.1 RATIONALE FOR CONUS DATA COLLECTION

The CONUS data collection effort was designed to provide information for two major objectives of the DSL investigation of suppression. The first objective was to obtain current information to fill the gaps discovered through the review of the literature. In particular, this effort concentrated on acquiring information on the role of context variables (e.g., mission, unit size, etc.), modern weapons, and current doctrine as they affect the production of suppression. The second objective was to obtain sufficient information from recent combat veterans to allow DSL to generate data collection instruments which could be used in Vietnam for the purpose of collecting first-hand information from soldiers coming out of combat situations.

3.2 DESCRIPTION OF DATA COLLECTION INSTRUMENTS

Four different instruments were devised to collect data within CONUS. The instruments were a structured interview, a paired comparison rating form, a multidimensional scaling form, and a questionnaire. Copies of these instruments will be found in Annex B of this report.

3.2.1 Structured Interviews

The primary CONUS data collection instrument was a structured interview, with alternate forms tailored to offensive or defensive operations. Essentially, the individual combat veteran was asked to describe in general terms a combat action in which he was suppressed. The respondent was briefed on the meaning of suppression and allowed to choose to report either an offensive or defensive operation. Following the general description, the appropriate series of structured questions was asked of the respondent, with in-depth probing used where called for. At the end of the structured portion of the interview, additional questions were asked, as deemed appropriate, to clarify answers or to invite free comment by the respondent. These questions usually centered around suggestions for weapons modifications. A total of 168 interviews of both varieties were given. Of these, 158 were deemed of sufficient value to be analyzed.

3.2.2 Paired Comparison Scale

The second data collection instrument used in the CONUS program was a paired comparison scaling of a combined set of eight modern U.S. and foreign weapons. This form required the respondent to indicate which member of each of the 28 pairs of weapons he considered to be the more dangerous. Two forms of the scale were developed. Form A asked that the comparison be made assuming that the weapons were employed against the respondent while he was occupying an open foxhole. Form B required the respondent to make the comparisons assuming that he was assaulting the enemy.

A total of 166 of these scales were administered at Fort Benning and Camp Pendleton during the period of the structured

interviews. The two scales were randomly assigned to individuals as they arrived for interviewing. A total of 86 individuals completed Form A, and 80 completed Form B.

3.2.3 Multidimensional Scale

The third instrument developed for the program was a multidimensional scale of weapons. Again, 28 pairs of weapons were presented to the respondent, who was asked to rate the similarity of the weapons on a scale from 1 (equal) to 9 (extremely different), with reference to the dangerousness of these weapons to the individual in a defensive position. This instrument was given a trial administration to a random sample of 27 Army combat veterans at Fort Benning during the period of the structured interviews.

3.2.4 CONUS Questionnaire

The CONUS questionnaire was designed to elicit, from a large number of individuals, information which would support or refute the conclusions derived from the structured interviews. In addition, items were included in the questionnaire to investigate differences in responses between combat veterans and troops with no combat or no combat zone experience. A total of 385 questionnaires were administered to Army and Marine personnel.

3.3 COMPOSITION OF RESPONDENT SAMPLES

3.3.1 Qualifications

All of the individuals included in the CONUS structured interviews, paired comparison scale, and multidimensional scale samples were combat veterans. In addition, they all had been

awarded the Army Combat Infantryman Badge (CIB) or Marine Corps Combat Action Ribbon (CAR), and at least one other award for valor. The officer portion of the sample met the same general requirements and had served in an infantry combat leadership capacity in Vietnam. All enlisted personnel served in Vietnam in a combat infantry MOS. The actual selection of respondents was made by the DSL staff through screening of personnel records. In addition, a personal data form was given to each respondent to update the information extracted from his military record. A copy of the personal data form is provided in Annex B.

The selections of respondents for the CONUS questionnaire were made by military authorities, who selected the combat veterans on the same basis as did the DSL staff for interviews and scales. The trainee samples were selected from available training units.

3.3.2 Structured Interview

The structured interview was given to a total of 168 military personnel, divided as follows:

84 enlisted men 10 officers	Fort Benning, Georgia
25 enlisted men 7 officers	Fort Bragg, North Carolina
37 enlisted men 5 officers	Camp Pendleton, California

3.3.3 Paired Comparison Scale

The paired comparison scale was given to all of the 168 individuals receiving structured interviews. The distribution

was the same as given in 3.3.1 above. Of the 168 scales handed out, 166 were completed.

3.3.4 Multidimensional Scale

The multidimensional scale was given to a sample of 27 enlisted men, chosen at random from the 84 enlisted-men interviewees at Fort Benning.

3.3.4 CONUS Questionnaires

A total of 389 questionnaires were completed by military personnel. The distribution is as follows:

Fort Benning

249 officers and enlisted men with combat experience
46 enlisted men with no combat experience

Camp Pendleton

44 officers and enlisted men with combat experience
50 enlisted men with no combat experience

3.4 PRESENTATION OF RESULTS

The results obtained from the four CONUS data collection instruments are presented below. An integration of these results into the overall framework of suppression will be found in Section 6.0 of this report.

3.4.1 Structured Interview Results

The structured interview results obtained from U.S. Army and Marine Corps personnel in CONUS were grouped into 12 general response categories by use of a content analysis procedure. Categories 1 through 8 are compilations of the characteristics

of the engagements described by the 168 interviewees. Categories 9 through 12 present the attitudes and opinions of the respondents regarding the phenomenon of suppression. These categories are listed below.

1. Range of engagement.
2. Length of engagement.
3. Types of enemy weapons encountered.
4. Means used to identify enemy weapons.
5. First reaction to fire.
6. Cause of initial reaction to fire.
7. Characteristics of the enemy fire.*
8. Secondary reaction to fire.
9. First thing that tells him he's being fired at.
10. Type of fire he thinks is the most suppressive.
11. Enemy weapon for which he has developed the most respect, and the reason.
12. How the suppressive effects of our weapons can best be increased.

Each of these categories are dealt with in separate subparagraphs, below. The number of individuals giving analyzable responses varied with the particular question. As such, the "N" reported for each question represents the number of usable responses obtained for that question. The results for each question are generally discussed as percentages of total responses for each category, and no differentiation is made between Army and Marine Corps respondents.

3.4.1.1 Range of Engagements. After describing a combat situation in which he was suppressed, the respondent was asked to estimate the range at which the initial small arms

*Category 7 data were obtained only for offensive missions.

contact was made during that engagement. A summary of interview results is presented below as three engagement range bands, and the percent of the sample indicating that small arms contact was initiated within each band. Separate tabulations are presented for offensive and defensive operations.

Range	Offense (N = 69)	Defense (N = 26)
25 m or less	39%*	50%
50 m	19%	19%
100 m or less	42%	31%

For engagements in which the enemy attacked friendly defensive positions, 50 percent of those responding reported that contact was initiated when the enemy was less than 25 m away. For engagements which occurred during friendly offensive missions, the range at initiation was reported as being either fairly close (25 m or less) or fairly distant (100 m or more). This bimodal response distribution correlates with two types of friendly offensive action typically encountered by U.S. troops, namely, the chance close encounter/ambush (25 m or less) and the assault of suspected enemy encampments (enemy fire encountered at 100 m or more from objective).

3.4.1.2 Length of Engagement. The respondents to the structured interview were also asked to estimate the time duration of the engagement. A summary of interview results is presented below in five intervals of duration and the percent of the respondents indicating that their engagements occupied the time stated in the interval. For both offensive and defensive operations, at least 40 percent of the engagements were said to have lasted less than 30 minutes.

*Percentages given in this section have been rounded to the nearest whole percentage and may not add to 100 percent.

Length of Engagement	Offensive (N = 72)	Defensive (N = 35)
30 min or less	47%	40%
∿ 60 min	17%	11%
∿ 120 min	10%	9%
∿ 180 min	8%	14%
4 hours or more	18%	26%

3.4.1.3 Enemy Weapons. The respondents were questioned concerning the types of enemy weapons they encountered in the engagement and the manner in which the weapons were identified. Almost all engagements were said to involve the AK47. Other weapons typically mentioned included the .30-caliber machinegun, the RPG, and the 60MM mortar. Less frequently encountered enemy weapons were the .51-caliber machinegun, B40 rocket, and the SKS semiautomatic rifle. Several respondents indicated that the enemy employed captured M16s and M79s against them.

The respondents were also asked to indicate the cues which enabled them to identify the enemy weapons employed against them. The percentage distribution of cues is as follows:

Cues to Weapon Identity (N = 15)	Distribution
1. Characteristic weapon sounds	75%
2. Round impact sounds	15%
3. Weapon visually detected	9%
4. Seeing rounds impact	1%

Since most of the reported engagements involved the AK47, it is not unusual to note that 75 percent of the sample identified the weapons on the basis of characteristic sounds. The

visual detection category (3) included seeing the weapon in the hands of the enemy or finding the weapon left behind by the enemy. This latter mode is typical of the machineguns.

3.4.1.4 Reactions to Enemy Fire. The respondents reported that first reactions to enemy fire fell into four main categories for offense and defense operations. These categories of first reactions to enemy fire are presented below, separately for offensive and defensive engagements. (The reactions are listed in descending order of percent response.)

Offensive Reaction (N = 85)	Distribution
Hit the dirt	57%
Take cover	21%
Continue to advance	13%
Return fire	9%

Defensive Reaction (N = 38)	Distribution
Move to prepared position	45%
Hit the dirt	29%
Observe his sector	5%
Return fire	5%

The differences in the nature of the reported responses and in the distribution of the responses can be attributed to the general conditions prevailing in the two situations. The predominant response for defensive engagement was to move to a prepared position, whereas for offensive missions it was to hit the dirt. In both cases, the responses most frequently reported may be characterized as taking immediate protective action.

Each structured interview was further analyzed to extract indications of the volume and accuracy of fire encountered by the respondent in the reported engagement. An attempt was made to identify the respondent's stated cause of his first reaction to enemy fire.

Seven specific causes of an individual's first reaction to enemy fire were delineated. Each of these is presented below and is related to the first reactions shown by the respondents. The percent of the sample stating each cause is presented for offensive and defensive operations.

Stated Cause	Offensive (N = 64)	Defensive (N = 29)
Saw weapons	5%	0
Saw impact	12%	6%
Heard weapons	42%	48%
Heard projectiles	17%	41%
Saw people hit	15%	0
Ordered down	4%	3%
Others in my unit initiated contact	5%	0

For both groups, hearing the sound of weapons firing was the primary stated cause for the individual's first reaction. The next most important cause of first reaction was hearing projectiles passing. The large differences between offense and defense in the percent stating that hearing projectiles was the cause of their first reaction is probably an artifact of the large differences in sample size.

The individual's first response to enemy fire was further subdivided into suppressed and nonsuppressed reactions.

His description of the volume and accuracy of the initial enemy fire was then classified as either: heavy/accurate, heavy/inaccurate, light/accurate, or light/inaccurate. The class of first reactions as a function of the characteristics of enemy fire is as follows:

	Characteristics of Enemy Fire			
First Reaction (N = 93)	Heavy Accurate	Heavy Inaccurate	Light Accurate	Light Inaccurate
Suppressed	88%	72%	84%	67%
Nonsuppressed	12%	28%	16%	33%

The data indicate, as expected, that where volume of fire is similar (either heavy or light) accurate fire produces a greater percent of suppressed responses than does inaccurate fire. The greater percentage of suppressed responses under light/accurate fire than under heavy/inaccurate fire would seem to indicate that accuracy can compensate for volume. This interpretation conforms to anecdotes which indicate that a single sniper is capable of pinning down (suppressing) an entire unit.

The respondents were also asked to state their second reaction to enemy fire, i.e., that response which they made immediately after their initial reaction. Their responses are shown below ordered in decreasing percentage of response.

Second Reaction to Enemy Fire	Offense (N = 79)	Defense (N = 37)
Returned fire	53%	62.0%
Maneuvered for position	20%	16.0%
Advanced*	9%	5.5%
Withdrew	9%	5.5%
Stayed down (never fired)	6%	5.5%
Called for support	3%	5.5%

*For defensive engagements this reaction was to counterattack.

The predominant second response for both types of engagements was to return the fire. The second most common response was to maneuver for position. Although most respondents reported that they took protective action as their first reaction to enemy fire, only a relatively small number reported that they either withdrew from the engagement or were suppressed to the degree that they did not return any fire as their second reaction.

The limited responses of advancing or counterattacking are largely due to the heavy reliance typically placed on indirect supporting fire in Southeast Asia. The fact that in this sample only a few individuals reported calling for support is mainly due to both the sample composition and the nature of the question. Calling for support is a leadership prerogative, and the call is passed via the RTO. Our sample included only a small percentage of officers, senior NCOs, and RTOs. Consequently, we would anticipate a low percentage of responses of the "called for support" variety. Further, the question stressed that the exact second reaction be reported. Before calling for support, the nature and composition of the enemy threat must be determined and generally is engaged with organic fire. Also, the precise location of friendly and enemy elements must be determined before calling in supporting fire.

3.4.1.5 General Impressions Regarding Suppression. A number of questions were presented to the interviewees in an attempt to elicit their general attitudes regarding the phenomenon of suppression and were not to be answered in the context of the specific engagement which the individual described. These questions elicited four categories of response.

The first category concerned the nature of the stimulus which first tells an individual that he personally is under fire.

A specific attempt was made to insure that the respondent differentiated between fire directed at his unit in general and fire directed at himself. Three stimulus situations account for 98 percent of the responses. These stimuli are presented below.

First Cue That Fire is Directed at the Individual (N = 75)

Sound of projectiles	43%
Impact signature	34%
Sound of weapon firing	21%
Others	2%

The most frequently reported stimulus is the sound of projectiles, followed by the visual aspects of rounds impacting. In both cases, the underlying dimension on which the sense of personally being under fire is based is the proximity of the sounds to the individual. The auditory aspects of the projectile signature are more frequently reported primarily due to the fact that concealment, illumination conditions, and accuracy of rounds reduce the opportunity for the individual soldier to respond to the impact cue. The auditory aspects of incoming projectile signatures are quite distinct even in situations where the individual is firing his own weapon.

The 21 percent who responded that the first cue was the sound of the weapon firing probably failed to grasp the differentiation between being generally and personally under fire. Also, as pointed out by many respondents, when in hostile country, any weapon firing must be responded to as if it were directed toward you as an individual, regardless of the distance and direction of fire.

The second general category of questions attempted to elicit information regarding the characteristics of enemy fire which were most suppressive. These characteristics and the percent of the respondents describing the characteristics are given below.

Most Suppressive Characteristics of Enemy Fire (N = 83)	
High rate	48%
Accuracy	44%
Caliber	4%
Loudness	4%

As indicated in earlier portions of the interview analyses, a high rate of fire and accurate fire are considered the most suppressive aspects of enemy fire. The individuals responding with caliber are probably responding to a combined caliber and rate/volume of fire characteristics, since these individuals were using heavy caliber machineguns as their point of reference in answering these questions. The individuals reporting loudness are also probably referring to another underlying dimension, namely, closeness of rounds or accuracy. Their point of reference was the loudness of passing rounds -- which is physically related to the closeness of those rounds to the individual.

A number of questions attempted to determine what enemy weapons the respondents developed the most respect for, and on what basis they made this judgment. The four most frequently selected weapons and the characteristics on which the choice was based are given in Table 3-1.

The actual selection of the most respected enemy weapon is no doubt highly influenced by the frequency of occurrence of the various weapons in the combat experience of this sample.

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TABLE 3-1 MOST RESPECTED ENEMY WEAPONS AND BASIS OF SELECTION

Most Respected Enemy Weapon	Percent Selecting Weapon (N = 51)	Basis of Weapon Selection				
		Casualty Producing	Fire-power	Accuracy	Caliber	Total
AK47	58%	17%	55%	14%	14%	100%
RPG	36%	50%	44%	6%	0	100%
.51-cal MG	4%	50%	0	50%	0	100%
.30-cal MG	2%	0	100%	0	0	100%

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Consequently, the AK47 is selected most frequently, with the RPG receiving the second highest percent selection. The machineguns, although generally considered as more dangerous weapons, are so infrequently seen, that in an open-ended question of respect for weapons they generally do not come to mind. Those few individuals reporting the machineguns also report specific incidents involving these weapons when discussing their choice.

The characteristics on which the respect is based reflect the usual mode of employment of the weapon. Fifty-five percent of those choosing the AK47 selected it on the basis of firepower, a volume/rate factor for rifles. It is reported by many of this sample that the AK47 is superior to our M16 solely on the basis of its 30-round magazine and its consequent ability to put out a greater volume of fire.

For the RPG, the most frequently selected characteristic was its casualty-producing capability. In the case of the RPG, firepower seems to be related to explosive capacity rather than to rate/volume as in rifles. Differentiation between the RPG and the M79 usually state that the RPG has more "power," and, as such, firepower is not clearly distinguishable from casualty production.

The fourth and last general category of questions involved direct discussion of potential changes in our own small arms weapons which would increase their suppressive capability. The most frequently discussed modifications were:

- Increase in magazine capacity for the M16.
- Increase in the caliber of the standard rifle.
- Increase in the noise made by weapons and their projectiles.
- Increase in the flash and bang of the M79 round.

In many of the interviews, potential modifications were suggested by the interviewer, and the respondent was asked to state his feeling about the suppressive effect of the suggested modification. From this approach, a number of less frequently considered modifications were assessed. Those which appear to have potential value are as follows:

- Develop a silent weapon/projectile system.
- Produce rounds with specific sound effects.
- Vary the color and number of tracer rounds in each magazine or belt.

It is interesting to note that a number of individuals felt that they would be more suppressed by seeing individuals around them wounded without hearing the rounds or weapon than by increases in weapon and projectile signatures.

Specific sound effects were discussed in the context of distinctive "cracks" for rifle and machinegun projectiles and special "screaming" effects for M79 rounds. The distinctive "thump" or "bloop" sound of the M79 is considered as an alerting signal to the fact that a round will be coming in. However, it was felt that a "screamer" on the round would increase the fear component associated with the incoming projectile.

While tracers in and of themselves were generally considered not to produce much suppression, it was felt by many respondents that changes in tracer color and brightness might have some effectiveness. They also suggested that an increase in the proportion of tracers in a basic load of ammunition might increase the suppressive effect.

3.4.2 Paired Comparison Scale

The paired comparison (PC) technique was employed to determine the differentially judged dangerousness of a set of eight U.S. and foreign weapons. Separate scales were derived for these weapons when employed against troops in foxholes (defense) and against assaulting troops (offense).

The outcome of the application of the PC technique are ordered lists of the perceived dangerousness of the weapons for each of the combat situations. The numerical values following each weapon are scale scores and may be interpreted as representing interval estimations of the perceived dangerousness, with higher scores indicating greater perceived dangerousness. The scale has a range of ascending dangerousness from 0 to 100. Weapons whose scale values are similar are considered equivalent in perceived dangerousness. Similarly, the greater the difference in scale values the greater the difference in perceived dangerousness. No ratio estimations may be made from this scale. The obtained scale values for the eight weapons are presented below.

- Form A: Defense (N = 86)

Weapon	Scale Value
.50-cal MG	100
Launched high-explosive grenade	66
M60, 7.62MM MG	66
ChiCom (RPD) .30-cal MG	46
High-explosive hand grenade	45
M16 rifle	10
AK47 assault rifle	5
M14 rifle	0

- Form B: Offense (N = 80)

Weapon	Scale Value
.50-cal MG	100
M60, 7.62MM MG	82
ChiCom (RPD) .30-cal MG	56
M16 rifle	37
Launched high-explosive grenade	35
AK47 assault rifle	29
M14 rifle	26
High-explosive hand grenade	0

As shown in the scales, the .50-caliber machinegun is considered the most dangerous weapon, regardless of whether it is employed against troops in foxholes or against an assaulting force. In general, the machineguns, as a class, are considered more dangerous than rifles. In view of the difference in characteristics between machineguns and rifles, these results may be interpreted to mean that those weapons which are capable of putting out the highest volume of fire over the longest period of time are considered the more dangerous.

The high rating (66) of the launched grenade when employed against defensive troops, as compared to its rating (35) against offensive troops, can be accounted for by its indirect fire capability, high trajectory, and burst radius. A foxhole provides little protection against an aimed, high-trajectory weapon. Near misses may also produce casualties through fragmentation. This fragmentation may be equally effective against offensive troops, but the launched grenade is ineffective against any given individual in the assualt, because with forward movement the individual in all probability will no longer be occupying the position at which the grenade was launched. Hence, in perceiving the dangerousness of the weapon, the man who assumes that he is in a static position

(foxhole) will consider this class of weapon more dangerous than a man who assumes he will be moving on assault. In a similar manner, the man in a foxhole may be more vulnerable to a hand grenade than an individual who is moving. The higher rank in both scales for launched grenades as compared to hand grenades may indicate that the individual respondent is aware of his ability to counter a potential hand-grenade threat through small arms fire.

It should be pointed out that any attempt to equate differences in perceived dangerousness to actual differences in weapons is open to question. Where there is a clear-cut caliber difference, such as the .50-caliber machinegun versus the 7.62MM or .30-caliber machinegun, the scale differences are potentially reflecting the true weapon difference. However, the magnitude of difference in perceived dangerousness between the 7.62MM and .30-caliber machineguns is out of proportion to the true differences in weapon capability. Bias in favor of selecting our own weapons in a forced choice situation where there is no real difference in weapon capability may account for the higher scale values of the M60 and M16 as compared to their ChiCom counterparts.

3.4.3 Multidimensional Scale

The analysis of the multidimensional scale trial run data showed such wide variability among individual scaling attempts that no stable dimensionality could be established. This result was interpreted as reflecting an inability of the average respondent to make the scaling judgments according to the described method. In view of this result, it was decided that no further effort would be expended in attempting to assess weapons dimensions through this technique.

3.4.4 CONUS Questionnaire

The CONUS questionnaire consisted of 24 questions relating to suppression. It was produced in two forms, differing only in the order in which the questions were presented. The questions are presented below, numbered as in Form A but in an order which limits itself to ease of presentation. (A copy of Form A is included in Annex B of this report.) Where essential to interpretation, the responses are broken out by such subgroups as Army, Marine, combat veteran, or trainee. For the Marine sample, the trainees were all enlisted men undergoing individual combat training at Camp Pendleton. The Army trainee sample was made up of Officer Candidate School trainees, none of whom had prior combat experience.

Question 1 asked respondents to rank the dangerousness of 10 weapons, assuming that the weapons were employed against them individually while they occupied an open foxhole. The question and the mean ranks* for the weapons are presented below for the combat veteran and trainee groups.

1. Assume that you are in an open foxhole and each of the weapons listed below is employed against you, one at a time. Further assume that each weapon is employed from the distance in which it usually would be employed in combat. You are to rank each of these weapons in terms of how dangerous you feel it would be to you if <u>you</u> were in the open foxhole. Write the most dangerous weapon on line 1, the next most dangerous on line 2, and so on until you have ranked all ten (10) weapons. Please place only one (1) weapon on each line. Rank <u>all</u> weapons.

*Rated dangerousness decreases with increasing numerical value.

WEAPONS	MEAN RANKS	
	Combat Veterans (N = 282)	Trainees (N = 93)
1. M16 rifle	6.95	7.51
2. High-explosive hand grenade	4.13	3.52
3. .50-cal MG	3.56	4.40
4. AK47 rifle	7.38	7.20
5. M79 launched grenade	3.65	2.40
6. M60 MG	4.45	4.59
7. M14 rifle	7.12	7.56
8. ChiCom .30-cal MG	5.41	5.67
9. RPG type grenade	3.33	3.77
10. SKS/CKC semiautomatic rifle	8.70	8.39

The trainees gave the lowest mean ranks to the three grenade weapons, indicating that they considered them the most dangerous class of weapons when occupying an open foxhole. Next in order are the machineguns, with the .50-caliber ranked as more dangerous than the M60, and the ChiCom machinegun the least dangerous of the machineguns. The rifles were considered least dangerous, and were ordered AK47, M16, M14, and finally the SKS/CKC semiautomatic rifle.

The pattern of rankings was similar for the combat veterans. Generally speaking, they also considered the grenades to be most dangerous, machineguns next, and, finally, rifles. The actual order shows the RPG ranked as the most dangerous, followed closely by the .50-caliber machinegun. The rest of the grenades and machineguns follow in the same order as given by the trainees. Both the M16 and M14 were considered superior to the AK47 by the combat veterans, with the SKS/CKC again ranked the least dangerous.

The rank difference correlation between the two sets of rankings was +0.87, showing considerable agreement among trainee and combat veteran judgments of weapon dangerousness.

Question 17 again asked the respondents to rank the dangerousness of the 10 weapons, this time assuming that the weapons were employed against them while assaulting the enemy over open ground. The mean rank of dangerousness for each weapon assigned by the two groups of subjects to the assault situation is presented with the question below.

17. Assume that you are assaulting the enemy over open ground and each of the weapons listed below is employed against you, one at a time. Further assume that each weapon is employed against you from the distance at which it usually would be employed in combat. You are to rank each of these weapons in terms of how dangerous you feel it would be to you if you were assaulting the enemy over open ground. Write the most dangerous weapon on line 1, the next most dangerous on line 2, and so on until you have ranked all ten (10) weapons. Please place only one (1) weapon on each line. Rank all weapons.

	WEAPONS	MEAN RANKS	
		Combat Veterans (N = 292)	Trainees (N = 92)
1.	M16 rifle	5.85	6.54
2.	High-explosive hand grenade	7.33	6.41
3.	.50-cal MG	2.32	2.70
4.	AK47 rifle	6.46	6.58
5.	M79 launched grenade	6.02	4.64
6.	M60 MG	3.17	3.10
7.	M14 rifle	6.88	7.26
8.	ChiCom .30-cal MG	3.94	3.98
9.	RPG type grenade	5.40	5.74
10.	SKS/CKC semiautomatic rifle	8.04	8.03

For both groups groups of respondents, the most dangerous class of weapons was the machinegun, and ordered by both groups as .50-caliber, M60, and ChiCom .30-caliber. The trainees ranked the grenades next, in the order M79, RPG, and hand grenade; and then the rifles, in the order M16, AK47, M14, and SKS/CKC. The order of the weapons within classes was the same for combat veterans with one exception (the RPG was judged more dangerous than the M79). However, the overall order for the combat veterans placed the hand grenade next to last as a danger to assaulting troops. The rank order correlation for the two groups was +0.88 showing considerable agreement between trainees and combat veterans on their perception of the dangerousness of weapons to assaulting troops.

Questions 2 and 7 asked the respondents to indicate the signature feature which would give them the first indication that they are being fired on.

2. During daylight conditions, what is the first thing (signal) that would tell you that the enemy is firing at you, personally? (check only one)

   A. _____ The sound of enemy weapons firing

   B. _____ The sound of rounds going by you in the air

   C. _____ The sound of rounds hitting things around you

   D. _____ Seeing rounds impacting near you

   E. _____ Seeing muzzle flashes and smoke from enemy weapons

The percentage response to each signature category is presented below for combat veteran and trainee respondents.

Q2	Combat Veterans (N = 293)	Trainees (N = 96)
A	43%	33%
B	26%	13%
C	16%	24%
D	14%	24%
E	1%	6%

In both groups the largest single factor was "the sound of enemy weapons firing" (A). However, if categories C and D are combined into a single "impact" signature category, we find that 48 percent of the trainees and only 30 percent of the combat veterans used impact as the first signal that the enemy is firing at them personally. The differences may be accounted for by the interpretation placed on the question by the combat troops, namely, that the sound of enemy weapons firing (A) was sufficient evidence to a large number of combat veterans that they were under fire personally, and that is was not necessary for the rounds to impact near them to prove the point. The trainees, lacking combat experience and perhaps more precise in their interpretation of the question, equated nearness of the rounds to being fired at personally.

The combat naivete of the trainees may also account for the difference in the proportions of combat veteran and trainee groups who selected response B, "the sound of rounds going by." Presumably, in contrast to combat veterans, trainees will have had little if any experience with the sound of rounds passing nearby, and will therefore attribute less importance to this cue than will combat veterans. It is possible, also, that the trainees may not realize, to the extent that combat veterans do, that the sound of a supersonic round passing nearby may appreciably precede the muzzle sound of that same round being fired.

7. During night conditions, what is the first thing (signal) that tells you that you, personally, are being fired on? (check only one)

		Combat Veterans (N = 293)	Trainees (N = 96)
A.	_____ The sound of enemy weapons firing	27%	21%
B.	_____ The sound of rounds going by	17%	7%
C.	_____ The sound of rounds hitting things around you	15%	18%
D.	_____ Seeing muzzle flashes of enemy weapons	26%	36%
E.	_____ Seeing incoming tracer rounds	15%	18%

As in question 2, there are discrepancies in the pattern of responses given by combat veterans and trainees. The proportion of trainees (36 percent) who stated that the muzzle flash of an enemy weapon (D) would be their first indication of being fired on is greater than that for any other response by either group. The veterans showed an approximately equal preference for A, hearing the weapons firing (27 percent), and for D, seeing the muzzle flash (26 percent). The low percentages for the auditory aspects of the rounds (B and C) and tracers (E) may be due to a strict interpretation of the requirement to indicate the first signal. Because the weapon firing and its attendant flash precede the other signatures in time of occurrence, they may have been responded to with a greater frequency. As in the responses to question 2, the experience factor may be evident in the difference between combat troops and trainees in the choice of B, the sound of rounds going by. The proportion of combat veterans choosing this item was between two and three times that of the trainees.

Questions 3, 4, and 5 attempted to determine the respondents' familiarity with enemy weapons. The questions and the percent response to each weapon are presented below for the combat veterans and trainees.

3. In your conversations about the war in Vietnam, which of the following enemy small arms weapons was referred to most often? (check only one)

		Combat Veterans (N = 293)	Trainees (N = 87)
A.	_____ ChiCom hand grenade	1%	3%
B.	_____ AK47	76%	69%
C.	_____ RPD .30-cal MG	1%	3%
D.	_____ ChiCom .51-cal MG	1%	5%
E.	_____ SKS/CKC semiautomatic rifle	1%	3%
F.	_____ RPG	18%	15%
G.	_____ Other small arms (name) ____	2%	1%

The pattern of responses was the same for both groups of respondents. The AK47 was the most talked about weapon (76% and 69%) with the RPG running a low second (18% and 15%). Responses in the "other" category (G) were few, but included the AK50, B40, and M16.

4. From your conversations involving enemy small arms weapons used in Vietnam, which one of the following enemy weapons was considered the most dangerous? (check only one)

			Combat Veterans (N = 293)	Trainees (N = 97)
A.	_____	ChiCom hand grenade	2%	3%
B.	_____	AK47	20%	32%
C.	_____	RPD .30-cal MG	5%	6%
D.	_____	ChiCom .51-cal MG	21%	22%
E.	_____	SKS/CKC semiautomatic rifle	2%	2%
F.	_____	RPG	48%	28%
G.	_____	Other small arms (name) ____	2%	7%

The data presented above represent the opinions of the respondents based on their conversations with others and may not represent the individual's own opinion as the most dangerous of the weapons. The only striking differences between the two groups of respondents were the proportions checking RPG and AK47. These weapons were the two most frequently mentioned in conversation (see question 3), but the proportion of combat veterans indicating that the RPG was considered the most dangerous weapon far exceed the proportion of trainees indicating the RPG. With respect to the AK47, the direction of proportions was reversed -- the trainees selecting the AK47 in much higher proportion than the combat veterans. This pattern of responses may be accounted for by the fact that, although the frequency of occurrence of these weapons in the conversations of the two groups was essentially equal, the combat veterans' conversational appraisal of the dangerousness of the two weapons was more realistic due to their first-hand experiences with the weapons.

Question 5 asked how the individual <u>first</u> learned of the dangerousness of the weapon he chose in question 4. The response percentages are presented below for each category for combat veterans and trainees.

5. Under which one of the following circumstances did you first hear or learn of the dangerousness of the enemy small arms weapon you check in question 4? (check only one)

			Combat Veterans (N = 294)	Trainees (N = 90)
A.	_____	During formal training (for example, in a lecture, during a weapons demonstration, or in printed literature)	7%	33%
B.	_____	Informal discussion with instructors	1%	11%
C.	_____	Conversations with Vietnam returnees	5%	38%
D.	_____	Discussions with other men in your unit during stateside training	1%	9%
E.	_____	Discussions with other men in your unit in Vietnam	18%	1%
F.	_____	Seeing for yourself what the weapon can do	68%	8%

The response pattern for the trainees was as anticipated, namely, that formal training (A) and conversation with returnees (C) account for 78 percent of the responses. The combat veterans, however, were probably ignoring the word "first," when 68 percent reported "seeing for yourself what the weapon can do" (F), and only 7 percent reported "formal training" (A).

Question 6 had two parts: A and B.

Question 6A asked both veterans and trainees to indicate the weapon characteristics which provide the basis for the reputation of the weapon they selected in question 4 as the most dangerous.

The distribution of characteristics selected for each weapon was essentially the same for the combat veterans and the trainees. Consequently, the data are broken out for each weapon by characteristics, and the percentages given below represent the percentages of the combined combat and trainee groups. The "R" represents the total number of responses given for each weapon.

6. For those who have had combat experience in Vietnam, answer both questions A and B below; those who have no combat experience in Vietnam, answer question A only.

   A. Which characteristic or combination of characteristics listed below was the basis for the reputation of the small arms weapon selected in question 4? (check those that apply)

Characteristic	ChiCom HG (R=9)	AK47 (R=156)	RPD .30-cal MG (R=56)	ChiCom .51-cal MG (R=157)	SKS/ CKC Rifle (R=30)	RPG (R=292)
Accuracy	11%	22%	18%	17%	17%	17%
Rate of fire	0	19%	20%	17%	13%	2%
Reliability	11%	14%	18%	6%	20%	8%
Volume of fire	0	15%	18%	16%	17%	3%
Killing power	22%	21%	18%	36%	23%	37%
Casualty area	56%	8%	9%	8%	10%	33%

The pattern of responses for the ChiCom hand grenade and the RPG fit with the characteristics of the weapon, namely, that killing power and casualty area are the characteristics which account for better than 70 percent of the response for both weapons. For the machineguns, over 30 percent of the responses are made to the two categories which, when taken together, represent the concept of the machinegun, namely, volume and rate of fire.

The pattern of response for both the AK47 and SKS/CKC rifles demonstrates no single outstanding characteristic. It is interesting to note, however, that the eight individuals who considered the SKS/CKC the most dangerous in question 4, gave 30 responses to the A portion of question 5, with 30 percent of these responses indicating that the volume and rate of fire of this weapon account for its reputed dangerousness. This result may be interpreted as a lack of true familiarity with the weapon and its semiautomatic operation on the part of those discussing the SKS/CKC.

Question 6B was to be answered by the combat veterans only, and asked them to evaluate the reputation of the weapons they chose in question 4 in light of their combat experience.

B. Which of the following statements best describes the reputation of the enemy small arms weapon you selected in question 4 now that you have been in combat?

1. _____ Although I never received any fire from this weapon, I believe its reputation is correct

2. _____ Although I never received any fire from this weapon, I believe its reputation is an overestimate of its effectiveness

3. _____ Although I never received any fire from this weapon, I now believe its reputation is an underestimate of its effectiveness

4. _____ I have had first-hand experience with this weapon and its reputation is correct

5. _____ I have had first-hand experience with this weapon and its reputation is an overestimate of its effectiveness

6. _____ I have had first-hand experience with this weapon and its reputation is an underestimate of its effectiveness

The responses are broken out for each weapon separately and presented below. The "R" represents the total number of responses given for each weapon.

Response	ChiCom HG (R=6)	AK47 (R=58)	RPD .30-cal MG (R=16)	ChiCom .51-cal MG (R=61)	SKS/ CKC Rifle (R=5)	RPG (R=139)
1	17%	10%	19%	26%	20%	14%
2	17%	0	6%	3%	0	1%
3	0	9%	0	10%	20%	3%
4	50%	61%	44%	49%	20%	58%
5	0	10%	12%	2%	0	4%
6	17%	10%	19%	10%	40%	20%

The response percentages* indicate that in all cases, with the exception of the SKS/CKC semiautomatic rifle, approximately 50 percent of the combat veterans felt that the weapon's reputation was borne out by their experience with the weapon in combat. The SKS/CKC was considered, by 40 percent of those choosing it as the most dangerous weapon, to be underrated in terms of its dangerousness.

It is of note that 59 of the 294 combat veterans responding to question 4 indicated in question 6B that they had never received fire from the weapon which they said was described in conversation as the most dangerous. This figure tends to support the previously stated interpretation that the combat veterans were not responding to the cue "first hear or learn of the dangerousness..." in selecting their answer to question 5.

*Percentages have been rounded to the nearest whole percentage and may not add to 100 percent.

Question 8 attempted to rank the effectiveness of four types of fire in producing the initiation of suppression in troops performing in an offensive sweep.

8. Assume that you are on an offensive mission sweeping through a series of rice paddies. Which of the following would most likely cause you to hit the ground or take cover? Place the number one (1) on the line by your first choice and then number the rest of the choices 2, 3, 4 so that the choice least likely to cause you to hit the ground or take cover is numbered four (4).

		Combat Veterans (N = 284)	Trainees (N = 91)
A.	_____ Grazing fire from an enemy heavy machinegun	1.81	1.72
B.	_____ Sniper fire from a hidden position	3.21	2.80
C.	_____ Automatic rifle fire from a wood line	2.64	2.68
D.	_____ An RPG impacting near you	2.34	2.79

The degree of agreement in the ranking of the effectiveness of each type of fire to suppress the individual is quite high. The rank difference correlation is +0.80. Both groups considered grazing fire from a machinegun as the mode of fire most likely to cause them to show suppressed behavior, i.e., hit the ground or take cover. The trainees, however, tended to consider sniper fire somewhat more suppressive than did the combat veterans. The veterans, however, tended to consider an RPG impact as potentially more suppressive than did the trainees.

Questions 9, 14, and 16 were included to assess whether there are perceived trends in the probability of suppressive behavior as a function of time into a combat tour. The percentage of responses in each time category are presented below for the combat and trainee groups.

9. In your opinion, at which time during a combat tour of duty is an individual most likely to take cover or other protective reactions to enemy small arms fire? (check only one)

		Combat Veterans (N = 293)	Trainees (N = 93)
A.	_____ During the first two months of the tour	23%	62%
B.	_____ During the middle of the tour	5%	7%
C.	_____ During the last two months of the tour	72%	31%

The completely reverse ordering of the alternatives for the two response groups points out the difference between expectations and actual performance. Combat veterans indicated here, as well as in interviews, that when first in the field new men generally have to learn when to take cover, and at times must be ordered to hit the dirt. The trainee, however, expects that early in his combat experience he will be quite anxious and anticipates readily taking cover when fired on.

The increase in percentage of response of taking suppressive action from the middle of the tour to the last two months was evident in both groups. The high percentage (72 percent) of combat veterans selecting this time period illustrates the current symptoms of the "short timer's attitude."

14. In your opinion, which one of the following individuals is the most likely to take cover or some other protective reaction to enemy small arms fire? (check only one)

		Combat Veterans (N = 312)	Trainees (N = 95)
A.	_____ One who has never experienced enemy fire	26%	51%
B.	_____ One who has been in combat less than two weeks	10%	21%
C.	_____ One who has been in combat six months	64%	28%

The responses to question 14 may be interpreted in a similar manner to that given for question 9. The trainees expect to be easily suppressed when first fired on, and become less anxious over time. The veterans' responses again reflected their knowledge that many individuals must learn when to hit the dirt, but become more wary as they approach the end of the combat tour.

16. In your opinion, which one of the following combat-experienced individuals is the most likely to take cover or some other protective reaction to enemy small arms fire? (check only one)

		Combat Veterans (N = 289)	Trainees (N = 89)
A.	_____ One who is just about to go on R&R	2%	4%
B.	_____ One who has just returned to combat after medical treatment for wounds suffered in combat	42%	56%
C.	_____ One who has one month to go in his combat tour	56%	40%

The response pattern shown by the two groups again reflects experience versus anticipation. Both groups recognized the potential aversion to exposure which would be shown by a recent casualty. However, the "short-timer" effect tended to override the casualty effect for the combat veterans.

Question 10 presented four different combat situations and required the respondent to indicate the action he would take in each situation. The choice of action was to be based on formal training, rather than on experience or individual initiative. Previous interviews with Army and Marine Corps personnel indicated that differences might be expected in the responses to this question for the two services. In view of this, the data are broken out into nine categories of respondents -- Overall, Army Combat, Marine Combat, Overall Combat, Army Trainee, Marine Trainee, Overall Trainee, Overall Army, Overall Marine -- with the percentage response of each group to each alternate presented in the tables. The results for each situation immediately follow the situation's presentation.

10. For each of the following situations (A, B, C, and D) check the statement which <u>best</u> describes the type of action (maneuver) you were <u>taught</u> to take during your training.

SITUATION A

You are a member of a platoon on a search and destroy mission. You are in the lead element walking in staggered column across an open rice paddy. The enemy opens fire on you with automatic rifles, a light machinegun, and RPGs from the tree line approximately 150 meters away on your left. (check only one)

A. _____ Turn toward direction of fire and immediately return fire

B. _____ Hit the ground and return fire

C. _____ Advance in direction of enemy fire while returning fire

D. _____ Take cover first, and then return the fire

E. _____ Take cover and await support fire

RESPONSE

Respondent		A	B	C	D	E
Overall	(N=388)	13%	47%	13%	22%	4%
Army Combat	(N=250)	12%	51%	9%	26%	3%
Marine Combat	(N=43)	25%	40%	23%	12%	0
Overall Combat	(N=293)	14%	49%	11%	24%	2%
Army Trainee	(N=46)	9%	46%	9%	22%	15%
Marine Trainee	(N=49)	14%	37%	33%	10%	6%
Overall Trainee	(N=95)	12%	41%	21%	16%	11%
Overall Army	(N=299)	11%	50%	9%	25%	10%
Overall Marine	(N=92)	20%	38%	29%	10%	3%

Responses B, D, and E, the suppression responses, accounted for approximately 74 percent of the overall responses, with A and C, the nonsuppressed responses accounting for the other

26 percent. Forty-nine percent of the Marines said that training dictated a nonsuppressed response (A or C), while only 20 percent of the Army sample indicated these alternatives.

SITUATION B

You are a member of a point squad which is moving along a jungle trail. You walk into the kill zone of a well-prepared enemy ambush. The enemy opens fire on you from a distance of 30 meters with automatic rifles and light machineguns. (check only one)

A. _____ Turn toward direction of fire and immediately return fire

B. _____ Hit the ground and return fire

C. _____ Advance in direction of enemy while returning fire

D. _____ Take cover and await support

E. _____ Break contact with the enemy

RESPONSE

Respondent		A	B	C	D	E
Overall	(N=388)	12%	29%	40%	4%	15%
Army Combat	(N=250)	14%	35%	29%	4%	18%
Marine Combat	(N=43)	16%	9%	70%	0	5%
Overall Combat	(N=293)	14%	31%	35%	4%	16%
Army Trainee	(N=46)	4%	30%	44%	7%	15%
Marine Trainee	(N=49)	10%	16%	64%	4%	6%
Overall Trainee	(N=95)	7%	23%	54%	5%	11%
Overall Army	(N=299)	12%	35%	31%	5%	18%
Overall Marine	(N=92)	13%	13%	67%	2%	5%

Forty percent of the overall sample said that they were trained to "advance in the direction of fire while returning fire" (C), with 12 percent choosing "turn toward direction of fire and immediately return fire" (A). These nonsuppressed responses account for 80 percent of the overall Marine responses but only 43 percent of the Army responses. It is apparent from these responses that, even in an ambush situation, more than 50 percent of the Army sample indicated that they were trained to take protective action rather than primarily aggressive reactions.

SITUATION C

You are a member of a rifle company whose mission is to assault a known enemy fortified position. The enemy is known to be well dug in with covered bunkers, spider holes, and tunnels. You are on line in the final phase of the assault. You are moving across several old dry rice paddies toward the enemy position which is situated straight ahead on the tree line. At approximately 300 meters from the enemy position, the enemy opens fire on you with mortars, heavy machineguns, RPGs, light machineguns, and automatic rifles. (check only one)

A. _____ Immediately return fire

B. _____ Hit the ground and return fire

C. _____ Advance in direction of enemy fire while returning fire

D. _____ Take cover and return fire

E. _____ Take cover and await supporting fire

RESPONSE

Respondent		A	B	C	D	E
Overall	(N=388)	3%	16%	21%	23%	36%
Army Combat	(N=250)	3%	15%	18%	26%	38%
Marine Combat	(N=43)	9%	16%	32%	18%	25%
Overall Combat	(N=293)	4%	15%	20%	25%	36%
Army Trainee	(N=46)	0	24%	15%	20%	41%
Marine Trainee	(N=49)	4%	14%	31%	14%	37%
Overall Trainee	(N=95)	2%	19%	23%	17%	39%
Overall Army	(N=299)	3%	17%	17%	25%	16%
Overall Marine	(N=92)	6%	15%	32%	16%	31%

The answer showing the greatest percent response in the aggregate was "take cover and await supporting fire" (E). This response was given by 38 percent of the overall Army sample and 31 percent of the overall Marines. However, 32 percent of the overall Marines, as opposed to 17 percent of the overall Army sample, indicated that in such a situation as described, they were trained to advance (C). Again, the nonsuppressed responses A and C showed 20-percent choice by the overall Army sample and 38 percent by the overall Marine sample. The low percentage for the alternative "immediately return fire" (A) is probably due to the inability of rifles and M79s to be effective, at 300 meters, against an enemy which has good cover.

SITUATION D

You are a member of a rifle platoon moving along a trail through a heavily wooded area. By chance you encounter an enemy patrol coming toward you on the same trail. The enemy opens fire on you first with automatic rifle fire. (check only one)

A. _____ Immediately return fire

B. _____ Hit the ground and return fire

C. _____ Advance in direction of enemy while returning fire

D. _____ Take cover and return fire

E. _____ Take cover and await supporting fire

RESPONSE

Respondent		A	B	C	D	E
Overall	(N=388)	28%	36%	12%	22%	2%
Army Combat	(N=250)	29%	43%	7%	20%	1%
Marine Combat	(N=43)	58%	19%	14%	9%	0
Overall Combat	(N=293)	33%	40%	8%	18%	1%
Army Trainee	(N=46)	11%	24%	9%	52%	4%
Marine Trainee	(N=49)	16%	22%	39%	18%	4%
Overall Trainee	(N=95)	14%	23%	24%	35%	4%
Overall Army	(N=299)	26%	41%	7%	25%	1%
Overall Marine	(N=92)	36%	21%	27%	14%	2%

Situation D presented a chance encounter with the enemy in proximity. The enemy opens fire first with automatic rifles. Sixty percent of the overall sample indicated that suppressive responses (B, D, and E) are doctrine in this situation. However, 63 percent of the Marine sample indicated that they

were trained in immediate action drills of an aggressive nature (A and C), while only 33 percent of the Army sample responded in this manner. It is interesting to note that a considerable difference appears between Army combat veterans and Army trainees in the choice of the response "take cover and return fire" (D). Twenty percent of the combat veterans and 52 percent of the trainees chose this response, a response which in the opinion of the DSL analysts is inappropriate to the situation. It might be noted that response D was selected by only 9 percent of the Marine combat veterans and 18 percent of the Marine trainees.

Question 11 asked for a comparison of the M79 and RPG on six tactical attributes.

11. Look at the series of statements listed below. Based on your experience with the M79 and RPG in Vietnam or based on what you have heard about these weapons, circle the weapon to which the statement best applies.

A.	The	M79	RPG	is the more accurate weapon
B.	The	M79	RPG	has the greater range
C.	The	M79	RPG	takes less time to reload
D.	The	M79	RPG	makes more noise when it is fired
E.	The	M79	RPG	makes more noise when it explodes
F.	The	M79	RPG	is the more versatile weapon

The pattern of responses was essentially the same for the combat veterans and trainees. The percentage of overall responses for each attribute is presented below.

Response (N = 322)	M79	RPG
A	72%	28%
B	50%	50%
C	93%	7%	
D	17%	83%
E	20%	80%
F	80%	20%

The M79 was considered the superior weapon by more than 70 percent of the sample, with respect to the attributes of accuracy and versatility. It was said to be reloaded faster than the RPG by 93 percent of the sample. However, the M79 was considered to be equivalent in range to the RPG. In both noise factors (firing and exploding) the RPG was rated louder than the M79 by 80 percent or more of the sample.

Question 12 asked the respondents to indicate the basis for their judgement in question 11.

12. Which of the following was most important in making the preceding judgments about the M79 and RPG in question 11? (check only one)

		Combat Veterans (N = 277)	Trainees (N = 89)
A.	_____ Judgments based on what I have heard about the weapons	17%	82%
B.	_____ Judgments based on my experience with the weapons	83%	18%

As anticipated, the responses of the combat veterans were based primarily on experience with the weapons, while the trainees predominantly reported that they based their judgments on hearsay.

Question 13 asked the respondents to select which of a number of combinations of sniper fire could be most effect in pinning an individual down in his foxhole.

The pattern of responses was the same for each of the four respondent groups. Consequently, the percent choice of each alternative is presented below for the entire sample.

13. Assume that you are in your foxhole in a defensive perimeter. Which one of the following circumstances would be the most effective in pinning you down? (check only one)

		Response
A.	____ A single sniper fires at you from an unknown position	24% (N = 93)
B.	____ A single sniper fires at you from a nearby clump of trees	1% (N = 5)
C.	____ A sniper fires at you along with automatic rifle fire	1% (N = 6)
D.	____ A sniper fires at you along with automatic rifle and machinegun fire	9% (N = 34)
E.	____ A sniper fires at you along with automatic rifle, machinegun, and RPG fire	65% (N = 251)
		100% (N = 389)

Responses A and B represent the firing of a single sniper weapon, while C, D, and E represent increasing amounts of fire accompanying the sniper. As expected, the greatest amount of fire (E) received the greatest percentage of response, 65 percent. However, sniper fire from an unknown position (A) was considered by 24 percent of the sample as being most effective in pinning a man down in his foxhole. Hence, it would appear that being unable to determine the

position from which fire is being initiated is even more suppressive for many individuals than is a somewhat higher volume of fire (C and D). This conclusion is supported by the fact that only 1 percent of the sample considered a sniper firing from a known position (B) as the most effective suppressive fire.

Question 15 asked the respondents to rank order the effectiveness of five combinations of sniper fire in pinning down an individual.

The pattern of responses and the numerical values of the average ranks for each alternative were equivalent for the four sampled subgroups. Consequently, the mean rank for each alternative for the entire group is presented below.

