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Performance Evaluation of Light Weapons Infantrymen (MOS 111.0), Graduates of the Advanced Individual Training Course (ATP 7-17)

by

T.F. Nichols, J.S. Ward, N.I. Fooks,
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U.S. Army Infantry Human Research Unit
Fort Benning, Georgia

Under the Technical Supervision of

The George Washington University
HUMAN RESOURCES RESEARCH OFFICE
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HEADQUARTERS
DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF RESEARCH AND DEVELOPMENT
ARMY RESEARCH OFFICE
WASHINGTON 25, D.C.

CRD/J

SUBJECT: Performance Evaluation of Light Weapons Infantrymen (MOS 111.0), Graduates of the Advanced Individual Training Course (ATP 7-17)

TO:

1. The attached report is for your information and retention.

2. This report concerns a study made to evaluate the combat readiness of graduates of the 16-week training course for Light Weapons Infantryman and to determine specific improvements in individual training required to achieve combat readiness.

3. Results of the research indicate areas where corrective action might be taken to strengthen the deficiencies in performance discovered.

4. This report is considered applicable and should be of interest to all agencies which are concerned with the training of Light Weapons Infantrymen (MOS 111.0).

5. It is desired that interested agencies review this report with a view toward making recommendations based on local experience with the performance of Light Weapons Infantrymen, graduates of the Advanced Individual Training Course (ATP 7-17). Recommendations should be processed through appropriate headquarters.

FOR THE CHIEF OF RESEARCH AND DEVELOPMENT:

1 Incl
as

GEORGE J. BAYERLE, JR
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PERFORMANCE EVALUATION OF LIGHT WEAPONS INFANTRYMEN (MOS 111.0), GRADUATES OF THE ADVANCED INDIVIDUAL TRAINING COURSE (ATP 7-17)—T.F. Nichols, J.S. Ward, N.I. Fooks, F.L. Brown, and H.S. Rosenquist (U.S. Army Infantry Human Research Unit, Fort Benning, Georgia)

Technical Report 81, Dec 62, 68 pp - figs - tables
(Contract DA 44-188-ARO-2) DA Proj OJ 95 50 001 Unclassified Report

To evaluate combat readiness and to educe factors contributing to unsatisfactory performance, an evaluation exercise, which simulated the first 21 hours of combat experienced by replacements assigned to a rifle squad, was administered to 51 men upon completion of 16 weeks of basic and advanced individual training. None of the subjects had had prior military service. The men were evaluated individually in a variety of situations which required response to commands, decision making, and the choice and use of weapons under combat-like conditions. Acceptable levels of performance were defined by military personnel familiar with each situation and with the conditions that prevailed during the evaluation. The results provide a detailed empirical basis for specific recommendations concerning weapons instruction and tactical training designed to result in greater combat readiness at the end of 16 weeks of individual training.

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T.F. Nichols, J.S. Ward, N.I. Fooks, F.L. Brown, and H.S. Rosenquist

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HUMAN RESOURCES RESEARCH OFFICE
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THE DEPARTMENT OF THE ARMY

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Task RIFLEMAN III

COMPOSITION OF RESEARCH TEAM

The research team responsible for this study consisted of Dr. Thomas F. Nichols, Task Leader; Col Nelson I. Fooks, USA Ret., Task Executive; Mr. Joseph S. Ward; Lt Col Frank L. Brown, AUS Ret.; Mr. Henry Rosenquist; CWO Robert F. Schroeder, AUS Ret.; and Mr. Howard C. Sarvis.

Capt Ralph H. Loney developed a prototype scenario incorporating aggressor tactics and assisted in setting up the exercise in the field. Capt Jesse C. Bowe was responsible for developing, setting up, and administering the exercise. The following key military personnel assisted Captain Bowe:

MSgt David D. Sellers
MSgt Thane G. Alley
MSgt Charles H. Bosley
MSgt Johnnie O. Holder
MSgt Octavio Comacho
SFC George W. DeVlaming
SP 4 Charles D. Allard

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Technical Reports and Research Bulletins may be requested from the Director's Office, which also issues a complete bibliography. Other publications may be obtained from the Director of Research of the originating Unit or Division.

1. PROBLEM. The objective of the present research was to evaluate the combat readiness of current graduates of the Basic and Advanced Individual Training Programs for Light Weapons Infantrymen (MOS 111.0), and to determine specific improvements in individual training needed to achieve this combat readiness. The military problem is to prepare men without prior military service to be effective as ground combat replacements, within the framework of the 16-week individual training program.

2. METHOD. A realistic combat field exercise was developed and administered to 51 men immediately after their graduation from the Advanced Individual Training course for the Light Weapons Infantryman. Live-firing portions of the evaluation were scored individually in terms of targets presented, targets fired at, hits, and rounds expended. In addition, each man was rated in various situations on the use of cover and concealment, choice of firing position, skill in maintaining formation, and ability to receive and act upon verbal and signaled orders. A post-evaluation interview was conducted with each subject to obtain information regarding previous use of small arms in civilian life, opinions about the Army training received or missed, and reactions to the exercise just completed.

3. RESULTS. Proficiency in the use of the M1 and the Browning automatic rifle, hand grenades, rifle grenades, and the 3.5-inch rocket launcher was evaluated for both stationary and moving targets in a variety of simulated combat situations. Response to unexpected small-arms fire, distribution of fire on a linear target, and shift of fire from farther targets to closer targets were also rated, as were observation for enemy targets and utilization of cover and concealment.

4. CONCLUSIONS. It is concluded that:

a. Certain deficiencies in performance can be corrected by changes in emphasis in weapons instruction and in tactical training as presently conducted.

b. Improved training is needed in the integration of a variety of individual skills into effective tactical actions, involving coordination with others and responsiveness to control by leaders.

5. RECOMMENDATIONS. Remedial training is recommended, within the framework of the present 16-week BCT and AIT programs, to accomplish the goals listed in detail in the Summary and Recommendations section of this report, on pages v-x.

SUMMARY AND RECOMMENDATIONS

A. MILITARY PROBLEM

1. Public Law 51 requires that the U.S. Army provide all soldiers with the equivalent of four months of basic individual training, not to include travel or administrative time, before assigning them outside the United States, its territories, and its possessions. In fulfillment of this requirement, the Light Weapons Infantryman (MOS 111.0) receives eight weeks of Basic Combat Training under ATP 21-114,[1] and eight weeks of Advanced Individual Training under ATP 7-17.[2]

2. The military problem is to prepare men without prior military service to be effective as ground combat replacements.

B. RESEARCH PROBLEM

The research problem was to evaluate the combat readiness of current graduates of the 16-week training course for the Light Weapons Infantryman and to determine specific improvements needed in individual training to achieve combat readiness.

C. RESEARCH METHOD

1. Previous research by the staff of Task RIFLEMAN had produced a listing of 13 critical individual combat performances designated by Army personnel as in need of training improvement. These performances (described in Appendix A) were used in the construction of tactical situations that formed a realistic combat field exercise. Realistic simulation of fleeting, moving indications of hostile targets and signs of enemy locations, as well as methods for obtaining individual scores on weapon proficiency, were provided by the devices and procedures described in Appendix B.

2. Within a combat-like atmosphere, men were received as replacements and integrated into a rifle squad of a reserve platoon. During each administration of the exercise, four men were evaluated individually while they took part as riflemen or automatic riflemen in a series of actions, which included a night engagement of infiltrators; an advance to, and reduction of, an outpost; an advance to, and assault of, an enemy position; a subsequent consolidation and defense of that position; and, finally, the engagement of a moving enemy tank.

3. Fifty-one men—25 M1 subjects and 26 BAR subjects—were evaluated immediately after graduation from the Advanced Individual Training course for the Light Weapons Infantryman, MOS 111.0, administered by an Infantry training division. Except for Basic Combat Training at one of six training centers, none of these men had had prior military training; all of them had completed the TRAINFIRE I rifle marksmanship course.

[1]Reference 3.
[2]Reference 2.

4. Live-firing portions of the evaluation were scored individually in terms of targets presented, targets fired at, targets hit, and rounds expended. Each man was rated in various situations on such tactical considerations as use of cover and concealment, choice of firing position, skill in maintaining formation, and ability to receive and act upon verbal and signaled orders. Standards for acceptable performance in specific situations were determined by a 10-man military board. Every subject was followed closely by a military observer who noted individual errors of omission and commission that detracted from the man's effectiveness as a member of the squad. A post-evaluation interview was conducted to obtain information about pertinent civilian experience and Army training, reactions to various parts of the exercise, and opinions regarding preparatory training. At the conclusion of the tactical situation, all the subjects were scored on the disassembly, cleaning, and assembly of the M1 rifle and the Browning automatic rifle (BAR).

D. RESULTS

Results are summarized under two topical headings: weapons training and tactical training.

1. **Weapons Training.** Proficiency in the use of hand grenades, rifle grenades, 3.5-inch rockets, the M1 rifle, and the BAR was evaluated in a variety of combat-like situations that involved the engagement of suspected enemy positions, as well as stationary and moving targets. To avoid repetition, results from use of the M1 rifle and the BAR are presented together.

a. *Rifles—M1 and Browning Automatic.* Various aspects of each subject's proficiency with his rifle were evaluated in several situations.

(1) The subject was required to engage moving (retreating and advancing) personnel targets, while he was advancing and from a foxhole position, at ranges of 15 to 270 meters. In engagement of moving targets, satisfactory proficiency was approached only when the subjects were firing from foxholes at targets at ranges of 15 to 30 meters. Proficiency was poorest when they were firing from foxholes at targets at ranges of 225 to 270 meters. At this distance, 96 per cent of the subjects firing the M1 and 71 per cent of those using the BAR failed to register a hit; 85 per cent of all subjects registered less than one hit for every three rounds or bursts expended. While firing from foxholes at ranges of 105 to 150 meters, 26 per cent of the M1 firers and 21 per cent of the BAR firers failed to register a hit; 62 per cent of all firers registered less than one hit for every three rounds or bursts expended. Firing during an advance, from standing or kneeling positions at ranges of 40 to 85 meters from the targets, 43 per cent of the M1 subjects and 50 per cent of those firing the BAR failed to register a hit; 81 per cent of all subjects registered less than one hit for every three rounds or bursts expended. Firing inaccuracy—inability to hit the targets fired at—was the major cause of poor proficiency. Slowness in detecting and in engaging these targets also contributed substantially to the low firing effectiveness demonstrated.

(2) Each subject was also evaluated in situations in which he engaged stationary (single and multiple) personnel targets at ranges of 66 to 264 meters. Firing effectiveness (ratio of targets hit to number of targets presented) decreased from 83 per cent for M1 firers and 66 per cent for BAR firers at ranges of 66 to 88 meters, to 13 and 14 per cent, respectively, for the M1 and the BAR subjects at ranges of 242 to 264 meters. Both sets of firers hit about 25 per cent of the targets presented at 198 to 220 meters, and about 60 per cent of the targets presented at 110 to 176 meters. In comparison with M1 subjects, BAR firers were less effective and engaged fewer targets at 66 to 88 meters, engaged more targets at 154 to 176 meters, and were more accurate at 242 to 264 meters. Most firers failed to use to good advantage the support available to them in the foxhole positions. Undue slowness and preoccupation with reloading operations prevented detection and engagement of many targets. Interview responses indicated that most firers used aiming points too high for the target ranges. For both sets of subjects, insufficient target engagement at all ranges was the major cause of low firing effectiveness. Firing accuracy was particularly inadequate at the nearest targets; that is, those out to 88 meters.

(3) Another situation in which the subjects were evaluated required that they assault an enemy position, beginning at a range of 100 meters. Seventy-two per cent of the subjects firing the M1 and 69 per cent of those firing the BAR failed to direct and to distribute their fire at point targets and at suspected enemy locations while advancing from 100 meters to within 35 meters of the simulated enemy position; 56 and 58 per cent, respectively, of the M1 and the BAR subjects failed to distribute their underarm fire while advancing from 35 meters to within 10 meters of the objective. All the M1 firers and 79 per cent of the BAR firers had undue difficulty in reloading their weapons. Rate of fire was about one-third of an effective rate for the M1 firers and one-fourth for the BAR subjects. Forty-eight per cent of the BAR firers failed to consistently use 2- or 3-round bursts and 40 per cent had marked difficulty in carrying their weapons.

(4) All the subjects were rated on over-all speed of reloading. Of the M1 firers, 12 per cent were rated as good, 48 per cent as average, and 40 per cent as poor. Comparable ratings for the BAR firers were 23 per cent good, 50 per cent average, and 27 per cent poor. Ten of the M1 firers had weapon stoppages; of these, four subjects were considered average in handling the situation, and six were considered poor. Twenty-three of the BAR firers had weapon stoppages; of these, 22 per cent were rated as handling stoppages well, 43 per cent as average, and 35 per cent as poor.

(5) The subjects were also evaluated on their ability to disassemble, clean, and assemble both the M1 rifle and the BAR. The average score on the M1 was 80 out of a possible 100 points; 82 per cent of the subjects earned scores of 71 or higher. The average score on the BAR was 55 out of a possible 100 points; only 55 per cent of the subjects earned scores of 51 or above.

b. *Hand Grenades.* This phase of the problem was evaluated in separate situations requiring effective use of hand grenades at night and in daylight at ranges of 25 to 35 meters. Eighty per cent of the subjects missed the target by more than four meters.