15. Assume that you are advancing toward your objective but are not under enemy fire. Rank order the following circumstances regarding their effectiveness in pinning you down. Place the number one (1) on the line beside the circumstance that would be most effective in pinning you down. Then number the rest of the choices 2, 3, 4, 5 so that the circumstances which would be least likely to pin you down would be numbered five (5).

		Response (N = 356)	Mean Rank
A.	____	A single sniper fires at you from an unknown position	3.08
B.	____	A single sniper fires at you from a nearby clump of trees	4.31
C.	____	A sniper fires at you along with automatic rifle fire	3.36
D.	____	A sniper fires at you along with automatic rifle and machinegun fire	2.51
E.	____	A sniper fires at you along with automatic rifle, machinegun, and RPG fire	1.73

With the exception of response A, and as anticipated, the mean rank decreased with increasing amounts of fire, which indicates increased suppression with increased fire (B through E). As in question 13, sniper fire from an unknown position is considered more effective than would be predicted on the basis of the firing of a single weapon alone. The difference in mean ranks between a sniper hidden (A) And a sniper in a known position (B) is significant at less than the .01 level. The differences in the mean ranks between all possible pairs of alternatives are also significant. That is, each alternative is significantly more suppressive than each of those whose numerical mean rank is higher.

Question 23 asked the respondents to rank four alternatives in order of their ability to keep an individual pinned down once he has taken cover; 349 individuals responded to this question.

The mean ranks of the four modes of fire are presented below for the entire sample. The "Other" category has not been ranked since the variety of answers given makes interpretation of this category meaningless.

23. Assume that you are on an offensive mission with the objective of taking a village. Enemy small arms have just caused you to take cover. Which of the following is most likely to keep you down and prevent your further movement in the assault? Place the number one (1) on the line by your first choice and then number the rest of the choices 2, 3, 4 so that the choice least likely to keep you down and prevent your continuing the attack is numbered four (4).

			Mean Rank
A.	____	Accurate sniper fire from a hidden position	2.87
B.	____	Grazing fire from an enemy .30-cal MG	2.16
C.	____	Heavy volume of RPG rounds coming into the area of your position	2.52
D.	____	Heavy volume of automatic rifle fire	2.65
E.	____	Other (describe) ____	--

The numerical closeness of the mean ranks for each alternative indicates that each of the modes of fire was considered nearly equal in its ability to keep a man pinned down. The order of the alternatives, despite the small differences, is as expected. Grazing fire from a machinegun was considered most effective. It was followed by RPG (C) and heavy volume of automatic rifle fire (D), with sniper fire (A) being last. A statistical analysis performed on the means indicates that the means do differ significantly. The t-tests performed on the pairs of means show all paired comparisons to be significant at less than the .01 level of confidence.

Question 19 asked the combat veterans to indicate what their primary small arms weapon was. The response pattern was essentially the same for the Marine and Army samples, and a single set of data will be presented.

For those who have had combat experience in Vietnam answer questions 19, 20, 21, and 22; those who have had no combat experience in Vietnam go on to question 23.

19. What was your primary small arms weapon? (check only one)

			Percent (N = 280)
A.	_____	Pistol, .45-cal	5%
B.	_____	M16 rifle	63%
C.	_____	M60 MG	15%
D.	_____	M79	4%
E.	_____	Other (name) ____	13%

The most commonly carried weapon was the M16, as would be expected. Among the answers given in the "Other" category (E) were the M14 rifle and shotgun.

Questions 20, 21, and 22 asked the respondents to indicate, respectively, the greatest, the average, and the closest range at which the individual fired the weapon he checked in question 19 at an enemy soldier.

20. What was the greatest range at which you engaged the enemy with this weapon? (write in answer in meters)

_____ meters

21. During your tour in Vietnam what was the average range at which you engaged the enemy with this weapon? (write in answer in meters)

_____ meters

22. What was the closest range at which you fired this weapon at an enemy soldier? (write in answer in meters)

_____ meters

The results are presented below for the Army and Marine combat samples separately. The data are reported as the median value for each category, rounded to the nearest whole meter, combining all weapons together.

Engagement Ranges	Army (N=228)	Marine (N=41)
20	149 m	263 m
21	60 m	87 m
22	20 m	9 m

The data derived for questions 20, 21, and 22 is biased by the disparity in the size of the Marine and Army samples. Hence, any comments on the disparity in the data between the services would be meaningless. However, it is safe to say that when combined, 50 percent of the maximum-range engagements were reported to take place at less than 160 meters, 26 percent between 160 and 300 meters, 10 percent between 300 and 400 meters, and 14 percent over 400 meters. This data has some applicability to the range/accuracy question for new infantry rifle concepts.

Question 18 required the respondents to rank a set of alternatives in terms of the likelihood that each would cause him to resume an attack after leaving to take cover in response to enemy small arms fire.

18. Assume that you are on an offensive mission with the objective of taking a village. Enemy small arms fire has just caused you to take cover. Which of the following is <u>most</u> likely to cause you to get up and resume your attack? Place the number one (1) on the line by your first choice and then number the rest of the choices 2, 3, 4 so that the choice <u>least</u> likely to cause you to continue the attack is numbered four (4).

A. _____ Your squad leader orders you to resume the attack

B. _____ There is a reduction in the volume of enemy fire

C. _____ You decide to get up and resume attack on your own

D. _____ There is an increase in the volume of your unit's fire

The mean ranks for each alternative are presented for the overall sample and broken down for the four sample subgroups.

Alternative	Overall (N=368)	Army Combat Veteran (N=237)	Army Trainee (N=44)	Marine Combat Veteran (N=41)	Marine Trainee (N=46)
A	2.24	2.40	2.14	2.12	1.67
B	1.83	1.75	1.68	2.05	2.22
C	3.52	3.53	3.52	3.54	3.48
D	2.40	2.33	2.66	2.29	2.63

On the composite, "there is a reduction in the volume of enemy fire" (B) received the lowest mean rank, and is therefore considered the most likely reason for resuming the attack. This result was concurred with by both combat veteran samples and the Army trainees. However, the Marine trainees ranked "your squad leader orders you to resume the attack" (A) as the most likely alternative. In all groups, personal initiative (C) was ranked as least likely to cause an individual to resume the attack.

Question 24 dealt with leadership qualities in relationship to motivating troops to mount an assault after being pinned down. The response pattern was essentially the same across the four responding groups. Consequently, the mean rank for each alternative, based on the responses of all 365 respondents, is presented below.

24. Assume that you have been pinned down by enemy small arms fire. Your platoon leader has just ordered you to get up, get on-line, and assault the enemy. From the list of leadership qualities or traits given below, which one trait is most important to you in determining your willingness to follow this order. Rank this choice number one (1). Rank the remaining traits in order of their importance to you, with that trait which is least important in determining your willingness to follow the leader's order as number ten (10).

			Mean Rank*
1.	___	He feels responsible for his men in combat	4.60
2.	___	He has a working knowledge of all the weapons used by his men	6.52
3.	___	He has a good knowledge of military tactics	4.41
4.	___	He has a great deal of combat experience	3.56
5.	___	He is considered as one of the group by his men	7.05
6.	___	He displays a high degree of self-confidence	5.70
7.	___	He considers his mens' comforts and interests	6.64
8.	___	He requires strict compliance with his orders	7.47
9.	___	He is considered as courageous and as a "cool" head in combat	5.48
10.	___	He is able to make rapid decisions in combat situations	3.55

*Importance of leader's attributes decrease with increasing numerical value

Responses 4 and 10 were considered to be the most important factors in determining the willingness of the solider to follow the leader's orders in this situation. These responses relate to amount of combat experience and ability to make rapid decisions in combat. Of least importance to the solider was alternative 8 which describes the leader as requiring strict compliance with orders.

The expected mean value for a set of 10 ranks is 5.50. Therefore, any attribute scoring below 5.50 can be considered as being relatively important. As indicated, responses 4 and 10 were low ranked. Of the remaining three attributes ranked lower than 5.50, number 3 (4.41), again reflects military experience, while numbers 1 and 9 (4.60 and 5.48, respectively) reflect on the personality of the leader.

It may be concluded that when in a suppressed situation and ordered to advance, soldiers will most likely follow experienced leaders who are calm under fire but are known to have a sense of responsibility for the men. Both the autocratic and the "one of the boys" type leaders are less likely to be followed in a situation in which the soldier's life is in immediate peril.

4.0 VIETNAM DATA COLLECTION

The Vietnam data collection program was carried out in the Republic of Vietnam (RVN) by two members of the DSL staff during the period 5 April through 21 May 1971. The program included the administration of English-language questionnaires to United States and Australian forces, and Vietnamese-language questionnaires to Vietcong (VC) and North Vietnam Hoi Chanh and POW complements. Individual interviews were conducted with a number of U. S. Army personnel and a group interview was held through an interpreter with a number of Hoi Chanh.

4.1 RATIONALE

The Vietnam data collection program was conceived as a method of obtaining first-hand information on the suppressive effects of both U.S. and foreign small arms. The data on the suppressive effects of foreign weapons was to be collected via interview and questionnaire from U.S. Army and Australian personnel in the field. In order to provide equivalent data on the effects of our own weapons, it was proposed that VC and NVA prisoners and Hoi Chanh be questioned. In addition to the weapons effects, it was felt that the information to be derived from the Australian and Vietnamese sources might provide indications of potential cultural differences in responsiveness to small arms fire.

4.2 RVN QUESTIONNAIRE - ENGLISH VERSION

The English version of the RVN Questionnaire was produced in three alternate forms; Forms 1VN, 2VN, and 3VN. Each of these forms consisted of 26 questions of the ranking and multiple-choice variety, plus a twenty-seventh question soliciting

free comments. The three forms differed only in the order in which the questions were presented. For analysis purposes, all answers were transposed to fit the order of Form 3VN, a copy of which is included in Annex B of this report.

4.3 RVN QUESTIONNAIRE - VIETNAMESE VERSION

The Vietnamese version of the RVN Questionnaire was produced in a single form, typed in modern Vietnamese. The basic form of the questionnaire is similar to the English version; however, several questions requiring comparisons between weapons across a number of characteristics have been broken out as separate questions for each weapon. Also, those questions which reflect a mode of thought alien to the Vietnamese culture were rewritten by a bilingual Vietnamese so that they would elicit information similar to that anticipated in the English version. A copy of the Vietnamese version of the questionnaire is included in Annex B of this report.

4.4 RVN INTERVIEWS

Individual interviews were held with U. S. Army personnel, and recorded for later analysis. The general form of the interviews were the same for each respondent, but no structured interview of the type employed in CONUS (see Section 3.2.1) was employed.

A group interview was conducted through an interpreter with 26 Hoi Chanh, who were unable to read. Because of the size of the group and difficulties in translation, this interview produced no reliable information and no further analysis of it has been made.

4.5 RVN DATA COLLECTION SAMPLES

The English-language version of the questionnaire was handed out through military channels to 502 U. S. Army and 55 Australian Army personnel. The number of U. S. Army questionnaires suitable for analysis was 402, and the number of usable Australian Army questionnaires was 46.

The Vietnamese-language version of the questionnaire was administered to two different groups of enemy troops. The first group of individuals were in a program of repatriation training to enable them to join the regular South Vietnam Army. This program is called Hoi Chanh, and the repatriated troops are referred to as "Ralliers." There were 93 individuals in the first group, half of whom were formerly Vietcong (VC) and half of whom were formally North Vietnam Army (NVA) troops. Of the 93 questionnaires administered to the first group, 92 were returned.

The second group were prisoners of war. Seventy percent of this second group were captured NVA troops, and the remainder were captured VC. There were 300 individuals in the second group. Of the 300 questionnaires administered to the second group, 298 were returned.

Interviews with U. S. Army personnel numbered 72. As previously stated, a group interview was held with 26 Hoi Chanh.

4.6 QUESTIONNAIRE RESULTS

The results obtained directly from the questionnaire responses are presented for each of the four samples. All questions are presented in their entirety for the U. S. Army sample, with the breakout of responses following each question. A brief

discussion of the responses to the questionnaire by Australian Army troops is presented. An overview of the Hoi Chanh and POW responses is presented next, highlighting the differences in the answers between these two groups. Finally, where the data permitted, relationships between various questions and answers are presented for the U. S. Army sample.

4.6.1 Responses from the U. S. Army Questionnaire

The first question presented was one of several designed to determine the nature and composition of individuals providing data for this study. The question was intended to indicate the size of the combat element most often referred to by the respondents to this questionnaire. This question was responded to by 392 persons.

The question and the percentages of persons responding to each alternative is presented below.

1. What was the size of the unit in the field, in your immediate vicinity, during <u>this</u> engagement? (check only <u>one</u>)

- Squad	32%	- Company	18%	- Brigade	1%
- Platoon	47%	- Battalion	2%	- Division	0

It is evident from these results that the respondents to this questionnaire were reporting platoon and squad engagements for the most part.

Question 2 was also intended to define the nature and composition of the sample of subjects responding to the questionnaire. There were 398 respondents to this question.

2. Your position within your unit. (check only one)

- Platoon leader	7%	- Squad member	44%
- Squad leader	16%	- Other	30%
- Fire team leader	3%		

The data show that 44 percent of our sample were squad members. The category called "Other," which accounts for 30 percent of our sample, is comprised of a combination of machinegunners, ammunition carriers, grenadiers, and a few other special MOSs. These individuals would normally be considered as squad members, thus raising that total to approximately 74 percent. The leadership categories account for the other 26 percent of the sample.

Question 3 further defined the sample. There were 379 subjects responding to this question, as follows:

3. Your duty assignment during the most recent small arms combat you have experienced. (check only one)

- Rifleman	43%	- RTO	12%
- Grenadier	8%	- Medic	6%
- Machinegunner	9%	- Other	18%
- Ammo bearer	4%		

The 18 percent who responded to the category "Other" comprised individuals whose assignments did not correspond to the categories listed in the question. Among these were first sergeants, squad leaders, communications chiefs, and armorers.

Question 4 related directly to the suppression aspect of the study. The question was directed toward determining which aspect of small arms fire arouses the greatest emotional response. This question was responded to by 366 subjects.

4. When you're under hostile fire, which of the following things bugs you the most? (check only one)

	Response
The sound of passing bullets	34%
The sound of their weapons firing	16%
Seeing their muzzle blasts	3%
Seeing tracers coming at us	8%
Seeing bullets hit trees, dirt, etc.	10%
Seeing grenades come at us	15%
Other	14%

These data indicate that the auditory aspects of projectile and weapon signature were considered the most disturbing. Seeing incoming grenades was also a source of anxiety. Among the answers given in the "Other" category, two particularly frequent answers were "running out of ammunition" and "not being able to see anyone to shoot back at."

Question 5 was directed at discovering which enemy weapon or type of weapon is the most effective in producing suppression. There were 361 respondents to this question.

5. During your time in Vietnam, for what weapon did you develop the most healthy respect? (check only one)

- ChiCom grenade	5%	- SKS carbine	1%
- AK47	50%	- RPG	15%
- RPD MG	2%	- B40 rocket	6%
- ChiCom .51-cal MG	8%	- B41 rocket	1%
		- Other	12%

The responses indicated that the AK47 rifle is the weapon for which the individuals developed the greatest respect. The low percentage of responses for the .51-caliber machinegun is

probably accounted for by the lack of direct experience with this weapon. Among the answers in the "Other" category were "the M16 rifle," "booby traps," and the "M79 grenade launcher."

Question 6 was asked in an effort to further define the sample of people responding to the questionnaire. There were 394 respondents to this question.

The question and the percentages of persons responding to each alternative is presented below.

6. During what type of operation was your most recent small arms combat experience? (check only one)

	Response
- LRRP	1%
- Sweep	8%
- Reconnaissance patrol	16%
- Combat patrol	29%
- Blocking force	6%
- Defense in a prepared position	8%
- Attack of a prepared position	3%
- Ambush	21%
- Other	8%

Question 7 was also directed at defining the sample. This question was responded to by 400 subjects.

7. During what time of the day did this engagement occur? (check only one)

	Response
- Daylight hours	74%
- Hours of darkness	14%
- Both	12%

These data indicate that for this sample the reported combat engagements occurred predominantly during the daytime.

Question 8 was also descriptive in nature. There were 392 respondents to this question.

8. What was the weather like during most, or all, of this engagement? (check only one)

	Response
- Heavy rain	3%
- Light rain	8%
- Overcast	7%
- Fog/haze	3%
- Partly cloudy	11%
- Clear (day)	61%
- Clear moonlight (night)	7%

The answers to this question may have been influenced by the time of year when the questionnaire was administered: April and May. As it is, the majority of the actions reported took place during fair weather.

Question 9 was intended to describe the individual's feeling with regard to the combat action under discussion. There were 382 respondents to this question.

9. Just before this engagement ended, how did you feel about the situation? (check only one)

		Response
A. ___ I thought:	"We've had it; we're going to get wasted."	3%
B. ___ I thought:	"I don't know if we're going to make it or not."	12%
C. ___ I thought:	"We could sure use some help."	18%
D. ___ I thought:	"We're in pretty good shape; it's looking good."	29%
E. ___ I thought:	"We can move out and get these bastards if we're cool."	12%
F. ___ I thought:	"Charlie screwed up this time; we're going to wipe them out."	13%
G. ___ Other _____		13%

The attitude most frequently reported was "D," which indicates a cautious but hopeful attitude. The "Other" category was characterized by such answers as "I do not remember."

Question 10 was asked in an effort to understand the sources of anxiety that lead to suppression. There were 354 respondents to this question.

10. When you're under hostile fire, what's the thing that worries you most? (check only one)

	Response
A. ___ Being killed	30%
B. ___ Being wounded and disfigured	12%
C. ___ Being wounded and crippled	9%
D. ___ Taking a very painful wound	3%
E. ___ Seeing other men get killed	20%
F. ___ Seeing other men get wounded	7%
G. ___ Other _____	19%

Fear of being killed and seeing others killed were reported as the most distressing aspects of a combat situation. The "Other" category (G) was characterized by answers relating to genital wounds and to the very unpleasant feeling of being in a state of fear.

Question 11 was different from the preceding questions in that the various answer categories were not mutually exclusive. Persons responding to the question were directed to check as many of the listed answers as applied. As a consequence, the percentages reported for the answer categories of this question represent the percentage of individuals choosing the category. Hence, the percentages sum to more than 100 percent.

There were 402 persons responding to this question, who gave a total of 671 responses.

11. When this engagement began, what sort of terrain and vegetation were you in? (check as many as apply)

		Response
A.	___ River/stream	18%
B.	___ Wet paddy	15%
C.	___ Dry paddy	10%
D.	___ Open, rolling hills	9%
E.	___ Ridges and valleys	19%
F.	___ Sharp, rocky cliffs	5%
G.	___ No vegetation	3%
H.	___ Elephant grass	9%
I.	___ Light-medium brush cover	28%
J.	___ Uplands forest	14%
K.	___ Double canopy jungle	14%
L.	___ Triple canopy jungle	9%
M.	___ Village	7%
N.	___ Built-up town/city	0
O.	___ Other _____	8%

Question 12 was intended to indicate what choices of cover were available when a combat action began. There were 401 persons who responded to this question and gave a total of 993 responses. Again, the percentages sum to more than 100 percent.

12. At the time you came under fire, what kinds of cover and concealment were available to you? (check as many as apply)

A. ____ Flat, open ground (no cover/concealment)

B. ____ Low grass

C. ____ High grass

D. ____ Bushes

E. ____ Small trees

F. ____ Large trees

G. ____ Fallen trees

H. ____ Ant hills

I. ____ Paddy dikes

J. ____ Water and marsh/ swamp

K. ____ Prepared foxhole (no overhead cover)

L. ____ Supply/transport vehicles

M. ____ Armored vehicles

N. ____ Shell craters

O. ____ Small rocks

P. ____ Large rocks

Q. ____ Natural, rolling terrain (ground depression)

R. ____ Building (wood, thatch, grass)

S. ____ Building (earth wall, masonry)

T. ____ Personal equipment

U. ____ Other

The percentages of responses were as follows:

A = 10%	F = 16%	K = 8%	P = 10%	U = 5%
B = 15%	G = 10%	L = 2%	Q = 12%	
C = 11%	H = 4%	M = 2%	R = 2%	
D = 39%	I = 19%	N = 6%	S = 2%	
E = 37%	J = 5%	O = 16%	T = 12%	

The persons responding to the "Other" category (U) of this question characteristically reported that they could not recall all of the types of cover available.

The question and percentages of persons responding to each alternative are presented below.

13. During this engagement, what kind(s) of supporting fire did you receive? (check as many as apply)

		Response
A.	___ Helicopter gunships	45%
B.	___ Air Force, Navy, Marine close air support	6%
C.	___ Mortars	14%
D.	___ Artillery	48%
E.	___ Naval gun fire	0
F.	___ Strategic air support (B52 bombers)	2%
G.	___ APCs or tanks	3%
H.	___ Other	34%

The high percentage of answers in the "Other" category in this question is somewhat misleading since the most frequent answer provided in this space was "none."

Question 14, relating to the breaking of contact with the enemy, was responded to by a total of 386 individuals.

14. How did the engagement end? (check only one)

		Response
A. ___	They withdrew under fire	54%
B. ___	We withdrew on foot under fire	11%
C. ___	We were extracted by chopper under fire	1%
D. ___	We overran their position	9%
E. ___	They overran our position, then withdrew	1%
F. ___	Both sides stopped firing	15%
G. ___	Other	9%

The answers to this question that were entered in the "Other" category tended to be reports of friendly or enemy casualties.

Question 15 was a companion question to question 9. It was responded to by 358 individuals.

15. After your initial reaction to hostile fire in this engagement, how did you first feel about the situation? (check only one)

			Response
A. ___	I thought:	"We've had it; we're going to to get wasted."	9%
B. ___	I thought:	"This is going to be bad!"	21%
C. ___	I thought:	"We're going to need some help this time."	15%
D. ___	I thought:	"We're in pretty good shape if we can get resupply."	8%
E. ___	I thought:	"We can move out and get them if we're cool."	15%
F. ___	I thought:	"Charlie screwed up this time; we're going to wipe them out."	15%
G. ___	Other _____		17%

The answers given in the "Other" category were characterized by either "scared" or "can't remember."

Question 16, relating to the relative position of friendly and enemy forces was responded to by 388 individuals who gave a total of 1167 responses.

16. When this engagement began what position were you in, relative to the enemy? (check as many as apply)

		Response
A. ___	We were both on the same level dry ground	17%
B. ___	They were on higher ground then we were	33%
C. ___	We were on higher ground then they were	24%
D. ___	We were both in water/marsh	2%
E. ___	They were in water/marsh, we were on dry ground	6%
F. ___	We were in water/marsh, they were on dry ground	8%
G. ___	We had equal amounts of cover/concealment	19%
H. ___	We had more cover/concealment then they did	10%
I. ___	They had more cover/concealment then we did	34%
J. ___	They ambushed us	35%
K. ___	We ambushed them	19%
L. ___	They attacked our prepared position	9%
M. ___	We attacked their prepared position	5%
N. ___	We saw each other at the same time	10%
O. ___	We saw them before they saw us	23%
P. ___	They saw us before we saw them	32%
Q. ___	Other	7%

The answers given the "Other" category (Q) tended to indicate that the friendly troops received fire but never saw the enemy and consequently did not know their situation. The relatively high percentages of responses given to items B, I, J, and P of this question give the impression that the enemy troops made very efficient use of the terrain in pursuing their combat operations.

Question 17 was intended as a normative question directed at determing the nature of the initiation of combat for the sample of people responding to the questionnaire. There were 382 individuals responding to this question.

17. What started the engagement? (check only one)

		Response
A.	___ We fired at the enemy	36%
B.	___ The enemy fired at us	55%
C.	___ Someone tripped a booby trap	3%
D.	___ I don't know who fired first	6%

Question 18 was included in an attempt to determine what types of actions were taken by the respondents during the combat operations. Four hundred individuals responded to this question and checked a total of 651 items.

18. During the course of this engagement, what actions did you take? (check as many as apply)

		Response
A.	___ Gave directions, fired when I could	28%
B.	___ Operated the radio, fired when I could	16%
C.	___ Fired my weapon(s) all the time	18%
D.	___ Carried ammo, fired when I could	10%

		Response
E. ___	Kept my head down, fired when I could	32%
F. ___	Kept my head down, didn't fire	6%
G. ___	Fired my weapon(s) when directed, advanced under fire	9%
H. ___	Fired my weapon(s) when directed, withdrew under fire	2%
I. ___	Did not fire, treated wounded men	4%
J. ___	Advanced when supporting fire was lifted	8%
K. ___	Advanced only when enemy fire had stopped/ eased up	14%
L. ___	Other _____	13%

The large percentage of responses to "Gave directions, fired when I could" (A) may be a reflection of the fact that our sample contained a large percentage of individuals in leadership positions (26 percent). The answers given in the "Other" category (L) were mostly descriptive of specific actions taken during the combat operations, such as "accompanied sweeping element."

Question 19 was aimed at discovering the most commonly observed manner in which the enemy troops made use of their weapons during combat engagements. Three hundred ninety-five persons checked a total of 736 items for this question.

19. How did the enemy seem to be using their weapons during <u>this</u> engagement? (check as many as apply)

		Response
A. ___	Fired machineguns in continuous grazing fire	6%
B. ___	Fired machineguns in regular bursts	7%
C. ___	Fired machineguns in random patterns	9%

		Response
D.	___ Fired ARs in regular bursts	22%
E.	___ Fired ARs in random patterns	28%
F.	___ Didn't use automatic weapons fire	7%
G.	___ Fired weapons accurately	23%
H.	___ Fired weapons with little accuracy	47%
I.	___ Fired their weapons in plunging fire	7%
J.	___ Threw grenades but didn't come close	8%
K.	___ Threw grenades and hurt us	12%
L.	___ Other _____	11%

It is interesting to note that 47 percent of the respondents reported that the enemy employed their weapons with little accuracy (H), while 23 percent of the respondents reported that the enemy fired accurately (G). The answers in the "Other" category (L) generally related to the volume of enemy fire, which was reported to be light.

Question 20 attempted to determine what sensory cues were used in identifying weapons. The "Other" category for both the weapons and the sensory cue lists was provided to allow individuals to report weapons and modes of identifications not found in the listed categories. The question was presented in the following manner.

20. Look at the two lists below. List 1 shows the small arms which the enemy may have used against you. List 2 shows several ways in which soldiers normally identify enemy weapons as they fire. Look at list 1 and decide which of these weapons the enemy <u>did</u> use against you. Now look at list 2 and decide how it was that you knew what weapons the enemy was firing at you. Put the code letter(s) from list 2 in front of the weapons in list 1 so that we will know how you identified each weapon you encountered.

For example, you may have known by the sound of the weapon firing that an AK47 was being fired at you, so you'd put the code letter "A" in front of "AK47." If there was more than one thing that identified the weapon for you, put as many letters as you need in front of the appropriate weapon. For example, you may have known by the sound of the round hitting something and the muzzle flash you saw that the enemy was firing an RPD machinegun, so you'd put the code letters "B" and "D" in front of "RPD machinegun."

List 1 (Weapons Enemy Used)

____ ChiCom grenade
____ AK47
____ RPD MG
____ ChiCom .51-cal MG
____ SKS carbine
____ RPG
____ B40 rocket
____ B41 rocket
____ Other_____

List 2 (How Identified)

A. Sound of the weapon firing
B. Sound of the round hitting something
C. What the round looked like when it hit
D. Muzzle flash
E. Tracer pattern
F. Weapon's rate of fire
G. Sound of the round passing overhead
H. Smoke from the weapon firing
I. The wounds others were taking
J. Other _____

Ninety-seven persons indicated that the ChiCom grenade was used against them and gave 109 identifying responses. The percentages of identifying responses were as follows:

ChiCom Grenade

A = 24%	F = 0
B = 16%	G = 1%
C = 25%	H - 2%
D = 1%	I = 22%
E = 0	J = 21%

For the ChiCom grenade, the sound of explosion (probably A and B) is mentioned by 40 percent of the respondents. Twenty-five percent of the respondents recognized the grenade by sight (C).

Three hundred fifty-two persons checked a total of 464 items for the AK47.

AK47

A = 89%	F - 15%
B = 4%	G - 8%
C = 2%	H - 0
D = 3%	I = 3%
E = 4%	J = 13%

The sound of the AK47 firing was the most frequently reported detection cue.

The RPD machinegun was detected by only 65 persons who gave a total of 90 identifying responses. The percentages of answers were as follows:

RPD MG

A = 29%	F = 42%
B = 15%	G = 8%
C = 3%	H = 2%
D = 22%	I = 3%
E = 15%	J = 3%

The high percentage of responses to the rate of fire (F) indicates that the weapon was being recognized as a machinegun, and not necessarily as an "RPD."

Fifty-nine persons responded that the ChiCom .51-caliber machinegun had been employed against them. They checked a total of 96 identification items.

ChiCom .51-cal MG

A = 46%	F = 34%
B = 14%	G = 7%
C = 10%	H = 2%
D = 15%	I = 8%
E = 25%	J = 2%

Forty-six percent of the respondents identified the weapon by the sound of its firing (A), while 34 percent identified it by its rate of fire (F). The tracer pattern (E) was an identifying characteristic for 25 percent of the respondents.

The low frequency of experience with the .51-caliber machine-gun was probably due to the small number of those weapons presumed to be in the enemy inventory, the lack of portability of that weapon, and the fact that the weapon itself was generally employed from fixed fortifications.

Ninety-one persons responded to the SKS carbine with a total of 129 identifying responses. The percentages of responses were as follows:

SKS Carbine

A = 70%	F = 24%
B = 10%	G = 4%
C = 5%	H = 2%
D = 5%	I = 2%
E = 3%	J = 4%

This weapon is no longer frequently seen in combat in Vietnam, having been replaced with the AK47. However, for those who reported having experienced the weapon, the sound of the weapon firing was the most frequently reported cue.

The actual firing cue is its semiautomatic mode of fire, as was indicated by the 24 percent response to rate of fire.

Eighty-seven persons responded to the RPG and checked a total of 119 identifying items. The percentages of responses were as follows:

RPG

A = 19%	F = 3%
B = 29%	G = 15%
C = 27%	H = 5%
D = 8%	I = 8%
E = 1%	J = 4%

The small frequency of reports of experience with RPG was most likely a function of the actual combat experiences being reported in this questionnaire, and did not reflect the true frequency of overall experience with the weapon.

The high percentage of responses to B and C (29 percent and 27 percent, respectively) are indicative of the auditory and visual aspects of the explosion of the round. The 19-percent response to the sound of weapon firing (A) refers to the characteristic ignition signatures of the RPG, while the 15 percent "G" response is indicative of the sound of the round going overhead.

Sixty-five persons reported experience with the B40 rocket and checked a total of 85 items. The percentages of responses were as follows:

B40 Rocket

A = 17%	F = 0
B = 31%	G = 31%
C = 23%	H = 8%
D = 5%	I = 6%
E = 3%	J = 8%

Thirty-six persons reported experience with the B41 Rocket, checking a total of 46 items. The percentage of responses were as follows:

B41 Rocket

A = 14%	F = 0
B = 31%	G = 31%
C = 22%	H = 0
D = 3%	I = 14%
E = 0	J = 14%

The B40 and B41 rockets are not highly discriminable from one another. It is possible that those individuals reporting experience with either of these weapons might actually have experienced the other rocket or even the RPG.

The last portion of question 20 was labeled "Other." This category was responded to by 46 individuals. Among the weapons reported were the M16 rifle, M60 machinegun, and M79 grenade launcher. A detailed breakdown of these responses is not regarded as useful data since the frequency for each weapon and identifying characteristic is quite small. Consequently, they will not be reported here.

Question 21 was concerned with identifying the cues that lead a person to the knowledge that he is under fire. There were 336 persons who responded to this question.

21. What was the first thing that let you know the enemy was firing at you with small arms? (check only one)

		Response
A. ___	The sound of enemy weapons firing	58%
B. ___	The sound of rounds going by	18%
C. ___	The sound of rounds hitting things around me	5%
D. ___	Seeing rounds kick up dirt/rocks in front of me	4%
E. ___	Seeing rounds hitting grass/brush/trees near me	1%
F. ___	Seeing one of our men get hit	3%
G. ___	Somebody shouted ("incoming," "take cover," etc.)	2%
H. ___	The muzzle flash or smoke from their weapons	2%
I. ___	Incoming tracer rounds	3%
J. ___	Other _____	17%

The majority of responses to this question indicated that auditory cues were most frequently used to identify incoming fire. No consistent pattern of responses was discovered in the "Other" category (J).

Question 22 related to the initial response the individual manifests when he realizes that he is under fire. There were 381 persons responding to this question.

22. When you realized you were being fired at, what was the first thing you did? (check only one)

		Response
A. ___	Looked around to see where it was coming from	7%
B. ___	Hit the ground	62%
C. ___	Fired back immediately while standing	9%
D. ___	Positioned too far to the rear to be immediately involved	6%
E. ___	Ran more than 10 feet in order to get behind protective cover of some sort	3%
F. ___	Got down into my bunker/foxhole	2%
G. ___	Other_____	11%

The most often reported response was "Hit the ground" (B). The "Other" category (G) was characterized by answers specific to particular combat situations, such as "got behind a tree," or "jumped into a drainage ditch by the road," etc.

Question 23 was the next in the series pertaining to the actions taken by troops when they are brought under enemy fire. There were 368 persons responding to this question.

23. After you took the action which you checked above, what what was the next thing you did? (check only one)

		Response
A. ___	Fired toward the sound of the enemy weapons	33%
B. ___	Fired toward the muzzle flash/smoke of the enemy weapons	6%
C. ___	Moved to better cover	13%
D. ___	Tried to find a specific target to shoot at	11%
E. ___	Kept covered up and didn't fire	2%
F. ___	Directed the fire of other men	6%
G. ___	Found protective cover	5%
H. ___	Got a weapon and ammo	2%
I. ___	Moved forward to the action	10%
J. ___	Started to set up my weapon (crew served)	2%
K. ___	Other _____	10%

The high percentage of responses in category A indicate that as soon as possible after being brought under fire and securing cover, U.S. troops began to return the fire even though the enemy position may not have been well identified.

Question 24 asked the individuals to estimate the time elapsing between their first and second responses to enemy fire. There were 394 individuals responding to this question.

24. Between the action you've checked as the "first" action you took, and the action you just checked as the "next" action you took, how much time passed? (check only one)

		Response			Response
A. ___	0 - 5 sec	38%	G. ___	30 - 45 sec	2%
B. ___	5 - 10 sec	29%	H. ___	45 - 60 sec	3%
C. ___	10 - 15 sec	11%	I. ___	1 - 1½ min	1%
D. ___	15 - 20 sec	6%	J. ___	1½ - 2 min	1%
E. ___	20 - 25 sec	2%	K. ___	more than 2 min	2%
F. ___	25 - 30 sec	5%			

The responses to question 24 are not considered to be extremely accurate data since people typically err in making time judgments. However, 78 percent reported that they had taken their second action within 15 seconds after the initial response to enemy fire.

Question 25 asked the individuals to indicate the types of cover they used in the reported engagements, and the order in which they were used.

25. Look at the list below. Several types of cover/concealment are listed. Put numbers in front of the ones you used during this engagement to indicate the order in which you used them. For example, if you first got behind a small tree, moved from there to a clump of high grass, and from there to a paddy dike, you would put the number one (1) in front of "small tree," the number two (2) in front of "high grass," the number three (3) in front of "paddy dike," and so on. Put numbers in front of as many items as you need to describe the kinds of cover/concealment you used during this engagement.

A. ____ Flat ground

B. ____ Low grass

C. ____ High grass

D. ____ Bushes

E. ____ Small trees

F. ____ Large trees

G. ____ Fallen trees

H. ____ Paddy dikes

I. ____ Water and marsh/ swamp

J. ____ Prepared foxhole

K. ____ Prepared bunker (overhead cover)

L. ____ Armored vehicles

M. ____ Shell craters

N. ____ Small rocks

O. ____ Large rocks

P. ____ Natural, rolling terrain (ground depressions)

Q. ____ Building (wood, thatch, grass)

R. ____ Building (earth wall, masonry)

S. ____ Personal equipment

T. ____ Other_____

A total of 364 first responses, 272 second responses, and 154 third responses were given to this question. The percentages of responses in each cover category were as follows:

	First Response	Second Response	Third Response
A	24%	2%	5%
B	9%	5%	3%
C	3%	6%	1%
D	16%	15%	1%
E	11%	14%	14%
F	4%	7%	13%
G	2%	5%	6%
H	7%	8%	7%
I	2%	3%	1%
J	3%	3%	1%
K	2%	1%	0
L	2%	1%	0
M	1%	3%	5%
N	2%	5%	5%

	First Response	Second Response	Third Response
O	3%	5%	12%
P	5%	8%	8%
Q	0	1%	1%
R	1%	0	3%
S	2%	5%	3%
T	4%	3%	2%

The "Other" category (T) for this question yielded no consistent pattern of responses.

Question 26 pertained to the weapons carried by the respondents in combat. The 394 respondents gave a total of 1022 responses.

26. What weapons were you carrying, personally, during this engagement? (check as many as apply)

		Response			Response
A. ___	M79	11%	I. ___	C.S. grenades	5%
B. ___	M16	81%	J. ___	Smoke grenades	42%
C. ___	M14	1%	K. ___	AK47	1%
D. ___	M60 MG	1%	L. ___	Carbine	1%
E. ___	.51-cal MG	1%	M. ___	Pistol	8%
F. ___	Fragmentation grenades	64%	N. ___	Shotgun	0
G. ___	WP grenades	2%	O. ___	LAW	13%
H. ___	Concussion grenades	2%	P. ___	Other _____	12%

As anticipated, the M16 (B) was carried by the majority of the respondents. In the "Other" category (P) of this question, the most often mentioned weapon items were knives and bayonets.

Question 27 permitted free comments on the part of the respondents. No conclusive information was derived from this question.

4.6.2 Responses from the Australian Army Questionnaire

An analysis of the results of the 46 questionnaires filled out by the Australian troops revealed that there were virtually no differences between the response patterns of the Australian troops and the U.S. troops. Only two questions gave evidence of substantial differences in response patterns. These were questions 16 and 25. Both of these questions were concerned with the relationship of the combat operations and the terrain in which the operations took place. The differences in the response patterns of the Australian troops and U.S. troops on these two questions is a reflection of the fact that the two groups were reporting on combat operations that took place in substantially different types of terrain.

4.6.3 Responses from the Vietnamese Questionnaire

The results obtained from the Vietnamese questionnaires showed large differences in the response patterns given by the Hoi Chanh (Rallier) sample and the POW sample.

Of the 34 questions on the questionnaire, 28 showed such large differences. Generally, a response category receiving a large percentage of the responses by one group in a given question received comparatively few responses from the other group. An example of this may be seen in the responses given to question 21. The question read:

21. During your most recent encounter involving small arms, did the enemy fire at you with an M60 machine-gun? (check either "yes" or "no") ____yes _____no

The number and percent of responses given by the two groups are as follows:

	Yes	No
POW		
Number	27	191
Percent	12%	88%
Rallier		
Number	32	13
Percent	71%	29%

Another question displaying the wide disparity between the two groups is question 4A. This question asks:

4. During the time you served with the VC or the NVA, how many engagements did you have?

The results of the question were as follows:

	Total Number of Engagements	Number of Respondents	Average Engagements
Rallier	1253	65	19.28
POW	357	112	3.19

These data would seem to indicate that Rallier troops on the average engaged in approximately six times as many combat operations as did the POWs.

The difference in the number of combat engagements between Ralliers and POWs cannot be explained by the composition of the two groups. Both Vietcong (VC) and North Vietnamese

Army (NVA) personnel are well represented in both groups, and as such, the more frequent action typical of the VC should have brought the mean number of engagements for the two groups closer together.

The DSL team has attempted to determine the cause of these discrepancies as a first step in determining the reliability of the obtained results. A number of hypothetical causes were discussed. Most of these were discarded because no clear-cut national differences were found in the two samples. One plausible explanation is that the two groups were given different verbal instructions and motivational sets. Since the DSL team was not present when the instructions were given, it is impossible to validate this hypothesis.

A second, and more acceptable, hypothesis for the differences in the samples' responses is that the attitudes of the respondents towards the United States and the Republic of Vietnam systematically influenced their responses. As an example, a POW would not wish to maximize his reported number of engagements with allied forces. On the contrary, a Rallier could theoretically enhance his position by stating that despite, or because of, a large number of engagements against the allied forces, he is now willing to be repatriated to the RVN cause. The attempt of Ralliers to establish themselves within their new roles may also cause them to answer questions in a manner which would enhance their personal and military value to the RVN cause. POWs, in fear of reprisal from RVN forces or from their own fellow prisoners, would be more likely to answer only enough questions to get by, and only those questions which they consider to be of no military importance.

In view of the above inferences, no detailed question-by-question response analysis is broken out for either group. Suffice it to say that the similarity of responses by both

groups to those of allied forces, on questions which highlight the importance of weapon signature effects as suppressive stimuli, does lend some additional degree of generality to these phenomena. However, the majority of questions elicited answers which must be considered as unreliable, and, therefore, no detailed analysis is presented in this section. A copy of the breakout of frequencies and percent response to each question is presented for Ralliers and POWs in Annex C of this report.

4.6.4 RVN Questionnaire Relationships

Some of the data produced by the questionnaire appear to indicate meaningful relationships when grouped in certain ways. In an effort to describe some of these relationships, a short series of computer analyses were made among pairs of questions or sequences of questions that appear to show a relational characteristic. Two such questions are question 2 and question 18. In question 2 we determined what position an individual occupied in his combat unit. The question roughly divided respondents into two groups, namely those in positions of authority such as "Platoon Leaders, Squad Leaders, and Fire Team Leaders" and other troops in the operation who are described only as "Squad Members." The "Squad Members" are troops who do not occupy positions of authority over others. When the responses to question 18 of these two groups were analyzed, it was discovered that the authority group reported in 66 percent of the cases that they "gave instructions to others, fired when I could"; whereas, the nonauthority group reported giving instructions in only 13 percent of the cases. The most frequently reported response to question 18 by the nonauthority group was "kept my head down, fired when I could." The nonauthority group gave this response in 42 percent of the cases, while the authority group gave this response only 30 percent of the time.

Another analysis related question 3 to question 18. The persons identified in question 2 as squad members, were further identified in question 3 as "Riflemen, Grenadiers, and Machinegunners."

It should be noted that question 3 had no categories to accommodate those persons who identified themselves as platoon leaders, squad leaders, or fire team leaders; however, all of these individuals could check the riflemen category since each of them was equipped with the M16 rifle. This may account for the high percentage (33 percent) of persons who reported themselves as riflemen in question 3, but indicated that they "gave directions, fired when I could" in question 18.

Those persons who identified themselves in question 3 as riflemen, grenadiers, or machinegunners, responded in question 18 that they "kept my head down, fired when I could." The riflemen gave this response 41 percent of the time, the grenadiers gave it 45 percent of the time, and the machinegunners gave it in 41 percent of the cases.

Two questions that have a direct relationship to each other were questions 9 and 15. The questions were directed at determining any change in attitude, of feeling tone, from the beginning of the combat action to the end of the same action. The two questions were phrased as follows:

Question 15 read, "After your initial fire in this engagement how did you <u>first</u> feel about the situation?" (check only <u>one</u>)

Question 9 read, "Just before this engagement ended how did you feel about the situation?" (check only one)

The response categories for these two questions were identical. They were as follows:

A. ____ I thought: "We've had it; we're going to get wasted."

B. ____ I thought: "I don't know if we're going to make it or not."

C. ____ I thought: "We could sure use some help."

D. ____ I thought: "We're in pretty good shape; it's looking good."

E. ____ I thought: "We can move out and get these bastards if we're cool.

F. ____ I thought: "Charlie screwed up this time; we're going to wipe them out."

G. ____ Other: _____

The total number of responses to the "Other" category (G) were so few in number and of such a diverse content that they did not appear to be comparable; consequently, the "Other" category responses were not included in this analysis.

The frequencies of the responses given to the first six categories of these two questions are as follows:

Category	Question 15 Frequency	Question 9 Frequency
A	34	11
B	83	44
C	58	70
D	27	109
E	59	47
F	60	51
	TOTAL (N) 321	332

It will be noted that the big change in attitude, as shown by these data, takes place in category D, "We're in pretty good shape; it's looking good." At the beginning of the engagement, this category drew fewer responses than any other, with the preponderance of responses being given to categories A, B, and C, the less favorable responses. On the other hand, near the end of the engagement, category D received by far the largest number of responses thereby indicating that from the beginning to the end of the engagement the attitude of the friendly troops had undergone a substantial improvement.

This change in attitude is taken to reflect the effectiveness of friendly fire in producing suppression of enemy troops and thereby effecting reduction of enemy fire.

Questions 22, 23, and 24 were a series of questions directed at discovering the sequence of events relating to the onset of a combat action and at determining how much time elapsed between the first and second actions performed by troops when they were under fire. It is interesting to note that in all three of these questions the largest percentage of answers fall into the first four response categories.

In question 22, 84 percent of the responses were given in the first four categories. (N = 320)

In question 23, 63 percent of the responses were in the first four categories. (N = 232)

In question 24, 84 percent of the responses were given in the first four categories. (N = 330)

In order to explain the large preponderance of responses in the first four categories of this series of questions, some of the functional relationships between the questions will be discussed.

In question 22 the most frequently given response was "Hit the ground." This response accounts for 62 percent of all answers given to question 22. In question 23, a special computer analysis shows that of the persons responding with the "Hit the ground" answer to question 22, 48 percent or nearly half responded with "Fired toward the sound of enemy weapons." This same computer analysis also indicates that the elapsed time between action 1 ("Hit the ground") and action 2 ("Fired toward the sound of enemy weapons") was only 2-1/2 seconds, i.e., response category A for question 24. This type of response appears to have some significance for suppression since the enemy can expect to receive return fire from our troops in a very brief period of time.

The next most frequently reported response to question 22 was "Fired back immediately while standing." This response accounted for 9 percent of all answers given to question 22. The computer analysis indicated that the persons who gave this response in question 22 responsed to question 23 as follows:

	Response
"Fired toward the sound of enemy weapons"	9%
"Fired toward the muzzle flash/smoke of the enemy weapons"	27%
"Moved to better cover"	18%
"Tried to find a specific target to shoot at"	23%

The analysis also indicated that the actions defined by responses to question 23 all took place within 2-1/2 seconds, i.e., answer to category A, question 24.

The third most frequently reported response to question 22 was "looked around to see where it was coming from." This response accounted for 7 percent of all answers given to question 22. The computer analysis indicated that the persons who gave this response to question 22 divided their responses into two significicant categories for question 23. These were:

	Response
"Fired toward the sound of the enemy weapons"	25%
"Moved forward to the action"	25%

The analysis indicated that question 24 showed that the actions described took place in 2-1/2 seconds.

The rather unusual response pattern described here appears to be explained by the fact that the M60 machinegunners and ammunition bearers/assistant gunners are not normally at the point of a column during a combat patrol. Consequently, when a fire fight starts the machinegun crews must move into a position sufficiently forward to give themselves a clear field of fire.

The fourth most frequently reported response category in question 22 was "Positioned too far to the rear to be immediately involved." This response accounted for 7 percent of

all the answers given to question 22. The computer analysis showed that persons who gave this response to question 22 divided their responses to question 27 as follows:

	Response
"Tried to find a specific target to shoot at"	31%
"Moved forward to the action"	47%

The computer analysis shows that the actions described were distributed about equally among time periods defined by questions 24, i.e., 2-1/2 seconds, 7-1/2 seconds, and 17-1/2 seconds.

The significance of these responses as they relate to suppression is probably that they reflect the actions of the crew-served weapons troops who must move into suitable positions before opening fire.

4.7 INTERVIEW RESULTS

The questions presented in the interviews held with U.S. Army personnel in Vietnam were not structured in the strict sense but were confined mainly to topics that affected in some way, or shed some light on, the suppression situation. The questions were directed at the suppression of friendly forces receiving fire from the enemy and also of enemy troops being fired on by U.S. troops. Open-ended questions were used for the most part in an effort to elicit a maximum amount of general information concerning the suppression effectiveness of various kinds of fire. Questions which called for yes/no, rating, or ranking answers were not used. In the event that a terse or one-word answer was forthcoming, a fuller description was requested. In some instances, persons who had participated in the same combat action were interviewed separately,

and, when possible, their descriptions of the action were compared in an attempt to validate the data being gathered by this interviewing technique. Nearly all of these reports agreed closely. In cases where discrepancies occurred in the reports, it was nearly always because the men being interviewed were located at different points in the action and consquently saw different events. Because of the good agreement among these interviews, it is believed that the information gained by this method of interviewing is both accurate and useful. On a few of the interviews no questions were asked at all and the person being interviewed was allowed to describe an action from beginning to end without interruption. Suprisingly, these "no-question" interviews usually covered most of the information given in the interviews in which questions were used. This fact gives confidence that the questions used were appropriate to the situations for which they were intended.

The actions reported in these interviews occurred in virtually every type of terrain existing in Vietnam. This includes mountains, jungles, jungle clearings, rice paddies, swamps, dry creek beds, railroad beds, elephant grass terrain, bushy and rocky terrain, and others. Most of the actions were brief in duration, lasting only 3 to 5 minutes, and most were the result of enemy ambushes. A typical description of such an action is given by a U.S. infantry soldier as follows:

Q: "Describe the situation, please."

A: "Well, we were on a small patrol in the edge of a garden plot and a wood line. We came out through a dry stream bed. There were about eight or nine of us, and we started up out of the stream bed and we were crossing a log on the bank there. About three men got up over the log, and they fired an RPG rifle grenade. It hit and went off; we all got down and the second one went off. The first thing you think is where it's going to hit. Well, we got this 60 going, you know, and just a few seconds after the 60 started firing, they fired about

two magazines of AK apiece and took off. Of course, by that time the 60 puts out a lot of lead and it scared them pretty good, so they left."

Q: "How many VC or NVA?"
A: "I would say two or three."

Q: "Two or three. Do you know whether they were NVA or VC?"
A: "They were probably VC."

Fire fights of the type described above were the ones most often described in the interviews. As a rule they resulted in no casualties on either side and were terminated by the enemy breaking contact after firing a relatively few rounds. VC troops are, as a rule, not as well trained and disciplined as NVA troops and are not as well supplied with weapons and ammunition.