Of these misses, 64 per cent were short of the target. The over-all mean error was eight meters. In a weapon-choice situation, only 14 per cent of the subjects properly chose hand grenades; 45 per cent took no action until ordered to throw grenades.

c. *Rifle Grenades.* Proficiency in the use of the rifle grenade was evaluated in a situation in which antitank rifle grenades were fired during daylight against a tank moving laterally at a speed of 10 to 15 miles per hour, at a range of 80 meters. Nineteen M1 subjects were evaluated. Of the subjects who fired three grenades, 72 per cent failed to hit the tank, 22 per cent hit it once, and 6 per cent hit it twice. Sixty-four per cent of the misses were errors of elevation; that is, they landed either short of or beyond the tank. Eighty-four per cent of the subjects were deficient in the use of the M15 sight, and 31 per cent were particularly inept when firing from the shoulder.

d. *3.5-Inch Rockets.* The proficiency of 19 BAR subjects with the 3.5-inch rocket launcher was evaluated in the moving tank situation described above. Of the subjects who fired either three or four rockets, 58 per cent failed to hit the tank, 37 per cent hit it once, and 5 per cent hit it twice. Sixty-two per cent of the misses were errors of elevation; that is, they landed either short of or beyond the tank. Thirty-seven per cent of the firers were inept in using the sight on the rocket launcher, and 26 per cent did not know the duties and procedures of the gunner during loading and firing.

2. **Tactical Training.** Proficiency in the application of firepower as a member of a rifle squad was evaluated in situations requiring response to unexpected effective small-arms fire, distribution of fire on a linear target, and shift of fire to suddenly appearing, close-in targets. Proficiency in the continuous systematic observation for enemy activities and targets, and in the utilization of cover and concealment against ground observation and flat-trajectory fire, was evaluated throughout the exercise.

a. *Response to Effective Small-Arms Fire.* Evaluation of the subjects in a situation which required immediate return of small-arms fire, utilization of cover, and subsequent fire and maneuver revealed that 24 per cent failed to take cover when fired upon. Fifty-five per cent failed to immediately return the fire (79 per cent of those who failed were BAR firers). Eighty-eight per cent of the M1 firers failed to register hits, and 24 per cent failed to maintain an adequate rate of fire as members of a base-of-fire element. Sixty-eight per cent of the BAR firers failed to register a hit. Three per cent of the firing positions taken by all the subjects were rated as good, 55 per cent as fair, and 42 per cent as poor.

b. *Distribution of Fire.* In a situation requiring distribution of fire over a linear target from foxhole positions at a range of 140 meters and in accordance with a verbal fire order, 30 per cent of the rounds fired by M1 subjects and 15 per cent of those fired by BAR subjects struck within effective vertical range of the target; 14 per cent of the M1 rounds and 6 per cent of the BAR rounds struck within effective lateral range of suspected enemy locations represented by fleeting-glimpse indicators. None of the subjects distributed their fire over more than two-thirds of the fleeting-glimpse indicators in their sectors of responsibility, and 11 per cent failed to get hits near any of them. Interview responses indicated that 31 per cent of the men did not know the right and left limits of their sectors of responsibility.

c. *Shift of Fire.* While advancing and while firing from foxhole positions, the subjects were evaluated in situations which required a shift of fire to suddenly appearing, close-in personnel targets. While advancing, 56 per cent of the subjects firing the M1 and 62 per cent of those firing the BAR failed to shift fire to a "surprise" target presented at 30 meters. Confronted with the same target at 20 meters, 24 and 35 per cent, respectively, of the M1 and the BAR subjects failed to shift fire to it. In foxhole positions, the subjects failed to shift fire to 31 per cent of the "surprise" targets presented at ranges of 22 and 44 meters, and shifted too late to fire at another 20 per cent.

d. *Observation.* While advancing, 80 per cent of the M1 firers and 16 per cent of the BAR subjects looked to fellow squad members for action cues instead of searching for enemy indications. Sixty-eight per cent of the BAR subjects fired ineffectively at the enemy outpost because they failed to locate that position with enough precision. During the assault, 36 per cent of the subjects failed to check for enemy activity while reloading their weapons. Interview responses indicated that 37 per cent of the subjects failed to notice the fleeting-glimpse indicators of enemy movement along the linear target. Subjects were observed blocking their view from the foxholes with their weapons.

e. *Cover and Concealment.* When brought under small-arms fire, 52 per cent of the subjects failed to take available cover. While moving under fire, 64 per cent of the subjects failed to use cover, and 52 per cent of the BAR firers made poor use of available concealment. While firing from positions on the ground, 36 per cent of the subjects failed to use cover, and 28 per cent of the BAR firers failed to use available concealment. While firing from foxholes, 58 per cent of all subjects unnecessarily exposed themselves to enemy fire. When firing at the moving tank, 52 per cent of the rifle grenade firers failed to use cover while loading and firing, and 32 per cent failed to use available concealment.

E. CONCLUSIONS

Two general conclusions are drawn from the results of this evaluation. First, there are deficiencies in performance that can be corrected by suitable changes in emphasis in weapons instruction and in tactical training as they are presently conducted. Second, there are deficiencies that can be corrected only by improved training in the integration of a variety of individual skills into effective tactical actions, which involve coordination with others and responsiveness to control by leaders. Development of such improved training in the integration of skills is being accomplished by the U.S. Army Infantry Human Research Unit.

F. RECOMMENDATIONS

It is recommended that remedial training be instituted, as needed, within the framework of the present 16-week BCT and AIT program to accomplish the following goals.

1. **M1 Rifle.** Provide training and practice in firing at moving personnel targets. Train men to reload quickly while observing for enemy activity, both while they advance

and while they are in stationary positions. Require men to make maximum use of available cover, concealment, and weapon support in selecting and using firing positions. Enforce systematic observation for targets and the rapid engagement of seen targets. Emphasize proper cleaning of the gas cylinder, tightening of the gas cylinder lock screw, and removal of excess oil from rifle surfaces.

2. **Browning Automatic Rifle.** Provide training and practice in firing at moving personnel targets. Train men to reload quickly while observing for enemy activity, both while they advance and while they are in stationary positions. Require men to develop skill in controlling the size of the burst, in carrying and firing the weapon while advancing, and in engaging multiple and close-in targets. Give additional training on the clearing of weapon stoppages. Stress correct disassembly of bolt and bolt lock; extractor and extractor spring; magazine base, spring, and follower; and bipod. Ensure proper use of gas cylinder cleaning tool, cleaning of all parts and groups, correct assembly, removal of excess oil from external surfaces, and inspection of magazine body for dents.

3. **Hand Grenades.** Emphasize training and practice in the use of hand grenades during daylight and at night, on various types of terrain and in a variety of simulated tactical situations. Teach the individual soldier, with combat load and rifle, to make appropriate use of cover and concealment while he detects, locates, approaches, and reduces suitable targets. Correct the tendency to throw short of targets.

4. **Rifle Grenades.** Provide training and practice in engaging moving targets. Emphasize proper use of the M15 sight and give special attention to overcoming the tendency toward errors of elevation. Give additional training in firing from the shoulder.

5. **3.5-Inch Rockets.** Provide training and practice in firing at moving targets. Emphasize proper use of sights and give special attention to overcoming tendency toward errors of elevation. Give additional instruction on the duties and procedures of the gunner during loading and firing.

6. **Individual Day and Night Training.** Emphasize the individual soldier's need to be constantly alert while in contact with the enemy. Teach and practice systematic and continuous search methods to be used while advancing and while stationary, to ensure detection of near, as well as more distant, hostile targets. Give special attention to the identification of suspected enemy positions indicated by fleeting movements. Make certain that the nature and use of cover and concealment are fully understood by requiring the men to demonstrate their ability in several tactical movements and stationary situations on varied terrain.

7. **Rifle Squad Tactical Training (Basic Combat Training Phase).** By supervised practice, improve ability to (a) spontaneously and quickly take cover and return fire when brought under effective small-arms fire while in a variety of formations, (b) choose and move to good firing positions as part of a maneuver element, and (c) achieve and maintain an adequate rate of fire as part of a fire-support element.

8. **Technique of Fire.** By supervised practice, while advancing and while in stationary situations, improve (a) the understanding of, and compliance with, leader's fire control orders, (b) the active search for targets, and (c) the distribution of fire. Give special attention to the detection and the engagement of suspected enemy locations.

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DESCRIPTION OF THE RESEARCH

PERFORMANCE EVALUATION OF LIGHT WEAPONS INFANTRYMEN (MOS 111.0), GRADUATES OF THE ADVANCED INDIVIDUAL TRAINING COURSE (ATP 7-17)

INTRODUCTION

The mission of Task RIFLEMAN is to improve the combat proficiency of the Light Weapons Infantryman (MOS 111.0). Current Army training provides for the MOS qualification of the Light Weapons Infantryman (LWI) during eight weeks of Advanced Individual Training (AIT), which is conducted after eight weeks of Basic Combat Training (BCT). Upon completion of this 16-week block of training, the soldier must be ready to be integrated into a rifle platoon in combat as an MOS-qualified LWI.

As the first phase of research, the staff of Task RIFLEMAN set forth its conceptualization of the essential combat subjects to be included in the training of the LWI, and the general levels of proficiency required in each subject.[1] Next, the staff of Subtask RIFLEMAN I prepared a detailed job description of the minimum qualifications they consider the LWI should possess for successful entry into combat. This comprehensive statement of requirements covers 41 subjects and specifies 102 performances, together with their underlying skills and knowledges.[2]

In order to effectively focus research efforts, two selective criteria were then used to isolate performances most likely to present urgent training problems. First, 13 RIFLEMAN I staff members, all combat veterans who had participated in the development of the requirements for entry into combat, chose 60 of the performances that they thought were more directly related to combat missions than were the others. They then used the same criterion to rank order the 60 performances.

The next step was performed by 50 members of a STRAC division, all combat veterans who had had a minimum of six months' experience in dealing with AIT graduates from a large number of training installations, and hence were thoroughly familiar with the abilities of such graduates. They arranged the 60 combat-related performances into categories reflecting their judgments of the relative effectiveness with which such graduates could carry them out.

Finally, the 13 performances that rated highest on both combat relatedness and need for training improvement were selected for empirical investigation to verify the presence of urgent training problems, to obtain specific information on performance deficiencies, and to provide insight into specific ways in which training might be improved.

[1]Reference 7.
[2]Reference 8.

THE PROBLEM

Research Objectives

The study reported here was undertaken to define urgent training problems encountered during the preparation of the LWI for entry into combat. The presence of such problems among the 13 selected combat performances was ensured by the way in which they were chosen.

The specific research objectives were:

(1) To determine the nature and extent of deficiencies existing among current graduates of AIT, Infantry, on the 13 selected performances.

(2) To observe and analyze the behavior of current graduates of AIT, Infantry, as they attempted to meet the operational requirements specified by the selected performances, in order to determine reasons for deficiencies.

Analysis of the Problem

Effective preparation for combat requires that military skills be practiced and evaluated under combat-like conditions. Only through the use of a variety of realistic situations that include the contextual atmosphere of the battlefield can the results of evaluation procedures lay claim to ecological generality and validity. This principle of ecological representativeness during training and testing is an extension of Brunswik's development of representative design for psychological research. Speaking of experimental and statistical results, Brunswik[1] makes the point that the proper sampling of situations and problems may be more important than the proper sampling of subjects, since individuals are probably, on the whole, more alike than are situations.

The sample of combat performances was deliberately drawn to maximize the chances of finding important and pressing military training problems. Ultimately, combat performances are executed in a variety of tactical situations within functional contexts defined by enemy activities and the physical attributes of the geographic environment. For general applicability, evaluations of combat proficiency must include representative samples of situations, enemy activities, and geographic conditions. Furthermore, the ultimate combat performances are initiated in response to various external stimuli (in a relatively broad use of that term) present in the immediate environment. Proficiency in combat depends on the soldier's ability to recognize and react properly to such cues to action. This relationship was acknowledged in Research Memorandum 23,[2] where, under the rubric of stimuli, typical cues to action are specified for each combat subject. These cues constitute an essential part of the tactical context of combat performances and, therefore, must be an integral part of proficiency evaluations if ecological validity is to be achieved.

[1]Reference 1.
[2]Reference 8.

Attainment of the research objectives, with due regard for ecological validity, required that the 13 combat performances be embedded in a set of realistic, tactically sound, simulated combat situations designed to elicit the responses of interest from recent graduates of AIT.

Concern with evaluation demands concern with problems of measurement. The assessment of technical skill with weapons poses no particular measurement difficulties. Objective scores may be derived from records of the number of targets presented, the number of rounds fired, and the number of hits on targets. However, technical skill with weapons is only one of the necessary components of combat proficiency that must be evaluated.

The performances required of an LWI engaged in ground combat involve order-following behavior, such as increasing the rate of fire when so ordered by a leader, and decision-making behavior, such as selecting the particular targets at which to fire.

That is, there are situations in which the consequences of simple alternative choices are relatively unambiguous—for example, to obey or not to obey the order of an authorized superior. On the other hand, there are situations in which the consequences of alternative choices depend upon a number of factors, the relative importance of which shifts with unique configurations of the environment. Such situations require decisions based upon evaluations of the multiple factors involved. For example, ordered to move forward and place effective fire upon an enemy position, the individual must make a series of decisions about the way in which to move, the particular route to travel, the cover and concealment to use en route, the firing position to take, and the specific targets at which to fire. An adequate evaluation of combat proficiency would, then, involve information on the effectiveness of order-following and decision-making behavior, as well as information on firing data.

Consequently, regard for the complexity of combat proficiency required that the evaluation procedures provide for the collection of firing data, the rating of tactical use of weapons and terrain, and the notation of errors of omission and commission that prevent or detract from combat effectiveness.

Interest in discovering factors contributing to performance deficiencies and in finding ways of improving training led to the use of a post-evaluation interview.

PROCEDURE

Specific Steps

Four steps were necessary for the accomplishment of this research:

(1) Design of an evaluation exercise that incorporated the selected combat performances in a series of situations within a combat-like context, and provided for objective measurements, ratings, and observations of performance.

(2) Installation of the necessary equipment in the field for the conduct of this exercise.
(3) Administration of the evaluation exercise to a group of AIT graduates.
(4) Analysis and interpretation of the results of the evaluation procedures.

Description of Performances

Seven of the 13 performances directly concerned technical skills with specific weapons; six had to do with tactical skills essential to effective use of the weapons. Those aspects of each performance included in the exercise are described below. Parenthetical references are to Research Memorandum 23,[1] in which a complete statement of each performance, together with pertinent skills and knowledges, is presented.[2]

(1) With the M1 rifle, the subject should take part in assault fire and, at ranges to 44 meters, engage—on order or as demanded by the situation—enemy personnel appearing suddenly on the ground, singly and in pairs (Annex I-D1).

(2) With the Browning automatic rifle (BAR), he should take part in assault fire and, at ranges to 44 meters, engage—on order or as demanded by the situation—enemy personnel appearing suddenly on the ground, singly and in pairs (Annex I-F1).

(3) With the M1 rifle, at ranges to 270 meters, he should engage—on order or as demanded by the situation—suspected enemy positions and stationary and moving enemy personnel appearing on the ground singly, in pairs, and in groups of four, for varying periods of time (Annex I-D2).

(4) With the BAR, at ranges to 270 meters, he should engage—on order or as demanded by the situation—suspected enemy positions and stationary and moving enemy personnel appearing on the ground singly, in pairs, and in groups of four, for varying periods of time (Annex I-F2).

(5) With hand grenades, as demanded by the situation, he should engage, at night from a foxhole, a group of infiltrators operating a machinegun at a distance of 35 meters; on order, during a daylight assault action, he should approach and engage an active enemy machinegun position (Annex I-A1).

(6) With antitank rifle grenades and M1 rifle with M15 sight and grenade launcher, on order, during daylight, the LWI should engage a moving tank at a distance of 80 meters (Annex I-E1).

(7) With the 3.5-inch rocket launcher, on order, during daylight, he should engage a moving tank at a distance of 80 meters (Annex I-H1).

[1]Reference 8.

[2]The performance statements are reproduced in Appendix A. Discrepancies between the distances cited in the complete statements and the distances actually used in the exercise were due to features of the terrain in which the exercise was conducted.

(8) When brought under unexpected, effective small-arms fire while advancing during daylight as a member of a squad, the subject, on his own initiative, should immediately return fire and take available cover; as the situation permits, he should move to a position generally abreast of the team leader and continue to place fire on the enemy (Annex V-A2).

(9) As a member of a team during daylight hours, he should—on his own initiative or on order—effectively concentrate and distribute fire on targets prescribed by his leader (Annex V-B1).

(10) During daylight, he should adjust and shift fire effectively as demanded by the situation (Annex V-B3).

(11) During daylight, he should continually and systematically observe for, detect, locate, identify, and engage hostile targets (Annex IV-I1).

(12) During daylight, as the situation demands, the subject should use best available cover against flat-trajectory fire (Annex IV-K1).

(13) During daylight, as the situation demands, he should conceal self, weapon, and equipment from enemy ground observation (Annex IV-L1).

Description of the Evaluation Exercise

The evaluation exercise was designed to simulate the first day of combat that might be experienced by an individual replacement at the end of 16 weeks of training. Programmed simulation of friendly and enemy artillery, mortar, and small-arms fire was an integral part of the exercise. Moving and stationary personnel-type targets, fleeting-glimpse indicators, and a target tank were used to represent enemy activities. A detailed description of these targets and of the equipment used in the problem is contained in Appendix B of this report.

Four men were evaluated individually during each administration of the exercise. The subjects were received, processed, and phased into the exercise as replacements for assignment to a rifle squad in a reserve platoon. The phasing-in included (1) reception, orientation, and assignments at division, battle group, company, and platoon levels of command, (2) a 10-mile road march, (3) an evening meal of field rations, and (4) night security guard duty.

During the night, a simulated attack by enemy infiltrators provided a situation in which data were gathered on proper choice of weapon and effectiveness with hand grenades.

After a field ration breakfast, the subjects joined an understrength rifle squad consisting of a squad leader, two fire-team leaders, and two riflemen. The five NCO's in these roles functioned as "experienced" fighters who, according to plan, moved the subjects through the exercise, issued and relayed orders, fired their own weapons, and assisted in safety control during live-firing phases

The squad leader assigned the subjects—two as riflemen and two as automatic riflemen—to positions within the squad, gave an attack order, issued weapons and ammunition, and ordered the squad to move out in a squad line toward an enemy outpost. During this movement, ability to maintain pace and proper interval was rated.

Sudden, simulated machinegun fire from an enemy outpost, accompanied by a display of silhouette targets, interrupted the forward movement and introduced a situation in which immediate reaction to surprise fire was recorded. During subsequent maneuvers in response to leaders' orders, subjects were rated on use of cover and concealment and choice of firing positions, and data were obtained on effectiveness with rifle, automatic rifle, and hand grenades.

Once the enemy outpost was "overcome," the squad leader ordered resumption of forward movement. As the squad crossed the assault position, moving enemy personnel targets appeared and "ran away" toward the enemy Forward Edge of the Battle Area (FEBA). Data from this situation covered effectiveness in firing at moving targets with rifle and automatic rifle.

Next, the squad moved forward in a squad line toward the enemy FEBA—designated by a display of silhouette targets and fleeting-glimpse indicators, backed by a scoring panel. As the assault continued, a series of silhouette-target presentations represented an unexpected enemy defense in depth. The assault ended when the squad reached a hilltop. This situation provided data on the effectiveness of various aspects of assault fire and engagement of surprise targets with rifle and automatic rifle. In addition, subjects were rated on their ability to maintain proper pace and interval.

At the conclusion of the assault, the squad occupied four 2-man foxholes on the hilltop objective. Each subject was paired with an "experienced" squad member who pointed out the limits of the subject's sector of responsibility. The expected counterattack began with simulated machinegun fire and a display of silhouette targets. A programmed presentation of single and multiple displays of killable silhouette targets, at progressively decreasing ranges and for varying durations, represented the progress of the enemy toward the squad. Some displays required shifts of fire from more distant to closer, more dangerous targets.

During this action, an enemy formation preparing to assault the squad's position was represented by a line of fleeting-glimpse indicators, which extended across all sectors of fire and was backed by a scoring panel. The squad leader, in a separate fire order, designated the limits of this linear target prior to its presentation and gave the command to fire as the display began. This situation provided data on rate, distribution, and effectiveness of fire on suspected enemy locations with rifle and automatic rifle, and on understanding and compliance with the verbal fire order.

In addition, during this general defense action, enemy personnel approaching by rushes and bounds were represented by moving personnel-type targets that appeared at far, midrange, and near distances. The defense phase terminated with the presentation of a moving personnel-type target which arose from a concealed position, advanced for five seconds, and then fell to a prone position 15 meters from the foxhole. These situations provided additional data on proficiency in firing at moving targets.

The silhouette target displays presented during the course of the simulated enemy counterattack provided a series of situations in which data were obtained on proficiency in engaging stationary single and multiple personnel-type targets, including "surprise" targets, under various conditions of distance and exposure time.

At the end of the defense phase, the squad leader ordered the squad to move to positions from which approaching enemy tanks could be engaged. A target tank traveling laterally back and forth represented the approaching tanks. The riflemen engaged the tank with inert antitank rifle grenades; the automatic riflemen used inert 3.5-inch rockets. Data on proficiency in engaging moving tanks with the respective weapons were provided by this situation.

The moving tank situation concluded the exercise. Immediately afterward, each subject was interviewed regarding his pre-evaluation experiences, his reactions during the exercise, and his opinions regarding certain aspects of training. Also, the ability of each subject to disassemble, clean, and assemble both the M1 and the BAR was evaluated and scored in terms of a checklist.

Description of the Subjects

Fifty-one subjects, obtained from an Infantry training division immediately after completion of AIT, were conducted through the evaluation exercise. This group included graduates of BCT from each of six training centers. All had completed the TRAINFIRE I rifle marksmanship course and none had had prior military service.

Twenty-five of the subjects were designated as riflemen and used M1 rifles throughout the exercise. These men threw practice hand grenades in the nighttime infiltrator situation and in the daylight enemy-outpost situation, and fired inert antitank rifle grenades at the moving target tank.

The remaining 26 men were designated as automatic riflemen and used the BAR throughout the exercise. These men threw practice hand grenades in the nighttime infiltrator situation, and fired inert 3.5-inch rockets at the moving target tank.

During Basic Combat Training, the marksmanship ability of each trainee with the M1 rifle is measured on a record firing course. On this course, each man is issued 112 rounds of ammunition and presented 112 targets, at ranges from 50 to 350 meters in 50-meter steps. The maximum possible score is 112. Anyone hitting fewer than 35 targets fails to qualify with the M1 rifle. To qualify as a "marksman," a man must score within the range of 36 to 53, inclusive, without necessarily hitting any targets beyond those at 150 meters. Qualification as a "sharpshooter" requires a score from 54 to 67, inclusive, and may be achieved without hitting targets beyond 200 meters. An "expert" must attain a score of 68 or higher. Scores from 68 to 84 may be earned without hitting any targets beyond 250 meters. Thus, the man with the highest M1 qualification score in the sample (see Table 1) may have failed to hit any targets beyond 250 meters when he fired the qualification course.

Table 1

Background Data on Subjects Used in Evaluation Exercise

(51 Subjects—25 M1 Firers, 26 BAR Firers)

	Age (Years)	Formal Education (Years)	Qualification Scores[a]		Target Detection Scores[b]	
			M1	BAR	Moving	Stationary
51 Subjects						
Mean	18.9	10.8	55.9	164.7	13.4	17.7
Standard Deviation	2.2	1.2	12.3	27.8	2.9	4.4
Range	17-30	8-12	20-79	77-223	8-20	10-27
25 M1 Firers						
Mean	18.9	10.8	55.8	NA	13.4	16.6
Standard Deviation	1.5	1.2	15.0	NA	2.9	4.0
Range	17-23	8-12	20-79	NA	8-18	11-25
26 BAR Firers						
Mean	18.9	10.8	NA	168.5	13.3	18.7
Standard Deviation	2.7	1.3	NA	31.5	2.9	4.6
Range	17-30	8-12	NA	77-223	8-20	10-27

[a]Based on scores of 50 subjects; one subject failed to fire for M1 qualification and one subject failed to fire for BAR qualification.

[b]Based on scores of 48 subjects; two M1 firers and 1 BAR firer were not available for testing.

The marksmanship ability of the subjects with the BAR had been measured on the basis of Firing Tables IV and V of Course A, described in Field Manual 23-15.[1] The qualifying scores were determined according to Change 2 of this Field Manual. On this course, each man fires 50 rounds at known-distance targets located 200, 300, and 500 yards (approximately 185, 275, and 455 meters, respectively) from the firing position. Five points are scored for each hit regardless of range; therefore, it is possible to attain a maximum score of 250 points. Anyone scoring fewer than 30 hits (150 points) fails to qualify with the BAR. In order to qualify as a "marksman," the firer must score from 150 to 185 points, without necessarily hitting any target beyond 300 yards. A score of 190 to 210 points, which must include at least three hits at 500 yards, is required to qualify as a "sharpshooter." An "expert" firer must score at least 215 points, of which at least 40 must be obtained for hits at 500 yards.

Prior to participating in the evaluation exercise, each available subject was administered a target detection test by personnel from the Weapons Department, U.S. Army Infantry School (USAIS). This test was scored separately for detecting moving and stationary targets. In detecting moving targets, the subject was allowed 30 seconds to "aim" a marking device at the point of disappearance of a forward-rushing target. One point was scored for each correct "aim"; the maximum

[1]Reference 5.

possible score was 26 points. The test for detecting stationary targets consisted of the presentation of ten targets in various positions at different ranges. Each target could be presented up to four times, each time becoming easier to detect. If a subject detected it on the first presentation, he was awarded four points; on the second presentation, three points, and so forth. A maximum score of 40 points was possible.

Table 1 contains background information on the subjects used in the evaluation exercise, including an over-all view of the 51 subjects as well as the information pertaining to the M1 riflemen and the BAR subjects, respectively.

The 13 performances tested were judged by 50 members of a STRAC division as being those on which AIT graduates were least effective. These men were familiar with the capabilities of trainees from a large number of training installations and their judgments are accepted as ample evidence of the existence of ineffectiveness on these performances among the population of interest. Therefore, the purpose of this study was not to establish the existence of performance deficiencies, but rather to determine the specific types of errors of commission and omission made by current graduates of AIT without prior military training, as they attempted to carry out the required actions.

A perusal of the background data, including military qualifications, presented on the 51 subjects provides no reason to believe that these men would make errors atypical of the population which they are considered to represent—men without prior military training who have completed BCT, including the TRAINFIRE I rifle marksmanship course, and AIT for the Light Weapons Infantryman. Consequently, the findings of this study are considered to apply to the population of concern in the military problem that generated the study; that is, the preparation of men without prior military service for duty as effective ground combat replacements.

Administration of the Evaluation Exercise

The evaluation exercise was administered to the 51 subjects in 13 separate groups, beginning in October 1960 and extending into early November. The weather remained consistently fair during this period and visibility was judged so uniform as to provide no particular advantage or disadvantage to any of the groups. The exercise required approximately 21 hours for each group to complete, starting at 1530 hours one day and ending at around 1230 hours the following day.

Weapon variability was controlled by providing the subjects with M1 rifles, BAR's, and 3.5-inch rocket launchers of known firing characteristics. Four M1 rifles, selected for their grouping abilities, were used by the subjects. The two rifles exhibiting the tightest shot groups were normally used throughout each administration of the exercise. The remaining two rifles were used as alternates when malfunctions necessitated substitution. Average shot groups obtained with these four rifles, based upon two 10-round groups fired by an expert rifleman from a benchrest at 250 meters, and expressed in terms of estimated mean radii, were 3.0, 3.1, 3.3, and 3.4 inches, respectively.