Our interviews indicate that engagements initiated by VC troops involved less fire and were of a shorter duration than engagements involving NVA troops. In spite of the low volume of fire as described in the interview quoted above, the suppressive effects of the fire were immediate and complete. The Rocket Propelled Grenade (RPG) mentioned above is a much feared weapon. It is of two types, both of which are tube-launched rounds. The RPG2 is a relatively simple weapon, often of local manufacture. The round is launched clear of the tube by a black powder charge and is then propelled by a series of black powder charges spaced by cardboard spacers to go off at specified intervals. This weapon is light and portable and is most often found in the hands of VC troops. Its maximum range is about 150 meters and it has an armor piercing head on a fragmentation round. The second weapon of this type is known as the RPG7 and is a much more sophisticated weapon. The round of the RPG7 is also armor piercing and

fragmentation in design; it weighs 7 to 8 pounds and is propelled by solid rocket fuel. Its maximum range is in excess of 600 meters and its detonating device is made of a piezoelectric mechanism capable of detonating the round regardless of its angle of impact. This weapon is found most often in the hands of the NVA. Both types have a characteristic sound signature and a sizable muzzle flash. The known power of either of these weapons and the anxiety produced by its recognizable sound signature make it effective in suppressing U. S. troops. Our interviews indicate that as soon as this weapon is heard to fire, the troops immediately take whatever cover they can find and do not look up or attempt to fire until the round has landed. The U.S. troops' feelings with regard to this weapon are expressed in the following interview:

Q: "What's the worst one? Which one do you hate the most?"
A: "RPGs are pretty scary, mainly because they do have a red flash and you can see them coming. When they hit they make a heck of an explosion, and if they go past they make a real big whoosh. It's a psychological thing."

Another type of weapon that has a distinctive sound signature is the M79 grenade launcher. This weapon fires a 40MM grenade that is spin-stabilized for accuracy and explodes on impact. The optimum range for the round is about 150 meters but the maximum range is more than double this distance. The launching barrel comes in two varieties, one of which is an individually carried gun-shaped device and the other is a launcher that clamps on underneath the barrel of a standard M16 rifle. In spite of the differences in mechanical setup and a slightly shorter barrel on the M16 device, the performance and sound signature of the two launchers is virtually the same. The sound of the round being fired makes a loud firm thumping sound. For this reason, the weapon has been named "the thump gun" among the troops and it is also known as "the bloop gun."

Considerable numbers of these grenade launchers and rounds have found their way into the hands of enemy troops in Vietnam and, consequently, when the sound of this thumping round is heard, it is effective in suppressing any troops in the vicinity, friendly or enemy, who are not aware of who fired the round. An example of this situation can be seen in the following quotation taken from one of the interviews:

Q: "When an M79 is fired at you, can you hear it being fired?"
A: "Yeah, there's a distinct thump."

Q: "That puts you down,too?"
A: "Yeah, because a lot of times when your own men fire it'll put you down because you don't know, you just hear a thump and you know something is coming. You don't know where it's going to hit. It'll put you down. As soon as you hear a thump, at least me, I go down. It'll go off, then you can move around. See, the good thing about the 79 is that you have time, you know, when you hear it thump nothing is going to happen, depending on the range, of course, but you can also tell because of the volume of the thump."

The same sort of suppression effect occurs when friendly troops hear fire from an M16 rifle. If the source of the fire is unknown it results in suppressing the troops because the M16 is frequently found in the hands of the enemy. In addition to this, incoming M16 rounds are more feared than AK47 rounds. Our interviews indicate that among the troops in Vietnam the AK47 has the reputation of producing a much less severe wound than the M16. The AK47 is reported to go in one side and out the other leaving a clean, puncture-type wound, while the M16 round is reported to tear up whatever it hits leaving a gaping and extensive wound. The reputation that these two weapons have developed is exemplified in the following excerpt from an interview with a soldier who had seen a considerable amount of combat.

A: "They have a lot of our weapons, to tell the truth. They have been known to open up, you know, 16s with us. The AK, I think, you know, the men are scared of AK. The AK has got a lot bigger round than the 16 does, and it will make a bigger hole in you. But I trust the 16 myself."

Q: "Why the 16 more than the AK?"
A: "First of all, the 16 is a lot faster. And the bullet twists and turns. It's been known to anyway, and if it does hit you, it won't just go through one spot, it'll travel down your bone, or, it won't, you know... ."

Q: "And an AK won't do that?"
A: "It just goes right through you."

Several of the men interviewed expressed feelings of resentment and anxiety over the fact that U.S. manufactured weapons were found in the possession of the enemy. The comments that were received frequently centered around the belief that enemy possession of our weapons deprived friendly troops of their superiority of firepower. Enemy possession of the M16 rifle, the M79 grenade launcher, and the M60 machinegun were most frequently mentioned in this connection.

During the interviews, an effort was made to establish which of the enemy weapons was the most feared, second most feared, etc. No consistent data on this subject resulted from this series of interviews because no single factor resulted in our troops' attitudes toward the various types of enemy weapons. For example, the AK47 rifle was most often mentioned as a fear-inspiring weapon but largely on the basis of the fact that it was the one our troops faced most often. The following quotation from an interview illustrates this attitude:

Q: "How about small arms?"
A: "Well, small arms--the only thing we've ever got shot at with is AKs. Our platoon hasn't lost anybody through AK yet, but the other platoons have lost a man apiece just last month."

Q: "Why is it that you respect the AK? Just because it's the only one you've come in contact with?"
A: "The NVA, from what I've heard, they're trained just like we do in AIT, you know; they train them how to shoot it. They're good shots because those two guys lost from the other platoons, they got it right through the heart both times with one shot."

The second most feared weapon used by the enemy, as deduced from our interview data, was the RPG. An example interview relating to this weapon has already been given, but it should be mentioned that it appears the frightening thing about this weapon is a combination of the visual signature of the round being launched (bright muzzle flash) and the auditory cue of the rocket-propelled round in flight (a loud whooshing noise). The extremely loud blast of the exploding round was also given as a fear-inspiring auditory cue.

The third most feared weapon our data identified was the .51-caliber machinegun. This gun has a reputation as an extremely dangerous weapon even among men who have had no personal experience with the weapon.

Two brief excerpts from interviews are given here to illustrate the fear-producing qualities of this weapon, and it must be emphasized again that reputation is in large degree responsible for the fearful regard in which this weapon is held.

Q: "Forgetting about the M16, 'cause it's an American-made weapon, what do you think, other than that, what do you think of their small arms?"
A: "Well, 51, but I've never run into a 51. I've got to take into consideration what they have, and they don't have 51s down here 'cause they can't move them."

Q: "Why do you think the 51 is so bad?"
A: "Well, like getting hit by an AK, getting hit by a 16 is worse than an AK, but getting hit by those 51s, you got a lot more power and they can't run with them. With an AK they can run, and they will run. But with a 51 they'll just sit there and fire away."

A second interview shows a different attitude toward the dangers of the .51-caliber machinegun, but reputation still plays a part in the man's response.

Q: "How many different kinds of weapons have been fired at you?"
A: "Uh, 30 cal, 51, 79, AK47, 60 (or 16), RPGs, ChiCom and SKS, I understand. I don't know, myself, just what they told me. After the whole thing was over."

Q: "Of all these weapons, which is the worse one?"
A: "Well, the most terrifying is the 51."

Q: "Why?"
A: "Why? Because knowledge of what it will do to you, I guess. If it touches any part of you, you know, it's pretty strong caliber weapon, and also the firepower it puts out. It's just a constant lay out. It's pretty dangerous."

Q: "Can't the AK47 put out faster?"
A: "Yeah, but if you get hit by an AK47, you just get wounds; if you get hit by a 51, you're missing part of your body. So, it's kind of, you know, you think a couple of times."

The situations relating to the enemy's possession of the M16 rifle and the M79 grenade launcher has been discussed elsewhere. It should be mentioned here, however, that the M16 and M79 rank fourth and fifth as the most feared enemy weapons. The reasons for the fear-producing qualities of these two weapons, as explained earlier, are complex and totally different from the attitudes relating to the fear-producing, and consequently, suppression-producing qualities relating to other weapons.

Even though they do not ordinarily operate as suppressive agents, booby traps were discussed, and emphasized by the men being interviewed, with great frequency. Since this report is devoted to suppression, the role of booby traps will not be discussed here beyond venturing the observation that booby traps may be the most feared of all of the enemy's weapons in Vietnam.

An interesting and somewhat puzzling set of facts that came to light during the interviews was the wide variability of our troop's attitudes with regard to the fear-producing and suppressive properties of tracers. One of the questions asked during the interview was "Have you ever experienced enemy fire when the incoming rounds were tracers?" If the answer was "yes," it was followed by the next question; "What scares you, or suppresses you, most--tracer rounds coming in or nontracer rounds coming in?" Three completely different types of answers were given in response to these questions. The first of these answers was "The tracers scare me and suppress the most." When asked why, the answer was "The tracers make you realize that you are actually under fire and it is more real and physical than when you can't see the rounds coming in."

The second type of answer is as follows: "When I am under fire, I am always scared and it doesn't make any difference to me whether the fire is tracer or not."

The third type of answer lies at the other end of the suppression continuum. For example, answers of the following type were given: "When I see tracers coming in I feel better because I know that they are going over me or off to one side. You can't see tracers coming straight at you. When I see tracers, I feel that I can change my position if I want to in order to get better cover or better position. Also, tracers help you spot the source of the fire and enable you to return fire more accurately."

The etiology of these three types of attitudes is unknown, although it may have its source in training. The phenomenon may prove to be a fruitful subject for future research.

One other aspect of the tracer topic that should be mentioned is that AK47 tracer rounds are green in color. This unfamiliar color has been reported as being very fear-producing in some individuals. Also, when friendly troops are fired on by red tracers from captured M60s, etc., they are always concerned that they may be under fire by friendly troops by mistake. This can reduce the efficiency of their return fire.

One question in the interview was devoted to an effort to collect suggestions about ways of improving the suppressive effects of our own weapons. This question resulted, in the main, in revealing that our troops feel that their weapons are very satisfactory in their present form and need no improvement. There were, however, a few suggestions that arose during the interviews that appear to have merit with reference to suppression of enemy forces.

The first suggestion, and the one most frequently heard, was that the troops needed 30-round magazines for their M16 rifles. It was felt that this larger magazine would substantially enhance the M16's effectiveness in keeping the enemy down. The smaller magazines were reported to require changing at frequent intervals, during which time the enemy could raise up and commence his own firing.

The second most often heard comment was that there should be more M203 rocket launchers available. Some people expressed the opinion that every man carrying an M16 rifle should have the "over and under" version as it is popularly named. The reason given for this suggestion was that, "The most effective use of small arms is to keep the enemy pinned down until supporting fire, in the form of artillery or attack helicopters, could be called in."

After this, there were a series of suggestions occurring with much less frequency. They are as follows:

- Need for a lighter M60 machinegun.
- Need for an M60 machinegun that does not jam so often.
- Replace LAW rocket with a weapon that can be reused. The LAW is reported to misfire frequently and it is then necessary to destroy the weapon. Also, the launching tube must be destroyed after firing because the enemy makes booby traps out of the tubes if they find them.
- More powerful M79 round.
- Better training in weapon handling to produce suppression.

The last suggestion is for a new type of weapon to be added to the combat group. The following excerpt from this man's interview expresses his reasons for this perceived need:

Q: "How do you think we could improve our own small arms, make them better?"
A: "The 16's pretty good as far as I'm concerned, but I was telling you before about the point man. It would be a hell of a help if they could give him those M15s,* sawed-off 16s, 'cause, you know, up in the mountains no matter almost every where you go you have to chop because it's so thick. With the 16, the point man doesn't have much of a chance if he sees something. It is big. It isn't as big as an M14 was or anything like that but, it's still kind of hard to handle with one hand. The 15 is beautiful -- it would be beautiful for the point man."

*The weapon this man refers to is probably the XM177E2. It is a modification of the Colt Automatic Rifle-15 as CAR-15.

5.0 FIELD EXPERIMENTATION

(U) The field experimentation took place at the Reserve Components Training Center of the California National Guard, Camp Roberts, California, during the period 7 September through 15 October 1971. Four phases of experimentation were conducted, and each will be discussed separately below.

5.1 MILITARY ORGANIZATIONS SUPPORTING FIELD EXPERIMENTATION

(U) Support for the field experimentation was provided by two military organizations; the California National Guard Reserve Components Training Center (CNG), Camp Roberts, California, and the United States Army Combat Development Command Experimentation Command (CDCEC), Fort Ord, California.

(U) The CNG surveyed the general experimentation area, and set the limits for firing-line placement, field of fire, and range fan. They also set the general safety requirements for range operation including procedures for opening the range, positioning of range guards, storage of ammunition, and communications with the CNG Range Safety Officer.

(U) Overall control of the military participation in the field experimentation was provided by the Office of the Deputy Chief of Staff (DCS) for Experimentation through CDCEC Project Office 20. Field support was provided through the Commanding Officer of the Experimentation Brigade of CDCEC. Construction of the facility was accomplished by the Engineer Company of the Support Battalion of CDCEC, with instrumentation provided by the Instrumentation Company of the Support Battalion and by DCS Instrumentation. Officers and enlisted personnel for support of, and participation in, the field experiment were provided by the Experimentation Brigade. The purchase of

outside resources was handled by DCS Admin Log, and photo coverage of the experiment was provided by DCS Instrumentation Photo Division.

5.2 DESCRIPTION OF FIELD FACILITIES

(U) The field experimentation facility was provided by the CNG at Camp Roberts, California. It occupied a portion of the impact area bounded by Bee Rock Road and the East Perimeter Road in the vicinity of Camp Roberts 1/50,000 map coordinates 042607. This facility is best described as being composed of two areas; the firing line and pit.

5.2.1 The Firing Line

(U) The firing line was an elevated platform of compacted earth approximately 150 feet long by 15 feet wide, with an artificial elevation of approximately 1 foot. Eleven firing positions were staked out along this line, beginning at the exact center of the firing line, and moving out at 3-meter increments in both directions.

(U) Weapon restraining devices were emplaced at each firing point, such that the muzzle of the weapons could be aimed at the required target and then locked in place. For the shoulder-fired weapons, an additional butt restraining box was also provided at each firing point. (See Figures 5-1 through 5-3.) The M60 and .50-caliber machineguns were tripod mounted, restrained in the "muzzle" device, with the tripod trails staked into the ground and sandbagged. (See Figure 5-4.)

(U) The firing-line area was shaded by the suspension of two cargo parachutes from telephone poles. Within the general

area were communications facilities connected with the pit, the range guards, Camp Roberts Range Central, and with Hunter Liggett Military Reservation. Tents were erected in the firing-line area to provide for weapon and ammunition storage, mess facilities, and a subject staging area. An armorer was in attendance throughout the field experiments to repair weapons and allocate ammunition. An ambulance and medic team were on call at the firing line. A 3-kilowatt field generator was also available in the area to provide power for various pieces of equipment.

5.2.2 The Pit

(U) The pit was the area in which the subjects were placed for all phases of the field experiment. The dimensions of the pit were 135 feet long, 40 feet wide at the top, 25 feet wide at the bottom, and 9 feet deep. All four sides of the pit sloped outward at approximately a 45-degree angle. (See Figure 5-5.) The pit was laid out with its long axis parallel to the firing line at a distance of 150 meters. (See Figure 5-6.) The center of the long axis of the pit was set by shooting a perpendicular line of sight from the center of the firing line to the pit. E-type targets were erected on 10-foot posts, 60 feet behind the trailing edge of the pit. Each target was identified by a symbol painted on its body. The targets were laid out at 3-meter intervals corresponding to the 11 firing points on the firing line. Target placement was also accomplished by shooting a perpendicular line of sight from each firing point to a baseline parallel to and 60 feet behind the pit.

(U) Where the perpendiculars crossed the baseline, all 11 targets were emplaced. The height of the targets was adjusted so that the trajectory of a bullet passing 2 meters

over the top of the pit would strike the center of the target. The firing point number and the corresponding perpendicular target designations are given in the following table. (See Figure 5-6.)

Firing Point Number	Target Symbol
1	X
2	Z
3	7
4	A
5	D
6	3
7	8
8	Y
9	N
10	B
11	T

(U) For Phases I, II, and IV of the field experimentation, subjects were seated in the pit in parallel rows, perpendicular to the long axis of the pit with the rows separated by a wooden partition. (See Figure 5-7.)

(U) For Phase III, the Impact Signature Test, four periscopes were placed in the pit, two at each end of the long axis (see Figure 5-8) and enclosed within a sandbagged bunker (see Figure 5-9). During all phases of the experiment, communications were maintained with the firing line via field telephone.

Figure 5-1 (U) XM19 Automatic Rifle Mounted for Suppressive Fire Study

Figure 5-2 (U) 7.62MM AK47 Chinese Communist (ChiCom) Assault Rifle Mounted for Suppressive Fire Study

Figure 5-3 (U) 5.56MM M16 Automatic Rifle Mounted for Suppressive Fire Study

Figure 5-4 (U) 7.62MM M60 Machinegun Mounted for Suppressive Fire Study

Figure 5-5 (U) Target Pit Area Showing Player Configuration for Suppressive Fire Study

Figure 5-6 (U) E-Type Targets, Behind Pit Area, Used for Suppressive Fire Study

Figure 5-7 (U) View of Player Configuration in Target Pit Area

Figure 5-8 (U) View of Target Area Showing Periscope Devices Used For Suppressive Fire Study

Figure 5-9 (U) Exterior View of Periscope Device Emplacement

5.3 SUBJECT POPULATION

(U) The subject population for the field experimentation was to be composed of 50 enlisted men with combat experience and 10 new trainees.

5.3.1 Qualifications for Subjects

(U) The 50 enlisted personnel who were to participate in the field experimentation were to meet the following qualifications:

1. Served in Vietnam within the past two years
2. Received the Combat Infantry Badge
3. Served in an infantry MOS -- preferably 11B
4. Present rank of E3 to E6
5. Under 35 years of age
6. Serial Profile 1 in hearing
7. GT score of 80 or above

5.3.2 Player Selection Procedures and Outcome

(U) A list of 60 combat veterans meeting the above criteria was compiled by DSL personnel from available USACDCEC Experimentation Brigade resources, through screening of Form 20s. From this list, the Experimentation Brigade was able to provide 25 men to serve as subjects. An additional seven men nominally meeting the player requirements were also provided. Hence, the combat veteran portion of the player population was reduced to 32. Updated personal data was also collected from these players by use of the Personal Data Form contained in Annex B.

(U) Ten basic trainees were provided by the Fort Ord Training Command as requested. These trainees were in their

second week of the training cycle, and naive with respect to military weapons.

5.3.3 Player Distribution

(U) Because of the reduction in the number of experienced subjects from the requested 50 to the available 32, some subjects had to serve in more than one phase of the experiment. The distribution of players to phases by player number is given in Table 5-1. Players numbered 33 through 42 were the trainees, and they were all assigned to participate in Phase III of the field experimentation.

TABLE 5-1 (U) DISTRIBUTION OF PLAYERS TO PHASES

Phase I		Phase II		Phase III		Phase IV
		Miss Distance	Dangerousness	CV*	NT**	
11	22	1	1	1	33	1
12	23	2	2	8	34	15
13	24	3	3	15	35	19
14	25	4	4	16	36	21
15	26	5	5	19	37	24
16	27	6	6	20	38	27
17	28	7	7	21	39	28
18	29	8	8	24	40	29
19	30	9	9	27	41	
20	31	10	10	28	42	
21		43				

*Combat Veterans

**New Trainees

(U) Table 5-2 shows those players who participated in more than one phase of the experiment and the phases in which they participated.

TABLE 5-2 (U) PLAYERS SERVING IN MORE THAN ONE PHASE OF FIELD EXPERIMENTATION

Player	Phase I	Phase II		Phase III	Phase IV
		Miss Distance	Dangerousness		
1		X	X	X	X
15	X			X	X
16	X			X	
19	X			X	X
20	X			X	
21	X			X	X
24	X			X	X
27	X			X	X
28	X			X	X
29	X				X

5.4 DETERMINAT[illegible] OF THE POLICY EMPLOYED IN THE JUDGMENT OF THE SUPPRESSIVE QUALITY OF SIMULATED LIVE-FIRE EVENTS: PHASE I

5.4.1 Rationale

(U) One of the major tasks to be accomplished in this program was to develop a model of the relationship between small arms weapons characteristics and suppression. In order to develop such a model, it was first necessary to model suppression itself. The basic principle of the DSL conceptual model of suppression is that it is composed of two sequential processes. The first process, initiation, is

considered as reflex in origin, while the second process, maintenance of suppression, is considered to be essentially a learned response.

(U) Initiation of suppression is considered to begin with the production of an alerting stimulus. This stimulus is typically auditory in nature and may be composed of the auditory signature of an incoming projectile, the muzzle blast of a weapon, or a combination of both. In addition, the visual aspects of muzzle blast (flash or smoke) or the visual signature of impacting projectiles may contribute to the total alerting stimulus complex.

(U) The application of the alerting stimulus complex (to be called the alerting stimulus, for simplicity) results in the evocation of a reflex response. At its lowest level, the reflex response to the alerting stimulus is an orienting response. Such a response is characterized by a continuum of physiological events ranging from minute changes in the state of muscle contraction to actual turning of the head and/or body in the direction of the stimulus. All of these physiological responses may be considered to be evoked by suprathreshhold stimulation which is sufficient to inform the individual that some event has taken place. At this level of response, the stimulus intensity is not considered to be sufficient to involve the autonomic nervous system. As the intensity of an alerting stimulus is increased, it eventually reaches a level capable of initiating a startle response. This startle response is also reflexive in nature, and is characterized by rapid contraction of several major muscle groups, resulting in an overt postural change in heart rate, blood pressure, respiration rate, and increased tension in small muscles of the stomach and the anal sphincter. All of these responses, when evolved reflexively, are of sufficient

magnitude to be measured and scored. The postural changes, in particular, may result in an interruption of on-going behavior and, thus, may momentarily reduce the ability of the soldier to continue his mission. How long this interruption will continue and what form it will finally take is described under the learned process of maintenance of suppression.

(U) A number of possible suppression responses exist in the repertoire of the soldier's behavior. Some of these have been the result of actual military training, while others have been learned by direct experience or through observation of others during combat. These behaviors run the gamut from the soldier immediately continuing the mission (for example, firing) after the momentary reflex interruption, to his taking cover and failing to observe or fire on the enemy, to throwing down his weapon and running away. Each of these responses exists in the family of responses which may be elicited following the alerting (startle) reaction. Which response is actually made will be mediated by other stimulus circumstances existing at the time of alerting. These circumstances include both individual variables, such as the soldier's morale and physical condition, and external factors such as the mission itself, availability of cover, and leadership. As a result of the interaction of these internal and external conditions, the soldier will choose an initial course of action. Since combat situations are likely to change from moment to moment, the soldier may modify this initial course of action. For example, as the soldier interprets that the existing threat is diminishing, he may modify his suppressed behavior from nonfiring to resumption of firing. By way of contrast, if the soldier's present form of suppression is such that he has taken cover and is returning sporadic fire, an increase in the amount of hostile fire directed toward his position may result in his choosing total cover and abandonment of firing.

(U) Psychological studies of human behavior indicate that such a complex phenomenon as suppression is not produced by the action of a single isolated stimulus event, but is determined by the interaction of a number of stimulus variables acting on the individual at a given moment in a given environment. The review of the literature described earlier has yielded a catalog of variables, including weapons characteristics, individual, and environmental variables which potentially contribute to the development of suppression.

(U) The manner in which these variables are to be combined, and the delineation of the exact number of variables needed to reliably predict suppression, requires the development of a methodology which is generally described as developing a theoretical model.

(U) The theoretical model advanced by DSL was based on a concept called "policy capturing." In essence, this model attempted to predict an individual's suppression index from a knowledge of the type of weapon fired at him, the volume of fire he encountered, and the nearness of the passing rounds to the individual's position. The review of the literature on suppression and the content analysis of the interviews conducted by DSL in CONUS indicated that other situational or context variables must be considered when attempting to predict how much suppression a given weapon will produce. In addition, it was the conclusion of the DSL analysts that personal history variables such as time in combat, intelligence, etc., may also be influential in determining the degree to which an individual is suppressed by enemy fire.

(U) In order to determine the contribution of each of these variables to the resulting suppression, the Policy Capturing Model took the form of a stepwise multiple regression equation.

Phase I experimentation was conducted in order to provide a quantitative basis for the evaluation of the Policy Capturing Model.

5.4.2 Objectives

(U) The primary objective of the policy capturing experiment was to provide a set of data on which to determine the predictive coefficients of the variables entering the Policy Capturing Model. The second objective was to determine the utility of this model for comparing the effectiveness of various weapons and weapon classes in producing suppression.

5.4.3 Subjects

(U) Twenty soldiers from the pool of 32 combat veterans were selected to participate in this experiment. The subjects were divided in four groups of five subjects each, and designated Groups A, B, C, and D. The assignment of individuals to groups was made in a manner designed to produce groups which were equivalent in their means and dispersions for the following factors:

1. Age
2. Intelligence as measured by the GT score
3. Level of education (to last completed year)
4. Number of months in service
5. Number of months in combat

(U) The Form 20 records of all of the participants had previously been screened for appropriate rank, MOS, and awards indicating actual combat experience (e.g., CIB and Purple Heart).

5.4.4 Method

(U) A schedule was developed in which two of the four matched groups were assigned to participate in each trial. The schedule was so designed that each group participated in one-half of the trials, with the constraint that no group would participate in more than two consecutive trials.

(U) The groups to participate in a given trial were seated in the pit in two parallel columns, separated by a wooden partition. The two columns faced the leading edge of the pit (see Figure 5-7) and were positioned on either side of the perpendicular line between firing point six and target "3," the midline of the pit. The subjects were then informed of the nature of their task, and instructed in the proper use of the Suppressive Behavior Scale.

(U) Each trial consisted of eight combination scenario - live-fire events. The subjects were instructed to read the scenario prior to each live-fire event. After the event, they were to circle the letter corresponding to the suppressive behavior they would have been most likely to display, had they been in the situation described by the scenario and received the same kind of fire as just presented. They were further instructed that their selection of behavior was to be based on the information in the scenario, the weapon fired at them, the number of rounds fired, and the closeness of the passing rounds.

(U) At the completion of an eight-event trial, both groups of subjects were removed from the pit and returned to the firing line. After setting up the weapon positions for the next trial, two more groups of subjects occupied the pit. This procedure continued over a two-week period until all 48 scheduled trials had been completed.

5.4.5 Independent Variables

(U) The independent variables employed in this study were:

1. Weapon employed
2. Volume of fire
3. Accuracy of fire (distance of projectiles from subject)
4. Situational variables

(U) The weapons employed in this study were the XM19, M16, and, AK47 rifles and the M60 and .50-caliber machineguns.

(U) Volume of fire was manipulated in conjunction with the weapons themselves. The XM19, M16, and AK47 rifles were fired in both the semiautomatic and automatic modes. In the semiautomatic mode, the volume of fire consisted of three consecutive rounds fired into the same target area. In the automatic mode, these weapons were fired in three consecutive three-round bursts into the target area. The machineguns were employed in three consecutive six-round bursts. In each case, a multiple-round firing was used to reduce the artificiality of an isolated round or burst.

(U) Accuracy of fire was represented by the lateral distance at which a round passed a subject. Three levels of accuracy were employed, namely, 0-, 3-, and 6-meter lateral miss distance. The 0-meter lateral miss distance was represented by firing directly over the subjects' heads, at a height of approximately 2 meters. The situational variables for this experiment were presented to the subjects in the form of written scenarios. The four variables included in these scenarios were mission, availability of cover, friendly unit size, and friendly casualties. Two levels were described

for each of the variables, resulting in the development of 16 different scenarios, presenting all possible combinations of the four two-level variables.

(U) The levels of each variable were presented as follows. Mission was described as the friendly unit being on either attack or defense. The available cover was described in detail and also labeled as being either medium or light. Friendly unit size was given in the scenario as either squad or platoon. The scenarios stated that the friendly unit had sustained either two casualties (WIA) or no casualties. The scenarios also included additional description of the enemy threat, but this factor was not treated as a variable in this study.

5.4.6 Dependent Variable

(U) The dependent variable in this experiment was the subject's judgment of the suppressive quality of each event. As indicated in Section 5.4.4, the subject was to mark his choice of action on the scale printed at the bottom of each scenario. This scale was composed of seven alternative courses of action as follows:

A. Take cover as best I could, but wouldn't be able to observe or fire on the enemy at all.

B. Take cover as best I could and would be able to observe the enemy occasionaly, but wouldn't be able to fire at the enemy at all.

C. Take cover as best I could and would be able to observe the enemy continuously but wouldn't be able to fire at the enemy at all.

D. Take cover as best I could, and would be able to observe the enemy occasionally and fire at the enemy occasionally.

E. Take cover as best I could, and would be able to observe the enemy continually and fire at the enemy occasionally.

F. Take cover as best I could, but would be able to observe the enemy continually and place continuous fire on the enemy.

G. Would continue doing what I had been doing before the incoming fire and wouldn't worry about getting better cover.

(U) These seven alternatives (A through G) represent a decreasing scale of suppressive behavior, and were originally given the ordinal values of 1 through 7. However, a Delphi Scaling process was performed on these alternatives by the USACDC Infantry Agency, and the resultant scale values were used in all subsequent analyses of the policy capturing data. The Delphi Scale values of the alternatives are as follows:

Alternative	Delphi Scale Value
A	100
B	90
C	80
D	59
E	34
F	17
G	0

5.4.7 Experimental Design

(U) The basic design of the experiment was an 8×3×16 factorial design, including eight weapon/volume combinations, three miss distances, and the 16 scenario combinations. As a complete factorial, this design called for 384 independent events. These events were divided into 48 trials of eight events each. Each of the eight weapon combinations appeared once in each trial, with the miss distance and scenario variables distributed among trials in a balanced manner.

(U) Since multiple regression was used, it was not necessary to have each subject participate in all 384 events. By rotating four equivalent groups through the 48 trials, each individual participated in only 192 of the total 384 events.

(U) This rotation also served to allow the distribution of groups to trials to overlap, rather than simply assigning an independent fixed portion of the total trials to each group.

5.4.8 Policy Capturing Experiment Results

(U) The data obtained from the policy capturing experiment were analyzed by stepwise multiple regression using the Bio-Med 02R Program developed by the Health Sciences Computing Facility of the University of California at Los Angeles. Initially, eight separate regression analyses were performed, one for each of the five weapons employed in the experiment (viz., XM19, M16, and AK47 rifles; M60 and .50-caliber machineguns), a regression combining the data for the two machineguns, a combined automatic rifle regression (based on the three rifles fired in the three-round-burst mode), and a semiautomatic rifle regression (based on the three rifles fired in the single-round mode). These initial regression analyses employed all of the independent variables on which data was collected in the development of prediction equations.

(U) These variables are listed in Table 5-3. The first 11 variables are the original independent variables. Variables 12 through 26 are transgenerated variables. Variable 12 is a transgenerated miss distance variable where miss distance is represented as an inverse "J" function with the loadings for the means of each of the three miss distances being +2, -1, -1, for the 0-, 3-, and 6-meter miss distances, respectively. The original miss distance variable 10, was given linear weights of +1, 0, -1, for the 0-, 3-, and 6-meter miss

TABLE 5-3 (U) VARIABLES EMPLOYED IN ORIGINAL MULTIPLE REGRESSION ANALYSIS

Variable Number	Variable Description	
1	Age	Individual Variables
2	General Technical Score	
3	Years of Education	
4	Months in Service	
5	Months in Combat	
6	Mission	Scenario Variables
7	Unit Size	
8	Cover	
9	Casualties	
10	Miss Distance	Live-Fire Variables
13	Burst Size	
12	Miss Distance "J"	
14	6×8	Transgenerated Variables
15	6×9	
16	6×12	
17	7×8	
18	7×9	
19	7×10	
20	7×12	
21	8×9	
22	8×10	
23	8×12	
24	9×10	
25	9×12	
26	6×10	
27	6×7	
11	Score	Dependent Variable

distances, respectively. Variables 13 through 26 represent interactions between pairs of original variables or the pairing of original variables with the transgenerated miss distance variable 12.

(U) For each of the original regressions, the F-level for inclusion of a variable in the regression was set at .01, with the F-level for deletion set at .005. The tolerance level for continuation of computation within the regression analysis was set at .001. Summary tables for each regression analysis will be found in Annex C of this report.

(U) For reporting and discussion purposes, the regression equations and their attendant multiple correlation coefficients (R) are presented, including only those variables whose contribution to the multiple R squared is greater than .01. Using this criterion, the resulting prediction equations, multiple R and F values, and significance levels are presented in Table 5-4.

(C) From each of the equations given in Table 5-4, an estimated value of suppression $\hat{Y}$ can be obtained by assigning values to the variables (X_i) in the equation. For example, taking the equation for semiautomatic rifles:

$\hat{Y} = 68.66-0.28X_2-0.85(X_5)-1.90(X_{10})$ and assigning values to the variables (X_i) as follows:

TABLE 5-4 (C) EQUATIONS FOR THE PREDICTION OF SUPPRESSION DERIVED FROM THE ORIGINAL STEPWISE MULTIPLE REGRESSION ANALYSES FOR EACH WEAPON OR WEAPON CLASS

Weapon/Class	Prediction Equation	R	R^2	F	p*
XM19	$\hat{Y} = 52.32 - 0.15(X_2) - 0.07(X_4) - 0.91(X_5) - 2.05(X_{10}) + 1.05(X_{13})$	.2821	.0796	13.8	<.01
M16	$\hat{Y} = 69.76 - 0.38(X_2) + 1.33(X_{13}) - 0.08(X_4) + 1.56(X_9) + 1.42(X_7)$	.3352	.1123	22.2	<.01
AK47	$\hat{Y} = 44.11 - 0.42(X_2) + 1.41(X_{12}) + 3.07(X_3) - 0.87(X_5)$	.3385	.1146	28.3	<.01
M60	$\hat{Y} = 47.20 - 0.46(X_2) + 3.60(X_3)$	.3013	.0908	22.6	<.01
.50-cal MG	$\hat{Y} = 57.96 + 11.03(X_3) - 0.73(X_2) - 3.57(X_1) + 2.40(X_5) - 2.56(X_8) - 2.53(X_7) - 2.87(X_{10})$	.5436	.2955	26.2	<.01
Semiautomatic Rifles	$\hat{Y} = 68.66 - 0.28(X_2) - 0.85(X_5) - 1.90(X_{10})$	.2503	.0627	28.6	<.01
Automatic Rifles	$\hat{Y} = 50.12 - 0.41(X_2) - 0.15(X_4) + 2.91(X_3)$	.3032	.0919	43.0	<.01
Machineguns	$\hat{Y} = 57.21 - 0.59(X_2) + 7.52(X_3) - 2.20(X_1) + 1.32(X_5) - 2.54(X_{10}) - 1.75(X_8)$	.4097	.1679	30.0	<.01

*P is the significance level associated with the multiple correlation coefficient in column R.

Variables	Assigned Value	Equation Coefficient	Product
X_2 (General Technical Score)	100	-0.28	-28.0
X_5 (Months in Combat)	10	-0.85	- 8.5
X_{10} (Miss Distance)	6	-1.90	-11.4
Constant	68.66	+1.00	+68.66
$\hat{Y}$ = (Sum of the Product Column)			20.76

(C) The predicted value of 20.76 corresponds to the estimated amount of suppression to be produced by semiautomatic rifles and must be interpreted against the Delphi Suppression Scale running from 0 to 100. This value indicates that only a small amount of suppression would be produced in this situation. Taking the equation for the M60, [illegible] again assigning the value of 100 to X_2, and 11 to X_3 (years of education), a higher predicted suppressive value of 40.80 is obtained. The difference between the predicted values for the M60 machinegun and semiautomatic rifles are in line with expectations for the effectiveness of these weapon classes in producing suppression.

(U) The above example alludes to a greater utility of these equations for the purposes of this study than is truly justifiable. Several other factors must be taken into consideration. First of all, one must consider the size of the multiple correlation coefficient (R) obtained for each of these equations. The smallest value reported in Table 5-4 is R = .2821, and the largest is R = .5436. Both of these values are significantly larger than zero, and the probability that each of these correlations could have been obtained by chance alone is less than one in 100 ($p \leq .01$). However, of real importance is the amount of the variability in the data that can be accounted for on the basis of a knowledge

of the variation in each of the variables entering the equation. This amount is presented in the column R^2 in Table 5-4. It can be seen that only 6 percent of the variance in semi-automatic rifle data is accounted for by this equation, while with the large multiple R for the .50-caliber machinegun the equation still only accounts for 30 percent of the variance in its data set.

(U) The second factor to be taken into consideration in interpreting the equations derived from the analysis of the policy capturing data is the set of variables which are included in the equation under the limitations for inclusion. Repeating the limitation, it was set that only those variables which, when added to the equation, produced an increase in R^2 of at least .01 would be included in the prediction equations discussed in this report.

(C) Every equation reported herein is heavily weighted with variables which characterize the individuals participating in the study (namely, variables 1 through 5). Each of the eight equations include at least two of these individual variables, with two equations containing four of the five variables. In contrast, only three of the eight equations utilize the context variables (variables 6 through 9), and of these, the largest number included in any equation is two. Miss distance is included in four of the eight equations. Burst is included as a variable in all three of the equations in which burst is part of the total set of independent variables (namely, the data for the XM19, AK47, and M16 taken spearately).

(U) In view of the fact that the purpose of this phase of the experiment was to develop a model that would relate the objective characteristics of small arms weapons to effectiveness in suppression, the equations would appear to indicate

that these characteristics do not materially contribute to the derived suppression values. However, the basic premise in policy capturing must be considered, namely, to determine what factors are important in the individual's determination of a course of action. As such, it is not surprising to find that the individual's intelligence, education level, and military experience are the factors which appear to determine his choice of response in this experiment. It is also expected that these factors contribute to the determination of the individual's actual behavior in combat, and that the degree and direction of such influence cannot be generalized from the data obtained in the "safe" environment of the field experiment.

(U) An attempt was made to determine the relative effectiveness of the context and live-fire variables on the choice of suppressive behavior by generating another set of regression equations in which the individual variables were deleted from the analysis. These equations are presented in Table 5-5. The numbers associated with the independent (X_i) variables were reassigned for this second set of regression equations. Table 5-6 presents this new numbering of the variables.

(U) For reporting purposes, only those variables which when added to the multiple regression increase the R^2 by .005 are included in the regression equations. This value for inclusion was set at .005 for these equations because the removal of the individual variables from the equation would so reduce the multiple R, that the use of the previous value of .01 would exclude most of the remaining variables from the prediction equation.

(C) As would be anticipated, all of the obtained multiple R values were quite small. Four of these were significant at less than the .01 level (XM19, M16, AK47, and semiautomatic

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TABLE 5-5 (U) EQUATIONS FOR THE PREDICTION OF SUPPRESSION DERIVED FROM THE SECOND STEPWISE MULTIPLE REGRESSION ANALYSES FOR EACH WEAPON OR WEAPON CLASS*

Weapon/Class	Prediction Equation	R	R^2	F	p**
XM19	$= 23.57 + 1.05(X_8) - 2.20(X_5) - 0.26(X_{13})$	.1695	.0207	7.89	<.01
M16	$= 26.92 + 1.35(X_8) + 1.52(X_4)$	.1876	.0352	16.01	<.01
AK47	$= 28.04 + 1.41(X_9)$	.1702	.0290	26.19	<.01
M60	$= 43.30 - 1.51(X_5)$	.0523	.0027	1.24	NS
.50-cal MG	$= 43.25 - 1.55(X_5)$	.0540	.0029	1.29	NS
Semiautomatic Rifles	$= 30.12 - 1.97(X_5)$	.0719	.0052	6.68	<.01
Automatic Rifles	$= 37.72 + 1.51(X_{11})$	.0496	.0025	3.15	NS
Machineguns	$= 52.06 - 2.15(X_5)$	.0611	.0037	3.37	NS

*Equations do not include any of the subject variables employed in the equations in Table 5-4.

**p is the level of significance associated with the multiple correlation coefficient R.

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TABLE 5-6 (U) VARIABLES EMPLOYED IN SECOND MULTIPLE REGRESSION ANALYSES

Variable Number	Variable Description	
1	Mission	Scenario Variables
2	Unit Size	
3	Cover	
4	Casualties	
5	Miss Distance	Live-Fire Variables
8	Burst	
7	Miss Distance "J"	
9	1×2	Transgenerated Variables
10	1×3	
11	1×4	
12	1×5	
13	1×7	
14	1×8	
15	2×3	
16	2×4	
17	2×5	
18	2×7	
19	2×8	
20	3×4	
21	3×5	
22	3×7	
23	3×8	
24	4×5	
25	4×7	
26	4×8	
27	5×7	
28	5×8	
29	7×8	
6	Score	Dependent Variable

rifles), but the amount of variance accounted for by the multiple R given in column R^2 does not exceed 4 percent. However, these equations do indicate that miss distance (X_5) and burst (X_8) do contribute to the choice of suppressive behavior, as relatively the first variables entered into the prediction equations, when individual subject variables are deleted.

(U) Although the ability to generalize from this data to real combat situations is severely limited, the weapons characteristics of miss distance and burst (volume of fire) should be considered as determinants of the individual's choice of suppressive behavior.

(U) Although the prediction equations obtained from the policy capturing analysis have only marginal utility, the mean suppression scores for weapons and weapon classes do present data of greater utility. The mean suppression scale score values for each weapon or class of weapons is presented in Table 5-7.

TABLE 5-7 (C) MEAN SUPPRESSION SCALE SCORES

Weapon/Class	Mean	Standard Deviation	Sample Size (N)
XM19	29.82	23.41	804
M16	35.10	22.83	881
AK47	36.44	24.84	880
M60	43.27	23.72	455
.50-cal MG	60.99	30.77	445
Semiautomatic Rifles	30.12	22.36	1287
Automatic Rifles	37.72	24.73	1278
Machineguns	52.03	28.82	900

(C) Since no overall analysis of variance was conducted during the regression analyses, an assessment of the significance of the difference between pairs of means was made by using the z test.* The differences between each of the 28 possible pairs of means were significant at less than the .001 level of confidence. It should be pointed out, however, that the large number of judgments entering into each mean allows very small mean differences to attain high statistical significance. The practical significance of these small differences is open to question. Thus, the difference between a mean of 35.10 for the M16 and 36.44 for the AK47 on a suppression scale of 0 to 100 should be interpreted with care.

(C) It is important to note that the XM19, as an individual weapon, receives the lowest mean suppression score, and is thus judged significantly less suppressive than any of the other individual weapons. For the three classes of weapons, the semiautomatic rifles are judged the least suppressive, followed by the automatic rifles, with a large increase in suppressiveness for the machinegun class. All differences between pairs of classes are significant.

5.5 MISS DISTANCE ESTIMATION EXPERIMENT: PHASE II-A

5.5.1 Rationale

(U) Previous experimentation by USACDCEC** compared the ability of individuals to estimate lateral miss distances for XM19 and M16A1 projectiles on the basis of auditory signatures. The

*The z test for differences between means. Fundamental Statistics in Psychology and Education - 4th Edition, Guilford, M.P. McGraw-Hill Book Company, New York, 1965, pp. 173-177.

**USACDCEC Project Analysis 21.9, XM19 Serially Fired Flechette Weapon Evaluation, Annex T: Plans and Results of the Audible Signature Test, 3 October 1969.

results of this study indicated that different equations were necessary to fit the regression of estimated miss distance on actual miss distance for the two weapons. This would imply that the ability to estimate the distance of a passing round is influenced by the characteristic sounds that the projectile produces.

(U) It was also found in this XM19* study that a change in the distance estimation function appears between 13 and 15 meters actual miss distance. This change is indicated by the need for two separate regression equations, one for miss distances up to 13 meters and a second for actual miss distances exceeding 15 meters. It is suggested that this change, requiring two different regression equations, is based on a shift in the individual soldier's perception of personal danger. In other words, within approximately 13 meters rounds are considered dangerous and the individual soldier is attentive to the nearness of the rounds. Beyond 13 meters, the rounds are not considered dangerous and attention to their location wanes, resulting in reduced accuracy of estimated miss distance.

5.5.2 Objectives

(U) The primary objective of the miss-distance-estimate portion of Phase II was to determine the accuracy with which soldiers can estimate the lateral miss distance of passing rounds, based on the auditory signature of the rounds. In addition, this study was designed to determine whether the accuracy of estimation is affected by the characteristic auditory signatures of the various rounds to be employed in the study.

*Ibid.

5.5.3 Subjects

(U) Ten soldiers, selected from the pool of qualified subjects (see Section 5.3), participated in this experiment.

5.5.4 Method

(U) The 10 players participating in a trial were divided into two groups of five players each. Each group was lined up in a column facing the forward edge of the pit. Group 1 was situated on a line which coincided with the line of fire from firing point 6 to target "3." Group 2 was lined up on the line of fire from firing point 5 to target "D." Thus, the lateral separation between the columns was 3 meters. With this placement of subjects, the firing of a single round would provide a different actual miss distance for each group and, hence, require fewer events to fill out the experimental design.

(U) Prior to each trial, the subjects were given a data collection form which gave instructions for the task, and provided spaces for the estimation to be made on each event within the trial. (A copy of this data collection form will be found in Annex B of this report.) The subjects were briefed by the DSL team on the appropriate method of distance estimation, including an orientation to the "meter" as the unit of measure. The subjects were also informed that a round which passed directly over their heads was to be estimated at 0 meters, with all other estimates of lateral distance being made to the nearest whole meter, with directionality (right or left) to be indicated also. The requirement to report directionality was imposed only to provide an internal check of the conscientiousness of the subjects. No analysis of the directionality data was made.

(U) The method required that the events be presented in trials of 12 events each. The events within a trial were presented on a variable interval schedule, averaging approximately 45 seconds interevent time. The timing of the events was controlled by the pit control officer, who gave a ready signal to the firing line when all subjects were ready to estimate the miss distance of the next event. The next event was fired as soon as the ready signal was received. The intertrial time was dependent on the conclusion of events scheduled to be interposed between consecutive miss distance trials. The average intertrial time was 20 minutes. The scheduled trials were conducted over a three-day period, with two makeup trials run a week later. These additional trials were run to make up for some invalid events and to attempt to fill in missing data occasioned by the absence of some players on some trials. However, makeup runs did not, in fact, complete the matrix, and the analysis of the data will be based on unequal cell frequencies.

5.5.5 Independent Variables

(U) The independent variables in this study were the actual miss distances at which rounds were fired, and the weapon employed. The actual miss distances varied from 0 to 18 meters in 3-meter increments. Six weapons were employed in the study, and were fired in single-round mode only. These weapons were the XM19, M16, and AK47 rifles; the M1A1 submachinegun; and the M60 and .50-caliber machineguns.

5.5.6 Dependent Variable

(U) The dependent variable in the miss distance portion of Phase II was the individual subject's estimate of the lateral miss distance of a passing round, reported to the nearest meter and in terms of right or left of the respondent.

5.5.7 Experimental Design

(U) The experimental design for miss distance estimation was a 6×7 factorial, involving six weapons and seven miss distances. This design thus called for 42 individual events, each event representing one weapon at one miss distance. Two replications of the 42 events were scheduled, but were treated as 84 separate events, rather than two complete replications. As such, the 84 events were assigned to seven trials of 12 events each, with the constraint that each weapon appear twice in each trial.

5.5.8 Analysis of Miss Distance Estimation Data

5.5.8.1 General (U) A linear regression analysis was conducted to establish the relationship beteen actual and estimated miss distances for the six test weapons. The weapons evaluated were, in order,

Weapon	Type
1	M1A1
2	XM19
3	M16
4	AK47
5	M60
6	.50-cal

(U) Seven actual miss distances (levels of the independent variable X) were selected: 0, 3, 6, 9, 12, 15, and 18 meters. The number of observed miss distances (dependent variable Y) was not the same at each level of X, however, the total number of (X, Y) pairs for each weapon was equal, N = 109.

(U) It was desirable (1) to establish prediction equations for each weapon separately using simple linear regression and (2) to verify, by a more complex analysis, whether test results for all weapons could be combined.

5.5.8.2 Linear Regression for Individual Weapons (U) The common regression model used in each case was

$$Y_{ij} = \alpha + \beta X_i + \varepsilon_{ij}$$

where

Y_{ij} = j^{th} observed miss distance at the ith level of X

α = true intercept

β = true slope

ε_{ij} = random error associated with the jth value of Y

(U) With the usual assumptions of normality and homoscedasticity concerning the ε_{ij}, least-squares solutions were obtained for α and β. These estimates along with their standard errors are presented in Table 5-8 below.

TABLE 5-8 (C) ESTIMATES OF REGRESSION COEFFICIENTS

Weapon	$\hat{\alpha}$	S_a	$\hat{\beta}$	S_β
M1A1	1.8537	.6271	.2994	.0613
XM19	4.4537	.8541	.4006	.0842
M16	4.5277	.7876	.3640	.0784
AK47	2.6439	.7553	.4820	.0733
M60	2.3905	.5946	.4420	.0585
.50-cal	3.0198	.8734	.3715	.0843

(U) With the information in Table 5-8, prediction equations are given in Table 5-9.

TABLE 5-9 (C) REGRESSION PREDICTION EQUATIONS

Weapon	Prediction Equation
1	$\hat{Y}_1 = 1.8537 + 0.2994X$
2	$\hat{Y}_2 = 4.4537 + 0.4006X$
3	$\hat{Y}_3 = 4.5277 + 0.3640X$
4	$\hat{Y}_4 = 2.6439 + 0.4820X$
5	$\hat{Y}_5 = 2.3905 + 0.4420X$
6	$\hat{Y}_6 = 3.0198 + 0.3715X$

(U) Predicted relationships between actual and observed miss distances for the six weapons are depicted graphically in Figure 5-10.

(U) A test of hypothesis $H_o : \beta_i = 0$ was conducted to ascertain whether individual true regression slopes were significantly different from zero. Based on experimental data, the null hypothesis was rejected in each case at the $\alpha = .01$ level and the conclusion was made that the true slopes were, in fact, significantly greater than zero.

(U) Similarly, the hypothesis $H_o : \alpha_i = 0$ was tested to determine whether the true regression line passes through the origin, i.e., through coordinates (0,0). This hypothesis also was rejected for each of the six weapons at the $\alpha = .01$ level indicating the true intercepts to be significantly greater than zero.