Similarly, four BAR's were selected and the two possessing the best grouping abilities were normally used by the subjects; the remaining two served as alternates. Average shot groups obtained with these weapons, under the same conditions and at the same distance as those obtained with the M1 rifles, were 3.6, 3.7, 3.9, and 4.1 inches, respectively.

Four 3.5-inch rocket launchers in perfect firing condition were selected and carefully bore-sighted by qualified NCO's for use by the subjects.

Prior to the exercise, each subject zeroed the rifle that he subsequently used throughout the exercise. This personal zero was recorded and later placed on the rifle at the time of issue for use during the exercise. The zeroes placed on the alternate rifles were set by an expert rifleman.

Administration of the exercise entailed four areas of responsibility, three of which were concurrent. First, responsibility for conducting the subjects through the exercise was borne by an Infantry captain aided by a staff of noncommissioned officers. The captain and his key personnel had participated in the development of the requirements for entry into combat set forth in Research Memorandum 23,[1] and in the design of the evaluation exercise.

Under the supervision of this officer, some of the noncommissioned officers played the roles of "experienced" squad members, including the squad leader, the two fire team leaders, and the two riflemen, and moved the subjects through the various situations. These NCO's fired their weapons, as squad members, at objects other than the targets evaluated, defined sectors of responsibility, corrected weapon malfunctions which the subjects were unable to handle, and enforced safety regulations.

Another group of noncommissioned officers, under the captain's supervision, had the responsibility for activating targets and fleeting-glimpse indicators, operating small-arms fire simulators, and detonating demolitions according to a detailed program of presentation. The captain maintained contact with these men throughout the exercise by means of a combined telephone and radio communications system.

Second, responsibility for scoring and rating the performance of the subjects was shared by four noncommissioned officers. These men had also taken part in the development of the combat job description previously mentioned, and in the design of the evaluation exercise. During a pilot run of the exercise and in numerous rehearsals, they became thoroughly familiar with each situation and received intensive training on the use of the score sheets and of a common set of criteria in rating tactical performances.

A scorer was assigned to each subject and, beginning with the movement from the bivouac area toward the enemy outpost, followed him throughout the exercise. The following data were recorded, as appropriate, for each situation:

(1) Quantitative data, such as number of rounds fired and number of hits on targets.

[1]Reference 8.

(2) Qualitative data, such as ratings of ability to maintain pace and interval during coordinated movement, use of cover and concealment, and choice of firing position.
(3) Administrative data, such as weapon and target malfunctions for use in adjusting firing scores.

Individual firing results were identified by the use of color-coded practice hand grenades and rifle ammunition. Scoring panels registered effective fire on linear targets.

Third, responsibility for making military observations on the behavior of the subjects as they were conducted through the exercise rested on four combat veterans thoroughly familiar with the exercise. Each subject, starting with the movement from the bivouac area toward the enemy outpost, was followed throughout the exercise by a military observer. The observers noted errors of omission and commission that either failed to contribute to, or detracted from, the effectiveness of the squad. These errors included such things as inept reloading of weapons, indiscriminate firing, and failure to observe for enemy activities. Notes made by individual observers were combined and summarized to form an analysis of performance deficiencies in terms of frequency of occurrence.

Finally, post-evaluation interviews with the subjects were conducted by three of the military observers and by a research psychologist thoroughly familiar with the situations. Three of these men had taken part in the construction of the questionnaire-checklist used during the interviews.

Each subject was interviewed individually by one of these four men at the conclusion of the moving-tank situation. The interviewers sought information on the following points:

(1) Aspects of pre-evaluation experience, such as nature and extent of experience with firearms prior to entry into service, and amount and circumstances of missed Army training.
(2) Reactions to various evaluation situations, such as the initial appearance of the moving personnel targets.
(3) Opinions about the required performances (such as, which were the most difficult and which the least difficult parts of the exercise) and opinions about the preparatory training (such as, what additional training would be desirable as preparation for similar exercises).

The information obtained from the interviews was combined and summarized, in terms of frequency of responses, for use as a source of explanations for performance deficiencies and of ideas for improved training methods.

RESULTS

Results bearing on the evaluated aspects of the 13 combat performances are presented in the same order followed in the description of those aspects on pages 6 and 7 of this report. Data on parallel performances with the M1 rifle and the BAR are presented together. Where

appropriate, the following four ratios, each defining a different aspect of firing proficiency, were used as measures of performance:

(1) Number of targets fired at per number of targets presented. Indicates extent to which subject engaged targets; i.e., target engagement.
(2) Number of targets hit per number of targets presented. Indicates subject's effectiveness in neutralizing targets; i.e., firing effectiveness.
(3) Number of targets hit per number of targets fired at. Indicates subject's accuracy; i.e., firing accuracy.
(4) Number of targets hit per number of rounds (M1) or bursts (BAR) expended. Indicates the efficiency of subject; i.e., firing efficiency.

These ratios are expressed in percentage terms.

Firing effectiveness is the aspect of firing proficiency that is of prime military significance. The most important measure of a man's firing proficiency is the proportion of enemy targets that he can neutralize with his weapon during an engagement. Firing effectiveness may be thought of as resulting from, and dependent upon, target engagement and firing accuracy. Failure to achieve a satisfactory level of firing effectiveness can then be accounted for in terms of deficiencies in either target engagement or firing accuracy, or a combination of both elements.

Thus, although a man may achieve a satisfactory level of firing accuracy, he may fail to engage a sufficient number of targets to achieve a satisfactory level of firing effectiveness in a given situation. Likewise, although a firer may engage every target presented, he may still fail to achieve a satisfactory level of firing effectiveness because of his poor firing accuracy. Similarly, a firer may fail to achieve satisfactory firing effectiveness not only because he fails to engage a sufficient number of targets, but also because he fails to hit a sufficient proportion of the targets at which he fires.

Firing efficiency serves as a measure of the cost in ammunition of obtaining hits. Of two firers with the same firing effectiveness, the one with the greater firing efficiency would rate higher in overall firing proficiency.

To provide an informed basis for evaluating the adequacy of performance in the various situations, the consensus of 10 military personnel (active and retired), who had participated in the design and administration of the exercise, was obtained. These men based their judgments on their knowledge and experience on each situation and the conditions under which the firing occurred and on pertinent portions of Field Manuals 23-5,[1] 23-15,[2] and 23-71.[3] References to acceptable performance in specific situations are to the judgments of these men. The criterion for each judgment was the level of proficiency which a

[1]Reference 4.
[2]Reference 5.
[3]Reference 6.

man—minimally prepared to join a rifle squad engaged in combat—would achieve under the conditions that actually prevailed in the situation as part of the exercise.

Assault Fire

Individual ability to take part in assault fire was evaluated in the assault portion of the attack phase of the exercise. After having engaged moving enemy personnel retreating toward the enemy FEBA, the squad, on order of the squad leader, moved forward in a squad line. Enemy activity was represented by intermittent displays of fleeting-glimpse indicators, presented in front of a scoring panel 244 feet long and 18 inches high, at a distance of approximately 100 meters. When the squad had advanced to within 80 meters of this panel, two silhouette targets appeared in each subject's sector for 3 to 5 seconds, then disappeared, to reappear when the subjects were 20 meters closer. This intermittent display of silhouette targets continued at 20-meter intervals until the final presentation when the subjects were 20 meters from the targets.

Actual firing data and acceptable performance standards are summarized in Table 2. As a matter of interest, data on the number of subjects who failed to score hits during this phase of the exercise are shown in Table 3.

Table 2

Assault Firing Data

(25 M1 Firers, 26 BAR Firers)

	Rounds Fired		Hits on Panel		Hits on Sections Backing Indicators		Hits on Silhouettes[a]	
	M1	BAR	M1	BAR	M1	BAR	M1	BAR
Acceptable Performance[b]	48	120	16	30	6	18	4	4
Mean Individual Performance	16.7	30.5	3.9	2.8	3.1	1.9	1.9	1.6
Standard Deviation	7.9	23.1	3.2	2.7	2.8	2.0	1.8	4.1
Range	7-36	0-102	0-11	0-9	0-10	0-7	0-7	0-21

[a]These were the targets directly in front of the BAR firer, and those in the M1 firer's sector.
[b]These are *individual standards*, not averages.

Some of the performance failures noted during the exercise—by scorers, military observers, and the subjects—are listed in Table 4.

In summary, individual rate of fire was approximately one-third (M1 firers) to about one-fourth (BAR firers) of what it should have been. Inept reloading contributed to this low rate. Fire was not adequately directed at the fleeting-glimpse indicators and at the silhouette targets. Of the rounds actually fired, on the average, only 23 per cent

Table 3

Number of Subjects Who Failed to Score Hits in the Assault

(25 M1 Firers, 26 BAR Firers[a])

Weapon Used	Number of Subjects		
	Scoring Panel	Sections of Panel Backing Targets	Silhouette Targets[b]
M1	1	3	6
BAR	5	7	12

[a]One subject failed to fire his weapon during the entire situation; he is included in these data.

[b]These were the targets directly in front of the BAR firers, and those in the sectors of the M1 firers.

(M1 firers) and 9 per cent (BAR firers) hit the scoring panel; 18 per cent (M1 firers) and 6 per cent (BAR firers) hit sections of panel immediately in back of targets and fleeting-glimpse indicators; 11 per cent (M1 firers) and 5 per cent (BAR firers) hit the silhouette targets. Preoccupation with reloading prevented observation for enemy activities, and awkwardness in carrying the BAR contributed to poor performance with that weapon.

Table 4

Percentage of Performance Failures as Noted by Scorers, Military Observers, and Subjects

(25 M1 Firers, 26 BAR Firers)

Observer	Phase	Observation	Performance Failures (Per Cent)	
			M1	BAR
Scorer	Assault	Failure to:		
		Distribute fire while advancing from 100 meters to 35 meters from the enemy target	72	69
		Distribute fire while advancing from 35 meters to 10 meters (underarm fire)	56	58
Military	Assault and Defense	Failure to:		
		Fire at sufficiently rapid rate	76	NA
		Fire consistent 2- to 3-round bursts	NA	48
		Observe enemy while reloading	28	44
		Fire at fleeting-glimpse indicators	ND	52
		Fire accurately at visible targets	ND	72
		Shift fire laterally within sectors	NA	54
		Difficulty in:		
		Reloading weapons	100	79
		Carrying weapons	ND	40
Subjects	Assault	Failure to:		
		Observe simulations of enemy movement and fire presented immediately in front of panel	44	31

Engagement of Surprise Targets and Shift of Fire

Ability to engage suddenly appearing personnel targets was evaluated in both the assault and the defense phases of the exercise. During the assault action, as the subjects advanced past the enemy FEBA, a silhouette target appeared for three seconds in each subject's sector at a distance of 30 meters, and later reappeared for three seconds when he was 20 meters away. The firing data are summarized in Table 5.

Table 5

Group Firing Proficiency Scores in Assault Surprise-Target Situation
(25 M1 Firers, 26 BAR Firers)
(Per Cent)

Proficiency Measure	30-Meter Range		20-Meter Range	
	M1	BAR	M1	BAR
Target Engagement $\frac{\text{Targets Engaged}}{\text{Targets Presented}}$	44	38	76	65
Firing Effectiveness $\frac{\text{Targets Hit}}{\text{Targets Presented}}$	8	15	60	23
Firing Accuracy $\frac{\text{Targets Hit}}{\text{Targets Engaged}}$	18	40	79	35
Firing Efficiency $\frac{\text{Targets Hit}}{\text{Rounds Expended}}$	12	7	37	6

Fifty-six per cent of the M1 firers and 62 per cent of the BAR firers failed to fire at their silhouette targets when they were presented at a distance of 30 meters. Those men who did fire were not accurate. Although the BAR firers were appreciably more accurate than the M1 subjects, the cost in ammunition expended was high in relation to the accuracy.

At 20 meters, considerably more members of each group engaged targets, and the M1 firers demonstrated over four times the firing accuracy they achieved at 30 meters. The BAR subjects, on the other hand, were less accurate at 20 meters than they were at 30 meters; consequently, their 8 per cent improvement in firing effectiveness was due to a 27 per cent improvement in target engagement. It is noteworthy that even at a distance of only 20 meters 24 per cent of the M1 firers and 35 per cent of the BAR firers failed to fire at the silhouette targets.

During the defense phase, while firing from foxholes at more distant targets each man was confronted with a programmed presentation of eight displays of single surprise targets, and four displays of paired

surprise targets.[1] The eight single target displays consisted of the presentation of an F-type silhouette target at a distance of 22 meters for three, four, five, and six seconds, and the presentation of the same type target at a distance of 44 meters for the same durations. The four paired surprise displays consisted of the presentation of these F-type silhouette targets at both distances simultaneously for six, seven, eight, and nine seconds. Each display was in conjunction with the appearance of an E-type silhouette target at a greater distance. The subjects were expected to detect the F targets and to shift their fire from the E-type targets to these suddenly appearing, closer, and more dangerous targets, which simulated enemy sappers.

The results for the M1 and BAR groups are presented in Table 6; for summary purposes, the results obtained on the single displays of the F target at 22 meters have been combined with those obtained at 44 meters. As expected, consistently higher values on all proficiency measures were obtained on the nearer target, whether presented singly or paired with the 44-meter target. However, even for target engagement, maximum values were not invariably obtained during longer exposures.

Table 6

Group Firing Proficiency Scores in Defense Surprise-Target Situation

(25 M1 Firers, 26 BAR Firers)

(Per Cent)

Proficiency Measure	Single Targets								Paired Targets							
	Time Exposed (Seconds)								Time Exposed (Seconds)							
	3		4		5		6		6		7		8		9	
	M1	BAR	M1	BAR	M1	BAR	M1	BAR	M1	BAR	M1	BAR	M1	BAR	M1	BAR
Target Engagement $\frac{\text{Targets Engaged}}{\text{Targets Presented}}$	61	62	79	79	63	82	60	62	44	46	68	66	98	71	75	91
Firing Effectiveness $\frac{\text{Targets Hit}}{\text{Targets Presented}}$	48	56	68	72	57	69	53	58	40	41	52	54	81	63	60	82
Firing Accuracy $\frac{\text{Targets Hit}}{\text{Targets Engaged}}$	79	90	86	92	90	85	89	94	90	90	77	82	83	89	81	90
Firing Efficiency $\frac{\text{Targets Hit}}{\text{Rounds Expended}^a}$	67	85	73	87	79	81	76	85	83	86	66	59	70	82	67	80

[a]For BAR firers, the number of bursts expended was used in computing this ratio.

Acceptable performance in this defense situation was judged to be 100 per cent for target engagement, for firing effectiveness, and for

[1]These targets are described in Appendix B.

firing accuracy. An analysis of the individual results revealed the following information:

(1) Single displays. Of the 25 M1 firers, none achieved 100 per cent effectiveness; 44 per cent failed solely because of insufficient target engagement, 12 per cent because of inadequate firing accuracy, and 44 per cent because of deficiencies in both elements. One BAR firer achieved 100 per cent firing effectiveness. Of the remaining 25 BAR subjects, 52 per cent failed solely because of insufficient target engagement, 4 per cent because of inadequate firing accuracy, and 44 per cent because of deficiencies in both elements.

(2) Paired displays. Two M1 firers achieved 100 per cent firing effectiveness. Of the remaining 23 M1 subjects, 39 per cent failed because of insufficient target engagement, 17 per cent because of inadequate firing accuracy, and 44 per cent because of deficiencies in both elements. One BAR firer achieved 100 per cent firing effectiveness. Of the remaining 25 subjects, 48 per cent failed because of insufficient target engagement, 12 per cent because of poor firing accuracy, and 40 per cent because of deficiencies in both elements.

The ability to shift fire in depth was evaluated in this defense situation as an integral part of the engagement of surprise targets. The scorers recorded whether each man shifted fire immediately upon presentation of surprise target, shifted later, or failed to shift. They also judged in each case of failure tc shift fire whether the man saw or failed to see the surprise target. A summary of these data is presented in Table 7. The subjects failed to shift fire on 31 per cent of the occasions which required a shift, and shifted too late an additional 20 per cent of the time. One-half of the failures to shift occurred even though the men apparently saw the surprise targets; thus, failure to engage the surprise targets was not entirely due to failure to detect them.

In summary, over-all average firing effectiveness in the surprise-target situation was about 59 per cent of that judged to be acceptable. Failure to engage targets was shown to be the major cause of poor

Table 7

Shift-of-Fire Performance in Defense Surprise-Target Situation

(25 M1 Firers, 26 BAR Firers)

Performance	Frequency[a]		
	M1	BAR	Total
Shifted Immediately	139	104	243
Shifted Too Late	33	64	97
Failed to Shift			
Target Not Seen	52	26	78
Target Seen	32	45	77
Total	256	239	495

[a]Values indicate the number of times performance occurred.

firing effectiveness. An improvement in target engagement would have raised the level of firing effectiveness of 96 per cent of the subjects; an improvement in firing accuracy would have benefited 75 per cent.

Engagement of Stationary Targets

The results of firing at stationary targets were obtained during the defense phase of the exercise. The subjects, in foxholes, were presented with killable E-type silhouette targets at each of 10 distances ranging from 66 to 264 meters, in increments of 22 meters. The targets were (1) displayed singly at each of the 10 distances for three, four, five, and six seconds; (2) displayed in five mutually exclusive pairs—formed of targets at adjacent distances—for six, seven, eight, and nine seconds; and (3) displayed in three mutually exclusive groups of four—formed of targets at adjacent distances—for 10, 12, 14, and 16 seconds. Killable F-type silhouette targets at 44 meters and 22 meters were included in the closest group in the last display described. The displays were programmed to simulate an enemy attack and, in general, progressed from those most distant to those closest to the foxholes.

Analyses of variance and covariance, in terms of number of hits and number of rounds expended, were made in order to reveal relationships among distance, exposure duration, and number of targets in a display.

Distance. In general, as distance to targets decreased, the number of hits and the number of rounds expended increased. When the number of rounds expended was controlled statistically, the increase in number of hits could not be attributed to differences in the number of rounds expended, exposure duration, or number of targets in a display. Relationships among five distance categories and four proficiency measures are shown in Table 8.

Over-all proficiency at the nearest distances was approximately three times that at the greatest distances. Both the rate and the degree of improved performance were about the same for M1 and BAR firers with the following exceptions:

(1) BAR firers lagged behind M1 firers in target engagement and in firing effectiveness at the nearest distances (66 and 88 meters).

(2) BAR firers excelled M1 firers in target engagement at the midrange distances (154 and 176 meters) and in firing accuracy at the farthest distances (242 and 264 meters).

Exposure Duration. No significant relationships were found between duration of target exposure and hits obtained or rounds expended for either M1 or BAR firers. For BAR firers, however, the relationship between number of bursts fired and duration of exposure was significant at the .05 level of confidence. Although more bursts were fired at targets during the shorter exposure periods, this tendency had no appreciable effect on any of the four measures of proficiency.

Table 8

Group Proficiency Scores on Stationary Targets, by Target Distance

(25 M1 Firers, 26 BAR Firers)

(Per Cent)

Proficiency Measure	Target Distance (Meters)									
	242, 264		198, 220		154, 176		110, 132		66, 88	
	M1	BAR	M1	BAR	M1	BAR	M1	BAR	M1	BAR
Target Engagement: Targets Engaged / Targets Presented	32	32	49	45	74	86	77	80	94	80
Firing Effectiveness: Targets Hit / Targets Presented	13	14	26	22	52	58	57	58	83	66
Firing Accuracy: Targets Hit / Targets Engaged	28	38	43	44	65	68	72	72	87	84
Firing Efficiency: Targets Hit / Rounds Expended*	22	26	29	26	47	49	52	56	74	72

*For BAR firers, the number of bursts expended was used in computing this ratio.

Number of Targets in a Display. Again, no significant relationships were found for M1 firers, nor was the relationship between this variable and the number of bursts fired by BAR firers significant. However, there was a highly significant relationship between the hits obtained by BAR firers and the number of targets in a display: More targets were hit when presented singly than when presented in pairs or groups of four. A covariance analysis indicated that this result could not be attributed to differences in the number of bursts fired, distance to targets, or exposure duration.

Table 9

Group Proficiency Scores of BAR Firers on Stationary Targets, by Number of Targets Displayed

(26 Subjects)

(Per Cent)

Proficiency Measure	Number of Targets in Display		
	1	2	4
Target Engagement: Targets Engaged / Targets Presented	70	65	58
Firing Effectiveness: Targets Hit / Targets Presented	49	45	39
Firing Accuracy: Targets Hit / Targets Engaged	69	69	66
Firing Efficiency: Targets Hit / Bursts Fired	52	48	47

The effects of this relationship upon the four proficiency measures are shown in Table 9 for BAR firers. Significantly more targets were engaged and hit when presented singly than when presented in groups of four. The differences between single and paired displays on these measures approached, but

did not reach, statistical significance. Firing accuracy and firing efficiency were not affected by differences in numbers of targets in a display.

Adequacy of Performance. For convenience in evaluating the adequacy of performance, distances were combined into three categories, and all exposure durations were combined. Acceptable performance in each of the nine resultant firing situations was judged to be as defined in Table 10 for each of the four proficiency measures.

Table 10

Suggested Acceptable Levels of Proficiency With the M1 and the BAR in Nine Firing Situations

(51 Subjects)

(Per Cent)

Proficiency Measure	Target Distance (Meters)								
	198-264			110-176			22-88		
	Number of Targets			Number of Targets			Number of Targets		
	1	2	4	1	2	4	1	2	4
Target Engagement: Targets Engaged / Targets Presented	63	69	63	100	100	100	100	100	100
Firing Effectiveness: Targets Hit / Targets Presented	31	37	31	50	56	50	100	100	94
Firing Accuracy: Targets Hit / Targets Engaged	50	55	50	50	56	50	100	100	94
Firing Efficiency: Targets Hit / Rounds Expended	50	55	50	50	47	50	80	73	71

The percentages of firers who achieved the levels of firing effectiveness stipulated for each of the firing situations are shown in Table 11.

Table 11

Percentage of M1 and BAR Subjects Achieving Acceptable Firing Effectiveness in Nine Firing Situations

(25 M1 Firers, 26 BAR Firers)

Distance (Meters)	Number of Targets in Display					
	1		2		4	
	M1	BAR	M1	BAR	M1	BAR
198-264	36	31	16	15	36	15
110-176	80	77	44	65	52	62
22-88	48	12	52	31	32	12

Analysis of the results obtained by firers who were unsuccessful in achieving acceptable levels of firing effectiveness indicated that 18 per cent of the M1 firers and 12 per cent of the BAR firers failed because of inadequate firing accuracy, 30 per cent of the M1 firers and 36 per cent of the BAR firers failed solely because of insufficient target engagement, and 52 per cent of each group failed because of inadequacies in both elements. For both groups, target engagement was a special problem at all ranges, and the deficiency in firing accuracy at near distances (22 to 88 meters) was particularly important.

Speed of Reloading. The scorers observed and rated the over-all speed of reloading and the ability to cope with weapon stoppages demonstrated by each subject during the course of the exercise. On over-all speed of reloading, 12 per cent of the M1 firers were rated as good, 48 per cent as average, and 40 per cent as poor. Comparable ratings of the BAR firers were 23 per cent good, 50 per cent average, and 27 per cent poor. Twenty-three of the BAR firers had weapon stoppages during the exercise, and, of these, 22 per cent were rated as handling stoppage well, 43 per cent as average, and 35 per cent as poor. Only 10 M1 firers had weapon stoppages; four were rated as average in handling the situation, the remaining six as poor.

Deficiencies Noted. Military observers noted a number of deficiencies in subject performance:

(1) Failure by a majority of firers to make maximum use of the support afforded by the foxhole position.
(2) Undue exposure to enemy fire while firing from foxholes.
(3) Slowness and undue preoccupation with reloading operations which resulted in failure to observe enemy targets and to have loaded weapons at times of target exposure. BAR men used magazines carried in their ammunition belts first, rather than the loaded magazines previously stocked on the position.
(4) Failure to detect close-in targets and distant targets (175 to 264 meters).
(5) Slowness in engaging targets.
(6) Failure to engage closest (most dangerous) targets first when confronted with multiple-target displays.
(7) Tendency by some firers to block their view with their weapons.

In the interviews, only 43 per cent of the subjects stated categorically that they had been in good, steady shooting position. Of the 27 subjects who had not been in a completely steady, satisfactory position, 90 per cent said they had made no effort to adjust their position with the sandbags supplied for that purpose. Most firers said they had aimed high on the far silhouette targets, at center for midrange targets, and below center for near targets. (Since a 250-meter battle-sight zero was used, the proper point of aim would have been center of target for far targets, below center for midrange, and at lowest visible portion for near targets.) About one-third (38 per cent) of the BAR firers stated that keeping the weapon in action was one of the most

difficult parts of the exercise. A like proportion (35 per cent) said that getting the magazines out of the AR belt was one of the most difficult parts of the exercise. About one-third (36 per cent) of the M1 firers cited finding the targets in the defense as one of the most difficult parts of the exercise; in contrast, about one-fourth (23 per cent) of the BAR firers stated that this was the easiest part of the exercise for them.

Summary. In summary, about 68 per cent of the M1 firers and 85 per cent of the BAR firers hit fewer than 30 per cent of the stationary silhouette targets presented to them at ranges of 198 to 264 meters. Approximately 40 per cent of the M1 firers and 30 per cent of the BAR firers hit fewer than 50 per cent of the targets presented at ranges of 110 to 176 meters. Finally, about 84 per cent of the M1 firers and all of the BAR firers were unable to hit all the targets presented at ranges of 22 to 88 meters.

Insufficient target engagement was shown to be the major contributor to low firing effectiveness. This factor was especially potent in multiple-target situations; thus, the problem was not confined simply to the detection of distant, hard-to-see targets. Inept reloading of weapons was observed as a probable impediment to the detection and the engagement of targets.

Poor firing accuracy contributed to poor firing effectiveness at all ranges including those as near as 22 to 88 meters. Widespread failure to take stable firing positions was observed, and this factor, together with the indicated use of improper aiming points, presumably could account for an appreciable amount of inaccuracy.

In comparison with the M1 firers, BAR firers were relatively ineffective on multiple targets and on near targets. This may indicate that the BAR should not be used on the bipod in multiple-target and close-in situations. Perhaps, on the other hand, a technique which does not require an awkward body swing in these situations could be developed.

Engagement of Moving Personnel Targets

Running-man targets, developed to simulate moving enemy personnel, were presented once during the assault situation and at three different distances during the defense phase of the exercise. In all displays, the target was raised from a prone position, "ran" at a rate of about three meters per second for a fixed distance, and then returned to a prone position. No other targets were displayed during a presentation of the running-man target.

Retreating-Man Situation. As the squad reached the assault position, four running-man targets were raised successively at a distance of 40 meters, "ran" directly toward the enemy FEBA for about 15 seconds, then were returned to a prone position at a distance of about 85 meters. Only one target was displayed at a time, and one of the four appeared directly in front of each subject.