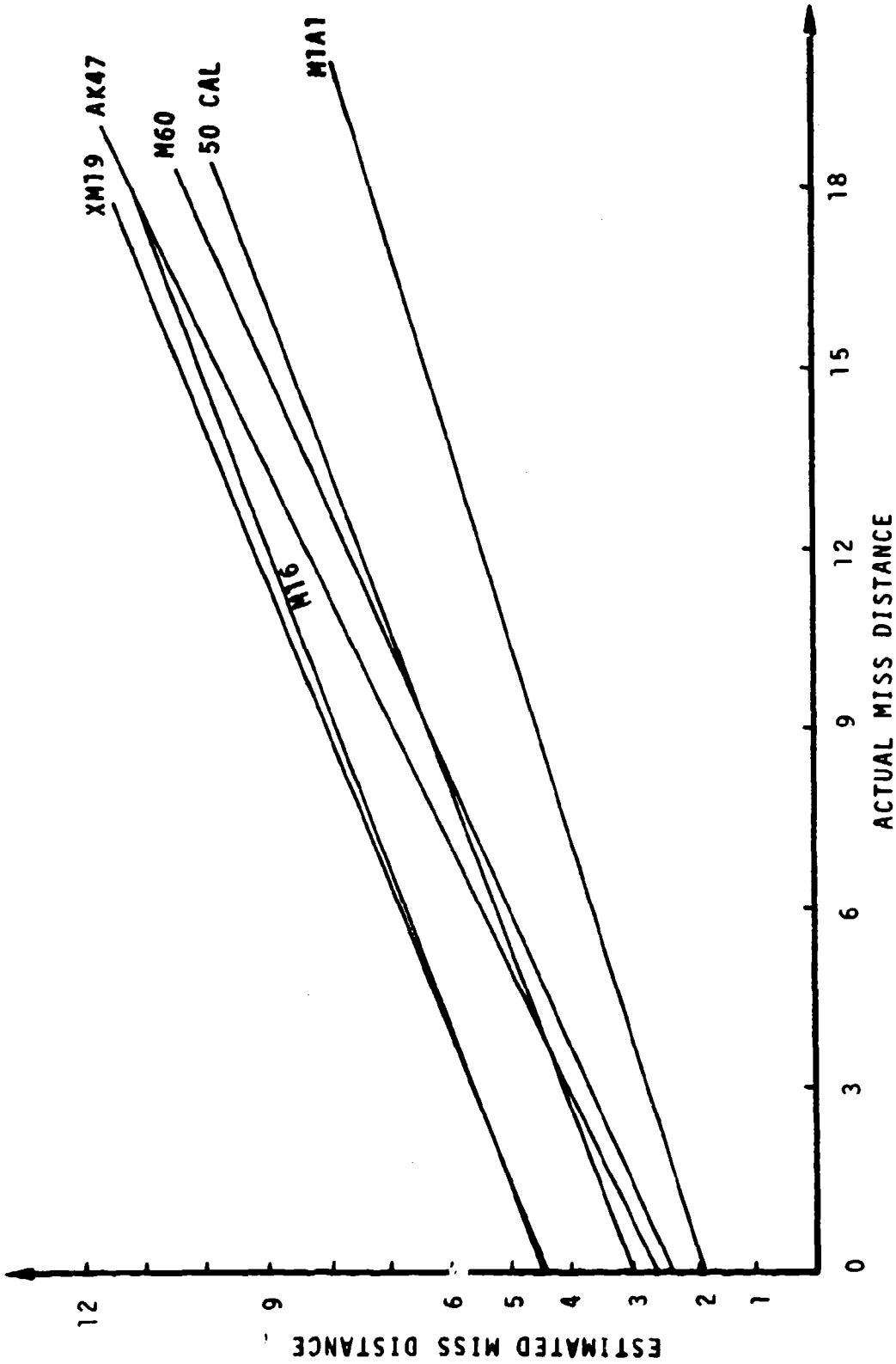

Figure 5-10 (C) Graphic Representation of Y_i (i=1,...,6)

(U) The test statistics (t-values) for both of these hypothesis tests are given in Table 5-10.

TABLE 5-10 (C) TEST STATISTICS FOR HYPOTHESES $H_o : \beta_i = 0$ and $H_o : \alpha_i = 0$

Weapon	$H_o : \beta_i = 0$	$H_o : \alpha_i = 0$
1	4.88	2.96
2	4.76	5.21
3	4.64	5.75
4	6.58	3.50
5	7.55	4.02
6	4.40	3.46

5.5.8.3 Analysis of Covariance for All Weapons (U) In regression analysis, when data from several groups is involved, the question frequently arises whether it can be justifiably pooled. More specifically: (1) Can one regression line be used for all observations? (2) Do regression slopes of groups estimate the same population slope? and (3) are intercepts of groups the same? To answer these questions, analysis of covariance was used and is presented in Table 5-11.

(U) Three hypotheses were formulated in turn corresponding to the questions raised:

1. Can one regression line be used for all weapons? The null hypothesis to be tested was $H_o : \beta_i = \beta_o$ and $\alpha_i = \alpha_o$ (i.e., are all the slopes and intercepts the same).

TABLE 5-11 (C) ANALYSIS OF COVARIANCE FOR WEAPON GROUPS

Weapons	Degrees of Freedom	x^2	xy	y^2	SS of Dev. from Regr. (Error)	Degrees of Freedom	Mean Square
M1A1	108	3758.37	1125.22	1849.32	1512.41	107	-
XM19	108	3542.37	1418.89	3254.33	2685.94	107	-
M16	108	3607.27	1312.93	2853.19	2375.33	107	-
AK47	108	3699.25	1783.13	2934.81	2125.30	107	-
M60	108	3578.04	1581.66	2009.89	1310.72	107	-
.50 cal	108	3601.82	1338.25	3238.72	2741.49	107	-
	Pooled Error = S_1 = 12751.20					642	19.86
Within Weapons	648	21786.44	8560.07	16190.26	S_1+S_2=12826.94	647	19.83
Among Weapons	5	9.08	-21.52	830.29	S_3= 779.28	4	194.82
Total	653	21795.52	8538.55	17020.54	S_T=13675.51	652	-

$$F = \frac{\left(S_T - S_1\right) / 2(k-1)}{S_1 \Big/ \left(\sum_{i=1}^{k} n_i - 2k\right)}$$

where

k = the number of weapon groups

n_i = the number of observations (X,Y) in the ith weapon group

S_1 = pooled sum of squares of deviations from regression (pooled error)

S_T = total sum of squares of deviations from regression

The F-statistic was calculated to be F = 4.65 with ν_1 = 642 degrees of freedom and, since the probability of obtaining an F-value as large or larger than this is much less than .01 (if H_o is true), the hypothesis that both the slopes <u>and</u> the intercepts are equal was rejected.

2. Do regression slopes of groups estimate the same population slope? The null hypothesis was $H_o : \beta_1 = \beta_2 = \ldots = \beta_6$, and the test statistic was

$$F = \frac{S_2 \ / \ (k-1)}{S_1 \Big/ \left(\sum_{i=1}^{k} n_i - 2k\right)}$$

Since the calculated F = .76 was not significant at the α = .01 level, the hypothesis was not rejected and the conclusion was made that the regression slopes for the six weapons were the same.

Adjusting the individual regressions for common slope, the last question to be answered was:

3. Are individual regression intercepts the same? The hypothesis was $H_o : \alpha_1 = \alpha_2 = \ldots = \alpha_6$, and the test statistic was given by

$$F = \frac{\sum_{i=1}^{k} \left[\left(\hat{\alpha}_i - \bar{\alpha} \right)^2 \Big/ \left(\frac{1}{n_i} + \frac{\bar{x}^2}{\sum (x_1 - \bar{x})^2} \right) \right] \Big/ k - 1}{S_1 \Big/ \left(\sum_1^k n_i - 2k \right)}$$

The calculated F = 10.89 with five and 642 degrees of freedom was highly significant ($\alpha \leq .01$), the null hypothesis was rejected, and it was concluded that individual intercepts for the six regresssions were different.

Based on the last result, it was desirable to determine which pairs of intercepts ($\hat{\alpha}_i$, $\hat{\alpha}_j$) differed from one another. To accomplish this, a multiple comparison technique was used involving the so-called least significant difference (LSD), which is defined by

$$LSD = t_{(1-\alpha)\nu} \sqrt{V(\hat{\alpha}_i - \hat{\alpha}_j)} \qquad (i \neq j)$$

where

ν = the degrees of freedom associated with the variance used in $\hat{V}(\hat{\alpha}_i - \hat{\alpha}_j)$

$$V(\hat{\alpha}_i - \hat{\alpha}_j) = V(\hat{\alpha}_i) + V(\hat{\alpha}_j) = S_1^2 \left[\sum_{i=1}^{2} \frac{1}{n_i} + \frac{\bar{x}_i^2}{\sum(x_i - \bar{x})^2} \right]$$

(C) The absolute differences of all pairs of adjusted intercepts (adjusted for common slope) were compared with the LSD, and those exceeding the latter were judged to be significantly different. The results of these comparisons are presented in Table 5-12. The results indicate that the regression intercept for M1A1 is significantly smaller than those for XM19, M16, and AK47 rifles, but not different for the M60 and .50-caliber machineguns. The intercepts for the rest of the weapons do not differ significantly from one another.

TABLE 5-12 (C) PAIRWISE COMPARISONS OF REGRESSION INTERCEPTS (TABULAR VALUES ARE ABSOLUTE DIFFERENCES)

Weapon	$\hat{\alpha}$	1	2	3	4	5	6
1	1.0688		3.4495**	3.2208**	2.3329*	1.7339	1.7667
2	4.5183			0.2287	1.1166	1.7156	1.6828
3	4.2896				0.8879	1.4869	1.4541
4	3.4017					0.5590	0.5662
5	2.8027						0.0328
6	2.8355						

*Significant at α = .05.
**Significant at α = .01.

5.6 STUDY OF PERCEIVED DANGEROUSNESS OF LIVE-FIRE EVENTS: PHASE II-B

5.6.1 Rationale

(U) An analysis of interviews with nearly 200 combat veterans led to the conclusion that combat soldiers perceive a personal danger radius outside of which a passing round is heard but is not perceived as dangerous or as producing suppression. These interviews indicate that the length of the danger radius varies with the individual soldier, the weapon employed against him, the volume of fire, and the general situation at the time he receives incoming fire.

5.6.2 Objectives

(U) The primary objective of this study was to determine the differential perceived dangerousness of a variety of small arms weapons fired in various volumes of fire. In addition, the study was designed to assess the changes in perceived dangerousness of each weapon over a series of increasing lateral miss distances. Potential interactions between weapon, volume, and miss distance were also to be assessed.

5.6.3 Subjects

(U) The 10 soldiers employed in Phase II-A, Miss Distance Estimation (see Section 5.5.3), also served as subjects in Phase II-B.

5.6.4 Method

(U) The 10 subjects were seated in parallel columns, separated by a partition, facing the foward edge of the pit. (See

Figure 5-7.) The two columns were lined up on the midline of the pit, which coincided with the perpendicular line of fire from firing position 6 to target "3." On each trial, each subject was provided with a booklet containing a description of the scenario within which each live-fire event was to be judged. This scenario was the same for each event of each trial. The booklet also contained 21 rating scales, one for each event within a trial. The scenario/rating scale booklet was the same for each trial, and a copy of this booklet will be found in Annex B of this report.

(U) Prior to the first event of each trial, subjects were instructed on the method of judging the events. The zero point on the dangerousness scale was described as the individual being in the situation described in the scenario, but with no incoming live fire. Maximum dangerousness (6 on the scale) for the described situation was illustrated by firing simultaneously 10 rounds of M60 and 10 rounds of .50-caliber machinegun fire directly over the heads of the subjects. They were then instructed to rate the ensuing live-fire events in relation to the 0 and 6 anchor points.

(U) Each event consisted of the firing of a given weapon, with a given number of rounds, at a given lateral miss distance. The study was composed of 216 independent events. For ease of presentation, these events were presented in 14 trials. The number of events in a given trial varied because of restrictions on weapon movement within trials. The events within a trial were presented with a variable interevent interval averaging approximately 60 seconds. The intertrial interval was also variable, and averaged approximately 20 minutes. The 14 trials were presented in two consecutive days.

5.6.5 Independent Variables

(U) The independent variables employed in this study were weapon, volume of fire, and miss distance. The weapons employed were the XM19, M16, and AK47 rifles; and the M1A1, M60, and .50-caliber machineguns. Volume of fire was varied by firing 1, 3, or 10 rounds for a given event. The miss distances varied over six levels, namely, 0 through 15 meters lateral miss distance.

5.6.6 Dependent Variable

(U) The dependent variable in this study was the individual's rating of the perceived dangerousness of each live-fire event on the 0 through 6 dangerousness scale.

5.6.7 Experimental Design

(U) The experimental design was a 3×6×6 factorial, encompassing three volumes of fire (1, 3, and 10 rounds), six miss distances (0 to 15 meters in 3-meter increments), and six weapons (M1A1, XM19, M16, AK47, M60, and .50-caliber machinegun). A complete replication of this factorial called for 108 independent events. The 108 individual events in the factorial matrix were assigned to seven trials for ease of presentation. Assignment of events to trials was made as far as possible in a balanced manner, but the restriction on weapon movement within trials imposed by safety constraints, required seven trials of varying number of events to present all 108 events. Two complete replications were run, for a total of 216 events presented in 14 trials. Each subject was to participate in all 14 trials.

5.6.8 Results

(U) Ten subjects were assigned to participate in this study, but only seven completed all 14 trials. For ease of interpretation and reporting, only the data for these seven subjects will be presented in this section. It suffices to say that no significant changes in main effects were produced by analyzing the entire set of data in an unequal "N" analysis of variance.

(U) A 6×3×6 analysis of variance (ANOVA) was performed on the data produced by the seven subjects completing the perceived dangerousness experiment. The summary of this analysis is presented in Table 5-13. The F-values presented in the table for the three main variables were all significant at less than the .001 level of confidence. None of the interactions between sets of variables were found to be significant in this analysis.

(U) The significant F for the weapon's main effect obtained in the main ANOVA indicates that there are significant differences among the mean perceived dangerousness values for various pairs of weapons.

(U) A Sheffé test for pairwise contrasts was performed on the means of the six weapons groups. With five and 1404 degrees of freedom and an $\alpha = .01$, the minimum contrast value (critical value) necessary for significance was computed to be 0.38. The actual contrast values computed for each pair of weapons are presented in Table 5-14. The signs on the table entries represent the direction of the differences, and are based on subtraction of the weapon entry from the column entry. All signs are positive with the exception of the comparison of the M1A1 submachinegun to the XM19 rifle. The minus sign on

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TABLE 5-13 (U) ANOVA: PERCEIVED DANGEROUSNESS FOR SEVEN PLAYERS COMPLETING THE ENTIRE TEST

Source of Variation	Degrees of Freedom	Sums of Squares	Mean Square	F	p
1) Weapon	5	1068.67	213.73	178.10	<.001
2) Volume of fire	2	1196.46	598.23	498.52	<.001
3) Miss distance	5	37.98	7.60	6.33	<.001
1×2) Weapon × volume	10	14.67	1.47	1.22	NS
1×3) Weapon × miss distance	25	21.26	0.85	<1	NS
2×3) Volume × miss distance	10	15.78	1.58	1.31	NS
1×2×3) Weapon × volume × miss distance	50	29.57	0.59	<1	NS
Within replicates	1404	1686.71	1.20		
Total	1511				

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this comparison indicates that the XM19 has a smaller mean dangerousness rating than does the M1A1.

TABLE 5-14 (C) PAIRWISE CONTRASTS FOR WEAPONS

Weapon	XM19	M16	AK47	M60	.50-cal MG
M1A1	-0.50	+0.95	+1.18	+1.34	+2.00
XM19		+1.45	+1.68	+1.84	+2.50
M16			+0.23	+0.39	+1.05
AK47				+0.16	+0.83
M60					+0.66
Critical value for significance at α = .01 for (5, 1404 df) is 0.38.					

(C) From Table 5-14 it can be seen that only the comparisons of the AK47 with the M60 (+0.16) and the AK47 with the M16 (+0.23) fail to reach the |C| of 0.38 necessary for the demonstration of a significant difference in the mean perceived dangerousness for the two weapons. The table further points out that for a given weapon, its comparison with the XM19 shows the largest contrast values. This result leads to the conclusion that despite the "sonic crack" of the XM19 flechette, its characteristic loudness and pitch do not produce stimuli sufficient for the subjects of this experiement to rate the flechette's perceived dangerousness as being of high magnitude. The "heavier" subsonic "swoosh" of the .45-caliber projectile of the M1A1 submachinegun is, however, perceived as significantly more dangerous than the XM19 flechette, but significantly less dangerous than the projectiles of the other four weapons.

(U) The five degrees of freedom associated with the significant weapons' main effect were also partitioned into a set of orthogonal trend comparisons. Table 5-15 presents the trend comparisons based on an ordering of the weapons along with a

TABLE 5-15 (U) TREND COMPARISONS FOR THE WEAPON VARIABLE, WITH ORDER BASED ON CALIBER OF ROUND

Source of Variation	Degrees of Freedom	Sums of Squares	Mean Square	F	p
1) Weapon	5	1068.67	213.73		
Caliber					
Linear	1	347.54	347.54	289.61	<.001
Quadratic	1	37.67	37.67	31.39	<.001
Cubic	1	481.00	481.00	400.83	<.001
Residual	2	202.46	------	------	
Within Replicates	1404	1686.71	1.20		

caliber continuum. The order used was as follows: XM19, M16, AK47, M60, M1A1 (.45 caliber), and .50-caliber machinegun. The AK47 was placed before the M60 because, although they are nominally the same caliber, the AK47 bullet weight (122 grains) is less than that of the M60 (150 grains).

(U) The Fs associated with the linear, quadratic, and cubic trend comparisons for weapons are all significant at less than the .001 level of confidence. However, the largest F is associated with the cubic trend. This result was interpreted as indicating that caliber was not the best dimension on which to order the weapons for the trend analysis.

(C) In that the basis of comparison of the perceived dangerousness of the weapons employed in this study was the loudness of the passing projectiles, a second trend analysis was performed on the weapons, ordered according to perceived loudness of the projectiles. In this case, it was assumed that the subsonic nature of the M1A1 .45-caliber projectile would make its perceived loudness less than that of the other five supersonic projectiles which produced characteristic "sonic cracks." Thus, the order employed in this analysis was as follows: M1A1 (.45-caliber), XM19, M16, AK47, M60, and .50-caliber machinegun. The results of this analysis are presented in Table 5-16. The obtained F-value of 764.42 for linearity is highly significant ($p<.001$). The cubic trend, with F equal to 17.47, is also significant at less than the .001 level of confidence. However, a comparison of the F values for the linear and cubic trends in Tables 5-15 and 5-16 shows that the ordering of the weapons along a perceived loudness dimension reverses the relative positions of the linear and cubic trends. Where the cubic trend accounted for approximately 45 percent of the sum of squares for weapons and the linear trend 32 percent, in the caliber dimension,

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TABLE 5-16 (U) TREND COMPARISONS FOR THE WEAPON VARIABLE, WITH ORDER BASED ON LOUDNESS (SIGNATURE) OF ROUND

Source of Variation	Degrees of Freedom	Sums of Squares	Mean Square	F	p
1) Weapon	5	1068.67	213.73		
Loudness					
Linear	1	895.71	895.71	764.42	<.001
Quadratic	1	1.26	1.26	1.05	NS
Cubic	1	20.96	20.96	17.47	<.001
Residual	2	151.36	-----	-----	
Within Replicates	1404	1686.71	1.20		

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the linear trend accounts for approximately 84 percent of the total sum of squares and the cubic trend 2 percent, when weapons are ordered by loudness. Thus, despite the statistical significance of the cubic trend, it is concluded that perceived dangerousness predominantly increases in a linear fashion with increases in perceived loudness of projectiles.

(U) The significant F-value obtained in the main ANOVA for the volume of fire indicates that there are significant differences among the perceived dangerousness values for the volume of fire groups.

(U) A Scheffé test of pairwise contrasts was performed on the mean perceived dangerousness of each volume of fire. The critical value necessary to demonstrate a significant difference between the means of each pair at $\alpha = .01$, with 2 and 1404 degrees of freedom, was calculated to be 0.21. The results of this analysis show that the obtained values for all of the paired contrasts exceeded the critical value of 0.21, and are thus significant at less than the .01 level of confidence. This may be interpreted as indicating that with each increase in volume of fire employed in this study, there is a significant increase in the mean value of the perceived dangerousness for that volume of fire.

(U) The two degrees of freedom associated with the significant F for the volume of fire variable were also partitioned into an orthogonal trend comparison. With only two degrees of freedom, only a linear trend with one degree of freedom could be assessed. The second degree of freedom is associated with the residual variance. Table 5-17 presents the summary of this trend analysis. The sum of squares for linearity accounts for over 99 percent of the sum of squares for the volume of fire variable. The resulting F-value of 991.26 is highly significant ($p < .001$) and may be interpreted

TABLE 5-17 (U) TREND ANALYSIS FOR THE VOLUME OF FIRE VARIABLE

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F	p
2) Volume of fire	2	1196.46	598.23	498.52	<.001
Linear	1	1189.51	1189.51	991.26	<.001
Residual	1	6.95	6.95	5.79	<.05
Within Replicates	1404	1686.71	1.20		

as indicating that perceived dangerousness increases linearly, with increases in volume of fire. The significant F for the residual ($F = 5.79$ for df 1,1404) does not alter the conclusion that the predominant relationship between volume of fire and perceived dangerousness is linear, within the limits of this experiment.

(C) The lack of any significant interaction between weapons and volume of fire in the main analysis presented in Table 5-13, indicates that the obtained linear trend in perceived dangerousness over increasing volumes of fire can specifically be expected for all of the weapons employed in this test, and in general for all small arms of the type employed in this study.

(C) The significant F in Table 5-13 for the miss distance variable ($F = 6.33$, $p < .001$) indicates that there are significant differences among the mean perceived dangerousness for the six miss distances. Table 5-18 presents the summary of an orthogonal trend analysis performed on the miss distance data. Over 99 percent of the sum of squares for miss distance is accounted for by a linear trend in the data. The obtained F for linearity of 31.30 is significant beyond the .001 level of confidence. The quadratic and cubic components, as well as the residual have F values less than 1.0, and are nonsignificant. This result is interpreted as demonstrating that perceived dangerousness decreases in a linear fashion with linear increases in the lateral miss distances of passing projectiles. Since the main ANOVA in Table 5-13 shows no interaction between weapon and miss distance, it is further concluded that perceived dangerousness decreases linearly over increasing lateral miss distances, specifically for the weapons and distances employed in this test, and may be expected to do so in general for all weapons of the type employed in this study.

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TABLE 5-18 (U) TREND ANALYSIS FOR THE MISS DISTANCE VARIABLE

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F	p
3) Miss Distance	5	37.98	7.60	6.33	<.001
Linear	1	37.56	37.56	31.30	<.001
Quadratic	1	0.18	0.18	<1	NS
Cubic	1	0.16	0.16	<1	NS
Residual	2	0.08	0.04	<1	NS
Within Replicates	1404	1686.71	1.20		

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(C) Since no significant interaction was obtained in the main ANOVA for weapon by volume of fire by miss distance, a separate prediction equation of the following form was computed for each weapon:

$$\hat{Y} = \beta_o + \beta_1 X_1 + \beta_2 X_2$$

where

$\hat{Y}$ = predicted perceived dangerousness
X_1 = volume of fire (1,3,10 rounds)
X_2 = lateral miss distance (0 to 15 meters)

(C) The coefficients were estimated pooling the responses for each weapon over replications and subjects. Table 5-19 contains a summary of the results.

TABLE 5-19 (C) PREDICTION EQUATION COEFFICIENTS

Coefficient	Weapon Type					
	XM19	M1A1	M16	AK47	M60	.50 cal
β_o	1.5127	2.0506	2.8463	3.0748	3.7603	4.0823
β_1	0.1657	0.1977	0.2215	0.2364	0.1076	0.2092
β_2	0.0053	0.0303	0.0237	0.0333	0.0228	0.0412

(C) It can be seen that the order of the β_o coefficients is the same as the order of the perceived dangerousness of the weapons as obtained in the experiment. It is also of note that the β_1 (volume of fire) coefficients are considerably higher than the β_2 (miss distance) coefficients for each weapon. This is interpreted as indicating that volume of fire is of more importance in the production of perceived dangerousness than is miss distance, in this study. In fact, for all of the weapons, the predicted value of the perceived dangerousness scale is higher

for 10 rounds at 15 meters lateral miss distance, than for one or three rounds at zero meters.

(U) As a check on the validity of these prediction equations, the mean predicted perceived dangerousness rating for each weapon was compared to the mean value obtained for each weapon in the experimental data. For all weapons, the predicted values and the obtained values agree to the third decimal place.

(U) It was the opinion of both the subjects and the DSL analysts that the basic stimulus that allowed the subjects to perceive and note the dangerousness of the events in the field experiment was produced by the projectile signatures and not by the characteristics of the muzzle blasts of the weapons themselves. Therefore, an attempt was made to relate projectile characteristics to the perceived dangerousness of each "weapon."

(U) The obvious overt characteristic producing the perception of danger is the loudness of the signature of passing projectiles. The sensation of loudness, however, is a complex function, relating to both the physical parameters of the stimulus and the physiological apparatus of the ear. It was considered too complex a function to derive on the basis of the data obtained in this study. However, the loudness phenomenon is in part based on kinetic energy. As a first approximation to predicting perceived dangerousness from projectile characteristics, a regression based in part on the kinetic energy (K.E. = 0.5 MV^2) of each projectile at 150 meters was calculated.

This regression took the form

$$\hat{Y} = \beta_o + \beta_1 X_1 + \beta_2 X_2 + (\beta_3 / X_3)$$

where

$\hat{Y}$ = predicted perceived dangerousness
X_1 = volume of fire (1,3,10 rounds)
X_2 = lateral miss distance (0 to 15 meters)
X_3 = projectile kinetic energy $\times 10^{-6}$ (where M is in grains and V is in feet per second at 150 meters)

(U) The definition of X_3 was reached following a search among various combinations of the physical parameters of the projectile. X_3 was chosen since it was the only combination discovered with which perceived dangerousness varied regularly.

(U) The values of M and V at 150 meters for the projectiles employed in this study are presented in Table 5-20.

TABLE 5-20 (U) PROJECTILE VELOCITY, WEIGHT, AND KINETIC ENERGY

Projectile	Velocity at 150 meters, V	Weight in grains, M	K.E. $\times 10^{-8}$
.50 cal	2800 fps	709	27.79
M60	2200	150	3.63
AK47	1900	122	2.20
M16	2200	55	1.33
.45 cal	900	230	0.93
XM645 flechette	4300	10.2	0.94

The regression calculated is as follows:

$$\hat{Y} = 4.0218 + 0.2135X_1 - 0.0293X_2 - (21.5657/X_3)$$

The fit to the 1512 experimental data points is quite good, except for the .45-caliber and the XM645 projectiles. The regression inflates the perceived dangerousness for these two projectiles.

(U) A plot of the mean perceived dangerousness as a function of the kinetic energy of the projectiles is presented in Figure 5-11. For convenience, this figure is plotted in terms of K.E. $\times 10^{-8}$. As can be seen, the plot has an extreme bend produced by the inclusions of the .45-caliber and the XM645 projectiles. The regression equation given above "straightens" this curve, and hence tends to predict higher than expected values for the perceived dangerousness of the .45-caliber and XM645 projectiles. Therefore, it is suggested that this regression only be used to predict the effects produced by projectiles whose kinetic energy is greater than 200×10^{-8}, but does not exceed 2779×10^{-8} (as calculated using grains and feet per second).

5.7 IMPACT SIGNATURE EXPERIMENT: PHASE III

5.7.1 Rationale

(U) The results of the interviews conducted by the DSL staff with U.S. combat forces in Vietnam indicated that the visual signature of impacting small arms projectiles plays a significant part in the production of suppression under actual battle conditions. This potential importance of visual impact signature was not specifically pointed out in the results of the CONUS interviews and, consequently, the original three experiments proposed for this study (Phases I, II, and IV) employed only the auditory signature of projectiles passing in the air as the suppression stimulus. In view of the different significance given to the visual impact signature by the two interview samples, it was decided to conduct a test to determine if significant differences existed in the ability of auditory and visual projectile signatures to produce suppression.

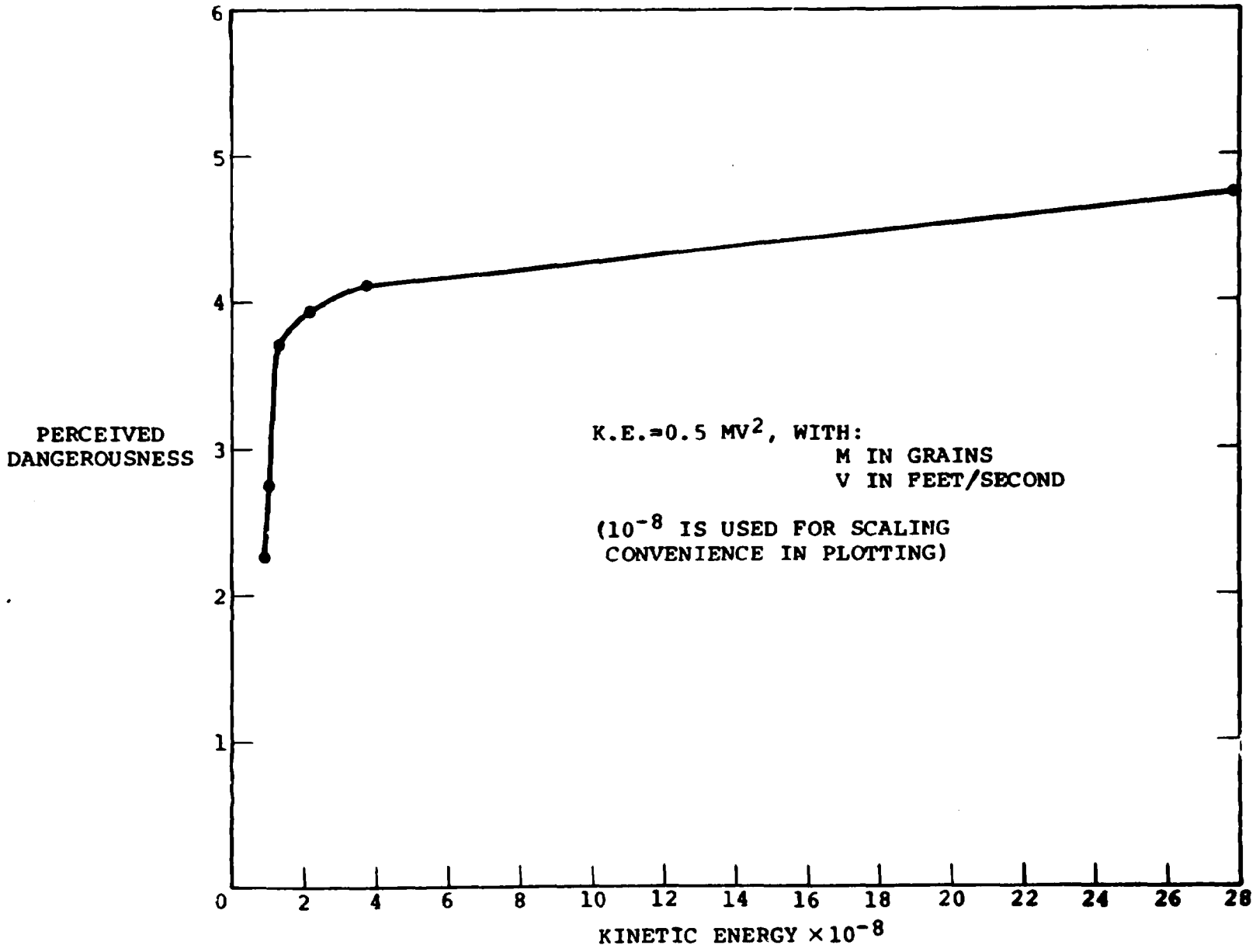

Figure 5-11 (U) Perceived Dangerousness as a Function of Kinetic Energy

5.7.2 Objectives

(U) The primary objective of this study was to determine the relative effectiveness of auditory and visual impact projectile signatures to produce suppression. The second objective of the study was to determine whether the signatures, either auditory or visual, produced by different weapons resulted in the production of different amounts of suppression.

5.7.3 Subjects

(U) Eight players from the available player pool served as subjects for this experiment. These subjects were selected to be equivalent to those subjects selected for the "policy capturing" phase of the field experiment (see Section 5.4.3).

5.7.4 Method

(U) In order to provide a safe viewing position for the subjects in this experiment, two wooden periscopes were emplaced at each end of the pit and angled toward the midline of the firing line. A bunker of plywood and sandbags was constructed around each pair of periscopes to protect the observers against ricochet. Overhead cover was provided by the periscopes themselves, which were built with a reverse slope. Details of the arrangement of the bunker and periscopes can be seen in Figure 5-8.

(U) The eight subjects for this study were assigned to two groups of four subjects each. Each group occupied the protective bunkers alternately with one man in each group assigned to each of the four periscopes. The individuals were instructed to observe each event through the periscope, and attend to both the visual and auditory phenomena which were produced. Figures 5-12 and 5-13 show visual signature through the periscope and from the firing line.

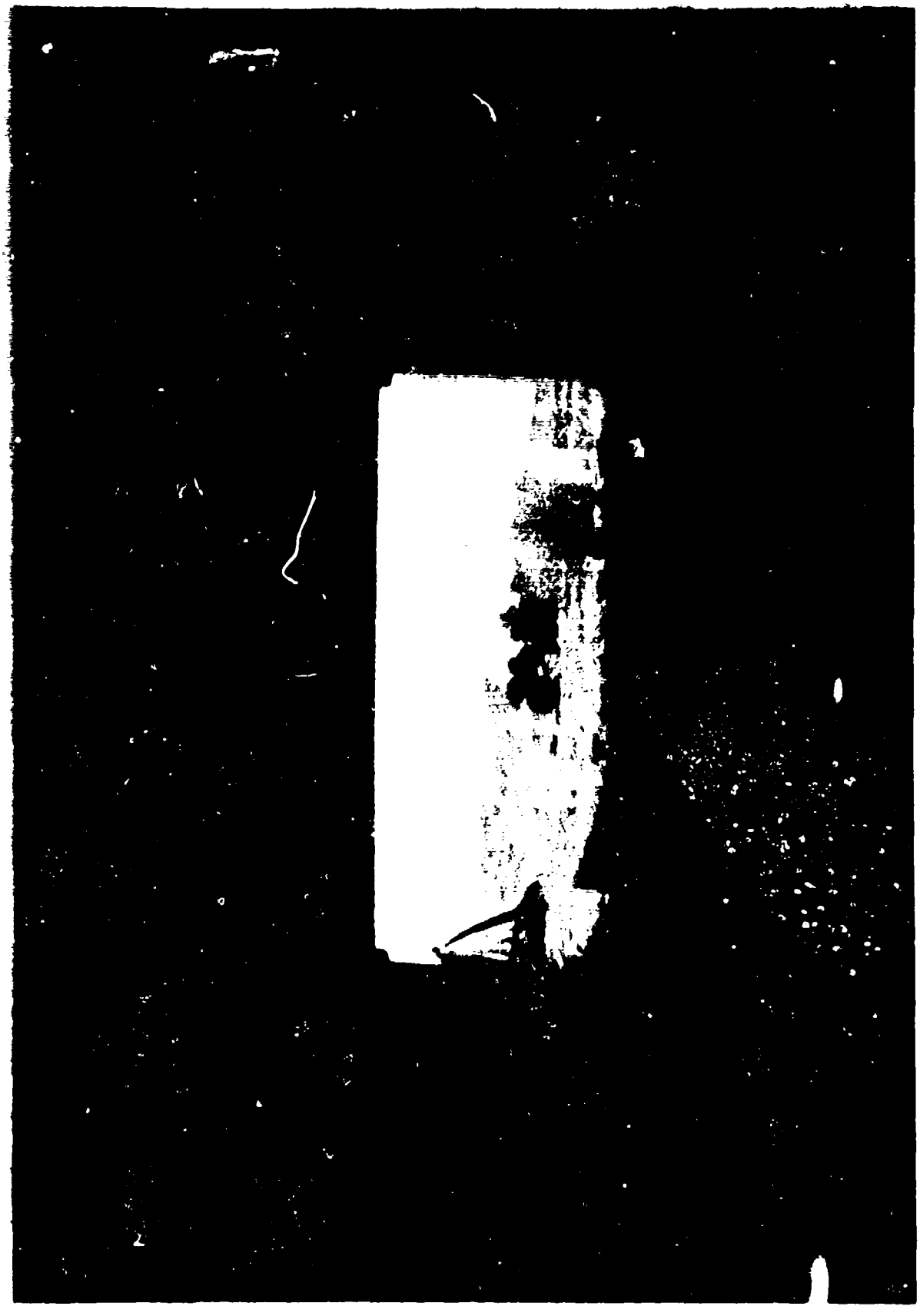

Figure 5-12 (U) View of Impact Signature Through Periscope

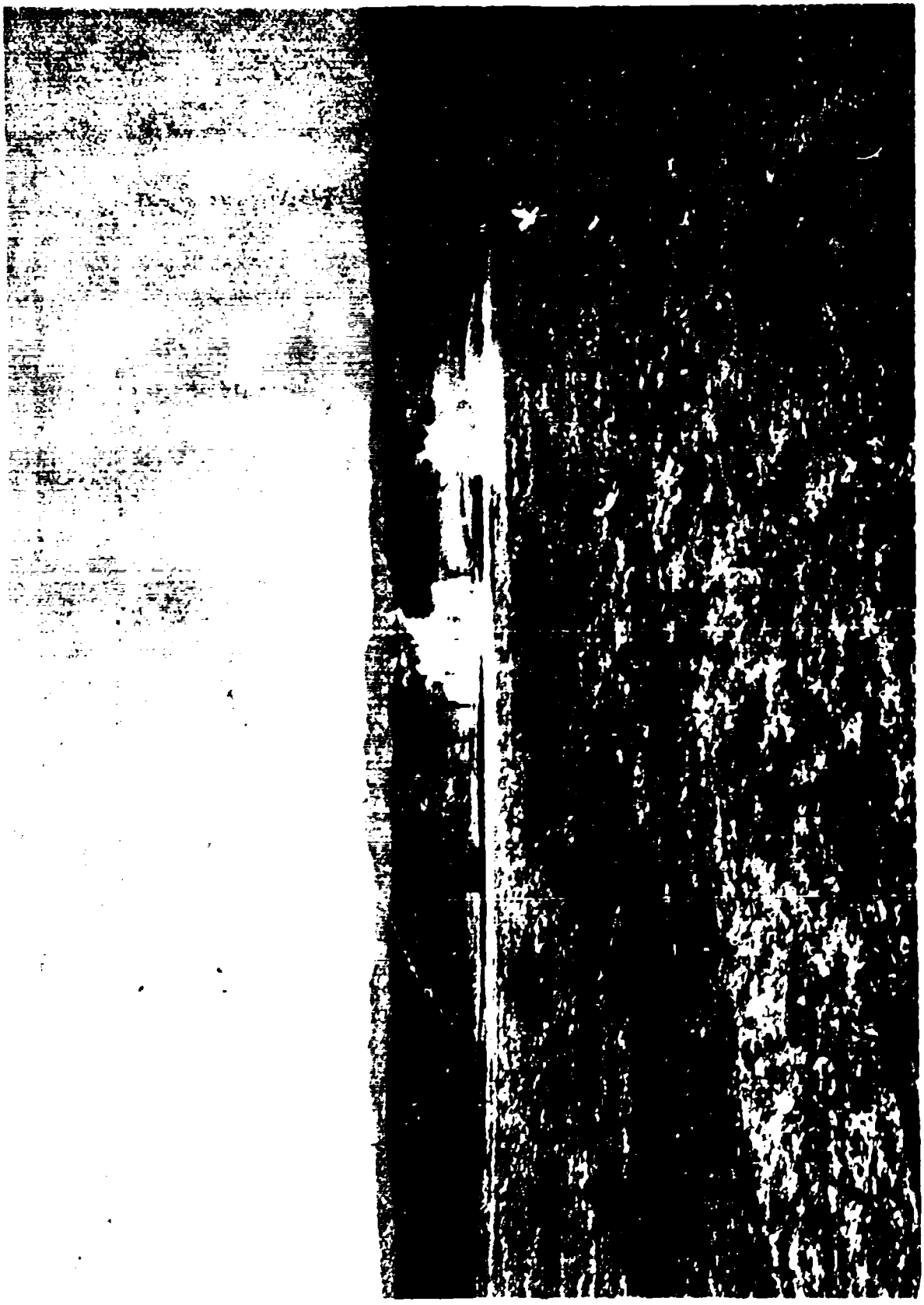

Figure 5-13 (U) View of Impact Signature at Target Area

(U) Following each event, the subjects were instructed to rate the suppressive quality of the event on the "suppression scale" developed for the "policy capturing" phase of the field experiment (see Section 5.4.5).

(U) An event in this experiment was composed of the firing of one type of weapon in one of the three signature modes. The auditory mode was produced by firing two consecutive 3-round bursts from a given weapon, over the midline of the pit, namely, firing from approximately firing position 6, over target "3." The visual impact signature was produced by firing two consecutive 3-round bursts from a given weapon, into the ground at an approximate aiming point 15 meters from the forward edge of the pit. The line of fire followed a perpendicular line from firing point 6 to target "3," with an aiming stake placed on this projected line at a distance of 135 meters from the firing point.

(U) The combined auditory/visual signature was produced by simultaneously firing two weapons of the same type. One weapon fired a single 3-round burst in the auditory mode, as described above. The other weapon fired a single 3-round burst in the previously described visual impact mode.

(U) During the course of this experiment, six of the subjects were tested for physiological responsiveness to the various live-fire events, while participating in the actual rating of the suppressive quality of these events. Physiological measurement was not initially planned for Phase III, but was enabled by the fact that Phase IV, Physiological Measurement, was actually conducted prior to the beginning of Phase III, Impact Signature. A full description of the physiological equipment and procedures will be found in Section 5.8. The results of such measurement in Phase III will be presented in Section 5.7.8.2, below.

5.7.5 Independent Variables

(U) The independent variables employed in this study were type of signature and weapons. Three signatures were employed, namely, auditory, visual impact, and/or combined auditory/visual signature. The weapons employed in the study presented a continuum of projectile size as shown below.

Weapon	Projectile Size
M16 rifle	5.56MM
M60 MG	7.62MM
M1A1 sub-MG	.45 cal
M2 (H.B.) MG	.50 cal

(U) Although the closeness of impacting rounds to the individual was considered to be of importance in the production of suppression, the constraints imposed on this test by safety considerations made it impossible to employ miss distance as a variable for the impact portion of this study. Consequently, miss distance was also excluded as a variable in the auditory portion of the test.

5.7.6 Dependent Variable

(U) The dependent variable of this experiment was the subject's rating of the suppressiveness of each live-fire event. The rating was made on the scale of suppressive behavior employed in Phase I of the field experiments. (See Section 5.6.6.)

5.7.7 Experimental Design

(U) The basic design for this study was a 4×3 factorial encompassing four weapons and three signatures. A trial

was composed of a single replication of the 12 events in the factorial matrix. A total of six replications of the factorial were run, three for each group of four subjects.

5.7.8 Results

(U) The results of the impact signature study is presented in two sections. Section 5.7.8.1 presents the analysis of the judgmental data taken from the scaled responses of the subjects. Section 5.7.8.2 presents the information obtained in this phase, through physiological measurement.

5.7.8.1 Results of Scaled Responses (U) The data for the Impact Signature Test was submitted to a 4×3 analysis of variance, using the Delphi values of the subjects' suppression scores as the dependent variable. (See Section 5.4.6 for scale description.) The results of this analysis are presented in Tables 5-21 and 5-22.

(U) Table 5-21 presents the overall analysis of variance. Significant F-values were obtained for both the weapon and signature main effects. This significant F for weapons ($F = 18.43$ for df 3,276; $p < .001$) indicates that there is a significant difference between the mean suppression values associated with each weapon. The significant F for signatures ($F = 4.59$ for df 2,276; $p < .005$) indicates that there is a significant difference between the mean suppression values associated with each signature. No significant interaction was obtained between weapon and signature.

(U) Table 5-22 presents a trend analysis based on the three degrees of freedom in the analysis of variance for the weapons effect. For this analysis, the weapons were ordered according to the assumed loudness of the projectile auditory signature, namely, M1A1, M16, M60, and .50-caliber machinegun. The results of this trend analysis shows a highly

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TABLE 5-21 (U) ANOVA: IMPACT SIGNATURE TEST BASED ON DELPHI SCALE VALUES OF 0-100*

Source of Variation	Degrees of Freedom	Sums of Squares	Mean Squares	F	P
1) Weapon	3	37,031.57	12,343.86	18.43	<.001
2) Signature	2	6,150.52	3,075.26	4.59	<.005
1×2) Weapon × Signature	6	319.84	53.31	<1	NS
Within Replicates	276	184,778.04	669.49		
Total	287	228,279.97			

*See Section 5.4.6 for description of Delphi scale.

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TABLE 5-22 (U) TREND COMPARISONS FOR THE ORDERED WEAPON VARIABLE, USING THE WITHIN REPLICATES MEAN SQUARE FROM THE ANOVA IN TABLE 5-21 AS THE ERROR TERM

Source of Variation	Degrees of Freedom	Sums of Squares	Mean Square	F	P
1) Weapon	3	37,031.57	12,343.86		
Linear	1	26,479.60	26,479.60	39.55	<.001
Quadratic	1	9,905.28	9,905.28	14.79	<.001
Residual	1	646.68	646.68	<1	NS
Within Replicates	276	184,778.04	669.49		

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significant linear trend ($F = 39.55$ for df 1,276; $p < .001$) and a smaller but still significant F ($F = 14.79$ for df 1,276; $p < .001$) for the quadratic trend. This quadratic component is accounted for by the fact that the trend comparison is based on the means of the weapons, summed across all three signatures. The M1A1 in the visual signature mode received a higher mean suppression scale value than did the M16 in the visual mode. This difference was large enough to make the overall mean of the M1A1 greater than that of the M16, despite the fact that the M16 received a higher mean suppression scale value than did the M1A1 in both the auditory and combined auditory/visual mode. Hence, the ordering of weapons as M1A1, M16, M60, and .50-caliber machinegun results in the deviation of a smaller but significant, quadratic trend for the data. Figure 5-14 shows somewhat of the "U" shape which is characteristic of data which contains a quadratic component. With both the linear and quadratic components significant, a better summation of the data is presented by the results of a Scheffé test for the differences in the mean scale values for each of the six possible pairs of weapons. The critical value required by this test to demonstrate a significant difference between pairs of means, at .05 level of confidence for 3 and 96 degrees of freedom, was calculated as 10.52. With a value of this magnitude, only the obtained differences in mean suppressive scale score for the .50-caliber machinegun, compared with each of the other weapons, was significant. No significant differences, therefore, were obtained between pairs of means for the M1A1, M16, and M60.

(U) A Scheffé test for multiple pairwise contrasts was also performed on the means of the three signature groups. The critical value needed to demonstrate significant differences

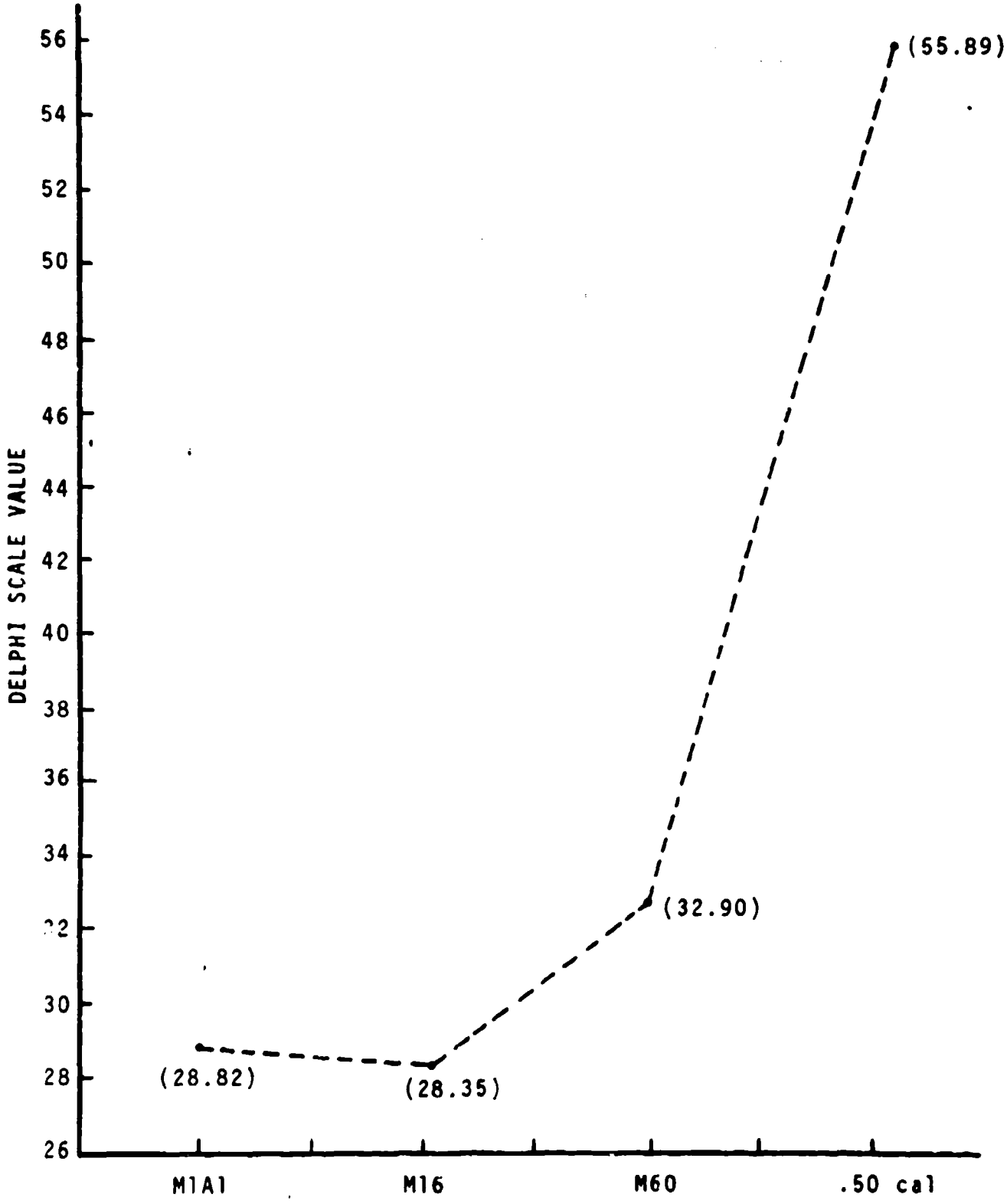

Figure 5-14 (U) Overall Mean Delphi Scale Suppression Values for Each Weapon

between pairs of means, with two and 276 degrees of freedom at $\alpha = .05$ was computed to be 9.14. The obtained values (c) for the three paired comparisons were:

c = 10.26 For the visual vs auditory comparison

c = 9.27 For the auditory/visual vs auditory comparison

c = 0.99 for the auditory/visual vs visual comparison

(U) Hence, there is a significant difference in the judged suppressive quality of the visual and auditory signatures in favor of greater suppressiveness for the visual. The combined auditory/visual signature is also significantly more suppressive than the auditory signature alone. However, no significant difference was obtained between the visual signature and the combined auditory/visual signature.