Results in terms of three proficiency measures are shown in Table 12. Firing efficiency, not shown in the table, was

Table 12

Distribution of Proficiency Scores in Retreating-Man Situation
(21 M1 Firers, 22 BAR Firers)

Proficiency Measure	Number of Subjects Who Scored:[a]													
	0%		25%		33%		50%		67%		75%		100%	
	M1	BAR	M1	BAR	M1	BAR	M1	BAR	M1	BAR	M1	BAR	M1	BAR
Target Engagement: Targets Engaged / Targets Presented	2	4	2	4	0	1	5	5	1	1	5	4	6	3
Firing Effectiveness: Targets Hit[b] / Targets Presented	9	11	5	6	2	1	2	3	0	1	2	0	1	0
Firing Accuracy: Targets Hit[b] / Targets Engaged	9	11	3	1	2	1	1	3	1	1	0	0	5	5

[a]Data cover subjects presented with fewer than four targets as well as those presented with four targets.

[b]There is a difference in the derivation of these proficiency measures for the retreating-man and the advancing-man situations. Four separate targets were presented in the former, allowing separate scoring of each presentation; the three presentations of a single target in the latter had to be treated as one presentation for scoring purposes. (See Table 13.)

low—81 per cent of the subjects registered less than one hit for every three rounds expended.

Acceptable performance in this situation was judged to be:

(1) Target engagement, 75 per cent
(2) Firing effectiveness, 75 per cent
(3) Firing accuracy, 67 per cent

Three M1 firers and none of the BAR firers achieved the level of firing effectiveness defined as acceptable. An analysis of the performance of those firers who were presented with four targets and failed to achieve acceptable effectiveness revealed that 15 per cent of the M1 firers failed principally because of insufficient target engagement, 46 per cent because of inadequate firing accuracy, and 31 per cent because of deficiencies in both elements. Similarly, for the BAR firers, 20 per cent failed because of insufficient target engagement, 27 per cent because of inadequate firing accuracy, and 47 per cent because of deficiencies in both elements. Thus, firing inaccuracy was the major factor contributing to low firing effectiveness.

The military observers noted that:

(1) Seventy-six per cent of the M1 firers and 24 per cent of the BAR firers fired too slowly.
(2) Forty per cent of the M1 firers and 32 per cent of the BAR firers were slow in detecting these targets.
(3) Forty-eight per cent of the BAR firers were slow in engaging these moving targets.

Responses to interview questions indicated that about 44 per cent of the subjects firing the M1 and 50 per cent of those firing the BAR

withheld their fire at first sight of the targets in order to verify that the target was not a real man. Thirty-six per cent of the M1 firers and 23 per cent of the BAR firers stated their first reaction was to shoot at it. Forty per cent of the M1 subjects and 23 per cent of the BAR subjects said they were surprised or startled at the first appearance of the target.

Advancing-Man Situation, 270 to 225 Meters. During the defense phase of the exercise, each subject was confronted with a running-man target which was raised at a distance of 270 meters and advanced in a zigzag course composed of three separate bounds of five, three, and seven seconds' duration, respectively, then returned to a prone position at a distance of 225 meters. The separate bounds were randomly spaced between presentations of silhouette targets; however, no other targets were displayed while the moving target was being presented.

No systematic relationship was found between target exposure duration and the number of subjects who fired during a particular display. An average of 34 per cent of the M1 subjects and 65 per cent of the BAR subjects fired at a given display. Similarly, no significant relationship was found between exposure duration and rounds fired during a given display.

Results in terms of three proficiency measures are shown in Table 13.

Acceptable performance in this situation was judged to be:

(1) Target engagement, 67 per cent
(2) Firing effectiveness, 33 per cent for the M1, 67 per cent for the BAR
(3) Firing efficiency, 33 per cent for the M1, 22 per cent for the BAR

Table 13

Distribution of Proficiency Scores in Advancing-Man Situation at 270 to 225 Meters

(23 M1 Firers, 24 BAR Firers)

Proficiency Measure	Number of Subjects Who Scored:									
	0%		33%		50%		67%		100%	
	M1	BAR	M1	BAR	M1	BAR	M1	BAR	M1	BAR
Target Engagement: Targets Engaged / Targets Presented	9	3	3	2	5	7	3	2	3	10
Firing Effectiveness: Hits on Targets* / Targets Presented	22	17	0	1	0	1	0	2	1	3
Firing Accuracy: Hits on Targets* / Targets Engaged	22	17	0	1	0	1	0	1	1	4

*The three presentations of the same target were treated as one presentation for scoring purposes.

One M1 firer and five BAR firers achieved the level of firing effectiveness defined as acceptable. Lack of firing accuracy was the major reason for failure to achieve firing effectiveness; 96 per cent of the M1 firers and 71 per cent of the BAR firers failed to register a hit. Insufficient target engagement by 74 per cent of the M1 firers and 50 per cent of the BAR firers also contributed to low firing effectiveness. Firing efficiency, not shown in the table, was low; 85 per cent of the subjects registered less than one hit for every three rounds expended.

Advancing-Man Situation, 150 to 105 Meters. This situation duplicated the previous one except that the first presentation was at 150 meters and the third ended at 105 meters, and the exposure durations were seven, three, and five seconds, in that order.

No systematic relationship was found between target exposure duration and the number of subjects who fired during a particular display. An average of 89 per cent of the M1 firers and 88 per cent of the BAR subjects fired at a given display. Similarly, no significant relationship was found between exposure duration and rounds fired during a given display.

Results in terms of three proficiency measures are shown in Table 14.

Acceptable performance in this situation was judged to be:

(1) Target engagement, 67 per cent
(2) Firing effectiveness, one hit per presentation for the M1, three hits per presentation for the BAR
(3) Firing efficiency, 60 per cent

Table 14

Distribution of Proficiency Scores in Advancing-Man Situation at 150 to 105 Meters
(23 M1 Firers, 24 BAR Firers)

Proficiency Measure	Number of Subjects Who Scored:									
	0%		33%		50%		67%		100%	
	M1	BAR	M1	BAR	M1	BAR	M1	BAR	M1	BAR
Target Engagement: Targets Engaged / Targets Presented	1	1	0	0	1	1	4	5	17	17
Firing Effectiveness: Hits on Targets / Targets Presented	6	5	6	0	0	0	6	2	5	17[a]
Firing Accuracy: Hits on Targets / Targets Engaged	6	5	3	0	3	0	6	0	5	19

[a]Although, for the BAR firers, three hits per presentation were considered as acceptable, for simplicity the 17 subjects shown as scoring 100 on firing effectiveness include all those who registered at least one hit per presentation. The breakdown in hits per presentation was three subjects, 100 per cent; four, 133 per cent; one, 150 per cent; four, 167 per cent; three, 200 per cent; one, 233 per cent; one, 367 per cent.

Five M1 firers and one BAR firer achieved the defined levels of acceptable firing effectiveness. Lack of firing accuracy was the major cause of firing ineffectiveness; 26 per cent of the M1 firers and 21 per cent of the BAR firers failed to get a hit. More than 90 per cent of each group achieved the defined level of acceptable target engagement. Firing efficiency, not shown in the table, was low in relation to the defined level of acceptable performance; 83 per cent of the M1 firers and 96 per cent of the BAR firers registered fewer than three hits for every five rounds expended. Sixty-two per cent of the firers registered less than one hit for every three rounds expended.

Assaulting-Man Situation. As the concluding situation of the defense phase, each firer was presented with a running-man target which was raised from a concealed position 30 meters directly in front of him, advanced for five seconds, then returned to a prone position at a distance of 15 meters. Each M1 firer had a full 8-round clip and each BAR firer had a full 20-round magazine in his weapon at the beginning of the situation.

Acceptable performance in this situation was judged to be:

(1) Target engagement, 100 per cent
(2) Firing effectiveness, 100 per cent
(3) Firing efficiency, M1 firers 100 per cent, BAR firers 80 per cent

In addition to the number of rounds fired and the number of hits obtained, a record of first-round hits was made in this situation. Every firer hit the target at least twice. Twenty-four of the 25 M1 firers and 19 of the 25 BAR firers achieved a first-round hit. Ten of the M1 firers achieved 100 per cent firing efficiency; the group mean was 79 per cent. Five of the BAR firers achieved a minimum of 80 per cent firing efficiency; the group mean was 55 per cent.

Use of Hand Grenades

Proficiency with hand grenades was evaluated at night during a simulated attack by infiltrators and again during action the following morning against an enemy outpost.

During the night, while the subjects were alternately sleeping and standing 2-hour security guard tours, an attack by enemy infiltrators was simulated by a series of bursts from a blank-firing machinegun 35 meters from the subjects' foxhole positions. The subjects were armed with M1 rifles, 24 rounds of blank ammunition, and three color-coded, practice hand grenades. After time was allowed for the subjects to react spontaneously to the situation, their initial choice of weapon—rifle or grenades—was noted and those who had not thrown grenades were ordered to do so. The location and distance of each grenade from the target and whether the pin had been pulled were determined and recorded for each subject.

Fifty-one men were evaluated in this situation. Of these, 14 per cent initially responded by throwing their grenades, 41 per cent fired their rifles, and 45 per cent did nothing until ordered to throw their grenades.

Three men failed to pull the pins on four grenades. To be fully effective, each grenade should have landed within four meters of the machinegun. The distribution of throwing errors for the 148 grenades thrown had a mean of 7.76 meters and a standard deviation of 5.01. Seventy per cent of the grenades thrown landed more than four meters from the target. Eighty per cent of the men had mean throwing errors of more than four meters. Location errors were distributed as follows:

(1) Sixty-six per cent of the grenades landed short of the target.
(2) Twenty-five per cent fell beyond the target.
(3) Thirty-three per cent landed to the left.
(4) Thirty-four per cent fell to the right.

During the attack phase, after receiving effective fire from an enemy outpost, the subjects returned the fire and, under the squad leader's command, maneuvered toward the enemy's dug-in position, indicated by a machinegun firing blank ammunition. When about 45 meters from the enemy position, the two subjects armed with M1 rifles and three color-coded practice hand grenades were ordered by the squad leader to work themselves within hand grenade range and reduce the position. At this point, a fleeting-glimpse indicator representing an enemy grenadier was activated at the site of the firing machinegun as an additional indication of its location. The distance from which each subject threw his grenades was noted, and the location and the distance of each grenade from the target, as well as whether the pin had been pulled, were determined and recorded for each subject.

Twenty-five men were evaluated in this situation. One lost all three of his grenades before he was within grenade-throwing range of the target. The remaining 24 threw 71 grenades; all pins were pulled. All subjects threw their grenades from a range of 25 to 30 meters from the target. To be fully effective, each grenade should have landed within one meter of the dug-in target. The distribution of throwing errors for the 71 grenades thrown had a mean of 8.21 meters and a standard deviation of 4.85. Four per cent of the grenades landed within one meter of the target. Seventy-nine per cent of the men who threw grenades had mean throwing errors in excess of four meters. Location errors were distributed as follows:

(1) Sixty-three per cent of the grenades landed short of the target.
(2) Twenty per cent fell beyond the target.
(3) Fifty-two per cent landed to the left.
(4) Thirty per cent fell to the right.

The military observers noted that, during the outpost situation, 20 per cent of the M1 firers were markedly ineffective in selecting and negotiating a route affording cover and concealment leading to a point within grenade-throwing distance of the target. Another 20 per cent were ineffective in taking a throwing position. Unnecessary exposure during throwing and unnecessary exposure to their own grenade fragments after throwing were also noted by military observers.

During interviews, 24 per cent of the M1 subjects indicated that throwing grenades effectively at the enemy outpost was one of the most difficult parts of the entire exercise. Ninety-six per cent of all subjects

reported they had thrown at least one live grenade during training. Eighty-four per cent had thrown from a standing position, and all of these had thrown from behind some man-made cover, such as a thick concrete wall. Only 18 per cent had previously thrown a grenade at night.

Engagement of Moving Tanks

At the conclusion of the defense phase of the exercise, on order of the squad leader the subjects moved to positions from which they could engage approaching enemy tanks, represented by a target tank which moved at a speed of 10 to 15 miles per hour laterally back and forth along a trail at a range of 80 meters. The M1 firers were issued three M29 (practice) antitank grenades, three M3 crimped cartridges, and an M1 rifle equipped with an M15 sight and a grenade launcher. The BAR firers were issued three 3.5-inch (practice) rockets, and a 3.5-inch rocket launcher. Six M1 and six BAR firers could not be evaluated in this situation because the tank was not available. Two of the subjects were inadvertently allowed to fire four rounds each.

No assistance other than the scorer acting as assistant gunner (loader) for the 3.5-inch rocket launcher was given to the subjects in this situation. Firing began on order of the squad leader and the tank continued to pass back and forth until each subject had fired his three rounds. Acceptable performance for all firers in this situation was defined as one hit out of each three rounds fired.

The scorers recorded the number of rounds fired, the number of hits obtained, the location of misses with reference to the tank, the number of tank passes required for the subjects to fire three rounds, and whether a correct firing position was used. In addition, whether the grenade was seated correctly was recorded for grenade firers, and whether the sights were properly adjusted was recorded for rocket firers.

Nineteen subjects fired 56 rifle grenades at the moving tank. Five per cent of the firing positions taken were incorrect; 12 per cent of the grenades were improperly seated. Seventy-four per cent of the subjects fired all their grenades during three tank passes; the rest completed firing on the fourth pass. One man fired two grenades and failed to hit the tank. Of the 18 who fired three grenades, 72 per cent failed to hit the tank, 22 per cent hit it once, and 6 per cent hit it twice. Thus, there were six hits obtained with 56 rounds fired for an over-all efficiency rate of 11 per cent. Three-fourths of the men were unable to hit the moving tank.

Table 15 shows the distribution of the grenades with reference to the tank. It is noteworthy that 64 per cent of the errors were on the vertical dimension; that is, on line with the tank laterally, but either short or over vertically.