(U) Since the interaction between weapon and signature was nonsignificant in main ANOVA ($F < 1$), no paired comparisons were made among weapons within signatures. Figure 5-15 illustrates that such comparisons would only show the .50-caliber machinegun to have a significantly higher suppression scale value than any of the other weapons. The remaining comparisons would all be nonsignificant as previously indicated by the Scheffé test reported above for the comparison of the overall means of the weapons taken in pairs.

5.7.8.2 Results of Physiological Measurement (U) Physiological responses made by six subjects during Phase III were recorded for left forearm electromyographic (EMG) response and eye blink. Virtually no response to live fire was recorded from the left forearm electrode for any of the subjects. Consequently, no statistical analysis of EMG could be made. The eye blink response was much more readily recorded in this phase. A total of 72 eye blink responses to

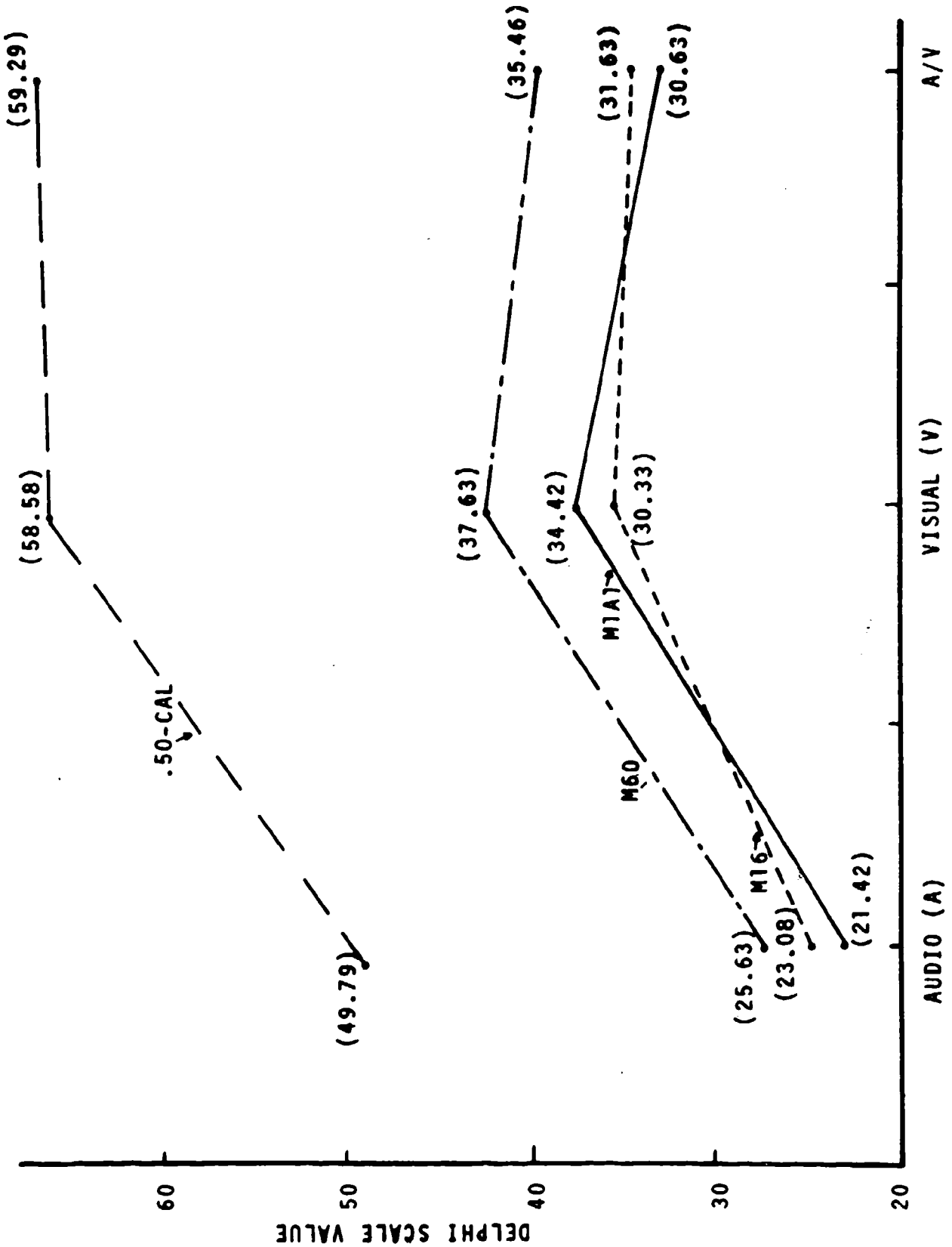

Figure 5-15 (U) Mean Delphi Scale Suppression Values for Each Weapon for Each Signature Mode

live-fire events were possible for the six subjects, based on 12 events per trial and each subject measured over one trial. Forty-two responses judged to be made in response to the live fire were recorded. Table 5-23 presents the breakout of these responses by weapon for each signature mode.

TABLE 5-23 (U) EYE BLINK RESPONSES

Weapon	Signature			Total
	A	V	A/V	
M1A1	1*	1	1	3
M16	5	1	4	10
M60	5	5	5	15
.50 cal	5	3	5	14
Total	16	10	16	42

*Cell entries are total number of responses per condition; observations per cell equal 6 with all six subjects tested under all conditions.

(U) In general, there was less responsiveness shown to the visual signature than to either the auditory or auditory/visual signature which were, themeselves, equal. (The values for signatures are based on the column totals in Table 5-23 and are pooled over weapons.) Although a chi-square test for frequencies indicates that these differences are not significant, it was interpreted that the auditory aspect of the signature is a better stimulus for eye blink than is the visual signature.

(U) The frequency of response to the individual weapons pooled over signatures are presented in the row totals of Table 5-23. A chi-square test of the hypothesis that the

frequency of eye blinks should be equally distributed over the four weapons was reflected at the .05 level of confidence. The obtained chi-square was 8.48 with three degrees of freedom. This result may be interpreted as indicating that there is an underlying difference in responsivity to the various weapons as measured in this study by eye blink response.

(U) The overall 4×3 table of frequencies (Table 5-23) was submitted to chi-square analysis. The obtained chi-square value of 2.25 with six degrees of freedom is nonsignificant. This result may be interpreted as indicating that for this sample there is no interaction between weapon and signature in the production of eye blink. It might be pointed out that this lack of interaction between weapon and signature is also shown for the scaled suppression responses presented in Table 5-21.

5.8 PHYSIOLOGICAL MEASUREMENT: PHASE IV

5.8.1 Rationale

(U) The DSL interpretation of the human behavior labeled as suppression is that it is composed of two sequential processes. The first process, initiation, is considered as reflex in origin, while the second process, maintenance of suppression, is considered to be essentially a learned response.

(U) Initiation of suppression begins with the production of an alerting stimulus. This stimulus is typically auditory in nature and may be composed of the auditory signature of an incoming projectile, the muzzle blast of a weapon, or a combination of both. In addition, the visual aspects of muzzle blast (flash or smoke) or the visual signature of impacting projectiles may contribute to the total alerting stimulus complex.

(U) The application of the alerting stimulus complex (to be called the alerting stimulus for simplicity) results in the evocation of a reflex response. This reflex may be a simple orienting response with attendant eye blink, minor postural adjustments, and some slight tensing of major muscle groups. However, it may also take the form of a startle response, which is composed of gross overt contraction of skeletal muscles, attendant body movement and postural change, accompanied by the evocation of autonomic responses such as change in heart rate, blood pressure, respiration rate, and increased tension in small muscles of the stomach and the anal sphincter.

(U) It is the opinion of the DSL analysts that a continuum of physiological responsiveness exists between the simple orienting response and the gross startle response. It is further postulated that the point on the continuum manifested by any individual in a combat situation, all other factors being equal, will be a function of the intensity of the alerting stimulus, such intensity being determined by the characteristics (e.g., type of weapon, volume of fire, proximity of incoming rounds) of the live fire the individual experiences. In order to test these hypotheses, DSL proposed to measure the physiological responsiveness of soldiers in a live-fire field experiment.

5.8.2 Objectives

(U) The primary objective of this experiment was to determine whether individuals show differential physiological responsiveness to the firing of various combinations of weapon type, volume of fire, and proximity of incoming rounds. A second objective was to determine whether prior combat experience influenced the responsiveness shown by the subjects in the field experiment.

5.8.3 Subjects

(U) Twenty Army enlisted men served as subjects in this phase of the field experimentation. Ten of the subjects were Vietnam combat veterans, provided by USACDCEC from the original player pool. (See Section 5.3.) The other 10 subjects were without combat experience and were obtained from a Fort Ord basic training unit on the eighth day after their induction into the Army. The former group is hereafter referred to as the Combat Experienced Group (E) and the latter as New Troops (N).

5.8.4 Method

(U) The 20 subjects employed in this phase of the field experimentation were tested individually. A subject was seated in the pit on the perpendicular line from firing position 6 to target "3," facing the leading edge of the pit. The subject was wired with electrodes which ran to a polygraph positioned in the pit behind a wooden partition. The subject then experienced a single trial of 20 live-fire events.

(U) The subject was instructed to relax and wait for a live-fire event. When the subject's polygraph record showed a relatively stable baseline, the firing line received a signal to fire the event. In order to prevent cueing the subject to the onset of the event, the polygraph was allowed to run throughout the entire trial, with the recording speed set at 10 mm/second. Following each event, the subject was asked to rate the perceived dangerousness of the event on the 0 to 6 dangerousness scale. (A description of this scale and its use is found in Section 5.6.6 of this report.) After making the rating, the subject was again asked to relax, and when a baseline was again achieved in the recordings, another event was presented. This procedure continued for 20 events.

(U) In order to facilitate the rapid return of the trainees to the Training Command, the 10 trainees were tested, consecutively, prior to the testing of the 10 combat veterans.

5.8.5 Independent Variables

(U) The independent variables employed in this study were weapon type, volume of fire, and lateral miss distance of passing projectiles. Five weapons were employed, namely, XM19, M16, and AK47 rifles; and the M60 and .50-caliber machineguns. Volume of fire was presented at two levels: single-round and 3-round burst. Lateral miss distance varied at two levels: 0 and 6 meters. As in the other phases of the field experiment, the height of passing rounds was approximately 2 meters over the top of the pit.

Because of an inadvertent shortage of XM19 ammunition, the combat experienced subjects had the M1A1 .45-caliber submachinegun substituted for the XM19 in this study.

5.8.6 Dependent Variables

(U) The primary dependent variable in this study was the measured physiological response of each subject to the live-fire events. These responses included the measurement of electromyographic (EMG) response from the neck, shoulder, and forearm of each subject, and the frequency of occurrence of eye blinks during each live-fire event. A description of scoring procedures for the physiological responses is presented in Section 5.8.9 below. In addition, the perceived dangerousness scores obtained from each subject for each event were used as a dependent variable.

5.8.7 Experimental Design

(U) The basic experimental design employed in this study was a 2×5×2×2 factorial, encompassing two groups of subjects, five weapons, two volumes of fire, and two lateral miss distances. Each group of subjects contained 10 individuals, and the study was conducted as 20 replications of the 2×5×2×2 factorial.

5.8.8 Instrumentation

(U) All physiological responses, time marks, and records of the occurrence of the "stimulus" events were recorded on an eight-channel Beckman Type R-411 Dynograph Recorder, located in the pit. Three channels were allocated to displaying direct EMG activity, three to the simultaneous display of "integrated" EMGs, one to the display of eye blink activity and one to the display of the "stimulus" event. The Dynograph Recorder is shown in Figure 5-16.

(U) The display of the occurrence of the stimulus event was effected through the use of a round-counting device provided by USACDCEC Instrumentation Division. This device consisted of a microphone and a pulse converter unit. The microphone was placed in front of and below the muzzle of the weapon to be fired. (See Figure 5-17.) Each round fired induced a current or pulse in the microphone which was conducted over hard wire to the converter unit. (See Figure 5-18.) This unit was basically a binary "flip-flop" relay and amplifier which switched the output voltage between 2 volts dc and 8 volts dc with each pulse received from the microphone. Since the output unit put out a constant voltage for each stage of the binary unit, the occurrence of an event could be displayed on the Beckman Dynograph by wiring a pen to the output of the round-count device. The point of initiation

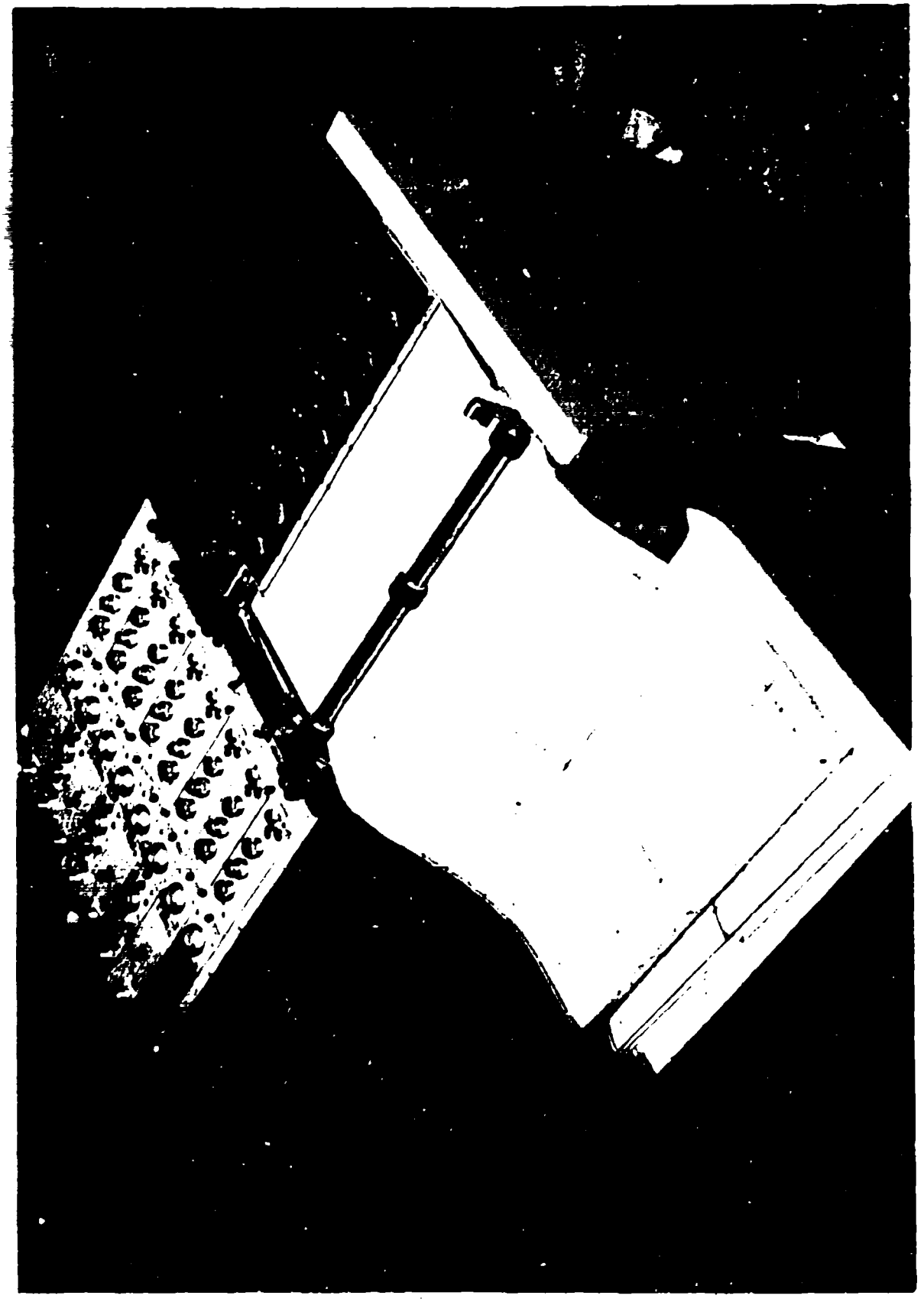

Figure 5-16 (U) Beckman Type R-411 Dynograph Recorder

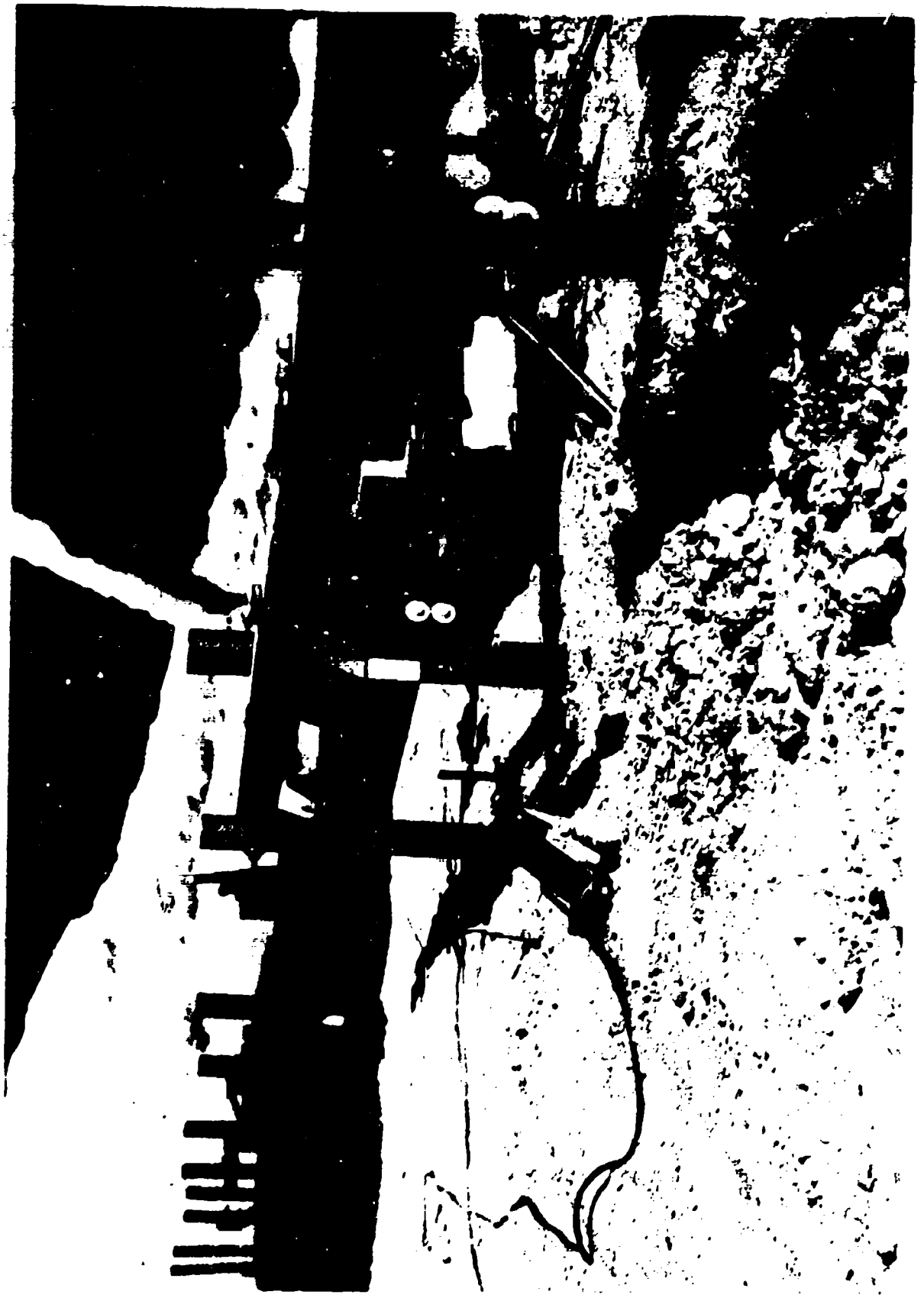

Figure 5-17 (U) Round-Counting Device's Microphone Shown in Front of M60 Machinegun

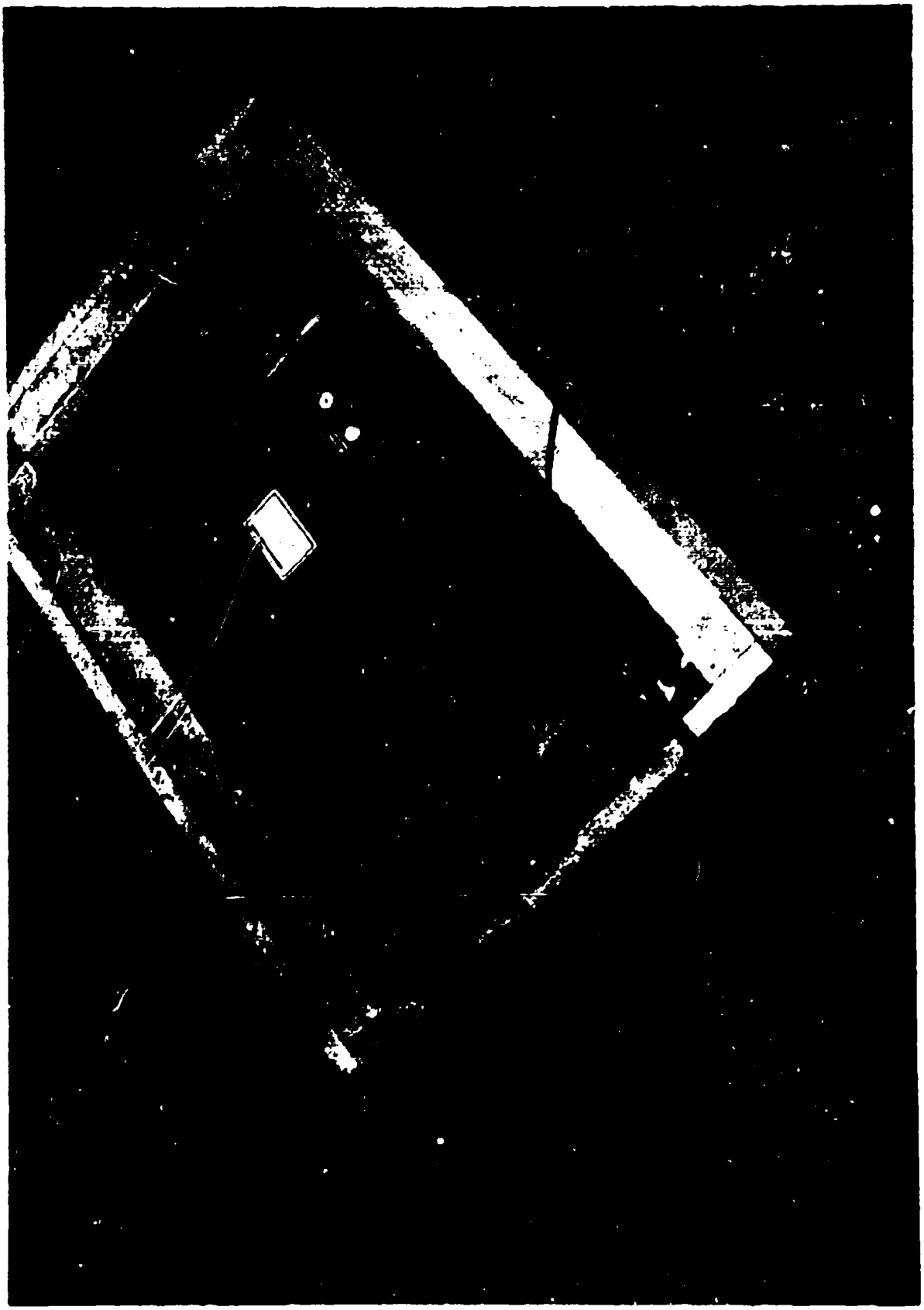

Figure 5-18 (U) Round-Counting Device's Converter Unit

of an event would then be represented by the offset of the event pen from whichever voltage line it wrote prior to the event. That is to say that if the binary output relay was transmitting 8 volts dc, the first round of a trial would drop the line voltage to 2 volts dc with the attendant offset of the event pen from the 8-volt line. Similarly, a pre-event state of 2 volts dc would be raised to 8 volts dc with the first round of an event, and the pen would offset correspondingly.

(U) Bioelectric potentials produced by EMG and eye blink were picked up via Beckman Number 650418 Skin Electrodes, and transmitted by hard wire to the Beckman R-411 Dynograph Recorder. The electrodes were monopolar, with 16-mm-diameter active recording surfaces. As such, a set of three electrodes was needed for each response pickup. Two of the three electrodes were active leads, and the third was a reference lead placed specifically to facilitate the recording of the potential changes between the active leads. The placements for the electrodes is described in Table 5-24. Figure 5-19 shows a "wired" subject. The actual placements of each of the set of three leads can be seen for picking up eye blink and forearm EMG.

(U) For the display of EMG activity, bioelectric potentials for one placement were conducted simultaneously to a Beckman Type 9852A Direct-Average EMG Coupler used in the direct mode and a Type 9873B Resetting Integrator Coupler used in the total + mode. The signal from each coupler was in turn led through a Beckman Type 481B Preamplifier and a Beckman Type 411 Amplifier for display through an ink-writing oscillograph unit. This arrangement permitted the simultaneous display of the direct electromyographic activity as picked up at the electrode placement and an "integrated" display of that activity.

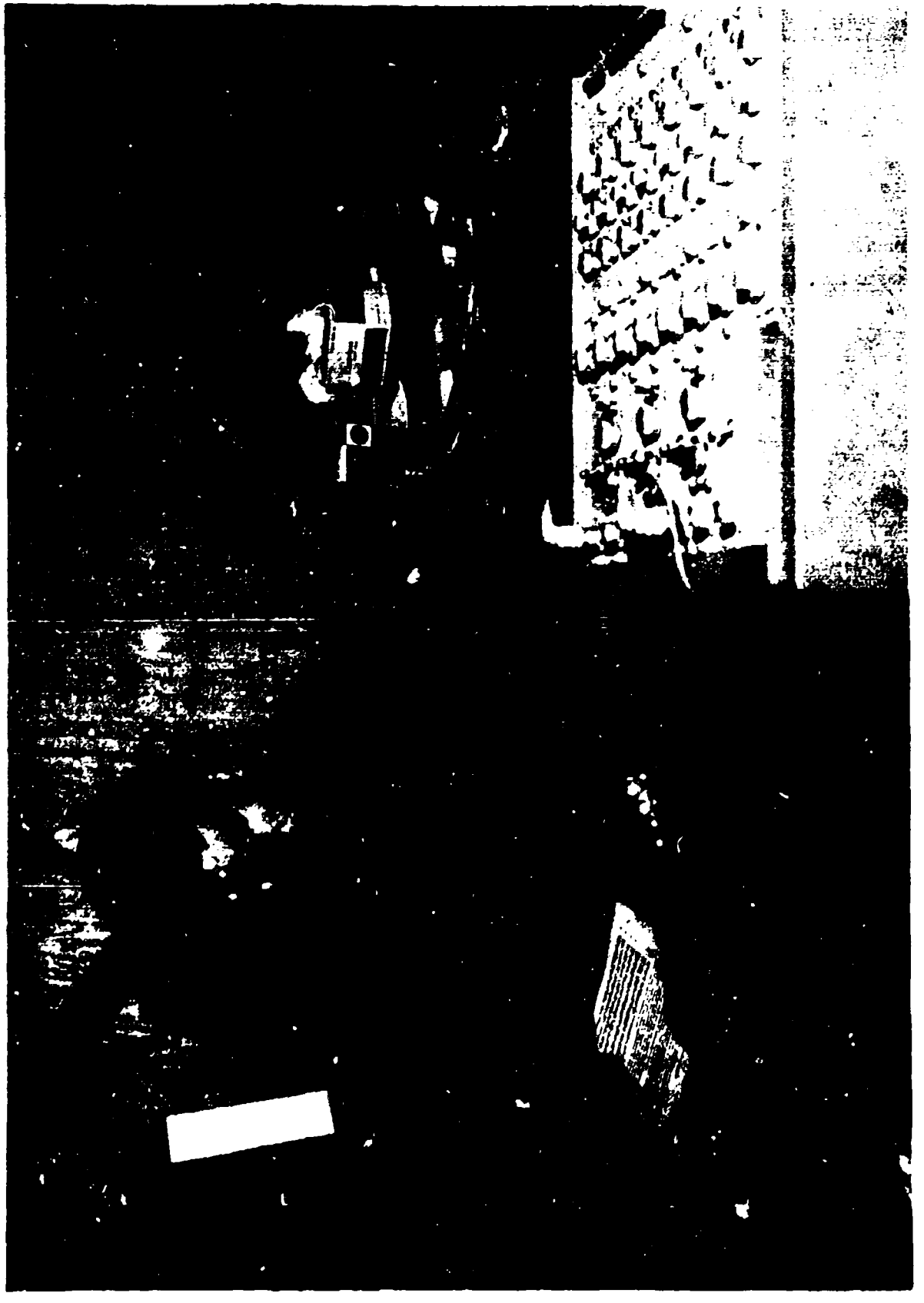

Figure 5-19 (U) Test Subject "Wired" for EMG Response Experiment

(U) Eye blink activity was recorded through a Beckman Type 9857A Direct-Average EM6 Coupler used in the direct mode. The preamplifier-amplifier units were Beckman Types 481B and 411, respectively. An example of the type of record obtained through this system is shown in Figure 5-20. Figure 5-21 presents a schematic configuration of the instrumentation.

TABLE 5-24 (U) ELECTRODE PLACEMENTS

Electrode	Electrode Placement (Anatomical Locos)	Electrode Placement (Common Term)*	Reference Electrode Placement	Number of Subjects
1	Rt. Pectoralis Major (sternal portion: 10 cm lateral of the sternum)	Chest	Clavicle	5
2	Rt. & Lt. Trapezious (2 cm either side of the midline)	Neck	Spine	10
3	Deltoid (at the shoulder)	Shoulder	Acromion Process	10
4	Lt. Flexor Corpi Ulnaris (4 cm below the elbow)	Forearm	Elbow	20
5	Rt. eye (on the orbital ridges above and below the eye)	Eyeblink	Forehead	20

*Denotes the term used hereafter to describe the electrode placement.

5.8.9 Event Scoring Procedures

(U) Figure 5-20 displays Dynograph records of two types of bioelectric events that were used for scoring, namely, EMG and

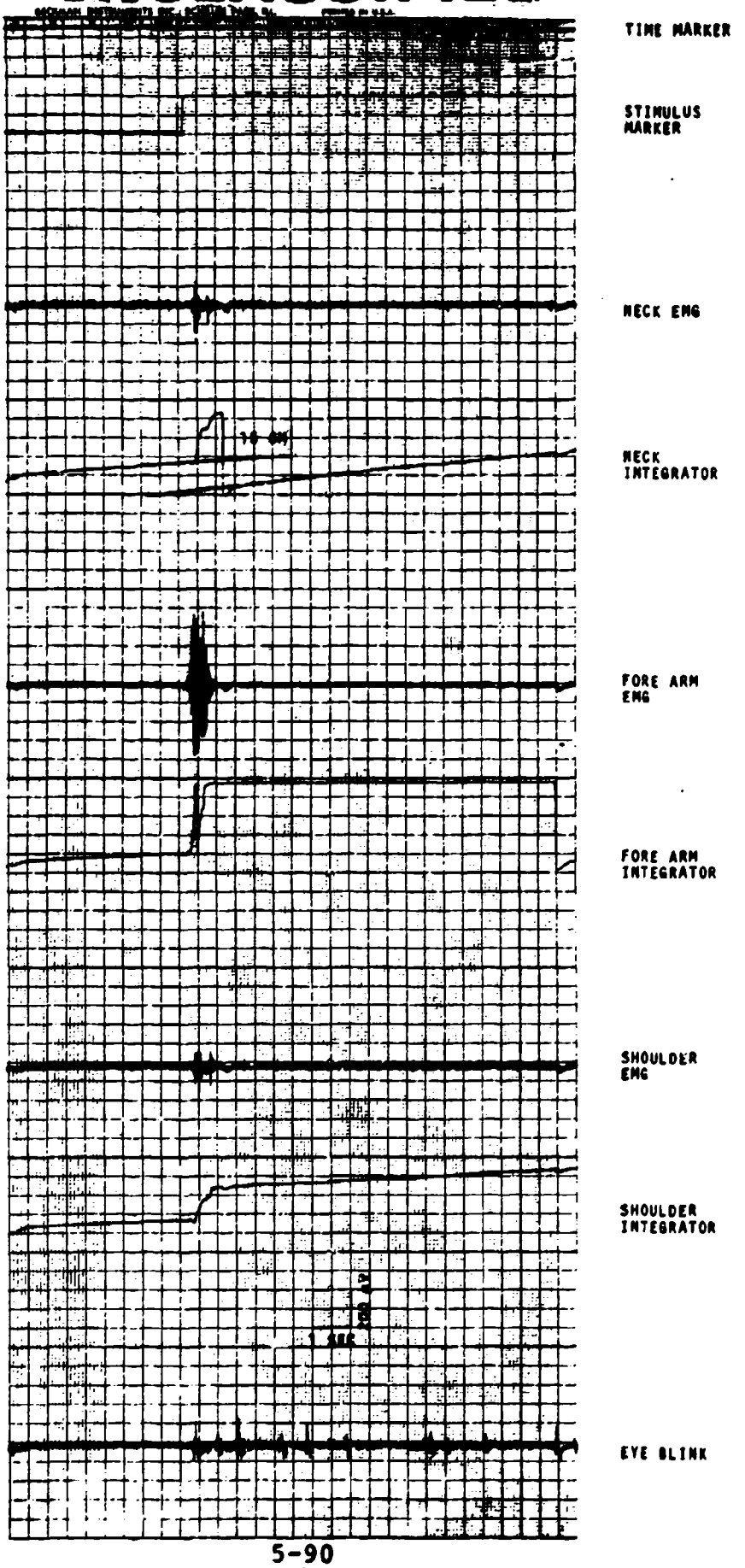

Figure 5-20 (U) Typical Physiological Response Recording

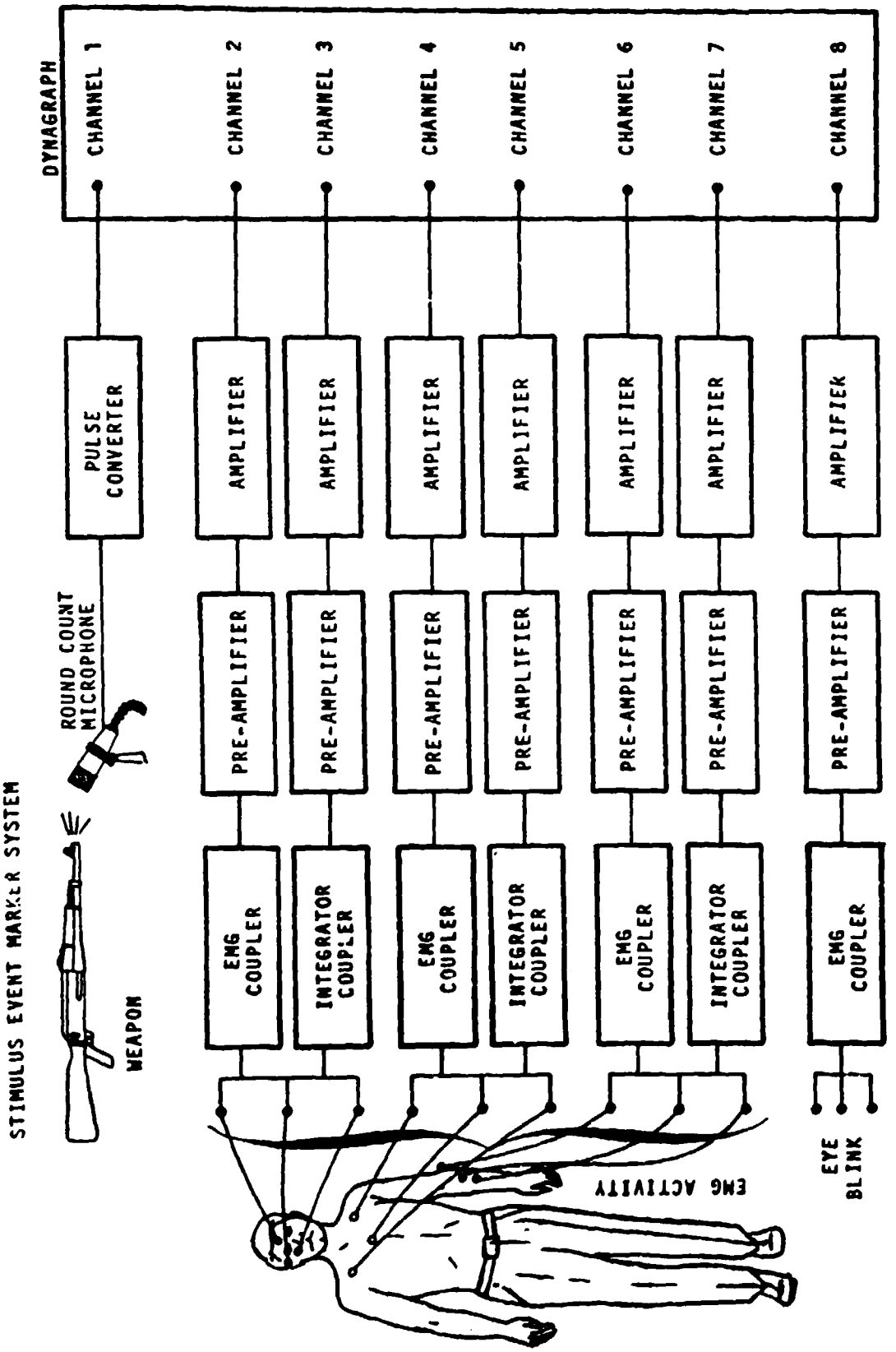

Figure 5-21 (U) Physiological Experiment Instrumentation

eye blink. EMG activity for a placement was scored through a quantification of the output of the integration coupler for that placement. Eye blink was scored on a 0-1 basis for each event.

(U) The Beckman integrator coupler provides an easily quantified index of EMG activity displaying, in on-deflection of the stylus from a baseline, a direct index of the volt/second activity contained within the EMG activity. For ease of scoring only, the positive (upward pen deflection) component of the EMG activity was used for "integration." For this study an EMG response was quantified by measuring the centimeter deflection of the integrator channel pen from a predetermined baseline of activity. A response was defined as any deviation of the integrator channel pen from baseline occurring within 1 second after the occurrence of the stimulus as indicated by the deflection of stimulus channel pen. The response was considered to continue until the integrator channel pen indicated a return to baseline activity. Baseline was determined by laying a ruler along the pen record and projecting the pen track through the 1-second period after the stimulus occurrence. In this way both baseline activity and integrator "drift" were considered in scoring responses.

(U) For eye blink activity, a response was defined as stimulus related if it occurred between 200 and 400 msec, after the stimulus channel pen deflection. This time interval was used to reduce the scoring of nonstimulus related blinks by reflecting that interval in time when an unconditioned response to the stimulus should occur, considering the time lag for the projectile to arrive overhead and the average latency of the eye blink response. To facilitate scoring, each subject was initially asked to blink several times on command while a Dynograph record was being made. In this way the bioelectric depiction characteristic of an individual's eye blink was obtained for comparison in scoring.

5.8.10 Results

5.8.10.1 Eye Blink Analysis (U) The data for the eye blink response takes the form of frequency data, and is displayed in Table 5-25. As previously indicated, the eye blink was scored on an all-or-none basis, with each subject experiencing each weapon four times in a given trial. Hence, the row totals for each matrix presented in Table 5-25 has a maximum value of 40, i.e., four responses for each of 10 subjects. The cell entries in each matrix are the total eye blink responses scored under the specific conditions.

(C) The basic statistical test applied to this data was the Chi-Square Frequency Test (χ^2). None of the χ^2 tests applied to this data attained customary levels of significance. There were, however, certain trends apparent in the data which warrant discussion. In viewing row and column totals for the four weapons common to both groups of subjects, it appeared that the experienced group showed a differentiation in responses not shown by the new troops. The experienced group showed an increase in the overall number of eye blinks as a function of an ordering of the weapons as "M16, AK47, M60, and .50 caliber"; a dimension that could be called either "caliber of projectile" or "projectile loudness (i.e., crack)." Further, this group of subjects showed more responses to the 0-meter miss distance than to the 6-meter miss distance. Number of rounds had no apparent differential effect.

(C) The new troops showed little differentiation in overt responsiveness as a function of weapons, miss distance, or number of rounds fired. They also showed essentially the same total responses as did the experienced troops. The new troops did show less responsiveness to the XM19 than they did to any of the other weapons. Similarly, the experienced troops showed less responsiveness to the M1A1 than to any other weapon.

TABLE 5-25 (C) EYE BLINK RESPONSES - PHASE IV

Combat Experienced	0 m		6 m		
	1	3	1	3	
M16	*6	4	3	3	16
AK47	8	5	4	3	20
M60	7	7	3	5	22
.50 cal	6	7	6	6	25
Totals	27	23	16	17	83

New Troops	0 m		6 m		
	1	3	1	3	
M16	6	4	3	7	20
AK47	5	5	7	3	20
M60	5	5	5	6	21
.50 cal	5	6	5	5	21
Totals	21	20	20	21	82

Combat Experienced	0 m		6 m		
	1	3	1	3	
M1A1	1	0	0	1	2

New Troops	0		6		
	1	3	1	3	
XM19	0	3	2	4	9

*All cell entries are total eye blinks per condition; observations per cell equal 10 with each of 10 subjects tested under all conditions.

(C) Figure 5-22 depicts the eye blink data displayed for comparison of the responsiveness of the two groups of subjects as a function of the weapon employed and miss distance. For each of the four weapon groups, a 2×2 χ^2 was computed and entered on the figure. None of these values reached customary levels of significance. In all cases except for the M1A1, however, the experienced group shows a tendency to be less responsive to rounds fired at a miss distance of 6 meters than 0 meters. The new troops, however, do not appear to show differential responses to either weapon or miss distance variations.

(C) Figure 5-23 shows the eye blink data for comparison of the responsiveness of the two groups of subjects as a function of number of rounds. Again, tests showed no significance for the 2×2 comparisons nor was there any consistency in trends apparent in the data. For two weapons, (M16, AK47) experienced subjects showed decreasing responsiveness as the number of rounds increased, and for two (M60, .50 caliber) increasing responsiveness. New troops showed increases for four weapons, XM19, M16, M60, and the .50 caliber machinegun, and a decrease for the AK47.

(C) One may conclude from this lack of significant effects in the eyeblink response analysis that this response is not an adequate measure for detecting differences in the ability of weapons to produce the initial reflex response proposed by DSL as the precursor to the learned response of maintenance of suppression.

(U) On the other hand, if one accepts that generally in combat there is an underlying state of emotional reactivity (fear) and a lessened threshold for elicitation of response in the individual, then the relatively safe environment of the present test may account for this evocation of only approximately

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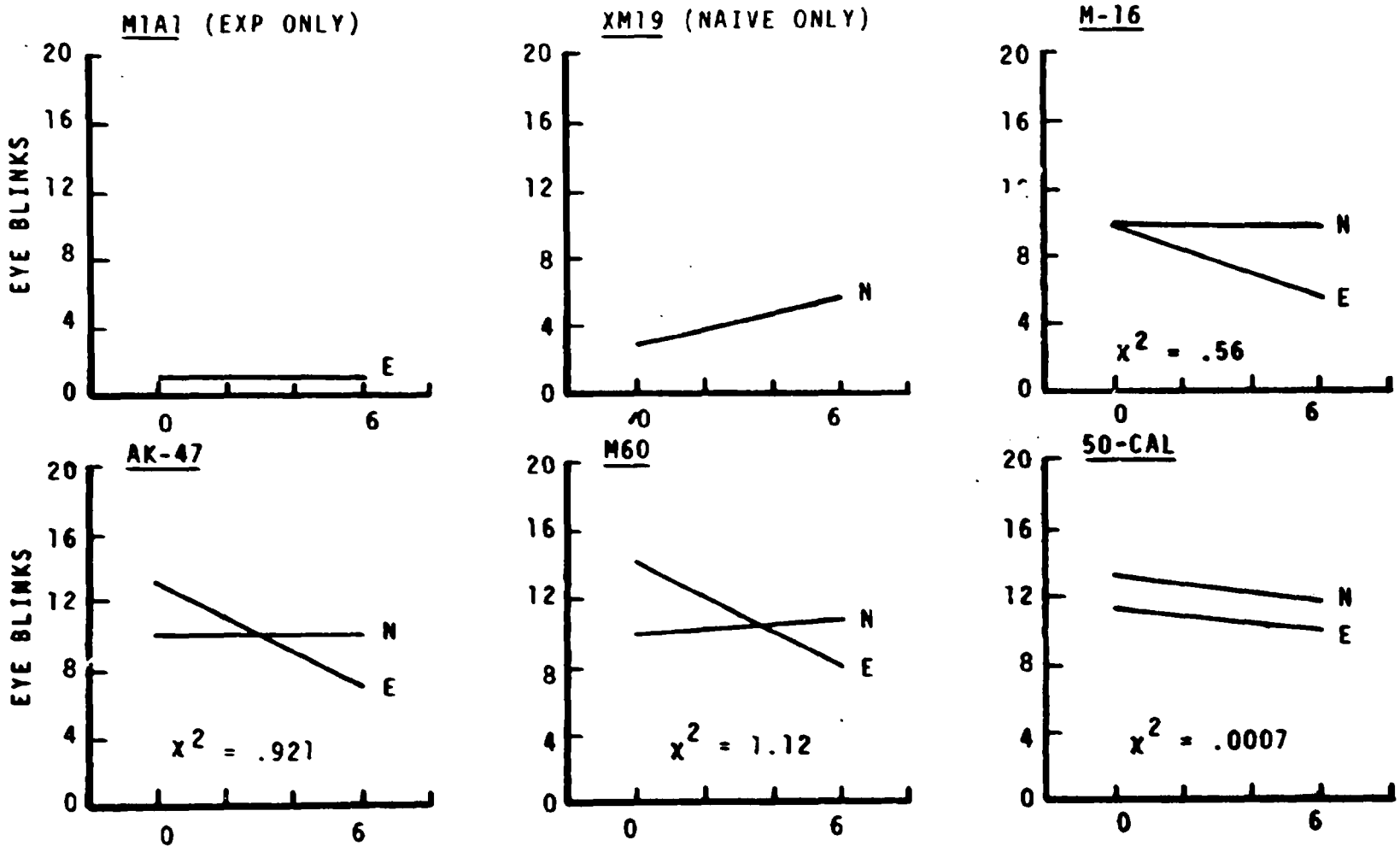

E = EXPERIENCED SUBJECTS
N = NAIVE SUBJECTS

Figure 5-22 (C) Eye Blink Data for Miss Distance by Groups, for Each Weapon

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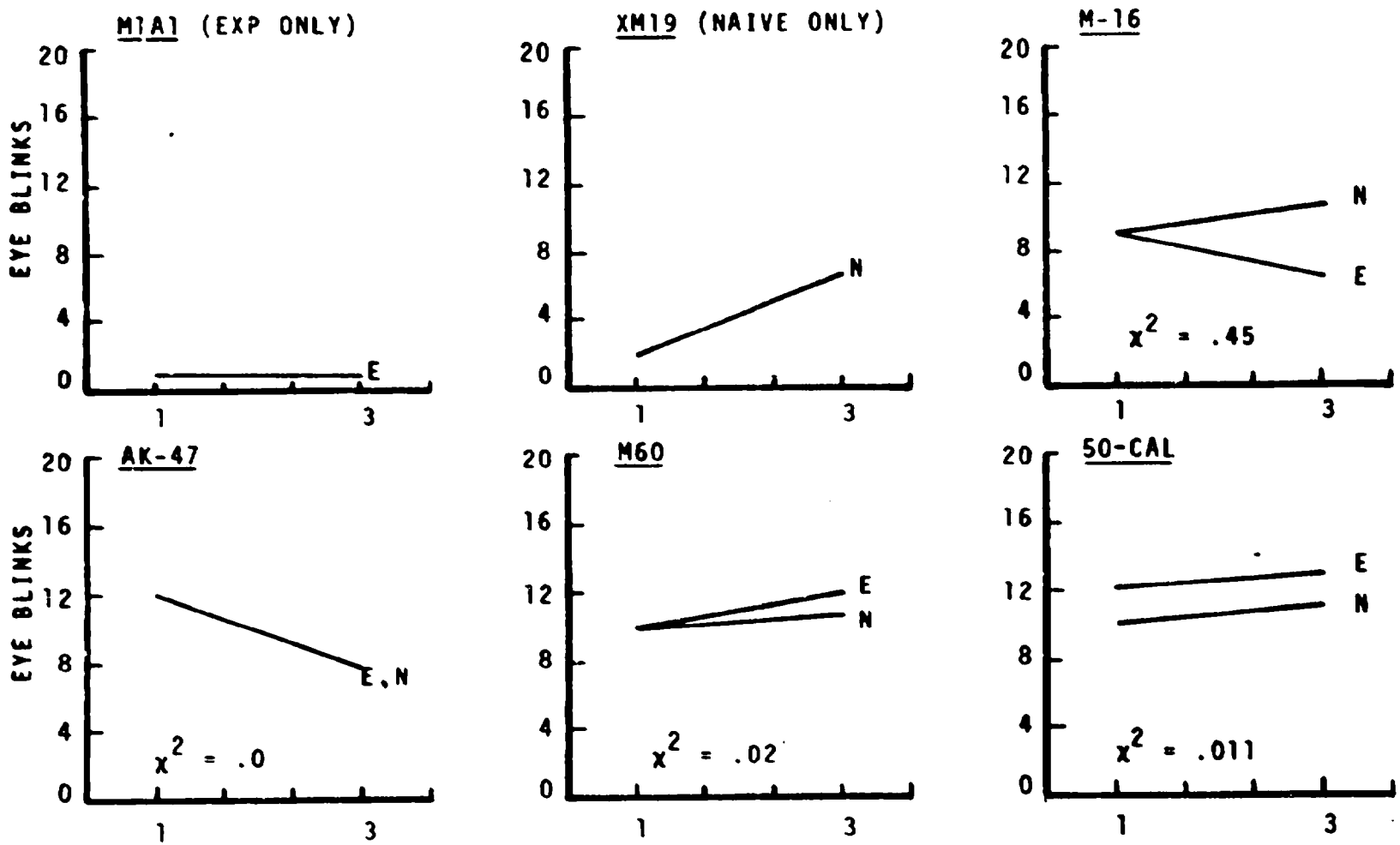

E = EXPERIENCED SUBJECTS
N = NAIVE SUBJECTS

Figure 5-23 (C) Eye Blink Data for Number of Rounds by Groups, for each Weapon

50 percent response in both groups of subjects. Further, although we are dealing with a small sample and small number of responses, it is of interest to note the failure of the new troops to show differentiation on their responses to weapons, miss distance, and volume of fire. This may be interpreted as indicating that some rational process based on experience with weapons, mediates even the reflex responsiveness of an individual to alerting stimuli.