Nineteen BAR subjects fired 59 rockets at the moving tank. Seventeen of these fired three rounds each; two fired four rounds each. Nine per cent of the firing positions taken were incorrect; four per cent of the sight adjustments were faulty. Eighty-four per cent of the subjects fired all their rockets during three tank passes; the rest completed

Table 15

Distribution of 56 Rifle Grenades Fired at a Moving Tank
(19 M1 Firers)

Vertical	Lateral			
	Behind	On Line	Ahead	Total
Over	1	14	4	19
On Line	4	6	4	14
Short	2	18	3	23
Total	7	38	11	56

firing on the fourth pass. The two who fired four rounds each failed to hit the tank. Of the 17 who fired three rockets each, 53 per cent failed to hit the tank, 41 per cent hit it once, and 6 per cent hit it twice. Thus, there were nine hits obtained with 59 rounds fired for an over-all efficiency rate of 15 per cent. Fifty-eight per cent of these subjects were unable to hit the moving tank.

Table 16 shows the distribution of the rockets with reference to the tank. The similarity to the results obtained with rifle grenades is striking. Again, the major errors were on the vertical dimension; 62 per cent were on line with the tank laterally, but either short or over vertically.

Table 16

Distribution of 59 Rockets Fired at a Moving Tank
(19 BAR Firers)

Vertical	Lateral			
	Behind	On Line	Ahead	Total
Over	3	12	1	16
On Line	2	9	5	16
Short	2	19	6	27
Total	7	40	12	59

The military observers noted that, of the men who fired the rifle grenades, 31 per cent were particularly inept at leading and 84 per cent were deficient in the use of the M15 sight. Thirty-seven per cent used high-angle fire technique with the rifle butt on the ground. Of the men who used the rocket launcher, 37 per cent were inept in using the sight, and 26 per cent did not know the duties and the procedures of the gunner during loading and firing.

Interview responses indicated that 68 per cent of the subjects had fired two or more practice rifle grenades from the shoulder and the

same number in indirect fire at stationary targets during training. Sixty-four per cent also had fired three or more practice rockets at stationary targets during training. Only 11 per cent had fired at a moving target. Twenty-five per cent had not fired any practice rockets in training.

Action Under Effective Small-Arms Fire

As the men advanced in a squad line toward the enemy outpost, they were suddenly brought under effective small-arms fire simulated by a machinegun firing blank ammunition, and a display of four E-type silhouette targets representing enemy personnel. After allowing time for spontaneous reactions, the squad leader ordered alternate fire and maneuver toward the enemy outpost by fire teams. The silhouette targets were presented in a series of eight 5-second displays during the course of this situation.

The scorers recorded whether cover was taken and fire returned immediately, rated the quality of each subject's firing position and recorded whether he fired from it, and also recorded the number of rounds fired and hits obtained.

Fifty-one men were evaluated in this situation. Twenty-four per cent of these men failed to take cover and 55 per cent failed to return fire immediately. Of those who failed to return fire, 79 per cent were carrying BAR's. Of the 163 firing positions taken, 3 per cent were rated as good, 55 per cent as fair, and 42 per cent as poor. Weapons were fired from 61 per cent of the positions.

The 25 M1 firers expended 396 rounds and obtained 6 hits on the silhouette targets. No hits were registered by 88 per cent of these men. Of the three subjects who obtained hits, one got 1, one got 2, and one got 3.

One of the 26 BAR firers did not fire during this situation. The 25 men who fired expended 1,552 rounds and obtained 66 hits on the silhouette targets. No hits were registered by 68 per cent of these subjects. Of the eight who obtained hits, two got 2, two got 3, one got 5, two got 16, and one got 19.

The military observers noted that 52 per cent of the men were deficient in taking cover and 62 per cent were slow to return fire. Twenty-four per cent of the M1 firers failed to maintain an adequate rate of fire as members of a fire team covering the maneuvering team.

Interview responses indicated that the subjects interpreted the simulation as a representation of enemy fire directed at them. Thirty-five per cent stated that they located the outpost by sight; 51 per cent located it by the sound of machinegun fire. Twenty-seven per cent said they did not see any targets at the outpost position, 65 per cent saw silhouette targets, and 8 per cent saw movement or the machinegun. Sixty-five per cent stated that they aimed at the silhouettes, the machinegun, or flash and smoke from the gun; 15 per cent aimed at the sound of the gun; and the rest used grazing fire or a reference object, such as a bush.

Distribution of Fire

The results pertaining to the distribution of fire already reported under the section "Assault Fire" are also a part of this evaluation of ability to effectively distribute fire.

During the defense phase, the squad leader designated a line of enemy riflemen preparing to assault the squad's position, and issued a verbal fire order to each fire team. This enemy activity was simulated by a programmed display of fleeting-glimpse indicators extended across the squad front at a distance of 140 meters and backed up by a continuous scoring panel 18 inches high. Machineguns firing blank ammunition represented enemy automatic fire. The fire order stipulated that M1 firers were to fire three clips (24 rounds) and that BAR firers were to fire three magazines (60 rounds); the simulation of enemy activity continued until all subjects had fired the prescribed number of rounds.

There were three fleeting-glimpse indicators that should have drawn fire in each M1 firer's sector of responsibility, and six indicators in each BAR firer's sector.

Acceptable performance in this situation was judged to be:

(1) All rounds fired within two minutes.
(2) Twelve hits on the scoring panel by each M1 firer; 20 hits by each BAR firer.
(3) Two hits on each of three designated sections of panel immediately behind fleeting-glimpse indicators by each M1 firer; two hits on each of six designated sections by each BAR firer.

The 25 M1 firers took from 38 to 230 seconds to fire 24 rounds of ammunition. Twenty-four per cent of these subjects required from 38 to 60 seconds; 52 per cent, from 63 to 114 seconds; and 24 per cent, from 124 to 230 seconds. The 26 BAR firers took from 24 to 215 seconds to fire 60 rounds of ammunition. Forty-six per cent of these firers required from 24 to 58 seconds; 50 per cent, from 62 to 115 seconds; and 4 per cent, 215 seconds. Thus, 76 per cent of the M1 firers and 96 per cent of the BAR firers completed firing within the acceptable time limit of two minutes.

The 25 M1 firers expended 600 rounds and obtained 183 hits on the scoring panel for an over-all efficiency rate of 30 per cent and a mean of 7.3 hits. Had each man obtained the specified 12 hits on the panel, 300 hits would have been registered. Twenty per cent of the M1 subjects registered from 12 to 18 hits; 60 per cent, from 4 to 10 hits; and 20 per cent, 2 or 3 hits.

The 26 BAR firers expended 1,560 rounds and obtained 238 hits on the scoring panel for an over-all efficiency rate of 15 per cent and a mean of 9.2 hits. Had each man obtained the specified 20 hits on the panel, 520 hits would have been registered. Eight per cent of these men registered from 23 to 29 hits; 15 per cent, from 14 to 17 hits; 50 per cent, from 5 to 11 hits; 15 per cent 3 or 4 hits; and 12 per cent failed to hit the panel.

Eighty-six hits were registered by 24 M1 firers on the sections of panel backing up fleeting-glimpse indicators. This compares with 150 hits, the number that would have been registered had each of the 25 M1 firers hit each of the three sections in his sector twice. None of the M1 firers obtained hits on all three of the designated sections in his sector. One man failed to hit any of these sections. Thirty-two per cent of the M1 firers hit two of the sections and 64 per cent hit one section, with from 1 to 17 rounds.

Twenty-two BAR firers registered 101 hits on the sections of panel backing up fleeting-glimpse indicators. This compares with 312 hits, the number that would have been registered had each of the 26 men hit each of the six designated sections in his sector twice. None of the BAR firers obtained hits on all six panels in his sector. Four men failed to hit any panels. Fifteen per cent hit four of the designated sections; 42 per cent hit three; 12 per cent hit two; and 15 per cent hit one section, with 1 or 2 rounds.

The military observers noted that 8 per cent of the M1 firers and 52 per cent of the BAR firers apparently failed to understand the fire order, particularly the lateral extent of the target. Forty-eight per cent of the subjects were deficient in distributing their fire along the target.

Interview responses indicated that 31 per cent of the men did not know the right and left limits of their firing sectors. Asked to state at what they directed their fire, 41 per cent were indefinite or named incorrect locations. Thirty-seven per cent of the subjects indicated that they had not been aware of the fleeting-glimpse indicators.

Observation of Enemy

The military observers noted particularly the extent to which the men continuously and systematically observed for hostile targets and enemy activities throughout the exercise.

Eighty per cent of the M1 firers and 16 per cent of the BAR firers demonstrated a marked tendency to watch fellow squad members for cues to action. This proclivity resulted in a failure to observe for enemy activities and hostile targets, particularly during the outpost and attack phases of the exercise. Sixty-eight per cent of the BAR firers failed to locate the outpost with enough precision to be effective.

The reloading of weapons seriously interfered with the continuity of observation; 36 per cent of the subjects gave their entire attention to the act of reloading and meanwhile were oblivious to enemy activities and targets.

Sixty-eight per cent of the subjects were ineffective in observing and detecting targets at distances from 175 to 260 meters. Of the M1 firers, 28 per cent were particularly deficient in detecting close-in targets (22 to 44 meters), and 24 per cent were observed to block their view from the foxholes by inept handling of their rifles.

Interview responses indicated that the men were aware of observational problems; 47 per cent of them mentioned finding the enemy as one of the most difficult parts of the exercise.

Cover and Concealment

Scorers rated the use made of available cover and concealment during the action in which the squad came under effective small-arms fire and subsequently took the enemy outpost by fire and maneuver. The subjects made 166 movements to positions during the action. Thirty-one per cent made four movements, 63 per cent made three movements, and the remaining 6 per cent made two movements. The use of cover and the use of concealment during each movement were rated separately on a three-point scale. The use made of cover was rated as good on 4 per cent of the movements, average on 34 per cent, and poor on 62 per cent. The use of concealment was rated as good on 7 per cent of the moyements, average on 46 per cent, and poor on the remaining 47 per cent. Thus, the subjects made poor use of available cover and concealment in about half their movements during this action.

The military observers particularly noted the use of cover and concealment throughout the exercise. Sixty-four per cent of the subjects unnecessarily exposed themselves to flat-trajectory fire while moving. Fifty-two per cent failed to take adequate cover when brought under effective small-arms fire from the enemy outpost. Thirty-six per cent unnecessarily exposed themselves to fire from flat-trajectory weapons while firing from positions on the ground. Fifty-eight per cent of the subjects failed to use the cover afforded by the foxhole position and were unduly exposed to fire during the defense phase of the exercise. In addition, 52 per cent of the rifle grenade firers failed to use available cover while loading their weapons and firing at the moving tank.

The use of concealment was neglected by 28 per cent of the BAR firers while they were firing from positions on the ground. Fifty-two per cent of the BAR firers failed to use available concealment while moving, and 32 per cent of the rifle grenade firers failed to use concealment while preparing to fire on the moving tank.

Care and Cleaning of Weapons

All the subjects disassembled and cleaned M1 rifles which had been fired during the exercise. They were scored on a 23-item checklist in terms of percentage of correct responses. Similarly, all subjects disassembled and cleaned BAR's and were scored on a 38-item checklist. The distribution of scores is shown in Table 17. Scores on cleaning the M1 rifle ranged from 26 to 96 with a mean of 80.2 and a standard deviation of 13.3. BAR scores ranged from 26 to 92 with a mean of 54.8 and a standard deviation of 14.3.

Table 17

Distribution of Scores on Care and Cleaning of Weapons

(51 Subjects)

Scores (Per Cent Correct)	Frequency	
	M1	BAR
21-30	1	3
31-40	–	4
41-50	1	16
51-60	1	12
61-70	6	8
71-80	15	6
81-90	11	1
91-100	16	1

For the M1 rifle, the major deficiencies, together with the percentage of subjects found deficient, were:

	Per Cent
(1) Cleaning of gas cylinder	69
(2) Tightening of gas cylinder lock screw	31
(3) Removal of excess oil from external surface	63

Comparable data for the BAR included:

(1) Disassembly of bolt link pin	47
bolt link	53
bolt and bolt lock	78
(2) Disassembly of extractor and extractor spring	78
(3) Disassembly of lower bipod thumb screws	94
bipod leg keys	96
sliding leg assembly	96
upper bipod thumb screws	86
(4) Disassembly of magazine base, spring, and follower	77
(5) Checking of magazine body for dents	67
(6) Disassembly of gas cylinder assembly from gas cylinder tube	49
(7) Use of gas cylinder cleaning tool	82
(8) Removal of carbon from gas cylinder	56
(9) Application of light coat of oil to gas cylinder	49
(10) Cleaning of all parts and groups	67
(11) Assembly in correct order	51
(12) Cleaning of bore and chamber and application of oil	35
(13) Application of light coat of oil to all metal parts	39
(14) Removal of excess oil from external surface	53

REFERENCES
AND
APPENDICES

REFERENCES

1. Brunswik, Egon. *Perception and the Representative Design of Psychological Experiments* (2d Edition), University of California Press, Berkeley, 1956.
2. Department of the Army. *Army Training Program for Rifle Company, Infantry and Airborne Division Battle Groups, Light Weapons Infantryman, Heavy Weapons Infantryman*, Army Training Program 7-17, Washington, August 1958, with Change 1, August 1959.
3. Department of the Army. *Basic Combat Training Program for Male Military Personnel Without Prior Service*, Army Training Program 21-114, Washington, November 1958. (This ATP has been superseded by ATP 21-114, December 1961.)
4. Department of the Army. *U.S. Rifle, Caliber .30, M1*, Field Manual 23-5, Washington, September 1958.
5. Department of the Army. *Browning Automatic Rifle, Caliber .30, M1918A2*, Field Manual 23-15, Washington, July 1951, with Change 2, June 1954. (This FM has been superseded by FM 23-15, May 1961.)
6. Department of the Army. *Rifle Marksmanship Course, TRAINFIRE I*, Field Manual 23-71, Washington, September 1957.
7. Fooks, N.I., McKay, John B., and Taylor, John E. *The Combat Subjects and Corresponding Proficiency Levels Essential to the 1962 Training Program for the Light Weapons Infantryman (MOS 111.0)*, Research Memorandum 6, U.S. Army Infantry Human Research Unit, Fort Benning, Ga., December 1958.
8. Staff, Subtask RIFLEMAN I, *Critical Combat Skills, Knowledges, and Performances Required of the 1962 Light Weapons Infantryman (MOS 111.0)*, Research Memorandum 23, U.S. Army Infantry Human Research Unit, Fort Benning, Ga., January 1961.