5.8.10.2 Electromyographic Response Analysis (U) Tables 5-26 through 5-28 present the EMG data for the forearm, neck, and shoulder electrode placements, respectively. Each table presents the separate data matrices for the combat experienced subjects and the new troops. As with the eye blink data, the main matrices are 4×2×2 matrices displaying obtained EMG data for the four weapons, two volumes of fire and two miss distances common to both groups of subjects. Separate matrices are presented in each table for the combat sample experiencing the M1A1, and for the new troops with the XM19.

(U) The cell entries in each matrix are the magnitudes of the pen deflections in centimeters, summed across all subjects in the group for each condition. This data can be converted to an integrator output expressed in volt-seconds (I) by the equation

$$I = 10 \times P\ (DN + D_t)/K$$

where

P = preamplifier sensitivity in mv/cm

$(DN + D_t)$ is an expression of the centimeter deflection

and K is the integrator constant.

(U) For all trials, $P = 1 \times 10^{-4}$ and $k = 1$. Thus, for example, in Table 5-22 for the new troops at 0 miss distance, 3 rounds, and the .50-caliber machinegun, the total integrator output

TABLE 5-26 (C) FOREARM EMG FOR COMBAT EXPERIENCED AND NEW TROOPS

Combat Experienced	0		6		Totals
	1	3	1	3	
M16	*4	0	0	3	7
AK47	2	0	11	10	23
M60	7	1	0	0	8
.50 cal	9	0	2	0	11
Totals	22	1	13	13	49

New Troops	0		6		Totals
	1	3	1	3	
M16	0	4	0	0	4
AK47	0	2	23	1	26
M60	2	3	3	2	10
.50 cal	22	57	23	47	149
Totals	24	66	49	50	189

Combat Experienced	0		6		Totals
	1	3	1	3	
M1A1	4	0	2	0	6

New Troops	0		6	
	1	3	1	3
XM19	2	0	0	0

*All cell entries are total cm per deflections per observation; observations per cell equal 10 with each of 10 subjects tested under all conditions.

TABLE 5-27 (C) NECK EMG FOR COMBAT EXPERIENCED AND NEW TROOPS

Combat Experienced	0		6		Totals
	1	3	1	3	
M16	*0	0	0	1	1
AK47	0	1	3	0	4
M60	0	0	0	0	0
.50 cal	0	0	0	0	0
Totals	0	1	3	1	5

New Troops	0		6		Totals
	1	3	1	3	
M16	**0	0	0	0	0
AK47	1	0	1	0	2
M60	2	0	0	0	2
.50 cal	0	2	0	1	3
Totals	3	2	1	1	7

Combat Experienced	0		6		Totals
	1	3	1	3	
M1A1	*1	0	0	0	1

New Troops	0		6	
	1	3	1	3
XM19	**0	0	0	0

*All cell entries are total cm pen deflections per observation; observations per cell equal 6 with each of 6 subjects tested under all conditions.

**Cell entries are total cm pen deflections per observation; observations per cell equal 4 with each of 4 subjects tested under all conditions.

TABLE 5-28 (C) SHOULDER EMG FOR NEW TROOPS

New Troops	0		6		Totals
	1	3	1	3	
M16	1	0	0	0	1
AK47	0	0	0	0	0
M60	1	0	1	2	4
.50 cal	2	8	0	3	13
Totals	4	8	1	5	18

New Troops	0		6		Totals
	1	3	1	3	
XM19	2	0	0	0	2

*All cell entries are total cm pen deflections per observation; observations per cell equal 10 with each of 10 subjects tested under all conditions.

can be expressed as 10 (1×10^{-4}) (57)/1 = 570×10^{-4} volt-seconds, or an average of 57×10^{-4} volt-seconds per subject for this event. By comparison, when subjects were asked to "twitch" arm muscles on command, an average integrator output of 84×10^{-4} volt-seconds was obtained from the forearm electrode placement. Values for shoulder and neck muscle contraction made on command and recorded from the same electrode placements for each subject used in the actual test averaged 68×10^{-4} and 96×10^{-4} volt-seconds, respectively.

(U) When the contribution of each subject to the total EMG activity, expressed in centimeters of pen deflection, was assessed, it was found that the variation between subjects within any cell of a matrix was sufficiently large to negate the ability to find statistical significance in all but one of the apparent differences among the various conditions. The one comparison achieving a significant F-value through ANOVA was an analysis of the rounds effect for the .50-caliber machinegun, as measured by forearm EMG for new troops only.

(U) The obtaining of only one significant effect out of the large number of comparisons attempted led the DSL analysts to the conclusion that the recording of electromyographic responses via surface electrodes under the conditions of this experiment is too insensitive a measure to be able to differentiate between the various subject and weapons conditions. There appears to be a large difference in total responsiveness seen between groups in Table 5-26 for the forearm measurement, alludes to a greater responsiveness for the naive (new troops) as compared to combat veterans. This result would appear to support the hypothesis that the naive troops, unaccustomed to receiving incoming fire, are more fearful and, hence, even in the relatively safe environment of the tests show a lower threshold for elicitation of response.

(U) However, it must be concluded that this hypothesis is not borne out statistically, in that the differences in responsiveness for the two groups do not approach the customary level of statistical significance.

5.8.10.3 Perceived Dangerousness Results. (C) A summary of the mean perceived dangerousness ratings are presented in Table 5-29. Separate matrices are presented for the combat experienced subjects and new troops. A 2×4×2×2 analysis of variance (ANOVA) was performed on the data obtained from the two groups of subjects for those weapons and firing conditions which were common to both groups. No analyses were performed including the M1A1 for the experienced subjects, or the XM19 for the new troops. It suffices to indicate that the mean perceived dangerousness ratings for these weapons occupied the lowest point on the weapons continuum for their respective groups.

(C) The summary of the ANOVA is presented in Table 5-30. The obtained F-values for the weapons effect and the volume of fire effect were both significant at less than the .001 level of confidence, while the miss distance effect was nonsignificant. As might be anticipated from the previous discussion of the physiological response analysis, there was no significant difference between the mean perceived dangerousness ratings of the two subject groups. None of the interaction terms involving subject groups were found to be significant.

(C) The results obtained in this analysis of perceived dangerousness ratings are essentially the same as those obtained in Section 5.6 and need not be reinterpreted at this point. However, the relationship of the data presented above, to the physiological measurements simultaneously obtained bears some comment. Of note is the fact that when the subjects are called upon to make a rational discrimination between

TABLE 5-29 (C) SUMMARY RATINGS OF PERCEIVED DANGEROUSNESS

Combat Experienced	0		6		
	1	3	1	3	
M16	*2.6	3.7	2.9	3.8	3.8
AK47	3.1	4.1	3.3	4.8	3.8
M60	4.0	3.8	3.0	3.8	3.6
.50 cal	4.5	5.6	4.2	5.2	4.9
	3.6	4.3	3.4	4.4	3.9

New Troops	0		6		
	1	3	1	3	
M16	2.7	3.6	2.9	4.2	3.3
AK47	3.5	4.6	3.4	4.5	4.0
M60	3.4	4.4	2.7	3.9	3.6
.50 cal	4.8	5.5	4.5	5.0	5.0
	3.6	4.5	3.4	4.4	3.97

Combat Experienced	0		6		
	1	3	1	3	
M1A1	1.5	1.8	1.5	2.2	1.8

New Troops	0		6		
	1	3	1	3	
XM19	.9	1.9	1.1	.7	1.2

*Cell entries are mean ratings of perceived dangerousness; 10 observations per cell.

TABLE 5-30 (U) ANALYSIS OF VARIANCE SUMMARY TABLE
JUDGMENTS OF PERCEIVED DANGEROUSNESS

Source	df	ss	ms	F	p
Groups (G)	1	.45	.45	-	
Weapons (W)	3	116.42	38.81	31.55	<.001
Mode (M)	1	70.31	70.31	57.16	<.001
Miss Distance (D)	1	1.01	1.01	-	
G×W	3	.52	.18	-	
G×M	1	.11	.11	-	
G×D	1	.31	.31	-	
W×M	3	2.76	.92	-	
W×D	3	10.26	3.42	2.78	<.025
M×D	1	.8	.8	-	
G×W×M	3	4.26	1.42	1.15	NS*
G×W×D	3	1.46	.48	-	
G×M×D	1	.20	.20	-	
W×M×D	3	1.48	.49	-	
G×W×M×D	3	1.38	.45	-	
Error Within	288	355.00	1.23	-	
Total	319	566.75			

*NS represents nonsignificant F value.

the dangerousness of the various weapons, they are in general able to discriminate the weapons along a continuum of projectile loudness. Such discrimination is not seen in any of the physiological measures. Volume of fire is also highly discriminable in perceived dangerousness, but fails to manifest itself in any overall analysis of the physiological data. The conclusion drawn from these results by the DSL analysts is that the subjects are able to make rational judgments of the difference between stimuli, based upon the instructions given them for the use of the scale. The fact that the scale is anchored by examples of the level of fire that is to be rated as 0 or as 6, forces the individual respondents to assign values to the stimuli in accordance with his perception of the position of each stimulus between the anchor points. This does not guarantee that, in the situation presented by the test environment, he perceives himself to be in any danger at all. If we accept the position that the individuals are not fearful in this test situation and that an underlying state of fear is necessary to lower physiological response thresholds, then we would not expect the physiological measurements taken in this study to show any great magnitude or frequency of response.

6.0 CONCLUSIONS

(U) This section recapitulates the conclusions generated by the various data collection efforts and their attendant analysis. For ease of presentation, the conclusions are presented in four separate subsections, 6.1 through 6.4, below.

6.1 CONCLUSION RELATED TO OBJECTIVE SMALL ARMS FIRE CHARACTERISTICS

(U) The questionnaire and interview data indicate that those small arms fire characteristics which are of prime importance to the production of suppression are the volume of fire, the proximity of incoming fire, the loudness of passing projectiles, and the magnitude of the signature of impacting rounds. It is concluded from the field experiments that volume of fire is a better determinant of suppression than is proximity of passing rounds. Also, project impact signature is, at the least, as effective a producer of suppression as the auditory signature of passing projectiles.

(U) Perceived dangerousness, an analog to suppression, was shown to increase linearly with increased loudness of projectile signature. As a first approximation to relating the projectile parameters which produce loudness to perceived dangerousness, it was concluded that projectile kinetic energy can be effectively employed as a predictive factor.

6.2 CONCLUSIONS DRAWN FROM FIELD EXPERIMENTATION

6.2.1 Policy Capturing Experiment - Phase I

(U) Conclusions drawn from the Policy Capturing Experiment are as follows:

- Under the recognizably safe conditions that were enforced during the experiments of this study, individual subject variables such as intelligence, education, time in service, and time in combat were found to be more related to the individual's choice of suppressive behavior than were weapons characteristics and situational variables.

- A multiple regression model can be employed to predict the degree to which an individual will be suppressed by a given weapon under various circumstances.

- The predictive validity of such a model will be enhanced by the development of a behavioral dependent variable.

- To predict suppression in combat, the model must include such factors as the characteristics of the weapons and situational variables, and must take into consideration the experience and psychological make-up of the individual.

6.2.2 Miss Distance Estimator - Phase I-A

(C) The results of the miss distance estimate study confirm the general opinion that the accuracy with which an individual can estimate the distance of a passing round, on the basis of its sound signature, decreases as the actual miss distance increases. The following specific conclusions are drawn from the present experiment:

- The accuracy of miss distance estimation varies with the actual acoustic properties of the projectile to be judged.

- Within this study the accuracy of miss distance estimation was generally best for the subsonic .45-caliber submachinegun round.

- The accuracy of miss distance estimation was poorest for the 10.2-grain flechette fired from the XM19 rifle.

6.2.3 Perceived Dangerousness - Phase II-B

(C) Perceived dangerousness is considered to be an important component in the constellation of factors which lead to an individual's being suppressed. As a result of the Perceived Dangerousness Field Experiment, the following conclusions were derived:

- The perceived dangerouness of the weapons employed in this study increased with the increase in the perceived loudness of the projectile signature of each weapon.

- Over the range of projectiles employed in this study, perceived dangerousness increased linearly with increase in perceived loudness of the projectile signature.

- The perceived dangerousness of the 10.2-grain flechette fired from the XM19 rifle was significantly less than any other projectile employed in this study.

- Perceived dangerousness was shown to increase linearly with linear increases in lateral miss distance over the distance 0 to 15 meters. This conclusion held for each of the weapons employed in this study.

- Perceived dangerousness increased linearly with increase in volume of fire, over the range of volume employed in this study. The effect was manifested in each weapon employed in this study.

- Volume of fire was shown to be a more effective determinant of perceived dangerousness than was lateral miss distance. This effect was demonstrated for each weapon employed in this study.

- Regression analysis indicated that the kinetic energy of a projectile can be used as a predictor of the perceived dangerousness of a live-fire event.

6.2.4 Impact Signature Test - Phase III

(U) Conclusions [illegible]n from the Impact Signature Test are as follows:

- Under the conditions of this field experiment, the visual signature produced by impacting rounds was generally judged to be more suppressive than was the auditory signature of the same projectiles passing by.

- The suppressive effectiveness of an impacting projectile was found to increase with the caliber of the weapon. It was therefore concluded that as the size of the impact signature increases, suppression will increase.

- While impact signature appeared to produce a significantly greater degree of suppression than does auditory signature, the finding of this experiment was

interpreted to indicate only that impact signature plays a greater role in suppression than was expected on the basis of interview and questionnaire data.

6.2.5 Physiological Measurement - Phase IV

(U) Conclusions drawn from the Physiological Measurement study are as follows:

- Under the conditions of this field experiment, surface electromyography (EMG) was too insensitive a measure to detect differential degrees of responsiveness to live-fire events.

- Eye blink records, while more consistent than EMG, were also found to be generally unable to differentiate between experimental conditions.

- The low level of threat and consequent low level of anxiety within the subject of this study is considered to account for the inability of the physiological measures to differentiate between experimental conditions.

6.3 CONCLUSIONS WITH RESPECT TO THE MODEL OF RELATIONSHIPS

(U) The data derived from the field experiments have led DSL to the conclusion that a multiple regression model can be generated which will relate objective weapon characteristics to the production of suppression. Further, the data collected in this study indicate that the major weapon characteristics which should be entered into the model are class of weapon, projectile caliber, projectile velocity, cyclic rate of fire of the weapon, and the weapon's dispersion. The actual form which these variables will take in the model is still to be ascertained.

(U) Differential suppressiveness has been demonstrated in the study for semiautomatic rifle, automatic rifle, and machine-gun weapon classes. This differentiation may be based on such functions as rate of fire, sustainability of fire, or some combination of both factors. Further study will be necessary to determine how best to represent this weapon class factor in a prediction equation.

(U) Both projectile caliber and velocity contribute to the auditory and impact signatures of the projectiles. The field experiments have shown that weapons are judged to be progressively more dangerous as their projectile signatures increase in loudness. As such, the physical parameters producing loudness can be equated to the suppressive effects of loudness to determine the exact form in which caliber and velocity may be entered into the prediction equations.

(U) A linear relationship between projectile size, in terms of its consequent impact signature, and suppressiveness was derived in the field experiments. It is, therefore, suggested that projectile size itself be entered as a prediction variable.

(U) The cyclic rate of fire of a weapon, when multiplied by a time factor, produces a volume of fire. The field experiments have shown volume of fire to be linearly related to suppression. If time is held constant, then suppression will be a linearly increasing function of the cyclic rate of the weapon, and cyclic rate may then be used as a predictor in the model.

(U) Round-to-round dispersion of projectiles within a burst of automatic weapons fire will result in a distribution of projectiles around the presumed target. Each round will thus

have a miss distance ranging from "0" (a hit) to a maximum value which, in the optimum firing condition, is a function of the weapon's dispersion. The field experiments indicate that suppression decreases in a linear fashion with increases in lateral miss distance. The maximum amount of suppression produced in the individual at which the weapon is fired is determined by that projectile which has the minimum lateral miss distance within a fixed-length burst. As such, the weapon with the smallest dispersion would be most likely to suppress a given target. On the other hand, the total amount of suppression produced by firing one or more weapons of a given type could be assumed to be a joint function of the burst-to-burst (or within-burst) dispersion for the weapon, and the hypothesized distribution of an enemy force. As such, one might predict that weapons with greater within-burst dispersion would produce the greatest amount of suppression for a fixed volume of fire by the very fact that a wider dispersion within the burst might result in suppressing individuals in addition to the target individual. In either case, the model must utilize dispersion data in order to accurately predict the suppressive effects of fire on an individual or unit.

(U) More important to the development of a model than the specification of the predictor variables is the development of a reliable dependent variable. From the results of this program, it is apparent that this dependent variable must be a behavioral response rather than a subjective response, and that the response must admit of quantification in the time dimension. The development of such a behavioral criterion will no doubt increase the predictive validity of any model and will facilitate the ability to differentiate the suppressive effectiveness of various weapons.

(U) The results of this program have led to the conclusion that any overall model for the prediction of suppression in combat must account for those situational and psychological variables which enter into an individual's rational decision process concerning the maintenance of suppression. These will include such situational factors as the characteristics of the mission, terrain, unit size, and casualty level. The prior military experience, training, education, and general psychological makeup of the individual must also be considered in making such predictions.

(U) Finally, the results of this study indicate that suppression is a continuous event which runs its course from initiation to termination. Live fire, superimposed on an underlying amount of anxiety in the combat soldier, initiates suppression. The behavior exhibited by the individual following the initiation and the duration of the suppression will be mediated by the interaction of subsequent live fire with the individual's appraisal of the combat situation, and his psychological makeup.

6.4 CONCLUSIONS WITH RESPECT TO EFFECTIVENESS CRITERIA

(U) The ultimate criterion of the suppressive effectiveness of small arms fire must be the degree to which such fire, delivered in combat, prevents or otherwise degrades the performance of important combat-related tasks. Specifically, to be effective, suppressive fire must degrade the ability of an individual or group of individuals to fire at the enemy, maneuver, or observe the enemy. This degradation must be produced by the psychological effects of small arms fire on the individual, and not accrue to wounding of that individual, or to destruction of materiel.

(U) A satisfactory criterion for suppression must recognize two complementary classes of variables:

- Magnitude of the degradation effect
- Duration of the degradation effect

(U) The greater the degradation produced within a fixed period of time, the greater the suppressive effectiveness. On the other hand, where the degradation is constant, the longer it can be maintained, the greater the suppressive effectiveness.

(U) The relative importance (to completion of the mission) of an individual's ability to fire, maneuver, or observe will vary with the role this individual plays in a given engagement. As such, a functional relationship must be developed between the role the individual plays in the unit and the type of suppressed behavior, when manifested, which will significantly contribute to the overall degree of suppression of the unit. For example, the reduction in the ability of a point-man to observe the enemy may contribute to the reduction of the unit's ability to fire effectively on the enemy through his inability to designate the target. The nature of these interactions have not at present been worked out. However, if one equates suppression with a reduction in firepower, then a satisfactory measure of suppression could most probably be obtained by multiplying some positive function of performance degradation (reduced firepower) by some positive function of the duration of this performance degradation. In its simplest form, the determination of such a value for a given individual might be added to the values derived for the other individuals in the unit to arrive at an overall index of suppression for that unit.

6.5 GENERAL CONCLUSIONS

(U) Based on the analysis of the literature and the data collection efforts in this study, the following general conclusions have been derived:

- The primary determinants of suppression in order of apparent importance are:

  - Volume of incoming fire
  - Proximity of incoming rounds to the individual
  - Type of weapon employed against the individual

- Signature effects relevant to suppression are:

  - Loudness of projectile signature is equated with suppression
  - Unique projectile or weapon signatures may create suppression
  - Visual and auditory signatures associated with impacting rounds affect suppression

- Factors which tend to mediate the suppressive effects of weapons are:

  - Nature of the mission
  - Availability of cover
  - Combat experience of the individual
  - Training
  - Time in combat
  - Psychological makeup of the individual

7.0 RECOMMENDATIONS

The recommendations which follow are suggestions for potential design considerations for small arms weapons and projectile characteristics which may enhance the suppressive capability of such weapons. The recommendations are made with the knowledge that implementation may potentially require a trade-off between suppressive capability and other physical parameters such as accuracy and lethality. The order of presentation of recommendations is not to be interpreted as an indication of the relative importance of these recommendations.

7.1 PROJECTILE SIGNATURES

- The auditory signature of passing rounds should be maximized as to loudness, and, where possible, unusual sounds such as would be produced by the addition of screamers to the rounds should be employed.

- The visual and auditory characteristics of impacting rounds should be maximized. In this context, an increase in the "flash" and "bang" of exploding grenade-type weapons is suggested. Exploding rifle and machine-gun projectiles, if permissible, would greatly increase the suppressive capability of these rounds.

- Grotesque terminal effects of small arms projectiles, when coupled with unique auditory signatures, are recommended as a source of increased fear and suppression.

7.2 WEAPON SIGNATURES

- The muzzle signature of a weapon is a source of identification of both the type of weapon and the location of the weapon. As such, muzzle signature may have a

suppressive effect on the enemy, or it may draw the enemy's fire. Two recommendations are thus made concerning weapon signature.

- If muzzle signature can be equated with a particularly lethal weapon, then its loudness and uniqueness should be maximized to increase suppression. This may be of greatest value in launched grenade-type weapons.

- If discrimination of lethality of weapon cannot be obtained through muzzle signature, then this signature should be minimized to reduce detectability of the weapon. Such reduced detectability may enhance suppression itself, in that there is an indication that an inability to effectively locate and counter an enemy threat may enhance the fear and, consequently, suppression associated with that threat.

7.3 WEAPON CHARACTERISTICS

- Volume of fire has been equated with creation of suppression. The cyclic rate of fire of our present small arms weapons appear to be at a relative maximum for the creation of suppression. However, it is suggested that a larger magazine capacity (above 20 rounds) should be provided for current and future rifles to increase their volume of fire potential.

- From the standpoint of suppressive effectiveness, it appears to be desirable to increase the dispersion of small arms projectiles within a target array, thus potentially increasing the number of target individuals experiencing suppressive near misses. To accomplish

this effect, it is suggested that small arms weapons be developed with a capacity to put out an effective dispersed pattern of automatic fire. It is further suggested that this dispersion be built on the variable choke, shotgun principle, so that the weapon may retain accurate point fire, when necessary.

8.0 CONCLUDING STATEMENT

The research cited in this report documents the existence of the phenomenon of suppression. Factors associated with the production of suppression have been enumerated, and suggested weapons modifications have been offered. A preliminary model of suppression has been advanced, along with a potential model and methodology for comparing the suppressive effectiveness of various weapons.

In reviewing these efforts, it is the consensus of the individuals involved in this project that it represents a first step in the development of a valid model of the suppression phenomenon. The factors of suppression have now been isolated, but the form these factors take and a quantitative expression of their interaction is still to be determined. The need for a more militarily significant behavioral task as the dependent variable in field experimentation has been espoused. It is also recognized that in order to be able to reliably predict suppression in combat, the suppressive effects of indirect fire support weapons must also be assessed. Need for further work in the area of potential ethnic differences in suppression is also recognized. Finally, a great deal of effort must be expended in the verification of any future modeling efforts. DSL recommends that research into suppression be continued, with the view toward developing prediction methods, production of weapon systems with increased suppressive capabilities, and development of training programs which may enable our forces to negate the suppressive effects of enemy weapons.

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PERSONAL DATA FORM

NAME _____ AGE _____ RANK _____

SERIAL NUMBER _____ PRIMARY MOS. _____

EDUCATION (Circle Highest Grade/Level attained and Degree)

Elementary/Secondary
1 2 3 4 5 6 7 8 9 10 11 12 High School Diploma GED
College
1 2 3 4 DEGREES _____

Graduate School _____ DEGREE _____

DATE OF ENTRY INTO SERVICE _____

LENGTH OF TIME IN SERVICE _____

PLACE OF COMBAT TOURS (RVN or OTHER)	DATES OF TOUR(S)	DUTY MOS. (If more than one, list all)	DUTY ASSIGNMENT AND LENGTH OF ASSIGNMENT (list all)
_____	____ TO ____	_____	_____
_____	____ TO ____	_____	_____
_____	____ TO ____	_____	_____
_____	____ TO ____	_____	_____

DO YOU HAVE A PURPLE HEART? _____ IF YES, WHAT TYPE OF WOUND(S)? _____

DATE(S) WOUNDS RECEIVED? _____ UNCLASSIFIED _____, _____.

Place an X in the box provided for each of the listed U.S. decorations you have been awarded. If you have received more than one award of any decoration, place the number of times awarded in the parentheses in front of the listed decoration.

For example: ☒ (2) Purple Heart

- ☐ ( ) Medal of Honor
- ☐ ( ) Distinguished Service Cross
- ☐ ( ) **Navy Cross**
- ☐ ( ) Silver Star
- ☐ ( ) Legion of Merit with "V" Device
- ☐ ( ) Bronze Star with "V" Device
- ☐ ( ) Distinguished Flying Cross
- ☐ ( ) Air Medal with"V" Device
- ☐ ( ) Army Commendation Medal with "V" Device
- ☐ ( ) Navy Commendation Medal with "V" Device
- ☐ ( ) Purple Heart
- ☐ ( ) Combat Infantry Badge

Name _____

STRUCTURED INTERVIEW

Note: Individual's Personal History Sheet to be attached prior to sheet of interview.

Most soldiers/marines who have been under fire in combat have experienced or witnessed the effects of enemy small arms fire on friendly troop missions. According to doctrine, it is the prime purpose of enemy small arms fire to neutralize or suppress friendly threats by preventing you from effectively employing your weapons against him.

1. Now lets talk a bit about neutralization or suppression. What does this term mean to you? (Be sure that he has a good understanding of the term and that you know the context in which he is using it.)

2. I would like you to think for a moment about an incident in your combat career in which enemy small arms fire neutralized or suppressed you that is, kept you from firing your weapon or moving. Specifically, think of a situation in which you were on the offense (including patrol actions) when enemy small arms fire suppressed you. If negative response, mark cover sheet with "NS" and continue)

3, Now I would like you to tell me about that engagement. (If negative response in 2, ask this and succeeding questions within the framework of someone else who the soldier has seen suppressed.)

(General Description of the Event)

4. What was your unit's mission?

5. What was going on at the time the enemy opened fire on you?

PROBES

a. Night or Day?

b. Could you see the enemy?

6. What sort of action did you take when you came under fire?

7. What did you do for the rest of the engagement?

8. How did the engagement finally end?

9. How long did the engagement last?

PROBES

a. How long suppressed during exchange of fire?

b. Post-fire suppression - how long to get moving again?

c. Did sporadic fire keep you down?

OK, now lets talk about the engagement itself.

10. You said that when you came under fire you (refer to 6) What initially caused you to take this action?

PROBES

a. Type of enemy weapon encountered?

b. How did you identify the weapon(s)?

c. Amount of fire? Burst lengths?

d. Direction of fire?

e. Closeness of enemy fire?

f. Visual and auditory cues which were reacted to?

g. Amount of cover and concealment available?

h. Casualties - personal, other friendly enemy?

11. Did you (key on 6) on your own, or did you follow other's behavior, or were you ordered to do (key on 6) ?

12. After your initial response to enemy fire, what did you do during the remainder of the engagement?

A. (If he continued the attack) What got you moving again?

PROBES

a. Change in enemy fire:

b. Orders from superior?

c. Behavior of friendly others?

d. Self initiated behavior?

e. How long to get moving again?

B. (If he subsequently withdrew) What caused you to withdraw?

PROBES

a. Enemy small arms fire too heavy to continue?

b. Other members of your unit were pulling back?

c. Was ordered to pull back?

13. How long do you think the enemy delayed your mission? (If unit withdrew) Was the mission rescheduled?

14. What type tactical unit were you with during this engagement?

    a. Size and composition?

    b. Location and approximate dates?

15. What weapons did your unit carry? LMG HMG M14 M16 M79 HG mortars antitank others ____

    _____

16. What weapons did you carry?

17. What was your position or role in the unit? (point, sq.L, radio)

18. What weapons did the enemy employ against you?

PROBES

    a. Types of small arms?

    b. Other weapons employed? (Mortars, etc.)

    c. (If any indirect fire weapons used ask) Before or after small arms fire was received, were they employed?

19. How was the enemy deployed?

PROBES

a. Size of enemy unit?

b. Type of cover used by the enemy?

c. Regular or militia (NV or VC)?

20. What was the rank and position of your immediate superior in the chain of command?

21. What was the rank and position of your immediate subordinate(s)?

22. How close to the end of your combat tour was this engagement?

23. Was this your first combat zone tour? If not, what time?

24. Were you wounded in this engagement?

25. Did you receive any combat wounds prior to this engagement?

PROBES

a. When?

b. What type of wound/treatment required?

26. What was the Unit SOP for individual basic load of ammunition for your weapon?

PROBES

a. How much ammunition did you have at the beginning of this engagement?

b. At the end?

27. Did you have any problems with weapon stoppages? Often?

28. Before you entered combat for the first time what did you think about your chances of being wounded? Killed?

29. What do you think now about your chances in combat?

30. Is there anything that you would like to tell me about this engagement, that we haven't covered?

PROBES

a. Leadership - willingness to follow?

b. Morale?

c. Physical condition?

Name _____

STRUCTURED INTERVIEW

Note: Individual's Personal History Sheet to be attached prior to sheet of interview.

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3. Now I would like you to tell me about that engagement. (If negative response in 2, ask this and succeeding questions within the framework of someone else who the soldier has seen suppressed.)

(General Description of the Event)

4. Were you on the perimeter or in a reserve position in this defense?

5. What kind of cover was available to you?

6. What was going on at the time the enemy opened fire on you?

PROBES

a. Were you in your prepared position at the time?

b. Night or Day?

c. Could you see the enemy?

7. What sort of action did you take when you came under fire?

PROBES

a. Were you immediately able to reach your position?

b. If in position, were you able to immediately return fire?

8. What did you do for the rest of the engagement?

9. How did the engagement finally end?

10. How long did the engagement last?

PROBES

a. How long suppressed during exchange of fire?

b. Post-fire suppression - how long to start firing again?

c. Did sporadic fire keep you down?

OK, now lets talk about the engagement itself.

11. You said that when you came under fire you (refer to 7) What initially caused you to take this action?

PROBES

a. Type of enemy weapon encountered?

b. How did you identify the weapon(s)?

c. Amount of fire? Burst lengths?

d. Direction of fire?

e. Closeness of enemy fire?

f. Visual and auditory cues which were reacted to?

g. Amount of cover and concealment available?

h. Casualties - personal, other friendly enemy?

11. Did you (key on7) on your own, or did you follow other's behavior, or were you ordered to do (key on 7) ?

12. After your initial response to enemy fire, what did you do during the remainder of the engagement?

A. (If respondent did not reach his position ask) Were you able to fire on the enemy? Yes/No

PROBES

a. Enemy small arms fire too heavy to continue?

b. Other members of your unit were pulling back?

c. Was ordered to stay where he was?

B. (If respondent reached his position ask) Were you able to fire on the enemy? Yes/No

PROBES

a. If he could not return fire,probe for volume of enemy fire?

b. Casualties - friendly and enemy/himself?

c. How long to start firing?

13. How long do you think the enemy kept you pinned down?

14. What weapons did your unit have for its defense? LMG HMG M14 M16 M79 HG mortars antitank others _____

15. What weapons did you use?

16. What weapons did the enemy employ against you?

PROBES

a. Types of small arms?

b. Other weapons employed? (Mortars, etc.)

c. (If any indirect fire weapons used ask) Before or after small arms fire was received, were they employed?

17. How was the enemy deployed?

PROBES

a. Size of enemy unit?

b. Type of maneuver used by the enemy?

c. Regular or militia (NV or VC)?

18. What type tactical unit were you with during this engagement?

a. Size and composition?

b. Location and approximate dates?

19. What was the rank and position of your immediate superior in the chain of command?

20. What was the rank and position of your immediate subordinate(s)?

21. How close to the end of your combat tour was this engagement?

22. Was this your first combat zone tour? If not, what tour?

23. Were you wounded in this engagement?

24. Did you receive any combat wounds prior to this engagement?

PROBES

a. When?

b. What type of wound/treatment required?

25. What was the Unit SOP for individual basic load of ammunition for your weapon?

PROBES

a. How much ammunition did you have at the beginning of this engagement?

b. At the end?

26. Did you have any problems with weapon stoppages? Often?

27. Before you entered combat for the first time what did you think about your chances of being wounded? Killed?

28. What do you think now about your chances in combat?

29. Is there anything that you would like to tell me about this engagement, that we haven't covered?

PROBES

a. Leadership - willingness to follow?

b. Morale?

c. Physical condition?

NAME **UNCLASSIFIED** SERIAL NUMBER

WEAPONS PAIRED COMPARISON

Scale B

A series of pairs of weapon types is listed below. For each pair, check the weapon you think would be more dangerous to you if you were an infantryman assaulting the enemy. Consider each weapon to be firing at you from the range and in the manner it would usually be employed in combat.

Check the More Dangerous Weapon in Each Pair

1.	___M16 Rifle	___Launched High Explosive Grenade
2.	___M60, 7.62mm Machine Gun	___High Explosive Hand Grenade
3.	___M14 Rifle	___.50 Caliber Machine Gun
4.	___AK47 Assault Rifle	___M60, 7.62mm Machine Gun
5.	___M60, 7.62mm Machine Gun	___M14 Rifle
6.	___High Explosive Hand Grenade	___Launched High Explosive Grenade
7.	___.50 Caliber Machine Gun	___M60, 7.62mm Machine Gun
8.	___AK47 Assault Rifle	___High Explosive Hand Grenade
9.	___.50 Caliber Machine Gun	___AK47 Assault Rifle
10.	___Launched High Explosive Grenade	___M14 Rifle

GO ON TO THE NEXT PAGE

11. ___AK47 Assault Rifle ___Launched High Explosive Grenade

12. ___M60, 7.62mm Machine Gun ___Launched High Explosive Grenade

13. ___High Explosive Hand Grenade ___.50 Caliber Machine Gun

14. ___M60, 7.62mm Machine Gun ___Chi Com (RPD) .30 Caliber Machine Gun

15. ___AK47 Assault Rifle ___M16 Rifle

16. ___Launched High Explosive Grenade ___Chi Com (RPD) .30 Caliber Machine Gun

17. ___M16 Rifle ___M14 Rifle

18. ___.50 Caliber Machine Gun ___Launched High Explosive Grenade

19. ___M16 Rifle ___.50 Caliber Machine Gun

20. ___Chi Com (RPD) .30 Caliber Machine Gun ___M14 Rifle

21. ___Chi Com (RPD) .30 Caliber Machine Gun ___M16 Rifle

22. ___Launched High Explosive Grenade ___M14 Rifle

23. ___.50 Caliber Machine Gun ___Chi Com (RPD) .30 Caliber Machine Gun

24. ___M14 Rifle ___AK47 Assault Rifle

25. ___Chi Com (RPD) .30 Caliber Machine Gun ___High Explosive Hand Grenade

26. ___High Explosive Hand Grenade ___M16 Rifle

27. ___AK47 Assault Rifle ___Chi Com (RPD) .30 Caliber Machine Gun

28. ___M60, 7.62mm Machine Gun ___M16 Rifle

NAME: _____ DATE: _____

RANK: _____

SERIAL NUMBER _____

MOS: _____

Multidimensional Scaling of the Perceived Dangerousness of Small Arms Weapons Systems

General

You are asked to assist us in the investigation of certain combat activities involving small arms fire. Results of this investigation will improve the effectiveness of U.S. Army and Marine combat operations.

Individual identification will be treated as confidential and never become part of any published report. This research is sponsored by the Advance Research Projects Agency of the Office of the Secretary of Defense, Washington, D.C.

Instructions

On the following pages you will find a list of U.S. and foreign small arms weapons grouped into pairs, e.g. M60 machine gun and M79 grenade, M16 rifle and AK47 assault rifle, etc. All of the listed weapons would be dangerous to you if you were being fired upon by any one of them.

There are many weapons on this list. In order to make your task easier, we have arranged the weapons into groups of two weapons. We want to know about each pair of weapons on the list.

In considering each pair of weapons, imagine that you are in a defensive position and that both weapons are firing at you. Ask yourself how similar or how different the two weapons would be in their dangerousness to you.

For example, imagine that you are in a defensive position and that an M16 and an AK47 are firing at you. Both are dangerous to you. But, how similar or how different would the M16 and AK47 be in their dangerousness to you?

Examples: If you consider the M16 and the AK47 to be exactly equal (as to dangerousness) you would draw a circle around No 1, as shown in A, below.

	Exactly Equal								Extremely Different
A. M16 AK47	(1)	2	3	4	5	6	7	8	9

If you consider the M16 and AK47 extremely different (as to dangerousness) you would draw a circle around No 9, as shown in B below.

Exactly Equal									Extremely Different
B. M16									
	1	2	3	4	5	6	7	8	(9)
AK47									

If you considered the M16 and AK47 to be somewhere in between exactly equal and extremely different you would draw a circle around the number that represents your judgement -- 2, 3, 4, 5, 6, 7, or 8.

Whatever number you chose, circle only one number for each pair.

NAME: _____

RANK: _____

SERIAL NUMBER: _____

MOS: _____

	Exactly Equal								Extremely Different
1. M16 / M79-Launched HE Grenade	1	2	3	4	5	6	7	8	9
2. M60MG / HE Hand Grenade	1	2	3	4	5	6	7	8	9
3. M14 / .50 Cal MG	1	2	3	4	5	6	7	8	9
4. AK47 / M60MG	1	2	3	4	5	6	7	8	9

NAME: _____

RANK: _____

SERIAL NUMBER: _____

MOS: _____

	Exactly Equal								Extremely Different
5. M60MG / M14	1	2	3	4	5	6	7	8	9
6. HE Hand Grenade / M79-Launched HE Grenade	1	2	3	4	5	6	7	8	9
7. .50 Cal MG / M60 MG	1	2	3	4	5	6	7	8	9
8. AK47 / HE Hand Grenade	1	2	3	4	5	6	7	8	9
9. .50 Cal MG / AK47	1	2	3	4	5	6	7	8	9

CONTINUE NEXT PAGE

NAME: _____

RANK: _____

SERIAL NUMBER: _____

MOS: _____

	Exactly Equal								Extremely Different
10. M79-Launched HE Grenade									
	1	2	3	4	5	6	7	8	9
M14									
11. AK47									
	1	2	3	4	5	6	7	8	9
M79-Launched HE Grenade									
12. M60MG									
	1	2	3	4	5	6	7	8	9
M79-Launched HE Grenade									
13. HE Hand Grenade									
	1	2	3	4	5	6	7	8	9
.50 Cal MG									

GO ON TO THE NEXT PAGE

NAME: _____

RANK: _____

SERIAL NUMBER: _____

MOS: _____

	Exactly Equal								Extremely Different
14. M60MG Chi Com (RPD) MG	1	2	3	4	5	6	7	8	9
15. AK47 M16	1	2	3	4	5	6	7	8	9
16. M79-Launched HE Grenade Chi Com (RPD) MG	1	2	3	4	5	6	7	8	9
17. M16 M14	1	2	3	4	5	6	7	8	9

GO ON TO THE NEXT PAGE

NAME: _____

RANK: _____

SERIAL NUMBER: _____

MOS: _____

	Exactly Equal								Extremely Different
18. .50 Cal MG M79-Launched HE Grenade	1	2	3	4	5	6	7	8	9
19. M16 .50 Cal MG	1	2	3	4	5	6	7	8	9
20. Chi Com (RPD) MG M14	1	2	3	4	5	6	7	8	9
21. Chi Com (RPD) MG M16	1	2	3	4	5	6	7	8	9
22. M79-Launched HE Grenade M14	1	2	3	4	5	6	7	8	9

CONTINUE NEXT PAGE

NAME: _____

RANK: _____

SERIAL NUMBER: _____

MOS: _____

	Exactly Equal								Extremely Different
23. .50 Cal MG Chi Com (RPD) MG	1	2	3	4	5	6	7	8	9
24. M14 AK47	1	2	3	4	5	6	7	8	9
25. Chi Com (RPD) MG HE Hand Grenade	1	2	3	4	5	6	7	8	9
26. HE Hand Grenade M16	1	2	3	4	5	6	7	8	9

GO ON TO THE NEXT PAGE

NAME: _____

RANK: _____

SERIAL NUMBER: _____

MOS: _____

	Exactly Equal								Extremely Different
27. AK47 Chi Com (RPD) MG	1	2	3	4	5	6	7	8	9
28. M60MG M16	1	2	3	4	5	6	7	8	9

END OF SCALE

TROOP QUESTIONNAIRE - LITTON (DSL)

USASASA - SUPPRESSION - DAAD05-71-C-0066

This questionnaire is presented as part of a scientific research project for the Advanced Research Projects Agency of the office of the Secretary of Defense. The information which we are seeking is related to improving the effectiveness of infantry small arms weapons, and will be used for research purposes only. Your replies to the questions will be held in strict confidence, and will not become part of your military record. No one except members of our research team will have access to your responses. Your actual answers to these questions will be combined with those of approximately 400 other officers and men of the Army and the Marine Corps, and summarized for use in this research project. We hope that you will cooperate with this effort by carefully reading each question and giving us your honest answer.

Thank you for your participation in this effort.

PERSONAL DATA FORM

NAME _____ AGE _____ RANK _____

SERIAL NUMBER _____ PRIMARY MOS. _____

EDUCATION (Circle Highest Grade/Level attained and Degree)

Elementary/Secondary

1 2 3 4 5 6 7 8 9 10 11 12 High School Diploma GED

College

1 2 3 4 Degrees _____

Graduate School _____ Degree _____

DATE OF ENTRY INTO SERVICE _____

LENGTH OF TIME IN SERVICE _____

HAVE YOU EVER SERVED IN COMBAT? (circle) YES NO

HOW MANY COMBAT TOURS HAVE YOU SERVED? (circle)

0 1 2 3 4 5 or more

WHERE DID YOU SERVE IN YOUR COMBAT TOUR(S)? (circle those that apply)

WORLD WAR II KOREA VIETNAM

WHAT WERE YOUR DUTY ASSIGNMENTS IN COMBAT? _____

_____

WHAT IS YOUR PRESENT DUTY ASSIGNMENT? _____

_____

WERE YOU EVER WOUNDED BY ENEMY SMALL ARMS FIRE? IF YES, PLEASE DESCRIBE _____

_____

FORM A

1. Assume that you are in an open foxhole and each of the weapons listed below is employed against you, one at a time. Further assume that each weapon is employed from the distance in which it usually would be employed in combat. You are to rank each of these weapons in terms of how dangerous you feel it would be to you if you were in the open foxhole. Write the most dangerous weapon on line 1, the next most dangerous on line 2, and so on until you have ranked all ten (10) weapons. Please place only one (1) weapon on each line. Rank all weapons.

WEAPONS

M16 rifle	1.	_____
high explosive hand grenade	2.	_____
.50 caliber machinegun	3.	_____
AK47 rifle	4.	_____
M79 launched grenade	5.	_____
M60 machinegun	6.	_____
M14 rifle	7.	_____
ChiCom .30 caliber machinegun	8.	_____
RPG type grenade	9.	_____
SKS/CKC semiautomatic rifle	10.	_____

2. During daylight conditions, what is the first thing (signal) that would tell you that the enemy is firing at you, personally? (check only one)

A. _____ The sound of enemy weapons firing

B. _____ The sound of rounds going by you in the air

C. _____ The sound of rounds hitting things around you

D. _____ Seeing rounds impacting near you

E. _____ Seeing muzzle flashes and smoke from enemy weapons

3. In your conversations about the war in Vietnam, which of the following enemy small arm's weapons was referred to most often? (check only one)

A. _____ ChiCom hand grenade

B. _____ AK47

C. _____ RPD .30 caliber machinegun

D. _____ ChiCom .51 caliber machinegun

E. _____ SKS/CKC semiautomatic fire

F. _____ RPG

G. _____ other small arms (name) _____

4. From your conversations involving enemy small arms weapons used in Vietnam, which one of the following enemy weapons was considered the most dangerous? (check only one)

A. _____ ChiCom hand grenade

B. _____ AK47

C. _____ RPD .30 caliber machinegun

D. _____ ChiCom .51 caliber machinegun

E. _____ SKS/CKC semiautomatic rifle

F. _____ RPG

G. _____ other small arms (name) _____

5. Under which one of the following circumstances did you first hear or learn of the dangerousness of the enemy small arms weapon you checked in question 4? (check one)

A. _____ During formal training (for example, in a lecture, during a weapons demonstration, or in printed literature)

B. _____ Informal discussion with instructors

C. _____ Conversations with Vietnam returnees

D. _____ Discussions with other men in your unit during stateside training

E. _____ Discussions with other men in your unit in Vietnam

F. _____ Seeing for yourself what the weapon can do

6. For those who have had combat experience in Vietnam, answer both questions A and B below; those who have no combat experience in Vietnam, answer question A only.

A. Which characteristic or combination of characteristics listed below was the basis for the reputation of the small arms weapon selected in question 4? (check those that apply)

1) _____ accuracy

2) _____ rate of fire

3) _____ reliability

4) _____ volume of fire

5) _____ killing power

6) _____ casualty area

B. Which of the following statements best describes the reputation of the enemy small arms weapon you selected in question 4 now that you have been in combat?

1) _____ Although I never received any fire from this weapon, I believe its reputation is correct

2) _____ Although I never received any fire from this weapon, I now believe its reputation is an overestimate of its effectiveness

3) _____ Although I never received any fire from this weapon, I now believe its reputation is an underestimate of its effectiveness

4) _____ I have had firsthand experience with this weapon and its reputation is correct

5) _____ I have had firsthand experience with this weapon and its reputation is an overestimate of its effectiveness

6) _____ I have had firsthand experience with this weapon and its reputation is an underestimate of its effectiveness

7. During night conditions, what is the first thing (signal) that tells you that you, personally are being fired upon? (check one)

A. ____ The sound of enemy weapons firing

B. ____ The sounds of rounds going by

C. ____ The sounds of rounds hitting things around you

D. ____ Seeing muzzle flashes of enemy weapons

E. ____ Seeing incoming tracer rounds

8. Assume that you are on an offensive mission sweeping through a series of rice paddies. Which of the following would most likely cause you to hit the ground or take cover? Place the number one (1) on the line by your first choice and then number the rest of the choices ...2...3...4 so that the choice least likely to cause you to hit the ground or take cover is numbered four (4).

A. ____ Grazing fire from an enemy heavy machinegun

B. ____ Sniper fire from a hidden position

C. ____ Automatic rifle fire from a woodline

D. ____ An RPG impacting near you

9. In your opinion, at which time during a combat tour of duty is an individual most likely to take cover or other protective reactions to enemy small arms fire? (check one)

A. ____ During the first two months of the tour

B. ____ During the middle of the tour

C. ____ During the last two months of the tour

10. For each of the following situations (A, B, C, and D) check the statement which best describes the type of action (maneuver) you were taught to take during your training.

SITUATION A

You are a member of a platoon on a search and destroy mission. You are in the lead element walking in staggered column across an open rice paddy. The enemy opens fire on you with automatic rifles, a light machinegun, and RPGs from the tree line approximately 150 meters away on your left flank. (check one)

A. _____ Turn toward direction of fire and immediately return fire

B. _____ Hit the ground and return fire

C. _____ Advance in direction of enemy fire while returning fire

D. _____ Take cover first, and then return the fire

E. _____ Take cover and await supporting fire

SITUATION B

You are a member of a point squad which is moving along a jungle trail. You walk into the Kill Zone of a well prepared enemy ambush. The enemy opens fire on you from a distance of 30 meters with automatic rifles and light machineguns. (check one)

A. _____ Turn toward direction of fire and immediately return fire

B. _____ Hit the ground and return fire

C. _____ Advance in direction of enemy while returning fire

D. _____ Take cover and await support

E. _____ Break contact with the enemy

SITUATION C

You are a member of a rifle company whose mission is to assault a known enemy fortified position. The enemy is known to be well dug in with covered bunkers, spider holes, and tunnels. You are on line in the final phase of the assault. You are moving across several old dry rice paddies toward the enemy position which is situated straight ahead on the tree line. At approximately 300 meters from the enemy position, the enemy opens fire on you with mortars, heavy machineguns, RPGs, light machineguns, and automatic rifles. (check one)

A. _____ Immediately return fire

B. _____ Hit the ground and return fire

C. _____ Advance in direction of enemy fire while returning fire

D. _____ Take cover and return fire

E. _____ Take cover and await supporting fire

SITUATION D

You are a member of a rifle platoon moving along a trail through a heavily wooded area. By chance you encounter an enemy patrol coming toward you on the same trail. The enemy opens fire on you first with automatic rifle fire. (check one)

A. _____ Immediately return fire

B. _____ Hit the ground and return fire

C. _____ Advance in direction of enemy while returning fire

D. _____ Take cover and return fire

E. _____ Take cover and await supporting fire

11. Look at the series of statements listed below. Based upon your experience with the M79 and RPG in Vietnam or based upon what you have heard about these weapons, circle the weapon to which the statement best applies.

A. The M79 RPG is the more accurate weapon

B. The M79 RPG has the greater range

C. The M79 RPG takes less time to reload

D. The M79 RPG makes more noise when it is fired

E. The M79 RPG makes more noise when it explodes

F. The M79 RPG is the more versatile weapon

12. Which of the following was <u>most</u> important in making the **preceding** judgments about the M79 and RPG in question 11? (check <u>one</u>)

A. _____ Judgments based on what I have heard about the weapons

B. _____ Judgments based on my experience with the weapons

13. Assume that you are in your foxhole in a defensive perimeter. Which one of the following circumstances would be the most effective in pinning you down? (check only one)

A. _____ A single sniper fires at you from an unknown position

B. _____ A single sniper fires at you from a nearby clump of trees

C. _____ A sniper fires at you along with automatic rifle fire

D. _____ A sniper fires at you along with automatic rifle and machinegun fire

E. _____ A sniper fires at you along with automatic rifle, machinegun, and RPG fire

14. In your opinion, which one of the following individuals is the most likely to take cover or some other protective reaction to enemy small arms fire? (check one)

A. _____ One who has never experienced enemy fire

B. _____ One who has been in combat less than two weeks

C. _____ One who has been in combat six months

15. Assume that you are advancing toward your objective, but are not under enemy fire. Rank order the following circumstances regarding their effectiveness in pinning you down. Place the number one (1) on the line beside the circumstance that would be most effective in pinning you down. Then number the rest of the choices (2, 3, 4, 5) so that the circumstances which would be least likely to pin you down would be numbered five (5).

A. _____ A single sniper fires at you from an unknown position

B. _____ A single sniper fires at you from a nearby clump of trees

C. _____ A sniper fires at you along with automatic rifle fire

D. _____ A sniper fires at you along with automatic rifle and machinegun fire

E. _____ A sniper fires at you along with automatic rifle, machinegun, and RPG fire

16. In your opinion, which one of the following combat experienced individuals is the most likely to take cover or some other protective reaction to enemy small arms fire? (check one)

A. _____ One who is just about to go on R&R

B. _____ One who has just returned to combat after medical treatment for wounds suffered in combat

C. _____ One who has one month to go in his combat tour

17. Assume that you are assaulting the enemy over open ground and each of the weapons listed below is employed against you, one at a time. Further assume that each weapon is employed against you from the distance at which it usually would be employed in combat. You are to rank each of these weapons in terms of how dangerous you feel it would be to you if you were assaulting the enemy over open ground. Write the most dangerous weapon on line 1, the next most dangerous on line 2, and so on until you have ranked all ten (10) weapons. Please place only one (1) weapon on each line. Rank all weapons.

WEAPONS

M16 rifle	1.	_____
high explosive hand grenade	2.	_____
.50 caliber machinegun	3.	_____
AK47 rifle	4.	_____
M79 launched grenade	5.	_____
M60 machinegun	6.	_____
M14 rifle	7.	_____
ChiCom .30 caliber machinegun	8.	_____
RPG type grenade	9.	_____
SKS/CKC semiautomatic rifle	10.	_____

18. Assume that you are on an offensive mission with the objective of taking a village. Enemy small arms fire has just caused you to take cover. Which of the following is most likely to cause you to get up and resume your attack? Place the number one (1) on the line by your first choice and then number the rest of the choices ...2...3...4 so that the choice least likely to cause you to continue the attack is numbered four (4).

A. _____ Your squad leader orders you to resume the attack

B. _____ There is a reduction in the volume of enemy fire

C. _____ You decide to get up and resume attack on your own

D. _____ There is an increase in the volume of your unit's fire

For those who have had combat experience in Vietnam answer questions 19, 20, 21, and 22; those who have had no combat experience in Vietnam go on to question 23.

19. What was your primary small arms weapon? (check one)

A. _____ Pistol .45 caliber

B. _____ M16 rifle

C. _____ M60 machinegun

D. _____ M79

E. _____ other (name) _____

20. What was the greatest range at which you engaged the enemy with this weapon? (write in answer in meters)

_____ meters

21. During your tour in Vietnam what was the average range at which you engaged the enemy with this weapon? (write in answer in meters)

_____ meters

22. What was the closest range at which you fired this weapon at an enemy soldier? (write in answer in meters)

_____ meters

23. Assume that you are on an offensive mission with the objective of taking a village. Enemy small arms has just caused you to take cover. Which of the following is most likely to keep you down and prevent your further movement in the assault? Place the number one (1) on the line by your first choice and then number the rest of the choices ...2...3...4 so that the choice least likely to keep you down and prevent your continuing the attack is numbered four (4).

A. _____ Accurate sniper fire from a hidden position

B. _____ Grazing fire from an enemy .30 caliber machinegun

C. _____ Heavy volume of RPG rounds coming into the area of your position

D. _____ Heavy volume of automatic rifle fire

E. _____ Other (describe)

24. Assume that you have been pinned down by enemy small arms fire. Your platoon leader has just ordered you to get up, get on-line and assault the enemy. From the list of leadership qualities or traits given below, which one trait is <u>most</u> important to you in determining your willingness to follow this order. Rank this choice number one (1). Rank the remaining traits in order of their importance to you, with that trait which is least important in determining your willingness to follow the leader's order as number ten (10).

1) _____ He feels responsible for his man in combat

2) _____ He has a working knowledge of all the weapons used by his men

3) _____ He has a good knowledge of military tactics

4) _____ He has a great deal of combat experience

5) _____ He is considered as one of the group by his men

6) _____ He displays a high degree of self-confidence

7) _____ He considers his mens' comforts and interests

8) _____ He requires strict compliance with his orders

9) _____ He is considered as courageous and as a "cool" head in combat

10) _____ He is able to make rapid decisions in combat situations

TROOP QUESTIONNAIRE - LITTON (DSL)

FORM 3VN

The questions that appear on the following pages are about small arms and small arms engagements. As you answer these questions, think about the most recent encounter you've had with enemy troops (VC/NVA) in which you were fired at with small arms.

Most of the questions ask you to put a check-mark in front of the answer that you think is true. In some cases you are asked to check more than one answer. If none of the answers seem correct to you, then check the space marked "other" and write the correct answer in the space provided. If you need more space, turn the page over and write on the back. If you have questions, ask the administrator.

Notice that there is no place on the questionnaire for your name, your rank, or your serial number; we don't want to know who you are. Once you've completed this questionnaire, nobody will ever be able to trace your answers back to you. If you have to answer a question by filling in "others", please do not use names; you may use rank designations if you wish, but no names, please. Turn the page and begin, and if you have questions, ask the administrator.

Troop Questionnaire - Litton (DSL)

USASASA - Suppression - DAAD05-71-C-0066

Form 3VN

PLACE _____

DATE _____

TIME _____

1. What was the size of the unit in the field, in your immediate vicinity, during this engagement? (check one)

____ Squad ____ Company ____ Brigade

____ Platoon ____ Battalion ____ Division

2. Your position within your unit (check one)

____ Platoon Leader ____ Squad Member

____ Squad Leader ____ Other _____

____ Fire Team Leader

3. Your duty assignment during the most recent small arms combat you have experienced (check one)

____ Rifleman ____ RTO

____ Grenadier ____ Medic

____ Machine Gunner ____ Other _____

____ Ammo Bearer

4. When you're under hostile fire, which of the following things bugs you the most? (check one)

____ The sound of passing bullets

____ The sound of their weapons firing

____ Seeing their muzzle blasts

____ Seeing tracers coming at us

____ Seeing bullets hit trees, dirt, etc.

____ Seeing grenades come at us

____ Other_____

5. During your time in Vietnam, for what weapon did you develop the most healthy respect? (check one)

____ ChiCom Grenade

____ AK47

____ RPD Machine Gun

____ ChiCom .51 Cal MG

____ SKS Carbine

____ RPG

____ B40 Rocket

____ B41 Rocket

____ Other_____

6. During what type of operation was your most recent small arms combat experience? (check one)

____ LRRP

____ Sweep

____ Recon. Patrol

____ Combat Patrol

____ Blocking Force

____ Defense in a prepared position

____ Attack of a prepared position

____ Ambush

____ Other_____

7. During what time of the day did this engagement occur? (check one)

____ Daylight Hours

____ Hours of Darkness

____ Both

8. What was the weather like during most, or all, of this engagement? (check one)

____ Heavy Rain

____ Light Rain

____ Overcast

____ Fog/Haze

____ Partly Cloudy

____ Clear (Day)

____ Clear Moonlight (Night)

9. Just before this engagement ended, how did you feel about the situation? (check one)

____ I thought: "We've had it; we're going to get wasted."

____ I thought: "I don't know if we're going to make it or not."

____ I thought: "We could sure use some help."

____ I thought: "We're in pretty good shape; it's looking good."

____ I thought: "We can move out and get these bastards if we're cool."

____ I thought: "Charlie screwed up this time; we're going to wipe them out."

____ Other _____

10. When you're under hostile fire, what's the thing that worries you most? (check one)

____ Being killed

____ Being wounded and disfigured

____ Being wounded and crippled

____ Taking a very painful wound

____ Seeing other men get killed

____ Seeing other men get wounded

____ Other _____

11. When this engagement began, what sort of terrain and vegetation were you in? (check as many as apply)

____ River/Stream
____ Wet Paddy
____ Dry Paddy
____ Open Rolling Hills
____ Ridges and Valleys
____ Sharp, Rocky Cliffs
____ No Vegetacion
____ Elephant Grass
____ Light-medium brush cover
____ Uplands Forest
____ Double Canopy Jungle
____ Triple Canopy Jungle
____ Village
____ Built-up Town/City
____ Other_____

12. At the time you came under fire, what kinds of cover and concealment were available to you? (check as many as apply)

____ Flat Open Ground (no cover/concealment)
____ Low Grass
____ High Grass
____ Bushes
____ Small Trees
____ Large Trees
____ Fallen Trees
____ Ant Hills
____ Paddy Dikes
____ Water and Marsh/Swamp
____ Prepared Foxhole (no overhead cover)
____ Supply/Transport Vehicles
____ Armored Vehicles
____ Shell Craters
____ Small Rocks
____ Large Rocks
____ Natural, Rolling Terrain (ground depression)
____ Building (Wood, Thatch, Grass)
____ Building (Earth Wall, Masonry)
____ Personal Equipment
____ Other

13. During this engagement, what kind(s) of supporting fire did you receive? (check as many as apply)

____ Helicopter Gunships

____ Air Force, Navy, Marine Corps close air support

____ Mortars

____ Artillery

____ Naval Gun Fire

____ Strategic air support (B52 Bombers)

____ APCs or Tanks

____ Other_____

14. How did the engagement end? (check one)

____ They withdrew under fire

____ We withdrew on foot under fire

____ We were extracted by chopper under fire

____ We over-ran their position

____ They over-ran our position, then withdrew

____ Both sides stopped firing

____ Other_____

15. After your initial reaction to hostile fire in this engagement, how did you first feel about the situation? (check one)

____ I thought: "We've had it; we're going to get wasted."

____ I thought: "This is going to be bad!"

____ I thought: "We're going to need some help this time."

____ I thought: "We're in pretty good shape if we can get resupply."

____ I thought: "We can move out and get them if we're cool."

____ I thought: "Charlie screwed up this time; we're going to wipe them out."

____ Other_____

16. When this engagement began what position were you in, relative to the enemy? (check as many as apply)

____ We were both on the same level dry ground

____ They were on higher ground than we were

____ We were on higher ground than they were

____ We were both in water/marsh

____ They were in water/marsh, we were on dry ground

____ We were in water/marsh, they were on dry ground

____ We had equal amounts of cover/concealment

____ We had more cover/concealment than they did

____ They had more cover/concealment than we did

____ They ambushed us

____ We ambushed them

____ They attacked our prepared position

____ We attacked their prepared position

____ We saw each other at the same time

____ We saw them before they saw us

____ They saw us before we saw them

____ Other

17. What started the engagement? (check one)

____ We fired at the enemy

____ The enemy fired at us

____ Someone tripped a bobby trap

____ I don't know who fired first

18. During the course of this engagement, what actions did you take? (check as many as apply)

____ Gave directions, fired when I could

____ Operated the radio, fired when I could

____ Fired my weapon(s) all the time

____ Carried ammo, fired when I could

____ Kept my head down, fired when I could

____ Kept my head down, didn't fire

____ Fired my weapon(s) when directed, advanced under fire

____ Fired my weapon(s) when directed, withdrew under fire

____ Did not fire, treated wounded men

____ Advanced when supporting fires were lifted

____ Advanced only when enemy fire had stopped/eased up

____ Other _____

19. How did the enemy seem to be using their weapons during this engagement? (check as many as apply)

____ Fired machine guns in continuous grazing fire

____ Fired machine guns in regular bursts

____ Fired machine guns in random patterns

____ Fired ARs in regular bursts

____ Fired ARs in random patterns

____ Didn't use automatic weapons fire

____ Fired weapons accurately

____ Fired weapons with little accuracy

____ Fired their weapons in plunging fire

____ Threw grenades but didn't come close

____ Threw grenades and hurt us

____ Other _____

20. Look at the two lists below. List #1 shows the small arms which the enemy may have used against you. List #2 shows several ways in which soldiers normally identify enemy weapons as they fire. Look at list #1 and decide which of these weapons the enemy did use against you. Now look at list #2 and decide how it was that you knew what weapons the enemy was firing at you. Put the code-letter(s) from list #2 in front of the weapons in list #1 so that we will know how you identified each weapon you encountered.

For example, you may have known by the sound of the weapon firing that an AK47 was being fired at you, so you'd put the code-letter "A" in front of "AK47".

If there was more than one thing that identified the weapon for you, put as many letters as you need in front of the appropriate weapon. For example, you may have known by the sound of the round hitting something and the muzzle flash you saw that the enemy was firing an RPD machine gun, so you'd put the code-letters "B" and "D" in front of "RPD machine gun".

List #1 (weapons enemy used)	List #2 (How identified)
_____ ChiCom Grenade	A. Sound of the weapon firing
_____ AK47	B. Sound of the round hitting something
_____ RPD machine gun	C. What the round looked like when it hit
_____ ChiCom .51 Cal MG	D. Muzzle flash
_____ SKS Carbine	E. Tracer pattern
_____ RPG	F. Weapon's rate of fire
_____ B40 Rocket	G. Sound of the round passing overhead
_____ B41 Rocket	H. Smoke from the weapon firing
_____ Other_____	I. The wounds others were taking
	J. Other_____

21. What was the first thing that let you know the enemy was firing at you with small arms? (check one)

____ The sound of enemy weapons firing

____ The sound of rounds going by

____ The sound of rounds hitting things around me

____ Seeing rounds kick up dirt/rocks in front of me

____ Seeing rounds hitting grass/brush/trees near me

____ Seeing one of our men get hit

____ Somebody shouted ("incoming", "take cover", etc.)

____ The muzzle flash or smoke from their weapons

____ Incoming tracer rounds

____ Other _____

22. When you realized you were being fired at, what was the first thing you did? (check one)

____ Looked around to see where it was coming from

____ Hit the ground

____ Fired back immediately while standing

____ Positioned too far to the rear to be immediately involved

____ Ran more than ten feet in order to get behind protective cover of some sort

____ Got down into my bunker/foxhole

____ Other _____

23. After you took the action which you checked above, what was the next thing you did? (check one)

____ Fired toward the sound of the enemy weapons

____ Fired toward the muzzle flash/smoke of the enemy weapons

____ Moved to better cover

____ Tried to find a specific target to shoot at

____ Kept covered-up and didn't fire

____ Directed the fire of other men

____ Found protective cover

____ Got a weapon and ammo

____ Moved forward to the action

____ Started to set-up my weapon (crew served)

____ Other_____

24. Between the action you've checked as the "first" action you took, and the action you just checked as the "next" action you took, how much time passed? (check one)

____ 0 - 5 sec.

____ 5 - 10 sec.

____ 10 - 15 sec.

____ 15 - 20 sec.

____ 20 - 25 sec.

____ 25 - 30 sec.

____ 30 - 45 sec.

____ 45 - 60 sec.

____ 1 - 1 1/2 min.

____ 1 1/2 - 2 min.

____ more than 2 min.

25. Look at the list below. Several types of cover/concealment are listed. Put numbers in front of the ones you used during this engagement to indicate the order in which you used them. For example, if you first got behind a small tree, moved from there to a clump of high grass, and from there to a paddy dike, you would put the number one (1) in front of "small tree", the number two (2) in front of "high grass", the number three (3) in front of "paddy dike", and so on. Put numbers in front of as many items as you need to describe the kinds of cover/concealment you used during this engagement.

____	Flat Ground	____	Prepared Bunker (overhead cover)
____	Low Grass	____	Armored Vehicles
____	High Grass	____	Shell Craters
____	Bushes	____	Small Rocks
____	Small Trees	____	Large Rocks
____	Large Trees	____	Natural, rolling terrain (ground depressions)
____	Fallen Trees	____	Building (Wood, Thatch, Grass)
____	Paddy Dikes	____	Building (Earth Wall, Masonry)
____	Water and Marsh/Swamp	____	Personal Equipment
____	Prepared Foxhole	____	Other _____

26. What weapons were you carrying, personally, during this engagement? (check as many as apply)

____	M79	____	C.S. Grenades
____	M16	____	Smoke Grenades
____	M14	____	AK47
____	M60 MG	____	Carbine
____	.50 cal MG	____	Pistol
____	Fragmentation Grenades	____	Shotgun
____	White Phosphorous Grenades	____	LAW
____	Concussion Grenades	____	Other_____

27. Other remarks you care to make

_____

_____

_____

_____

_____

_____

_____

VIETNAMESE TRANSLATION
OF TROOP QUESTIONNAIRE

1.- Anh là hồi chánh viên hay là tù binh? (Đánh dấu X vào câu trả lời đúng dưới đây)

_X_ Hồi-chánh-viên

____ Tù binh

2. Anh thuộc thành-phần xâm nhập hay là Việt-Cộng?(Đánh dấu X vào câu trả lời đúng)

____ Bắc Việt xâm nhập

_X_ Việt-Cộng

3.- Chức-vụ cuối cùng của anh trước khi hồi chánh hay bị bắt là chức-vụ gì ? (Đánh dấu X vào câu trả lời đúng)

____ Đại-Đội Trưởng

____ Trung đội trưởng

____ Tiểu đội trưởng

____ Tổ trưởng tổ tam tam

_X_ Chiến sĩ

Chức vụ khác :

4.- Trong thời gian phục-vụ Mặt Trận hay bộ đội Bắc-Việt, anh có bao giờ đụng trận với quân-đội Quốc-Gia và Đồng-Minh không ?

____ Có

_X_ Không

Nếu có, thì anh đã đụng trận bao nhiêu lần ?

____ lần

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5.- Trong lần đụng trận cuối cùng với địch, chung quanh anh còn có thêm đơn-vị bạn cùng hoạt-động không ?

_____ Có

_____ Không

Nếu có, thì đơn-vị bạn gần vị-trí của anh thuộc cỡ nào ?

_____ Tiểu đội hay nhỏ hơn

_____ Trung đội

_____ Đại-đội hay lớn hơn

6.- Trong lần chạm súng lần cuối cùng đó, nhiệm vụ tác-chiến của anh trong đơn-vị là nhiệm-vụ gì ?

__X__ Xử-dụng súng trường

_____ Điều khiển súng phóng lựu đạn

_____ Điều-khiển tiểu hay trung-liên

_____ Tải đạn

_____ Giữ máy vô-tuyến hay máy điện-thoại

_____ Y tá

_____ Chỉ-huy đồng-đội

Nhiệm-vụ khác :

7.- Trong cuộc đụng trận nhẹ gần đây nhất, đơn-vị anh đang làm công tác gì ? (Đánh dấu X vào câu trả lời đúng nhất).

_____ Phá cầu

_____ Tuần tra

_____ Tập kích địch

_____ Chặn viện địch

__X__ Phòng thủ căn-cứ

_____ Tấn công (công-kích) vị trí địch

_____ Phục kích địch

_____ Việc khác

8.- Cuộc đụng trận này đã xảy ra lúc nào ? (Đánh dấu vào câu trả lời đúng nhất)

_____ Ban ngày

_____ Ban đêm

_____ Cả ngày lẫn đêm

9.- Thời-tiết phần lớn hay suốt cuộc đụng trận như thế nào ?

_____ Mưa to (lớn)

_____ Mưa nhỏ

_____ Mù mịt

_____ Có sương mù

_____ Bị mây che một phần nào

_____ Quang đãng (ban ngày)

_____ Sáng trăng (ban đêm)

10.- Khi bắt đầu đụng trận, địa-thế và cây cỏ chỗ anh đứng thuộc loại nào ? (Đánh dấu X vào những câu trả lời mà anh thấy là đúng)

_____ Sông/Suối

_____ Ruộng nước

_____ Ruộng khô

_____ Nhiều đồi trọc

_____ Chóp núi và thung-lũng

_____ Mỏm đá thẳng nhọn

_____ Không có cây cối gì cả

_____ Đầy cỏ rậm và cao (cỏ lan)

_____ Rừng thưa

_____ Rừng cao nguyên

_____ Rừng rậm

_____ Làng mạc

_____ Thị trấn/Thành phố

_____ Loại khác

11.- Khi bị bắn, quanh anh có những vật gì có thể giúp anh ẩn núp được không ? (Trả lời càng nhiều càng tốt mà ann thay là đúng).

_____ Đất bằng (không có vật gì để ẩn núp)

_____ Cỏ thấp

_____ Cỏ cao

_____ Nhiều bụi cây

_____ Nhiều cây nhỏ

_____ Nhiều cây to

_____ Các thân cây nằm ngang

_____ Ụ kiến

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_____ Bờ ruộng

_____ Vùng nước và sình lầy

_____ Hố cá nhân đào sẵn (miệng hố để trống)

_____ Xe tiếp tế hay vận-tải

_____ Hố đạn, hố bom

_____ Tảng đá nhỏ

_____ Tảng đá lớn

_____ Địa-thế gồ ghề (lồi lõm)

_____ Nhà ở (bằng cây, bằng lá, bằng cỏ)

_____ Nhà ở (tường đất, tường gạch)

_____ Vật-dụng cá nhân

_____ Vật khác

12.- Khi cuộc giao-chiến bắt đầu, vị-trí của anh đối với địch như thế nào? (Trả lời càng nhiều càng tốt mà anh thấy là đúng).

_____ Địch và tôi cùng ở trên mặt đất khô ngang nhau

_____ Địch ở cao hơn chúng tôi

_____ Chúng tôi ở cao hơn địch

_____ Địch và chúng tôi đều ở trong nước và sành lầy

_____ Địch ở trong vũng nước và sình lầy, chúng tôi ở trên đất khô

_____ Chúng tôi ở trong vũng nước và sình lầy, địch ở trên đất khô

_____ Những nơi ẩn núp của địch và chúng tôi nhiều bằng nhau.

_____ Chúng tôi có nhiều nơi ẩn núp hơn địch

_____ Địch có nhiều nơi ẩn núp hơn chúng tôi

_____ Địch phục kích chúng tôi

_____ Chúng tôi phục kích địch

_____ Địch tấn công vị trí phòng vệ của chúng tôi

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_____ Chúng tôi tấn công vị trí phòng thủ của địch

_____ Địch và chúng tôi cùng thấy nhau trong một lúc

_____ Chúng tôi thấy địch trước

_____ Địch thấy chúng tôi trước

_____ Hoàn cảnh khác

13.- Ai đã khởi sự cuộc giao chiến?

_____ Chúng tôi bắn địch

_____ Địch bắn chúng tôi

_____ Có người dẫm phải bàn chông

_____ Tôi không biết ai đã bắn trước

14.- Điều gì đầu tiên đã khiến anh biết ngay là địch đang bắn anh bằng súng cá nhân ?

_____ Tiếng súng của địch

_____ Tiếng đạn bay ngang

_____ Tiếng đạn bắn vào các vật chung quanh tôi

_____ Thấy đạn bắn văng đất và đá trước mặt tôi

_____ Thấy đạn bắn trúng cỏ, bụi cây nay cây ở gần tôi

_____ Thấy một người bên tôi bị trúng đạn

_____ Nghe tiếng người la ("địch bắn", "núp đi" v.v...)

_____ Thấy lửa miệng súng khói súng địch

_____ Đạn chiếu sáng bắn tới

_____ Điều khác

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15.- Khi nhận ra là bị địch bắn thì phản-ứng đầu tiên của anh như thế nào ? (Đánh dấu X vào câu trả lời đúng nhất).

_____ Nhìn quanh để xem đạn từ đâu đến

_____ Nằm dài xuống đất

_____ Bắn trả lại tức thì ở thế đứng

_____ Ở phía sau xa chỗ bắn nên chưa phản-ứng ngay

_____ Chạy quá ba thước để tìm chỗ núp

_____ Chun xuống công sự hay hố cá nhân của tôi

_____ Việc khác

16.- Tiếp theo phản-ứng đầu tiên ở câu hỏi 12, anh sẽ làm điều gì ? (Đánh dấu X vào câu trả lời đúng nhất)

_____ Bắn về phía có tiếng súng địch

_____ Bắn về phía có lửa miệng súng hay khói súng địch

_____ Dời tới chỗ trú ẩn tốt hơn

_____ Cố tìm ra một mục-tiêu rõ-ràng để bắn

_____ Ẩn núm và không bắn gì cả

_____ Điều-khiển những người khác bắn

_____ Tìm được chỗ an-núp an-toàn

_____ Lấy súng và đạn dược ra

_____ Tiến tới phía có tiếng súng

_____ Khởi sự đặt vũ-khí (cộng đồng) để bắn

_____ Điều khác

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17.- Thời-gian giữa phản-ứng đầu tiên của anh (câu 12) và hành-động kế tiếp (câu 13) là bao lâu? (Đánh dấu X vào câu trả lời đúng)

_____ Lối 5 giây

_____ Từ 5 đến 10 giây

_____ Từ 10 đến 15 giây

_____ Từ 15 đến 20 giây

_____ Từ 20 đến 25 giây

_____ Từ 25 đến 30 giây

_____ Từ 30 đến 45 giây

_____ Từ 45 đến 60 giây

_____ Từ 1 phút đến 1 phút rưởi

_____ Từ 1 phút rưởi đến 2 phút

_____ Trên 2 phút

18.- Dưới đây là bản kê khai các chỗ có thể ẩn núp được khi đụng trận. Hãy tả lại theo thứ tự từ đầu đến cuối sự di chuyển của anh qua các chỗ ẩn núp đó như thế nào ? Tỷ dụ: nếu trước hết anh đã núp sau một cái cây nhỏ, rồi từ đó chạy tới một lùm cỏ rậm, rồi tới một bờ ruộng rồi quay trở lại lùm cỏ rậm, thì anh hãy ghi số 1 trước "cây nhỏ", số 2 trước "cỏ rậm", số 3 trước "bờ ruộng", số 4 trước "cỏ rậm" v.v... (Nhớ ghi tất cả những vật anh đã dùng để ẩn-núp)

_____ Đất bằng

_____ Cỏ thấp

_____ Cỏ rậm

_____ Nhiều bụi cây

_____ Nhiều cây nhỏ

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_____ Nhiều cây lớn

_____ Các thân cây nằm ngang

_____ Các bờ ruộng

_____ Vùng nước và bùn lầy

_____ Hố cá-nhân đào sẵn

_____ Công sự đào sẵn (có nóc che)

_____ Hố bom đạn

_____ Tảng đá nhỏ

_____ Tảng đá lớn

_____ Địa thế có nhiều chỗ lồi lõm thiên-tạo

_____ Nhà ở (bằng cay, bằng lá, bằng cỏ)

_____ Nhà ở (tường bằng đất, tường bằng gạch)

_____ Dụng cụ cá nhân

_____ Các vật khác

19.- Riêng anh, anh đã mang theo võ-khí gì trong cuộc đụng trận đó?

(Đánh dấu X vào câu trả lời đúng)

_____ M79

_____ M16

_____ M14

_____ Liên thanh M60

_____ Liên thanh cỡ 50

_____ Lựu đạn văng mảnh

_____ Lựu đạn phốt pho trắng

_____ Lựu đạn gây chạn động

_____ Lựu đạn gây hơi độc

_____ Lựu đạn khói

_____ AK 47

_____ Súng cac bin

_____ Súng lục

_____ Súng săn

_____ Súng bắn xe tăng hạng nhẹ

_____ Võ-khí khác

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20.- Trong lần đụng trận cuối cùng, có phải địch đã bắn anh bằng súng trường M.16 không?

_____ Có

_____ Không

Nếu không, thì bạn nhảy qua câu hỏi kế tiếp. Nếu có, thì làm sao bạn biết ngay đó là súng trường M.16, chứ không phải loại vũ-khí khác? Bạn nhận ra vũ-khí đó bằng cách gì ? (Đánh dấu X vào cách bạn nhận ra vũ-khí này).

_____ Tiếng nổ của súng

_____ Tiếng đạn bắng trúng vào vật gì

_____ Nhìn hình dáng viên đạn khi nó trúng vào vật gì

_____ Ánh lửa lóe ra ở miệng súng

_____ Đường bay của đạn chiếu sáng

_____ Nhịp bắn của súng

_____ Tiếng đạn bay qua đầu

_____ Nhìn khói tỏa ở miệng súng

_____ Nhìn vết thương của đồng đội

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21.- Trong lần đụng trận cuối cùng, có phải địch đã bắn anh bằng súng liên thanh M.60 không ?

_____ Có

_____ Không

Nếu không thì bạn nhảy qua câu hỏi kế tiếp. Nếu có thì làm sao bạn biết ngay đó là liên thanh M.60, chứ không phải loại vũ-khí khác ? Bạn nhận ra vũ-khí đó bằng cách gì ? (Đánh dấu X vào cách bạn nhận ra vũ-khí này).

_____ Tiếng nổ của súng

_____ Tiếng đạn bắn trúng vào vật gì

_____ Nhìn hình dáng viên đạn khi nó trúng vào vật gì

_____ Ánh lửa lóe ra ở miệng súng

_____ Đường bay của đạn chiếu sáng

_____ Nhịp bắn của súng

_____ Tiếng đạn bay qua đầu

_____ Nhìn khói tỏa ở miệng súng

_____ Nhìn vết thương của đồng đội

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22.- Trong lần đụng trận cuối cùng, có phải địch đã bắn anh bằng súng liên thanh 7,62 ly không ?

_____ Có

_____ Không

Nếu không thì bạn nhảy qua câu hỏi kế-tiếp. Nếu có thì làm sao bạn biết ngay đó là liên-thanh 7,62 ly, chứ không phải loại vũ-khí khác? Bạn nhận ra vũ-khí đó bằng cách gì ? (Đánh dấu X vào cách bạn nhận ra vũ-khí này).

_____ Tiếng nổ của súng

_____ Tiếng đạn bắn trúng vào vật gì

_____ Nhìn hình dáng viên đạn khi nó trúng vào vật gì

_____ Ánh lửa lóe ra ở miệng súng

_____ Đường bay của đạn chiếu sáng

_____ Nhịp bắn của súng

_____ Tiếng đạn bay qua đầu

_____ Nhìn khói tỏa ở miệng súng

_____ Nhìn vết thương của đồng đội

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23.- Trong lần đụng trận cuối cùng, có phải địch đã bắn anh bằng súng trường M.14 không ?

_____ Có

_____ Không

Nếu không thì bạn nhảy qua câu hỏi kế tiếp. Nếu có thì làm sao bạn biết ngay đó là súng trường M.14. chứ không phải loại vũ-khí khác ? (Đánh dấu X vào cách bạn nhận ra vũ-khí này).

_____ Tiếng nổ của súng

_____ Tiếng đạn bắn trúng vào vật gì

_____ Nhìn hình dáng viên đạn khi nó trúng vào vật gì

_____ Ánh lửa lóe ra ở miệng súng

_____ Đường bay của đạn chiếu sáng

_____ Nhịp bắn của súng

_____ Tiếng đạn bay qua đầu

_____ Nhìn khói tỏa ở miệng súng

_____ Nhìn vết thương của đồng đội

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24.- Trong lần dụng trận cuối cùng, có phải địch đã bắn anh bằng súng phóng lựu đạn M.79 không ?

_____ Có

_____ Không

Nếu không thì bạn nhảy qua câu hỏi kế tiếp. Nếu có thì làm sao bạn biết ngay đó là súng phóng lựu đạn M.79, chứ không phải loại vũ-khí khác ? Bạn nhận ra vũ-khí đó bằng cách gì ? (Đánh dấu X vào cách bạn nhận ra vũ-khí này)

_____ Tiếng nổ của súng

_____ Tiếng đạn bắn trúng vào vật gì

_____ Nhìn hình dáng viên đạn khi nó trúng vào vật gì

_____ Ánh lửa lóe ra ở miệng súng

_____ Đường bay của đạn chiếu sáng

_____ Nhịp bắn của súng

_____ Tiếng đạn bay qua đầu

_____ Nhìn khói tỏa ở miệng súng

_____ Nhìn vết thương của đồng đội

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25.- Trong lần đụng trận cuối cùng, có phải địch đã bắn anh bằng ống phóng hỏa tiễn không ?

_____ Có

_____ Không

Nếu không thì bạn nhảy qua câu hỏi kế tiếp. Nếu có thì làm sao bạn biết ngay đó là ống phóng hỏa tiễn, chứ không phải loại vũ khí khác? Bạn nhận ra vũ-khí đó bằng cách gì ? (Đánh dấu X vào cách bạn nhận ra vũ khí này)

_____ Tiếng nổ của súng

_____ Tiếng đạn bắn trúng vào vật gì

_____ Nhìn hình dáng viên đạn khi nó trúng vào vật gì

_____ Ánh lửa lóe ra ở miệng súng

_____ Đường bay của đạn chiếu sáng

_____ Nhịp bắn của súng

_____ Tiếng đạn bay qua đầu

_____ Nhìn khói tỏa ở miệng súng

_____ Nhìn vết thương của đồng đội

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26.- Suốt trong thời gian đụng trận đó, anh đã làm những chuyện gì ?

(Trả lời càng nhiều càng tốt đúng như anh đã hành động)

_____ Chỉ đạo những người khác, và bắn khi nào tôi có thể bắn được

_____ Giữ máy vô tuyến, và bắn khi nào có thể

_____ Bắn trả bằng vũ khí của tôi

_____ Mang đạn dược và bắn khi nào có thể

_____ Cúi đầu thấp xuống để tránh đạn và bắn khi nào có thể

_____ Cúi đầu thấp xuống và không bắn

_____ Chỉ bắn khi nào được lệnh, và tiến lên dưới hỏa lực của địch

_____ Chỉ bắn khi nào được lệnh, và thối lui dưới hỏa lực của địch

_____ Không hề bắn và chỉ chăm sóc các thương nhân

_____ Tiến lên khi tác xạ yểm trợ đã ngưng

_____ Chỉ tiến lên khi địch đã ngừng bắn hay bắn bớt đi

_____ Điều khác

27.- Trong lần đụng trận đó địch đã dùng võ khí của họ như thế nào ?

(Trả lời càng nhiều càng tốt như anh đã thấy)

_____ Bắn súng liên thanh sát đất không ngừng

_____ Bắn súng liên thanh từng loạt đều

_____ Bắn súng liên thanh loạn xạ

_____ Bắn súng trường tự động từng loạt đều

_____ Bắn súng trường tự động loạn xạ

_____ Không bắn súng tự động

_____ Bắn rất đúng đích

_____ Không bắn trúng đích nhiều

_____ Bắn chúi

_____ Ném lựu đạn nhưng không đến gần

_____ Ném lựu đạn làm cho chúng tôi bị thương

_____ Cách gì khác

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28.- Trong lần đụng trận đó, anh có được những thứ yểm-trợ tác-xạ không ? (Trả lời bằng cách đánh dấu trên những cái gạch ngang vào mà anh thấy là tả đúng sự thật).

_____ Súng cối

_____ Pháo binh

_____ Thứ gì khác

29.- Cuộc đụng trận đã chấm-dứt như thế nào ? (Trả lời bằng cách đánh dấu trên một cái gạch ngang dưới đây)

_____ Địch rút lui trước sức tác xạ của chúng tôi

_____ Trước sức tác-xạ của địch chúng tôi rút lui bằng cách đi bộ

_____ Trước sức tác-xạ của địch chúng tôi rút đi nơi khác bằng xuồng.

_____ Chúng tôi tràn vào vị trí của địch

_____ Địch tràn vào vị trí của chúng tôi

_____ Cả hai bên đều ngừng bắn

_____ Cách gì khác

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30.- Trong lần đụng trận đó, anh đã nghĩ thế nào về tình thế ngay sau sự phản ứng đầu tiên của anh khi gặp hỏa lực của địch? (Trả lời bằng cách đánh dấu trên một cái gạch ngang dưới đây).

_____ Tôi nghĩ : "Thế là xong rồi, chúng ta sắp bị tiêu diệt"

_____ Tôi nghĩ : "Lần này chúng ta khó mà thoát"

_____ Tôi nghĩ : "Lần này chúng ta cần phải có tiếp cứu"

_____ Tôi nghĩ : "Nếu nhận được tiếp tế, chúng ta sẽ không sợ gì"

_____ Tôi nghĩ : "Nếu bình tĩnh thì chúng ta có thể xông ra giết địch"

_____ Tôi nghĩ : "Lần này ngụy quân đã hớ, chúng ta sắp diệt gọn chúng"

_____ Điều gì khác

31.- Anh đã nghĩ như thế nào về tình thế ngay trước khi cuộc đụng trận đó chấm dứt ? (Trả lời bằng cách đánh dấu trên một cái gạch ngang dưới đây)

_____ Tôi nghĩ : "Xong rồi, chúng ta sắp bị tiêu diệt"

_____ Tôi nghĩ : "Không biết tình thế sẽ ngã ngũ ra sao"

_____ Tôi nghĩ : "Chúng ta cần phải được tiếp cứu"

_____ Tôi nghĩ : "Không có gì lo ngại, tình thế khả-quan"

_____ Tôi nghĩ : "Nếu bình tĩnh, chúng ta có thể xông ra giết sạch bọn chúng nó"

_____ Tôi nghĩ : "Lần này bọn ngụy đã hớ, chúng ta sắp diệt bọn chúng"

_____ Điều gì khác

32.- Khi gặp hỏa lực địch, điều gì làm cho anh lo ngại nhiều hơn cả ?
(Trả lời bằng cách đánh dấu trên một cái gạch ngang dưới đây)

_____ Bị chết
_____ Bị thương và tàn phế
_____ Bị thương và què quặt
_____ Sự đau đớn do thương tích gây nên
_____ Thấy người khác chết
_____ Thấy người khác bị thương
_____ Điều gì khác

33.- Khi bị địch bắn, điều nào dưới đây khiến anh thấy khó chịu nhứt ?
(Trả lời bằng cách đánh dấu trên một cái gạch ngang dưới đây)

_____ Nghe tiếng đạn bay ngang
_____ Tiếng súng nổ
_____ Thấy lửa lóe nhiều ở miệng súng của địch
_____ Thấy đạn chiếu sáng bay tới phía chúng tôi
_____ Thấy đạn bắn trúng cây, đất v.v...
_____ Thấy lựu đạn ném tới phía chúng tôi
_____ Điều gì khác

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34.- Trong suốt thời gian chiến đấu cho MT hay Bộ Đội BV, anh sợ thứ võ-khí nào của địch nhất? (Trả lời bằng cách đánh dấu trên một cái gạch ngang dưới đây)

_____ Súng trường M.16

_____ Súng liên thanh M.60

_____ Liên thanh cỡ 7.62 ly

_____ Súng trường M.14

_____ Súng phóng lựu đạn

_____ Súng phóng hỏa tiễn

_____ Thứ gì khác

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SUPPRESSIVE FIRE FIELD EXPERIMENT

PHASE I

TRIAL NO._____

NAME_____

DATE_____

SCENARIO # 1 EVENT #____

DESCRIPTION OF SITUATION

The time is 0700 hours. Your squad is conducting an independent search and destroy operation away from the rest of the platoon. Your unit makes contact with a five man enemy patrol and opens fire on that patrol. Cover available to you and the enemy is medium. It consists of rice paddy dikes, irrigation ditches, and small trees. Some additional concealment is afforded by grass one foot high. The enemy returns your fire, and a fire fight is now in progress. Two members of your squad have been hit by enemy small arms fire.

The incoming fire which you will now experience is representative of the return fire which the enemy is now directing toward your location. Given the situation described above, and the type of incoming fire (weapon, volume and nearness of rounds) which you will now experience, circle the letter next to the statement below that best describes the action you would take during the time that fire of this type is being directed at you.

A. Take cover as best I could, but wouldn't be able to observe or fire on the enemy at all.

B. Take cover as best I could and would be able to observe the enemy occasionally, but wouldn't be able to fire at the enemy at all.

C. Take cover as best I could and would be able to observe the enemy continuously but wouldn't be able to fire at the enemy at all.

D. Take cover as best I could, and would be able to observe the enemy occasionally and fire at the enemy occasionally.

E. Take cover as best I could, and would be able to observe the enemy continually and fire at the enemy occasionally.

F. Take cover as best I could but would be able to observe the enemy continually and place continuous fire on the enemy.

G. Would continue doing what I had been doing before the incoming fire and wouldn't worry about getting better cover.

SCENARIO # 2 EVENT #____

DESCRIPTION OF SITUATION

The time is 0700 hours. Your platoon is conducting a platoon sweep operation and is moving on line toward an enemy held position estimated to be occupied by 20 enemy soldiers. Your platoon leader directs the M60 gunners to set up a base of fire and orders the platoon to assault the enemy position. You are moving forward in the assault. Cover available to you and the enemy is medium. It consists of rice paddy dikes, irrigation ditches, and small trees. Some additional concealment is afforded by grass one foot high. The enemy returns your fire, and a fire fight is now in progress. Two members of your platoon have been hit by enemy small arms fire.

The incoming fire which you will now experience is representative of the return fire which the enemy is now directing toward your location. Given the situation described above, and the type of incoming fire (weapon, volume and nearness of rounds) which you will now experience, circle the letter next to the statement below that best describes the action you would take during the time that fire of this type is being directed at you.

A. Take cover as best I could, but wouldn't be able to observe or fire on the enemy at all.

B. Take cover as best I could and would be able to observe the enemy occasionally, but wouldn't be able to fire at the enemy at all.

C. Take cover as best I could and would be able to observe the enemy continuously but wouldn't be able to fire at the enemy at all.

D. Take cover as best I could, and would be able to observe the enemy occasionally and fire at the enemy occasionally.

E. Take cover as best I could, and would be able to observe the enemy continually and fire at the enemy occasionally.

F. Take cover as best I could but would be able to observe the enemy continually and place continuous fire on the enemy.

G. Would continue doing what I had been doing before the incoming fire and wouldn't worry about getting better over.

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SCENARIO # 3 EVENT #____

DESCRIPTION OF SITUATION

The time is 0700 hours. Your squad has been conducting search and destroy operations without platoon support. Your squad has occupied a night defensive position and is now preparing to move out. As you are making these preparations, the enemy, estimated to be a five-man patrol, opens up on you with small arms fire. Cover available to you and the enemy is medium. It consists of rice paddy dikes, irrigation ditches, and small trees. You also have as cover the individual fighting holes dug by you the previous evening. Some additional concealment is afforded by grass one foot high. In the initial burst of enemy small arms fire two members of your squad are hit.

The incoming fire which you will now experience is representative of the fire which the enemy is now directing toward your location. Given the situation described above, and the type of incoming fire (weapon, volume and nearness of rounds) which you will now experience, circle the letter next to the statement below that best describes the action you would take during the time that fire of this type is being directed at you.

A. Take cover as best I could, but wouldn't be able to observe or fire on the enemy at all.

B. Take cover as best I could and would be able to observe the enemy occasionally, but wouldn't be able to fire at the enemy at all.

C. Take cover as best I could and would be able to observe the enemy continuously but wouldn't be able to fire at the enemy at all.

D. Take cover as best I could, and would be able to observe the enemy occasionally and fire at the enemy occasionally.

E. Take cover as best I could, and would be able to observe the enemy continually and fire at the enemy occasionally.

F. Take cover as best I could but would be able to observe the enemy continually and place continuous fire on the enemy.

G. Would continue doing what I had been doing before the incoming fire and wouldn't worry about [illegible] better cover.

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SCENARIO # 4 EVENT #____

DESCRIPTION OF SITUATION

The time is 0700 hours. Your platoon has been conducting sweep operations. Your platoon has occupied a night defensive position and is now preparing to move out. As you are making these preparations, the enemy, estimated to be 20 men, opens up on you with small arms fire. Cover available to you and the enemy is medium. It consists of rice paddy dikes, irrigation ditches, and small trees. You also have as cover the individual fighting holes dug by you the previous evening. Some additional concealment is afforded by grass one foot high. In the initial burst of enemy small arms fire two members of your platoon are hit.

The incoming fire which you will now experience is representative of the fire which the enemy is now directing toward your location. Given the situation described above, and the type of incoming fire (weapon, volume and nearness of rounds) which you will now experience, circle the letter next to the statement below that best describes the action you would take during the time that fire of this type is being directed at you.

A. Take cover as best I could, but wouldn't be able to observe or fire on the enemy at all.

B. Take cover as best I could and would be able to observe the enemy occasionally, but wouldn't be able to fire at the enemy at all.

C. Take cover as best I could and would be able to observe the enemy continuously but wouldn't be able to fire at the enemy at all.

D. Take cover as best I could, and would be able to observe the enemy occasionally and fire at the enemy occasionally.

E. Take cover as best I could, and would be able to observe the enemy continually and fire at the enemy occasionally.

F. Take cover as best I could but would be able to observe the enemy continually and place continuous fire on the enemy.

G. Would continue doing what I had been doing before the incoming fire and wouldn't [illegible] better cover.

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SCENARIO # 5 EVENT #____

DESCRIPTION OF SITUATION

The time is 0700 hours. Your squad is conducting an independent search and destroy operation away from the rest of the platoon. Your unit makes contact with a five man enemy patrol and opens fire on that patrol. Cover available to you and the enemy is light. It consists of small scrub brush and a few shallow shell craters. Some additional concealment is afforded by grass one foot high. The enemy returns your fire, and a fire fight is now in progress. Two members of your squad have been hit by enemy small arms fire.

The incoming fire which you will now experience is representative of the return fire which the enemy is now directing toward your location. Given the situation described above, and the type of incoming fire (weapon, volume and nearness of rounds) which you will now experience, circle the letter next to the statement below that best describes the action you would take during the time that fire of this type is being directed at you.

A. Take cover as best I could, but wouldn't be able to observe or fire on the enemy at all.

B. Take cover as best I could and would be able to observe the enemy occasionally, but wouldn't be able to fire at the enemy at all.

C. Take cover as best I could and would be able to observe the enemy continuously but wouldn't be able to fire at the enemy at all.

D. Take cover as best I could, and would be able to observe the enemy occasionally and fire at the enemy occasionally.

E. Take cover as best I could, and would be able to observe the enemy continually and fire at the enemy occasionally.

F. Take cover as best I could but would be able to observe the enemy continually and place continuous fire on the enemy.

G. Would continue doing what I had been doing before the incoming fire and wouldn't worry about getting better cover.

SCENARIO # 6 EVENT #_____

DESCRIPTION OF SITUATION

The time is 0700 hours. Your platoon is conducting a platoon sweep operation and is moving on line toward an enemy held position estimated to be occupied by 20 soldiers. Your platoon leader directs the M60 gunners to set up a base fire and orders the platoon to assault the enemy position. You are moving forward in the assault. Cover available to you and the enemy is light. It consists of small scrub brush and a few shallow shell craters. Some additional concealment is afforded by grass one foot high. The enemy returns your fire, and a fire fight is now in progress. Two members of your platoon have been hit by enemy small arms fire.

The incoming fire which you will now experience is representative of the return fire which the enemy is now directing toward your location. Given the situation described above, and the type of incoming fire (weapon, volume and nearness of rounds) which you will now experience, circle the letter next to the statement below that best describes the action you would take during the time that fire of this type is being directed at you.

A. Take cover as best I could, but wouldn't be able to observe or fire on the enemy at all.

B. Take cover as best I could and would be able to observe the enemy occasionally, but wouldn't be able to fire at the enemy at all.

C. Take cover as best I could and would be able to observe the enemy continuously but wouldn't be able to fire at the enemy at all.

D. Take cover as best I could, and would be able to observe the enemy occasionally and fire at the enemy occasionally.

E. Take cover as best I could, and would be able to observe the enemy continually and fire at the enemy occasionally.

F. Take cover as best I could but would be able to observe the enemy continually and place continuous fire on the enemy.

G. Would continue doing what I had been doing before the incoming fire and wouldn't [illegible] getting better cover.

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SCENARIO # 7 EVENT #____

DESCRIPTION OF SITUATION

The time is 0700 hours. Your squad has been conducting search and destroy operations without platoon support. Your squad has occupied a night defensive position and is now preparing to move out. As you are making these preparations, the enemy, estimated to be a five-man patrol, opens up on you with small arms fire. Cover available to you and the enemy is light. It consists of small scrub brush and a few shallow shell craters. Also, it was only possible for you to dig shallow prone fighting holes the previous evening. Some additional concealment is afforded by grass one foot high. In the initial burst of enemy small arms fire two members of your squad are hit.

The incoming fire which you will now experience is representative of the fire which the enemy is now directing toward your location. Given the situation described above, and the type of incoming fire (weapon, volume and nearness of rounds) which you will now experience, circle the letter next to the statement below that best describes the action you would take during the time that fire of this type is being directed at you.

A. Take cover as best I could, but wouldn't be able to observe or fire on the enemy at all.

B. Take cover as best I could and would be able to observe the enemy occasionally, but wouldn't be able to fire at the enemy at all.

C. Take cover as best I could and would be able to observe the enemy continuously but wouldn't be able to fire at the enemy at all.

D. Take cover as best I could, and would be able to observe the enemy occasionally and fire at the enemy occasionally.

E. Take cover as best I could, and would be able to observe the enemy continually and fire at the enemy occasionally.

F. Take cover as best I could but would be able to observe the enemy continually and place continuous fire on the enemy.

G. Would continue doing what I had been doing before the incoming fire and wouldn't worry about [illegible] better cover.

UNCLASSIFIED

SCENARIO # 8 EVENT #_____

DESCRIPTION OF SITUATION

The time is 0700 hours. Your platoon has been conducting sweep operations. Your platoon has occupied a night defensive position and is now preparing to move out. As you are making these preparations, the enemy, estimated to be 20 men, opens up on you with small arms fire. Cover available to you and the enemy is light. It consists of small scrub brush and a few shallow shell craters. Also, it was only possible for you to dig shallow prone fighting holes the previous evening. Some additional concealment is afforded by grass one foot high. In the initial burst of enemy small arms fire two members of your platoon are hit.

The incoming fire which you will now experience is representative of the fire which the enemy is now directing toward your location. Given the situation described above, and the type of incoming fire (weapon, volume and nearness of rounds) which you will now experience, circle the letter next to the statement below that best describes the action you would take during the time that fire of this type is being directed at you.

A. Take cover as best I could, but wouldn't be able to observe or fire on the enemy at all.

B. Take cover as best I could and would be able to observe the enemy occasionally, but wouldn't be able to fire at the enemy at all.

C. Take cover as best I could and would be able to observe the enemy continuously but wouldn't be able to fire at the enemy at all.

D. Take cover as best I could, and would be able to observe the enemy occasionally and fire at the enemy occasionally.

E. Take cover as best I could, and would be able to observe the enemy continually and fire at the enemy occasionally.

F. Take cover as best I could but would be able to observe the enemy continually and place continuous fire on the enemy.

G. Would continue doing what I had been doing before the incoming fire and wouldn't [illegible] better cover.

SCENARIO # 9 EVENT #_____

DESCRIPTION OF SITUATION

The time is 0700 hours. Your squad is conducting an independent search and destroy operation away from the rest of the platoon. Your unit makes contact with a five-man enemy patrol and opens fire on that patrol. Cover available to you and the enemy is medium. It consists of rice paddy dikes, irrigation ditches, and small trees. Some additional concealment is afforded by grass one foot high. The enemy returns your fire, and a fire fight is now in progress. No members of your squad have been hit.

The incoming fire which you will now experience is representative of the return fire which the enemy is now directing toward your location. Given the situation described above, and the type of incoming fire (weapon, volume and nearness of rounds) which you will now experience, circle the letter next to the statement below that best describes the action you would take during the time that fire of this type is being directed at you.

A. Take cover as best I could, but wouldn't be able to observe or fire on the enemy at all.

B. Take cover as best I could and would be able to observe the enemy occasionally, but wouldn't be able to fire at the enemy at all.

C. Take cover as best I could and would be able to observe the enemy continuously but wouldn't be able to fire at the enemy at all.

D. Take cover as best I could, and would be able to observe the enemy occasionally and fire at the enemy occasionally.

E. Take cover as best I could, and would be able to observe the enemy continually and fire at the enemy occasionally.

F. Take cover as best I could but would be able to observe the enemy continually and place continuous fire on the enemy.

G. Would continue doing what I had been doing before the incoming fire and wouldn't worry about getting better cover.

SCENARIO # 10 EVENT #_____

DESCRIPTION OF SITUATION

The time is 0700 hours. Your platoon is conducting a platoon sweep operation and is moving on line toward an enemy held position estimated to be occupied by 20 enemy soldiers. Your platoon leader directs the M60 gunners to set up a base of fire and orders the platoon to assault the enemy position. You are moving forward in the assault. Cover available to you and the enemy is medium. It consists of rice paddy dikes, irrigation ditches, and small trees. Some additional concealment is afforded by grass one foot high. The enemy returns your fire, and a fire fight is now in progress. No members of your platoon have been hit.

The incoming fire which you will now experience is representative of the return fire which the enemy is now directing toward your location. Given the situation described above, and the type of incoming fire (weapon, volume and nearness of rounds) which you will now experience, circle the letter next to the statement below that best describes the action you would take during the time that fire of this type is being directed at you.

A. Take cover as best I could, but wouldn't be able to observe or fire on the enemy at all.

B. Take cover as best I could and would be able to observe the enemy occasionally, but wouldn't be able to fire at the enemy at all.

C. Take cover as best I could and would be able to observe the enemy continuously but wouldn't be able to fire at the enemy at all.

D. Take cover as best I could, and would be able to observe the enemy occasionally and fire at the enemy occasionally.

E. Take cover as best I could, and would be able to observe the enemy continually and fire at the enemy occasionally.

F. Take cover as best I could but would be able to observe the enemy continually and place continuous fire on the enemy.

G. Would continue doing what I had been doing before the incoming fire and wouldn't worry about getting better cover.

SCENARIO # 11 EVENT #_____

DESCRIPTION OF SITUATION

The time is 0700 hours. Your squad has been conducting search and destroy operations without platoon support. Your squad has occupied a night defensive position and is now preparing to move out. As you are making these preparations, the enemy, estimated to be a five-man patrol, opens up on you with small arms fire. Cover available to you and the enemy is medium. It consists of rice paddy dikes, irrigation ditches and small trees. You also have as cover the individual fighting holes dug by you the previous evening. Some additional concealment is afforded by grass one foot high. In the initial burst of enemy small arms fire no members of your squad are hit.

The incoming fire which you will now experience is representative of the fire which the enemy is now directing toward your location. Given the situation described above, and the type of incoming fire (weapon, volume and nearness of rounds) which you will now experience, circle the letter next to the statement below that best describes the action you would take during the time that fire of this type is being directed at you.

A. Take cover as best I could, but wouldn't be able to observe or fire on the enemy at all.

B. Take cover as best I could and would be able to observe the enemy occasionally, but wouldn't be able to fire at the enemy at all.

C. Take cover as best I could and would be able to observe the enemy continuously but wouldn't be able to fire at the enemy at all.

D. Take cover as best I could, and would be able to observe the enemy occasionally and fire at the enemy occasionally.

E. Take cover as best I could, and would be able to observe the enemy continually and fire at the enemy occasionally.

F. Take cover as best I could but would be able to observe the enemy continually and place continuous fire on the enemy.

G. Would continue doing what I had been doing before the incoming fire and wouldn't worry about finding better cover.

SCENARIO # 12 EVENT #_____

DESCRIPTION OF SITUATION

The time is 0700 hours. Your platoon has been conducting sweep operations. Your platoon has occupied a night defensive position and is now preparing to move out. As you are making these preparations, the enemy, estimated to be 20 men, opens up on you with small arms fire. Cover available to you and the enemy is medium. It consists of rice paddy dikes, irrigation ditches, and small trees. You also have as cover the individual fighting holes dug by you the previous evening. Some additional concealment is afforded by grass one foot high. In the initial burst of enemy small arms fire no members of your platoon are hit.

The incoming fire which you will now experience is representative of the fire which the enemy is now directing toward your location. Given the situation described above, and the type of incoming fire (weapon, volume and nearness of rounds) which you will now experience, circle the letter next to the statement below that best describes the action you would take during the time that fire of this type is being directed at you.

A. Take cover as best I could, but wouldn't be able to observe or fire on the enemy at all.

B. Take cover as best I could and would be able to observe the enemy occasionally, but wouldn't be able to fire at the enemy at all.

C. Take cover as best I could and would be able to observe the enemy continuously but wouldn't be able to fire at the enemy at all.

D. Take cover as best I could, and would be able to observe the enemy occasionally and fire at the enemy occasionally.

E. Take cover as best I could, and would be able to observe the enemy continually and fire at the enemy occasionally.

F. Take cover as best I could but would be able to observe the enemy continually and place continuous fire on the enemy.

G. Would continue doing what I had been doing before the incoming fire and wouldn't worry about getting better cover.

SCENARIO # 13 EVENT #____

DESCRIPTION OF SITUATION

The time is 0700 hours. Your squad is conducting an independent search and destroy operation away from the rest of the platoon. Your unit makes contact with a five-man enemy patrol and opens fire on that patrol. Cover available to you and the enemy is light. It consists of small scrub brush and a few shallow shell craters. Some additional concealment is afforded by grass one-foot high. The enemy returns your fire, and a fire fight is now in progress. No members of your squad have been hit.

The incoming fire which you will now experience is representative of the return fire which the enemy is now directing toward your location. Given the situation described above, and the type of incoming fire (weapon, volume and nearness of rounds) which you will now experience, circle the letter next to the statement below that best describes the action you would take during the time that fire of this type is being directed at you.

A. Take cover as best I could, but wouldn't be able to observe or fire on the enemy at all.

B. Take cover as best I could and would be able to observe the enemy occasionally, but wouldn't be able to fire at the enemy at all.

C. Take cover as best I could and would be able to observe the enemy continuously but wouldn't be able to fire at the enemy at all.

D. Take cover as best I could, and would be able to observe the enemy occasionally and fire at the enemy occasionally.

E. Take cover as best I could, and would be able to observe the enemy continually and fire at the enemy occasionally.

F. Take cover as best I could but would be able to observe the enemy continually and place continuous fire on the enemy.

G. Would continue doing what I had been doing before the incoming fire and wouldn't worry about getting better cover.

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SCENARIO # 14 EVENT #____

DESCRIPTION OF SITUATION

The time is 0700 hours. Your platoon is conducting a platoon sweep operation and is moving on line toward an enemy held position estimated to be occupied by 20 enemy soldiers. Your platoon leader directs the M60 gunners to set up a base of fire, and orders the platoon to assault the enemy position. You are moving forward in the assault. Cover available to you and the enemy is light. It consists of small scrub brush and a few shallow shell craters. Some additional concealment is afforded by grass one foot high. The enemy returns your fire, and a fire fight is now in progress. No members of your platoon are hit.

The incoming fire which you will now experience is representative of the return fire which the enemy is now directing toward your location. Given the situation described above, and the type of incoming fire (weapon, volume and nearness of rounds) which you will now experience, circle the letter next to the statement below that best describes the action you would take during the time that fire of this type is being directed at you.

A. Take cover as best I could, but wouldn't be able to observe or fire on the enemy at all.

B. Take cover as best I could and would be able to observe the enemy occasionally, but wouldn't be able to fire at the enemy at all.

C. Take cover as best I could and would be able to observe the enemy continuously but wouldn't be able to fire at the enemy at all.

D. Take cover as best I could, and would be able to observe the enemy occasionally and fire at the enemy occasionally.

E. Take cover as best I could, and would be able to observe the enemy continually and fire at the enemy occasionally.

F. Take cover as best I could but would be able to observe the enemy continually and place continuous fire on the enemy.

G. Would continue doing what I had been doing before the incoming fire and wouldn't worry about getting better cover.

UNCLASSIFIED

SCENARIO # 15 EVENT #____

DESCRIPTION OF SITUATION

The time is 0700 hours. Your squad has been conducting search and destroy operations without platoon support. Your squad has occupied a night defensive position and is now preparing to move out. As you are making these preparations, the enemy, estimated to be a five-man patrol, opens up on you with small arms fire. Cover available to you and the enemy is light. It consists of small scrub brush and a few shallow shell craters. Also, it was only possible for you to dig shallow prone fighting holes the previous evening. Some additional concealment is afforded by grass one foot high. In the initial burst of enemy small arms fire no members of your squad are hit.

The incoming fire which you will now experience is representative of the fire which the enemy is now directing toward your location. Given the situation described above, and the type of incoming fire (weapon, volume and nearness of rounds) which you will now experience, circle the letter next to the statement below that best describes the action you would take during the time that fire of this type is being directed at you.

A. Take cover as best I could, but wouldn't be able to observe or fire on the enemy at all.

B. Take cover as best I could and would be able to observe the enemy occasionally, but wouldn't be able to fire at the enemy at all.

C. Take cover as best I could and would be able to observe the enemy continuously but wouldn't be able to fire at the enemy at all.

D. Take cover as best I could, and would be able to observe the enemy occasionally and fire at the enemy occasionally.

E. Take cover as best I could, and would be able to observe the enemy continually and fire at the enemy occasionally.

F. Take cover as best I could but would be able to observe the enemy continually and place continuous fire on the enemy.

G. Would continue doing what I had been doing before the incoming fire and wouldn't worry about getting better cover.

SCENARIO # 16 EVENT #_____

DESCRIPTION OF SITUATION

The time is 0700 hours. Your platoon has been conducting sweep operations. Your platoon has occupied a night defensive position and is now preparing to move out. As you are making these preparations, the enemy, estimated to be 20 men, opens up on you with small arms fire. Cover available to you and the enemy is light. It consists of small scrub brush and a few shallow shell craters. Also, it was only possible for you to dig shallow prone fighting holes the previous evening. Some additional concealment is afforded by grass one foot high. In the initial burst of enemy small arms fire no members of your platoon are hit.

The incoming fire which you will now experience is representative of the fire which the enemy is now directing toward your location. Given the situation described above, and the type of incoming fire (weapon, volume and nearness of rounds) which you will now experience, circle the letter next to the statement below that best describes the action you would take during the time that fire of this type is being directed at you.

A. Take cover as best I could, but wouldn't be able to observe or fire on the enemy at all.

B. Take cover as best I could and would be able to observe the enemy occasionally, but wouldn't be able to fire at the enemy at all.

C. Take cover as best I could and would be able to observe the enemy continuously but wouldn't be able to fire at the enemy at all.

D. Take cover as best I could, and would be able to observe the enemy occasionally and fire at the enemy occasionally.

E. Take cover as best I could, and would be able to observe the enemy continually and fire at the enemy occasionally.

F. Take cover as best I could but would be able to observe the enemy continually and place continuous fire on the enemy.

G. Would continue doing what I had been doing before the incoming fire and wouldn't worry about getting better cover.

MISS DISTANCE ESTIMATION

TRIAL NO. _____ NAME _____

DATE _____

INSTRUCTIONS

In this experiment you are asked to estimate how far to the right or left of you incoming rounds from various weapons have passed. Your estimate is to be made to the nearest whole meter. Be sure to indicate whether the round passed to your right or to your left as well as how many meters away. If you feel that the round passed directly overhead mark the distance as zero (0).

EVENT	MISS DISTANCE IN METERS (Left or Right)
1	_____
2	_____
3	_____
4	_____
5	_____
6	_____
7	_____
8	_____
9	_____
10	_____
11	_____
12	_____
13	_____
14	_____

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PERCEIVED DANGEROUSNESS STUDY

SCENARIO NO. 1

DESCRIPTION OF SITUATION

The time is 0700 hours. Your squad is conducting an independent search and destroy operation away from the rest of the platoon. Your unit makes contact with a five-man enemy patrol and opens fire on that patrol. Cover available to you and the enemy is medium. It consists of rice paddy dikes, irrigation ditches, and small trees. Some additional concealment is afforded by grass 1 foot high. The enemy returns your fire, and a fire fight is now in progress. Two members of your squad have been hit by enemy small arms fire.

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PERCEIVED DANGEROUSNESS STUDY

TRIAL NO._____ NAME_____

DATE_____

INSTRUCTIONS

In this study you will be asked to rate the dangerousness of a series of live-fire events. Based on the illustrations of maximum dangerousness (6), and no personal danger (0) which were just presented, rate each of the following firing events on the seven point scale provided below. Ratings are to be made by circling one of the scale values for each firing event. Remember that 0 represents no personal danger and 6 represents maximum dangerousness. Scale values 0, 1, 2, 3, 4, 5, 6 represent increasing degrees of dangerousness.

EVENT	NO PERSONAL DANGER						MAXIMUM DANGER-OUSNESS
1	0	1	2	3	4	5	6
2	0	1	2	3	4	5	6
3	0	1	2	3	4	5	6
4	0	1	2	3	4	5	6

PERCEIVED DANGEROUSNESS STUDY (Continued)

EVENT	NO PERSONAL DANGER						MAXIMUM DANGER-OUSNESS
5	0	1	2	3	4	5	6
6	0	1	2	3	4	5	6
7	0	1	2	3	4	5	6
8	0	1	2	3	4	5	6
9	0	1	2	3	4	5	6
10	0	1	2	3	4	5	6
11	0	1	2	3	4	5	6
12	0	1	2	3	4	5	6
13	0	1	2	3	4	5	6
14	0	1	2	3	4	5	6
15	0	1	2	3	4	5	6

PERCEIVED DANGEROUSNESS STUDY (Continued)

EVENT	NO PERSONAL DANGER						MAXIMUM DANGER-OUSNESS
16	0	1	2	3	4	5	6
17	0	1	2	3	4	5	6
18	0	1	2	3	4	5	6
19	0	1	2	3	4	5	6
20	0	1	2	3	4	5	6
21	0	1	2	3	4	5	6

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M02R - STEPWISE REGRESSION - VERSION OF MAY 2, 1966
HEALTH SCIENCES COMPUTING FACILITY, UCLA

PROBLEM CODE XM19
NUMBER OF CASES 90.
NUMBER OF ORIGINAL VARIABLES 8
NUMBER OF VARIABLES ADDED 21
TOTAL NUMBER OF VARIABLES 29
NUMBER OF SUB-PROBLEMS 1

SUMMARY TABLE

STEP NUMBER	VARIABLE ENTERED	VARIABLE REMOVED	MULTIPLE R	RSQ	INCREASE IN RSQ	F VALUE TO ENTER OR REMOVE	NUMBER OF INDEPENDENT VARIABLES INCLUDED
1	BURST 8		.1326	.0176	.0176	14.3539	1
2	MISS D 5		.1520	.0231	.0055	4.5263	2
3	3 X 8 23		.1695	.0287	.0056	4.6319	3
4	5 X 8 28		.1777	.0316	.0029	2.3564	4
5	3 X 7 22		.1819	.0331	.0015	1.2477	5
6	2 X 4 16		.1856	.0344	.0013	1.1036	6
7	4 X 8 28		.1883	.0355	.0010	.8564	7
8	U SIZE 2		.1909	.0364	.0010	.8099	8
9	2 X 6 19		.1946	.0379	.0014	1.1768	9
10	2 X 3 15		.1969	.0388	.0009	.7307	10
11	4 X 7 25		.1990	.0395	.0008	.6849	11
12	4 X 5 24		.2090	.0433	.0037	3.0332	12
13	MISSON 1		.2095	.0439	.0006	.5022	13
14	7 X 8 29		.2109	.0445	.0006	.5007	14
15	3 X 5 21		.2121	.0450	.0005	.4239	15
16	1 X 8 14		.2123	.0455	.0005	.4246	16
17	MISS J 7		.2138	.0457	.0002	.1619	17
18	3 X 4 26		.2141	.0459	.0001	.1028	18
19	2 X 7 18		.2143	.0458	.0001	.0832	19
20	1 X 2 9		.2145	.0460	.0001	.0833	20
21	1 X 7 13		.2146	.0461	.0001	.0539	21
22	1 X 5 12		.2154	.0464	.0003	.2708	22
23	1 X 4 11		.2155	.0464	.0000	.0378	23
24	CASUAL 4		.2156	.0465	.0000	.0117	24

UNCLASSIFIED

UNCLASSIFIED

2R022 - STEPWISE REGRESSION - VERSION OF MAY 2, 1966
HEALTH SCIENCES COMPUTING FACILITY, UCLA

PROBLEM CODE M16
NUMBER OF CASES 881
NUMBER OF ORIGINAL VARIABLES 8
NUMBER OF VARIABLES ADDED 21
TOTAL NUMBER OF VARIABLES 29
NUMBER OF SUB-PROBLEMS 1

SUMMARY TABLE

STEP NUMBER	VARIABLE ENTERED	VARIABLE REMOVED	MULTIPLE R	RSQ	INCREASE IN RSQ	F VALUE TO ENTER OR REMOVE	NUMBER OF INDEPENDENT VARIABLES INCLUDED
1	BURST 8		.1754	.0308	.0308	27.8947	1
2	CASUAL 4		.1876	.0352	.0044	4.0301	2
3	U SIZE 2		.1967	.0387	.0035	3.1794	3
4	MISS D 5		.2028	.0411	.0025	2.2555	4
5	2 x 8 19		.2049	.0420	.0008	.7547	5
6	1 x 6 14		.2057	.0427	.0007	.6798	6
7	MISS J 7		.2064	.0434	.0007	.6681	7
8	3 x 0 23		.2102	.0442	.0008	.6896	8
9	CANCER 3		.2131	.0454	.0012	1.1012	9
10	1 x 7 13		.2148	.0461	.0007	.6532	10
11	2 x 4 16		.2160	.0467	.0005	.4880	11
12	2 x 5 17		.2172	.0472	.0005	.4677	12
13	4 x 5 24		.2180	.0475	.0003	.3072	13
14	4 x 7 25		.2188	.0479	.0003	.3165	14
15	3 x 4 20		.2194	.0481	.0003	.2526	15
16	7 x 8 29		.2200	.0484	.0003	.2431	16
17	5 x 8 28		.2205	.0486	.0002	.2124	17
18	2 x 3 15		.2209	.0488	.0001	.1346	18
19	1 x 3 10		.2211	.0489	.0001	.0944	19
20	1 x 2 9		.2213	.0490	.0001	.0850	20
21	4 x 8 26		.2214	.0490	.0000	.0415	21
22	3 x 5 21		.2215	.0491	.0000	.0363	22
23	3 x 7 22		.2217	.0491	.0001	.0667	23
24	2 x 7 18		.2217	.0492	.0000	.0194	24

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UNCLASSIFIED

BMD20 - STEPWISE REGRESSION - VERSION OF MAY 2, 1966
HEALTH SCIENCES COMPUTING FACILITY, UCLA

PROBLEM CODE AK47
NUMBER OF CASES 888
NUMBER OF ORIGINAL VARIABLES 8
NUMBER OF VARIABLES ADDED 21
TOTAL NUMBER OF VARIABLES 29
NUMBER OF SUB-PROBLEMS 1

SUMMARY TABLE

STEP NUMBER	VARIABLE ENTERED	VARIABLE REMOVED	MULTIPLE R	MULTIPLE RSQ	INCREASE IN RSQ	F VALUE TO ENTER OR REMOVE	NUMBER OF INDEPENDENT VARIABLES INCLUDED
1	BURST 8		.1702	.0290	.0290	26.1919	1
2	2 X 4 16		.1742	.0303	.0014	1.2375	2
3	U SIZE 2		.1773	.0315	.0011	1.0096	3
4	1 X 2 9		.1802	.0325	.0010	.9262	4
5	3 X 4 20		.1829	.0335	.0010	.8916	5
6	2 X 3 15		.1852	.0343	.0008	.7457	6
7	MISS D 5		.1870	.0350	.0007	.6110	7
8	1 X 4 11		.1885	.0355	.0006	.5224	8
9	COVER 3		.1897	.0360	.0005	.4152	9
10	3 X 6 23		.1910	.0365	.0005	.4324	10
11	CASUAL 4		.1921	.0369	.0004	.3851	11
12	7 X 8 29		.1932	.0373	.0004	.3626	12
13	4 X 7 25		.1938	.0376	.0003	.2302	13
14	3 X 5 21		.1944	.0378	.0002	.1888	14
15	2 X 5 17		.1946	.0379	.0001	.0830	15
16	3 X 7 22		.1948	.0380	.0001	.0759	16
17	4 X 8 26		.1950	.0380	.0001	.0571	17
18	2 X 8 19		.1951	.0381	.0000	.0442	18
19	1 X 8 14		.1952	.0381	.0000	.0238	19
20	MISSON 1		.1954	.0382	.0001	.0937	20
21	4 X 5 24		.1955	.0382	.0000	.0106	21

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BMD02R - STEPWISE REGRESSION - VERSION OF MAY 2, 1966
HEALTH SCIENCES COMPUTING FACILITY, UCLA

PROBLEM CODE	468
NUMBER OF CASES	455
NUMBER OF ORIGINAL VARIABLES	7
NUMBER OF VARIABLES ADDED	15
TOTAL NUMBER OF VARIABLES	22
NUMBER OF SUB-PROBLEMS	1

VARIABLES IN EQUATION

VARIABLE		COEFFICIENT	STD. ERROR	F TO REMOVE
(CONSTANT		43.35493)		
COVER	3	-.52659	1.12232	.2201
CASUAL	4	1.05545	1.12365	.8826
MISS D	9	-1.47929	1.37352	1.1599
1 X 3	9	-1.28705	1.12278	1.3140
1 X 4	10	.79382	1.12281	.4998
1 X 5	11	-.66943	1.37369	.2375
2 X 4	14	-.78771	1.12254	.4924
2 X 5	15	1.25503	1.37272	.8358
3 X 5	18	-.57745	1.37174	.1773
4 X 5	20	1.78791	2.73357	.3902
4 X 7	21	.54156	1.58771	.1633

VARIABLES NOT IN EQUATION

VARIABLE		PARTIAL CORR.	TOLERANCE	F TO ENTER
MISSCN	1	.01163	.9913	.0930
U SIZE	2	-.00787	.9989	.0274
MISS J	7	-.01322	.2589	.0779
1 X 2	8	.00373	.9989	.0041
1 X 7	12	-.01111	.2589	.0546
2 X 3	13	.00193	.9948	.0015
2 X 7	16	-.00563	.2589	.0140
3 X 4	17	.00556	.9942	.0137
3 X 7	19	-.01036	.2518	.0474
5 X 7	22	.01322	.7567	.0772

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BMD02R - STEPWISE REGRESSION - VERSION OF MAY 2, 1966
HEALTH SCIENCES COMPUTING FACILITY, UCLA

PROBLEM CODE SOCIL
NUMBER OF CASES 445
NUMBER OF ORIGINAL VARIABLES 7
NUMBER OF VARIABLES ADDED 15
TOTAL NUMBER OF VARIABLES 22
NUMBER OF SUB-PROBLEMS 1

VARIABLES IN EQUATION

VARIABLE	COEFFICIENT	STD. ERROR	F TO REMOVE
(CONSTANT	43.24488)		
U SIZE 2	-.29405	1.14588	.0659
COVER 3	-.67039	1.14249	.3844
CASUAL 4	.95947	1.14552	.7015
MISS D 5	-1.53740	1.18322	1.2289
1 X 3 9	-1.79164	1.14461	1.4782
1 X 4 10	.67822	1.14673	.3504
1 X 5 11	-.72058	1.18224	.2718
2 X 4 14	-.99273	1.14257	.6105
2 X 5 15	1.20977	1.18113	.7459
3 X 5 18	-.62789	1.18075	.2843
4 X 5 20	1.94735	2.79632	.4764
4 X 7 21	.76215	1.43298	.2179

VARIABLES NOT IN EQUATION

VARIABLE	PARTIAL CORR.	TOLERANCE	F TO ENTER
MISSON 1	.00823	.9803	.0147
MISS J 7	-.01013	.2403	.0442
1 X 2 8	-.00118	.9819	.0006
1 X 7 12	-.00708	.2419	.0246
2 X 3 13	-.00254	.9869	.0028
2 X 7 16	-.00243	.2427	.0025
3 X 4 17	.00114	.9871	.0006
3 X 7 19	-.00778	.2411	.0275
5 X 7 22	.01013	.7395	.0442

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BMD02R - STEPWISE REGRESSION - VERSION OF MAY 2, 1966
HEALTH SCIENCES COMPUTING FACILITY, UCLA

PROBLEM CODE	SEMI
NUMBER OF CASES	1287
NUMBER OF ORIGINAL VARIABLES	7
NUMBER OF VARIABLES ADDED	15
TOTAL NUMBER OF VARIABLES	22
NUMBER OF SUB-PROBLEMS	1

SUMMARY TABLE

STEP NUMBER	VARIABLE ENTERED	VARIABLE REMOVED	MULTIPLE R	RSQ	INCREASE IN RSQ	F VALUE TO ENTER OR REMOVE	NUMBER OF INDEPENDENT VARIABLES INCLUDED
1	MISS D	5	.0719	.0052	.0052	6.6803	1
2	2 X 3	13	.0887	.0079	.0027	3.4990	2
3	CASUAL	4	.0955	.0091	.0013	1.6220	3
4	2 X 4	14	.0994	.0099	.0009	1.0402	4
5	1 X 5	11	.1032	.0107	.0007	.9480	5
6	MISSON	1	.1069	.0114	.0007	.8990	6
7	2 X 7	16	.1095	.0120	.0006	.8173	7
8	3 X 4	17	.1119	.0124	.0005	.5865	8
9	MISS J	7	.1131	.0128	.0004	.4624	9
10	4 X 5	20	.1146	.0131	.0003	.4292	10
11	4 X 7	21	.1233	.0152	.0021	2.6940	11
12	1 X 4	10	.1244	.0155	.0003	.3401	12
13	3 X 7	19	.1253	.0157	.0002	.2968	13
14	1 X 2	8	.1261	.0159	.0002	.2523	14
15	COVER	3	.1264	.0160	.0001	.1223	15
16	1 X 3	9	.1267	.0161	.0001	.0881	16
17	1 X 7	12	.1268	.0161	.0000	.0210	17
18	U SIZE	2	.1268	.0161	.0000	.0100	18

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BMD02R - STEPWISE REGRESSION - VERSION OF MAY 2, 1966
HEALTH SCIENCES COMPUTING FACILITY, UCLA

PROBLEM CODE	AUTO
NUMBER OF CASES	1278
NUMBER OF ORIGINAL VARIABLES	7
NUMBER OF VARIABLES ADDED	15
TOTAL NUMBER OF VARIABLES	22
NUMBER OF SUB-PROBLEMS	1

SUMMARY TABLE

STEP NUMBER	VARIABLE ENTERED	VARIABLE REMOVED	MULTIPLE R	RSQ	INCREASE IN RSQ	F VALUE TO ENTER OR REMOVE	NUMBER OF INDEPENDENT VARIABLES INCLUDED
1	1 X 5	11	.0496	.0025	.0025	3.1475	1
2	COVER	3	.0692	.0048	.0023	2.9788	2
3	CASUAL	4	.0861	.0044	.0015	2.0875	3
4	1 X 4	10	.0891	.0079	.0015	1.9648	4
5	MISS D	5	.0958	.0092	.0012	1.5745	5
6	MISS J	7	.0978	.0096	.0004	.5046	6
7	2 X 3	13	.0996	.0099	.0004	.4704	7
8	3 X 7	19	.1018	.0102	.0003	.3575	8
9	3 X 5	15	.1026	.0105	.0003	.3988	9
10	1 X 3	9	.1037	.0107	.0002	.2875	10
11	2 X 7	16	.1045	.0109	.0002	.2128	11
12	1 X 7	12	.1052	.0111	.0002	.1976	12
13	2 X 5	15	.1059	.0112	.0002	.1918	13
14	2 X 4	14	.1063	.0113	.0001	.1219	14
15	4 X 7	21	.1067	.0114	.0001	.0959	15
16	3 X 4	17	.1070	.0115	.0001	.0938	16
17	4 X 5	20	.1073	.0115	.0001	.0779	17
18	1 X 2	8	.1076	.0116	.0001	.0658	18
19	MISSON	1	.1078	.0115	.0000	.0628	19
20	U SIZE	2	.1079	.0116	.0000	.0229	20

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BMD02R - STEPWISE REGRESSION - VERSION OF MAY 2, 1966
HEALTH SCIENCES COMPUTING FACILITY, UCLA

PROBLEM CODE	M GUN
NUMBER OF CASES	900
NUMBER OF ORIGINAL VARIABLES	7
NUMBER OF VARIABLES ADDED	15
TOTAL NUMBER OF VARIABLES	22
NUMBER OF SUB-PROBLEMS	1

VARIABLES IN EQUATION

VARIABLE	COEFFICIENT	STD. ERROR	F TO REMOVE
(CONSTANT	52.03965)		
MISSON 1	-.54074	.06315	.7152
U SIZE 2	-1.25211	.06720	1.6620
COVER 3	-1.62541	.06294	2.7795
MISS D 5	-2.21040	1.17433	3.5430
1 X 2 8	.37883	.06310	.1547
1 X 3 9	-.58579	.06276	.5118
1 X 7 12	.40532	.08203	.3532
2 X 3 13	-.31427	.06206	.1065
2 X 4 14	-.28778	.06240	.0932
3 X 5 18	-1.79486	2.35204	.5437
3 X 7 19	-.57164	1.76591	.3707

VARIABLES NOT IN EQUATION

VARIABLE	PARTIAL CORR.	TOLERANCE	F TO ENTER
CASUAL 4	-.00318	.9560	.0090
MISS J 7	-.01021	.2487	.0925
1 X 4 10	-.00599	.9571	.0885
1 X 5 11	-.00447	.2452	.0177
2 X 5 15	.00989	.9574	.0700
2 X 7 16	-.00886	.9589	.0697
3 X 4 17	.00984	.9571	.0693
4 X 5 20	-.00695	.9572	.0429
4 X 7 21	.00689	.9582	.0421
5 X 7 22	.01021	.7574	.0925

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BMD02R - STEPWISE REGRESSION - VERSION OF MAY 27, 1966
HEALTH SCIENCES COMPUTING FACILITY, UCLA

PROBLEM CODE XM19
NUMBER OF CASES 604
NUMBER OF ORIGINAL VARIABLES 13
NUMBER OF VARIABLES ADDED 14
TOTAL NUMBER OF VARIABLES 27
NUMBER OF SUB-PROBLEMS 1

SUMMARY TABLE

STEP NUMBER	VARIABLE ENTERED	VARIABLE REMOVED	MULTIPLE R	RSQ	INCREASE IN RSQ	F VALUE TO ENTER OR REMOVE	NUMBER OF INDEPENDENT VARIABLES INCLUDED
1	ND CGT 5		.2119	.0449	.0449	37.6993	1
2	BURSTS 10		.2500	.0625	.0176	15.0416	2
3	GT 2		.2441	.0598	.0072	6.2903	3
4	MISS D 10		.2737	.0749	.0151	4.4489	4
5	NO.SYC 4		.2821	.0796	.0047	4.0921	5
6	COVER 6		.2887	.0834	.0038	3.2892	6
7	AGE 1		.2934	.0861	.0027	2.3418	7
8	8 X 12 23		.2971	.0883	.0022	1.9745	8
9	7 X 9 18		.2997	.0898	.0015	1.3484	9
10	CASUAL 9		.3311	.0956	.0010	.8728	10
11	MISSOU 6		.3321	.0916	.0003	.6671	11
12	9 X 12 25		.3038	.0993	.0007	.6937	12
13	9 X 10 24		.3100	.0961	.0038	3.3019	13
14	U SIZE 7		.3118	.0948	.0007	.6248	14
15	6 X 7 27		.3121	.0974	.0008	.5028	15
16	YRS ED 3		.3126	.0977	.0003	.8777	16
17	6 X 12 16		.3131	.0980	.0003	.2484	17
18	6X10 26		.3135	.0983	.0003	.2983	18
19	8 X 10 22		.3137	.0984	.0001	.1219	19
20	7 X 12 20		.3139	.0985	.0001	.0714	20
21	7 X 8 17		.3139	.0984	.0001	.0709	21
22	MISSOU 12		.3138	.0985	.0001	.0889	22
23	6 X 8 14		.3141	.0986	.0000	.0934	23

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BMDP2R - STEPWISE REGRESSION - VERSION OF MAY 2, 1966
HEALTH SCIENCES COMPUTING FACILITY, UCLA

PROBLEM CODE M16
NUMBER OF CASES 881
NUMBER OF ORIGINAL VARIABLES 13
NUMBER OF VARIABLES ADDED 14
TOTAL NUMBER OF VARIABLES 27
NUMBER OF SUB-PROBLEMS 1

SUMMARY TABLE

STEP NUMBER	VARIABLE ENTERED	VARIABLE REMOVED	MULTIPLE R	RSQ	INCREASE IN RSQ	F VALUE TO ENTER OR REMOVE	NUMBER OF INDEPENDENT VARIABLES INCLUDED
1	GT 2		.2476	.0613	.0613	57.3829	1
2	BURSTS 13		.3031	.0919	.0306	29.5543	2
3	HO SVC 4		.3228	.1042	.0123	11.7229	3
4	CASUAL 9		.3294	.1085	.0047	4.5865	4
5	U SIZE 7		.3358	.1128	.0039	3.8913	5
6	YRS ED 3		.3408	.1162	.0033	3.2161	6
7	MISS D 10		.3439	.1183	.0027	2.6264	7
8	MISS J 12		.3455	.1194	.0011	1.0464	8
9	MISSON 6		.3467	.1202	.0009	.8360	9
10	7 X 9 18		.3478	.1209	.0007	.7223	10
11	7 X 10 19		.3484	.1215	.0006	.6048	11
12	6 X 12 16		.3494	.1221	.0005	.5138	12
13	9 X 10 24		.3499	.1225	.0004	.3938	13
14	9 X 12 25		.3518	.1236	.0009	.8659	14
15	HO OBT 5		.3519	.1237	.0005	.3894	15
16	6 X 8 14		.3528	.1239	.0002	.2428	16
17	7 X 8 17		.3523	.1241	.0002	.1778	17
18	COVER 8		.3529	.1242	.0001	.1405	18
19	7 X 12 20		.3524	.1244	.0001	.0500	19
20	AGE 1		.3526	.1245	.0000	.0356	20
21	8 X 10 22		.3527	.1245	.0000	.0258	21
22	8 X 12 23		.3529	.1245	.0000	.0179	22
23	6 X 9 15		.3529	.1246	.0000	.0249	23
24	8 X 9 21		.3529	.1246	.0000	.0142	24

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BMD02R - STEPWISE REGRESSION - VERSION OF MAY 2, 1966
HEALTH SCIENCES COMPUTING FACILITY, UCLA

PROBLEM CODE AK47

NUMBER OF CASES 880
NUMBER OF ORIGINAL VARIABLES 13
NUMBER OF VARIABLES ADDED 14
TOTAL NUMBER OF VARIABLES 27

NUMBER OF SUB-PROBLEMS 1

SUMMARY TABLE

STEP NUMBER	VARIABLE ENTERED	VARIABLE REMOVED	MULTIPLE R	RSQ	INCREASE IN RSQ	F VALUE TO ENTER OR REMOVE	NUMBER OF INDEPENDENT VARIABLES INCLUDED
1	GT 2		.2767	.0914	.0914	47.9469	1
2	BURSTS 13		.2834	.0846	.0791	27.7097	2
3	YRS ED 3		.3191	.1018	.0214	20.8094	3
4	MO CBT 5		.3384	.1146	.0127	12.5685	4
5	8 X 9 21		.3407	.1161	.0015	1.4803	5
6	MO SVC 4		.3429	.1173	.0012	1.2751	6
7	6 X 9 15		.3443	.1186	.0013	1.2479	7
8	7 X 8 17		.3461	.1198	.0012	1.1921	8
9	U SIZE 7		.3478	.1209	.0012	1.1457	9
10	7 X 9 18		.3493	.1220	.0011	1.0562	10
11	6 X 7 27		.3504	.1229	.0009	.8991	11
12	8 X 10 22		.3510	.1232	.0003	.2930	12
13	MISS D 10		.3514	[illegible]	.0003	.3272	13
14	MISS J 12		.3518	.1237	.0003	.2585	14
15	9 X 12 25		.3521	[illegible]	.0003	.2491	15
16	6X10 26		.3523	.1241	.0002	.1549	16
17	CASUAL 9		.3524	.1243	.0002	.1485	17
18	6 X 8 14		.3528	.1244	.0001	.1467	18
19	6 X 12 16		.3529	.1245	.0001	.0846	19
20	8 X 12 23		.3530	.1246	.0001	.0738	20
21	MISSOV 6		.3530	.1246	.0000	.0264	21
22	7 X 10 19		.3531	.1246	.0000	.0166	22

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BMD02R - STEPWISE REGRESSION - VERSION OF MAY 2, 1966
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PROBLEM CODE	M40
NUMBER OF CASES	455
NUMBER OF ORIGINAL VARIABLES	12
NUMBER OF VARIABLES ADDED	14
TOTAL NUMBER OF VARIABLES	26
NUMBER OF SUB-PROBLEMS	1

SUMMARY TABLE

STEP NUMBER	VARIABLE ENTERED	VARIABLE REMOVED	MULTIPLE R	RSQ	INCREASE IN RSQ	F VALUE TO ENTER OR REMOVE	NUMBER OF INDEPENDENT VARIABLES INCLUDED
1	BT	2	.2406	.0579	.0579	27.0269	1
2	YRS ED	[illegible]	.3013	.0903	.0324	15.3671	2
3	AGE	[illegible]	.3095	.0958	.0050	2.4875	3
4	6 x 8	14	.3161	.0993	.0041	2.0623	4
5	MISS D	10	.3227	.1042	.0042	2.1229	5
6	CASUAL	9	.3267	.1067	.0026	1.2791	6
7	6 x 9	15	.3287	.1081	.0014	.6862	7
8	COVER	8	.3299	.1095	.0014	.7082	8
9	7 x 10	20	.3327	.1107	.0012	.6094	9
10	NO CHT	5	.3345	.1119	.0012	.5789	10
11	MISSON	6	.3359	.1128	.0010	.4790	11
12	7 x 9	19	.3371	.1136	.0008	.4052	12
13	6 x 10	16	.3393	.1144	.0008	.3967	13
14	MISS J	12	.3392	.1151	.0006	.3086	14
15	8 x 10	23	.3398	.1154	.0004	.1882	15
16	9 x 10	25	.3402	.1157	.0003	.1519	16
17	9 x 12	26	.3419	.1169	.0012	.8713	17
18	NO SVC	4	.3422	.1171	.0002	.6954	18
19	6 x 7	13	.3424	.1172	.0001	.0609	19
20	9 x 12	24	.3425	.1173	.0001	.0376	20
21	U SIZE	7	.3424	.1174	.0001	.0335	21
22	6 x 12	17	.3426	.1174	.0000	.0178	22

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BMD02R - STEPWISE REGRESSION - VERSION OF MAY 2, 1966
HEALTH SCIENCES COMPUTING FACILITY, UCLA

PROBLEM CODE	SOCAL
NUMBER OF CASES	445
NUMBER OF ORIGINAL VARIABLES	12
NUMBER OF VARIABLES ADDED	14
TOTAL NUMBER OF VARIABLES	26
NUMBER OF SUB-PROBLEMS	1

SUMMARY TABLE

STEP NUMBER	VARIABLE ENTERED	VARIABLE REMOVED	MULTIPLE R	RSQ	INCREASE IN RSQ	F VALUE TO ENTER OR REMOVE	NUMBER OF INDEPENDENT VARIABLES INCLUDED
1	YRS ED	3	.2828	.0800	.0800	38.4979	1
2	GT	2	.4555	.2075	.1275	71.1210	2
3	AGE	1	.4937	.2437	.0363	21.1457	3
4	MO CBT	5	.5254	.2760	.0323	19.6094	4
5	COVER	8	.5320	.2830	.0070	4.2677	5
6	U SIZE	7	.5382	.2896	.0067	4.1054	6
7	MISS D	10	.5436	.2955	.0059	3.6158	7
8	MISSOU	6	.5466	.2987	.0033	2.0382	8
9	MO SVC	4	.5491	.3015	.0027	1.7078	9
10	8 x 10	23	.5507	.3033	.0018	1.1194	10
11	9 x 10	25	.5521	.3048	.0015	.9434	11
12	7 x 10	20	.5534	.3062	.0016	.8716	12
13	7 x 9	19	.5545	.3075	.0013	.7933	13
14	7 x 8	18	.5556	.3087	.0012	.7169	14
15	6 x 12	17	.5564	.3096	.0009	.5949	15
16	6 x 10	16	.5578	.3111	.0015	.9530	16
17	CASUAL	9	.5584	.3119	.0007	.4491	17
18	6 x 9	15	.5590	.3125	.0006	.3901	18
19	6 x 7	13	.5594	.3129	.0005	.2877	19
20	8 x 12	24	.5598	.3133	.0004	.2748	20
21	8 x 9	22	.5598	.3134	.0001	.0452	21
22	MISS J	12	.5599	.3134	.0000	.0130	22
23	9 x 12	26	.5599	.3135	.0000	.0106	23

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PROBLEM CODE SEMT
NUMBER OF CASES 1287
NUMBER OF ORIGINAL VARIABLES 12
NUMBER OF VARIABLES ADDED 14
TOTAL NUMBER OF VARIABLES 26
NUMBER OF SUB-PROBLEMS 1

SUMMARY TABLE

STEP NUMBER	VARIABLE ENTERED	VARIABLE REMOVED	MULTIPLE R	RSQ	INCREASE IN RSQ	F VALUE TO ENTER OR REMOVE	NUMBER OF INDEPENDENT VARIABLES INCLUDED
1	GT 2		.2037	.0415	.0415	55.6111	1
2	MC CBT 5		.2415	.0579	.0164	22.2838	2
3	MISS D 10		.2553	.0652	.0074	9.5757	3
4	7 X 8 13		.2553	.0652	.0025	3.4574	4
5	CASUAL 3		.2549	.0673	.0015	2.0727	5
6	AGE 1		.2622	.0687	.0017	2.3996	6
7	MC SVC 4		.2650	.0702	.0015	2.0776	7
8	MISSDV 6		.2674	.0715	.0013	1.7601	8
9	6 X 10 16		.2699	.0727	.0010	1.0656	9
10	7 X 9 10		.2701	.0729	.0007	.9147	10
11	7 X 12 21		.2712	.0735	.0006	.7919	11
12	6 X 7 11		.2722	.0741	.0004	.6162	12
13	8 X 9 20		.2731	.0745	.0005	.6241	13
14	MISS D 12		.2739	.0750	.0004	.5919	14
15	8 X 10 23		.2744	.0754	.0004	.5294	15
16	6 X 9 15		.2742	.0757	.0004	.4852	16
17	9 X 12 26		.2747	.0760	.0002	.3369	17
18	9 X 10 25		.2752	.0765	.0005	3.4401	18
19	6 X 8 14		.2754	.0766	.0001	.1440	19
20	VPS ED 7		.2755	.0767	.0001	.0909	20
21	7 X 10 22		.2756	.0767	.0000	.0427	21
22	TU SIZE 7		.2756	.0767	.0000	.0192	22
23	COVER 4		.2756	.0767	.0000	.0191	23

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BMD02R - STEPWISE REGRESSION - VERSION OF MAY 2, 1966
HEALTH SCIENCES COMPUTING FACILITY, UCLA

PROBLEM CODE	AUTO
NUMBER OF CASES	1778
NUMBER OF ORIGINAL VARIABLES	12
NUMBER OF VARIABLES ADDED	14
TOTAL NUMBER OF VARIABLES	26
NUMBER OF SUB-PROBLEMS	1

SUMMARY TABLE

STEP NUMBER	VARIABLE ENTERED	VARIABLE REMOVED	MULTIPLE R	RSQ	INCREASE IN RSQ	F VALUE TO ENTER OR REMOVE	NUMBER OF INDEPENDENT VARIABLES INCLUDED
1	GT 2		.1957	.0381	.0381	58.5819	1
2	HO SVG 6		.2692	.0719	.0338	44.4596	2
3	YRS ED 3		.3632	.0919	.0200	28.0721	3
4	COVER 5		.3845	.0939	.0020	2.[illegible]	4
5	5 X 13 15		.3857	.0959	.0020	2.0141	5
6	5 X 9 15		.3925	.0977	.0019	2.4835	6
7	MISS J 13		.3943	.0996	.0017	2.4271	7
8	CASUAL 9		.3972	.1006	.0012	1.6832	8
9	AGE 1		.3986	.1015	.0009	1.2492	9
10	7 X 8 14		.3993	.1020	.0005	.6528	10
11	5 X 12 24		.3999	.1023	.0004	.5497	11
12	5 X 10 23		.4006	.1024	.0004	.5744	12
13	MISS J 12		.4009	.1029	.0002	.2769	13
14	HO CST 5		.4011	.1031	.0002	.2491	14
15	9 X 12 26		.4014	.1033	.0002	.2119	15
16	9 X 10 25		.4017	.1034	.0002	.2708	16
17	6 X 6 14		.4020	.1037	.0001	.2028	17
18	U SIZE 7		.4021	.1038	.0001	.1174	18
19	MISSON 6		.4022	.1038	.0001	.1134	19
20	6 X 12 17		.4024	.1039	.0001	.1162	20
21	8 X 9 22		.4025	.1040	.0001	.0859	21
22	7 X 9 19		.4025	.1040	.0001	.0844	22
23	6 X 7 13		.4026	.1041	.0001	.0769	23
24	7 X 10 20		.4027	.1041	.0000	.0658	24
25	7 X 12 21		.4028	.1042	.0001	.1067	25

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BMD02R - STEPWISE REGRESSION - VERSION OF MAY 2, 1966
HEALTH SCIENCES COMPUTING FACILITY, UCLA

PROBLEM CODE	M GUN
NUMBER OF CASES	900
NUMBER OF ORIGINAL VARIABLES	12
NUMBER OF VARIABLES ADDED	14
TOTAL NUMBER OF VARIABLES	26
NUMBER OF SUB-PROBLEMS	1

SUMMARY TABLE

STEP NUMBER	VARIABLE ENTERED	VARIABLE REMOVED	MULTIPLE R	RSQ	INCREASE IN RSQ	F VALUE TO ENTER OR REMOVE	NUMBER OF INDEPENDENT VARIABLES INCLUDED
1	GT 2		.2352	.0553	.0553	52.5874	1
2	YRS ED 3		.3605	.1300	.0746	75.5502	2
3	AGE 1		.3831	.1463	.0168	17.6310	3
4	MO CUT 5		.3987	.1593	.0122	14.5787	4
5	MISS D 10		.4052	.1642	.0052	5.5949	5
6	COVER 8		.4097	.1678	.0037	3.9314	6
7	U SIZE 7		.4120	.1698	.0019	2.0558	7
8	MO SVC 4		.4135	.1710	.0012	1.2775	8
9	6 x 8 14		.4144	.1717	.0008	.8316	9
10	8 x 10 23		.4152	.1724	.0007	.7512	10
11	6 x 12 17		.4160	.1730	.0006	.6344	11
12	8 x 12 24		.4164	.1734	.0004	.4438	12
13	9 x 12 26		.4169	.1738	.0003	.3700	13
14	7 x 8 18		.4172	.1740	.0003	.2929	14
15	MISS J 12		.4174	.1742	.0002	.1786	15
16	8 x 9 22		.4175	.1743	.0001	.0973	16
17	6 x 10 16		.4176	.1744	.0001	.0816	17
18	9 x 10 25		.4176	.1744	.0000	.0519	18
19	MISSON 6		.4177	.1745	.0000	.0445	19
20	7 x 12 21		.4177	.1745	.0000	.0306	20
21	CASUAL 9		.4178	.1745	.0000	.0274	21
22	7 x 9 19		.4178	.1745	.0000	.0157	22
23	6 x 9 15		.4178	.1746	.0000	.0103	23

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1/13/03

DEFENSE ADVANCED RESEARCH PROJECTS AGENCY
3701 NORTH FAIRFAX DRIVE
ARLINGTON, VA 22203-1714

November 6, 2003

Ms. Jeannette Kingery
Technical Information Office Specialist
Defense Technical Information Center
8725 John J. Kingman Road
Suite 0944
Ft. Belvoir, VA 22060-6218

Dear Ms. Kingery:

This letter is a follow up to DTIC Form 55 request # 3273006, a request from Jonathan Berberian, an SBIR contractor with unclassified/unlimited access. The document AD# 519874, "The Identification of Objective Relationships Between Small Arms Fire Characteristics and Effectiveness of Suppressive Fire," has been revised and now carries Distribution Statement A, Approved for Public Release. The enclosed document should replace its older version.

If you have any questions, my point of contact on this matter is Davin Williams. He can be reached at (703) 526-4154 or via e-mail at TIO@darpa.mil.

Sincerely,

Debra K. Amick
Technical Information Officer

cc: Clarence McCloud, Documentation Technician, DTIC Form 55 Section.

Enclosures:
1. Zip Disk containing revised AD519874
2. DTIC Form 55 Request No. 3273006