Appendix A

CRITICAL COMBAT PERFORMANCES EVALUATED IN RIFLEMAN FIELD EXERCISE

A complete statement of each of the 13 combat performances evaluated in the field exercise is given in this appendix, quoted directly from Research Memorandum 23.[1] These performances, with their associated skills and knowledges, are stated in the cited annex of the reference document.

1. AT RANGES FROM 0 TO APPROXIMATELY 35 METERS, THE LWI, UNDER EXTREME TIME PRESSURE, WILL ENGAGE SUDDENLY APPEARING CLOSE-IN TARGETS, SUCH AS STATIONARY, MOVING (SOME FLEETING), SINGLE- AND MULTIPLE-LOCATED PERSONNEL ON THE GROUND, AND SUSPECTED ENEMY POSITIONS, AND WILL TAKE PART IN ASSAULT FIRE. HE WILL COMMENCE AND TERMINATE FIRE AS DEMANDED BY THE SITUATION OR ON ORDER. *(Rifles, M14 and M1—Annex 1-D1)*

2. AT RANGES FROM 0 TO APPROXIMATELY 35 METERS, THE LWI, UNDER EXTREME TIME PRESSURE, WILL ENGAGE SUDDENLY APPEARING CLOSE-IN TARGETS, SUCH AS STATIONARY, MOVING (SOME FLEETING), SINGLE- AND MULTIPLE-LOCATED PERSONNEL ON THE GROUND, AND SUSPECTED ENEMY POSITIONS, AND WILL TAKE PART IN ASSAULT FIRE. HE WILL COMMENCE AND TERMINATE FIRE AS DEMANDED BY THE SITUATION OR ON ORDER. *(Rifles, M14AR and BAR—Annex 1-F1)*

3. AT RANGES FROM 0 TO APPROXIMATELY 350 METERS, THE LWI, UNDER TIME PRESSURE VARYING FROM GREAT TO NONE, WILL ENGAGE TARGETS SUCH AS STATIONARY, MOVING (SOME FLEETING), SINGLE- AND MULTIPLE-LOCATED PERSONNEL ON THE GROUND OR IN THE AIR, AIRCRAFT, AND VEHICLES, AND SUSPECTED ENEMY POSITIONS. HE WILL COMMENCE AND TERMINATE FIRE AS DEMANDED BY THE SITUATION OR ON ORDER. *(Rifles, M14 and M1—Annex 1-D2)*

4. AT RANGES FROM 0 TO APPROXIMATELY 500 METERS, THE LWI, UNDER TIME PRESSURE FROM GREAT TO NONE, WILL ENGAGE TARGETS, SUCH AS STATIONARY, MOVING (SOME FLEETING), SINGLE- AND MULTIPLE-LOCATED PERSONNEL ON THE GROUND OR IN THE AIR, AIRCRAFT, AND VEHICLES, AND SUSPECTED ENEMY POSITIONS. HE WILL COMMENCE AND TERMINATE FIRE AS DEMANDED BY THE SITUATION OR ON ORDER. *(Rifles, M14AR and BAR—Annex 1-F2)*

5. UNDER ALL CONDITIONS OF VISIBILITY, AT RANGES FROM APPROXIMATELY 5 TO 35 METERS, THE LWI WILL ENGAGE TARGETS SUCH AS LOCATED SINGLE OR MULTIPLE PERSONNEL IN THE OPEN, FOXHOLES, TRENCHES, ENCLOSED DUGOUTS, BUNKERS, BUILDINGS, AND OPEN-TYPE VEHICLES. HE WILL THROW GRENADES AS DEMANDED BY THE SITUATION OR ON ORDER. *(Hand Grenades—Annex 1-A1)*

[1]Reference 8.

6. WITHIN THE LIMITS IMPOSED BY VISIBILITY, THE LWI WILL ENGAGE LOCATED TARGETS SUCH AS TANKS, ARMORED VEHICLES, CONCRETE AND REINFORCED EMPLACEMENTS, BUILDINGS, AND GROUPED PERSONNEL WITH HEAT GRENADES AT APPROXIMATELY 25 TO 115 METERS, AND GROUPED PERSONNEL WITH HAND GRENADES (FRAGMENTARY AND WP) USING A GRENADE PROJECTION ADAPTER AT APPROXIMATELY 35 TO 150 METERS AND 35 TO 100 METERS, RESPECTIVELY. HE WILL FIRE ON ORDER OR AS DEMANDED BY THE SITUATION. *(Rifle Grenades—Annex I-E1)*

7. ON ORDER OR AS DEMANDED BY THE SITUATION, THE LWI WILL ENGAGE LOCATED TARGETS SUCH AS STATIONARY OR MOVING TANKS AND ARMORED VEHICLES, EMPLACEMENTS, FORTIFICATIONS, OBSTACLES, AND GROUPED PERSONNEL WITH THE ROCKET LAUNCHER AT RANGES FROM 30 TO 275 METERS FOR STATIONARY TARGETS AND FROM 30 TO 185 METERS FOR MOVING TARGETS WITHIN THE LIMITS OF VISIBILITY. *(3.5-Inch Rocket Launcher—Annex I-H1)*

8. WITHIN THE LIMITS IMPOSED BY VISIBILITY, THE LWI, AS A MEMBER OF A TEAM OR SQUAD, WILL, ON HIS OWN INITIATIVE, WHEN BROUGHT UNDER UNEXPECTED AND EFFECTIVE SMALL-ARMS FIRE WHILE ADVANCING, IMMEDIATELY RETURN FIRE AND TAKE AVAILABLE COVER. AS THE SITUATION PERMITS, HE WILL MOVE TO A POSITION GENERALLY ABREAST OF HIS TEAM LEADER AND CONTINUE TO PLACE FIRE ON THE ENEMY. *(Formations, Battle Drill, and Elementary Fire and Maneuver—Annex V-A2)*

9. THE LWI, AS A MEMBER OF A TEAM OR SQUAD, ON HIS OWN INITIATIVE OR ON ORDER, WILL OPEN FIRE AND WILL CONCENTRATE OR DISTRIBUTE HIS FIRE ON TARGET(S) PRESCRIBED BY HIS LEADER, EITHER AT THE MOMENT OR IN PREARRANGED PLANS. *(Technique of Fire—Annex V-B1)*

10. THE LWI WILL ADJUST AND SHIFT HIS FIRE ON ORDER OR AS DEMANDED BY THE SITUATION. *(Technique of Fire—Annex V-B3)*

11. THE LWI MUST CONTINUALLY AND SYSTEMATICALLY OBSERVE FOR, DETECT, LOCATE, IDENTIFY, AND ENGAGE OR DESIGNATE HOSTILE TARGETS UNDER ALL CONDITIONS OF VISIBILITY. HE WILL DESIGNATE HOSTILE TARGETS TO THE NEAREST LEADER OR FIRE SOURCE WHEN HIS OWN WEAPON IS NOT SUFFICIENTLY EFFECTIVE AGAINST A TARGET. *(Observation, Combat Intelligence, and Reporting—Annex IV-I1)*

12. UNDER ALL CONDITIONS OF VISIBILITY, THE LWI, AS THE SITUATION DEMANDS OR ON ORDER, WILL USE THE BEST AVAILABLE COVER AGAINST FLAT TRAJECTORY, HIGH ANGLE, AND NUCLEAR FIRE, AND CBR AGENTS. *(Cover—Annex IV-K1)*

13. THE LWI, ON ORDER OR AS THE SITUATION DEMANDS, UNDER ALL CONDITIONS OF VISIBILITY, WILL CONCEAL HIMSELF, HIS WEAPONS, AND HIS EQUIPMENT FROM ENEMY GROUND AND AERIAL OBSERVATION. *(Concealment and Camouflage—Annex IV-L1)*

Appendix B

SPECIAL DEVICES AND PROCEDURES

INTRODUCTION

It was evident early in the planning of Subtask RIFLEMAN III that a number of special devices and procedures would be necessary to simulate combat realism in testing LWI performance. An effective test of LWI performance must deal with the fleeting, moving nature of actual targets under approximation of combat conditions (noises, terrain, etc.). A special subtask[1] was established to develop devices and simulation procedures to meet these requirements.

The diagrams of these devices are as they were used in the field exercise. In the event of mass production, certain changes would be needed.

SPECIAL DEVICES

Personnel Targets

Moving Personnel

Running man. This target was developed to simulate the elusive, furtive nature of a moving aggressor. It provided a test of firing skills such as quick firing, tracking, and leading the target, and allowing for irregular deviation or dodging.

The running man target is a cable-towed, winch-operated, moving target which provides lifelike motions of personnel. Diagrams of this target and its operating source are presented in Figures B-1 through B-6. Its course can be preset to include any movement desired for varying degrees of firing difficulty. By simple, low-voltage switching, an operator can cause the target to rise and run as desired. The target assumes the prone position when it is stopped. The figures show the 110-volt a.c. winch unit, the essential features of the target, and its dolly. Four of these targets were used on the attack phase. They were the "Bug-Out" targets set to make one long rush toward the aggressor FEBA. Eight of these targets, each set to make three rushes of varying lengths, were used on the defense phase.

Assaulting man. A modification of the previous target was the assaulting-man target. This target was essentially the same as the running man (Figure B-1), but was towed by a jeep by means of a rope-pulley system. The speed of movement was controlled by the speed of the jeep. The length of run was provided by predetermining the driving distance. Four of these targets, set to make one rush on a defensive position, were used to assault the subjects in their foxholes

[1]Subtask RIFLEMAN II, Devices Required to Accomplish the Research Mission of Task RIFLEMAN.

View of Running-Man Target in Erect Position

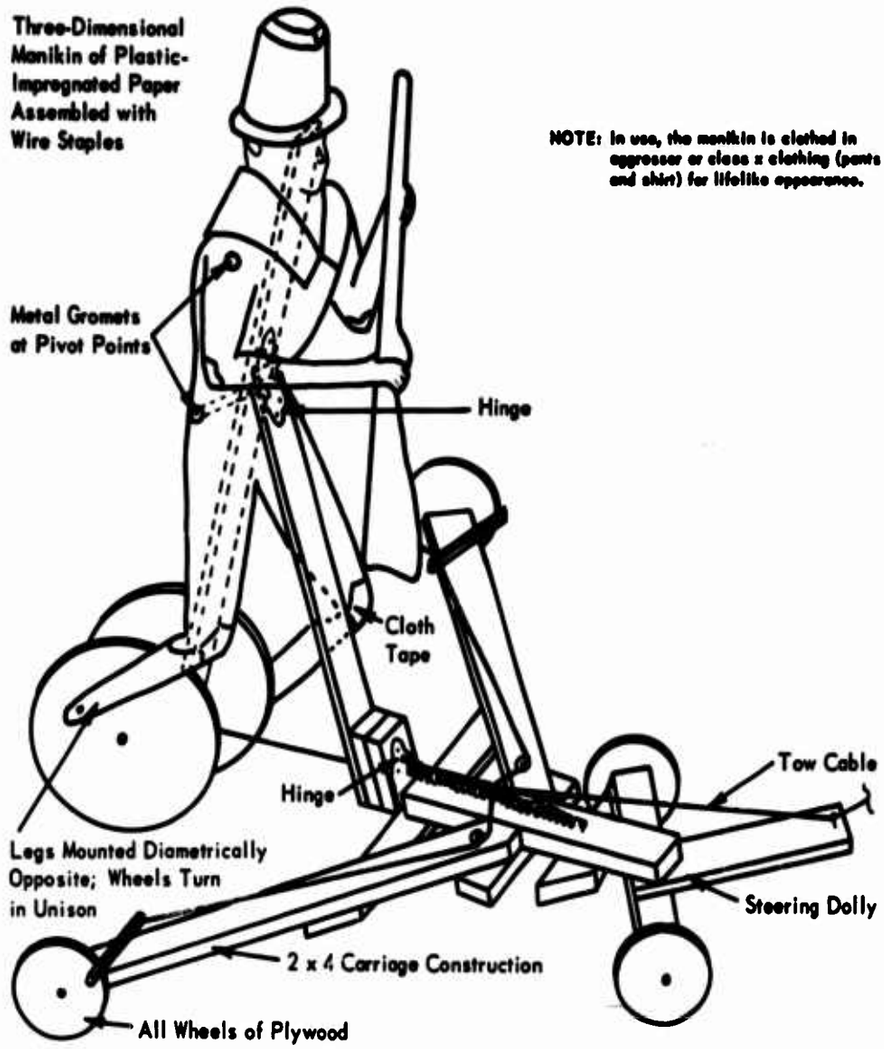


Figure B-1

at the conclusion of the defense phase. Diagrams of the apparatus are presented in Figures B-2, B-3, and B-4.

Stationary Personnel

This device was designed to simulate a human figure that appears, remains exposed for a period of time, and then disappears. It consists of two main parts:

(1) Target-holding mechanism. This mechanism is the standard TRAINFIRE mechanism utilized in Army training programs. This device, M31, is designed to raise or lower a standard E- or F-type target by remote control. It is equipped with switches which cause the target to fall when hit; thus, the subject knows immediately when he gets a hit. Installation, operation, and maintenance of this device are completely described in TM 9-6920-203-34.

Top View of Running-Man Cart

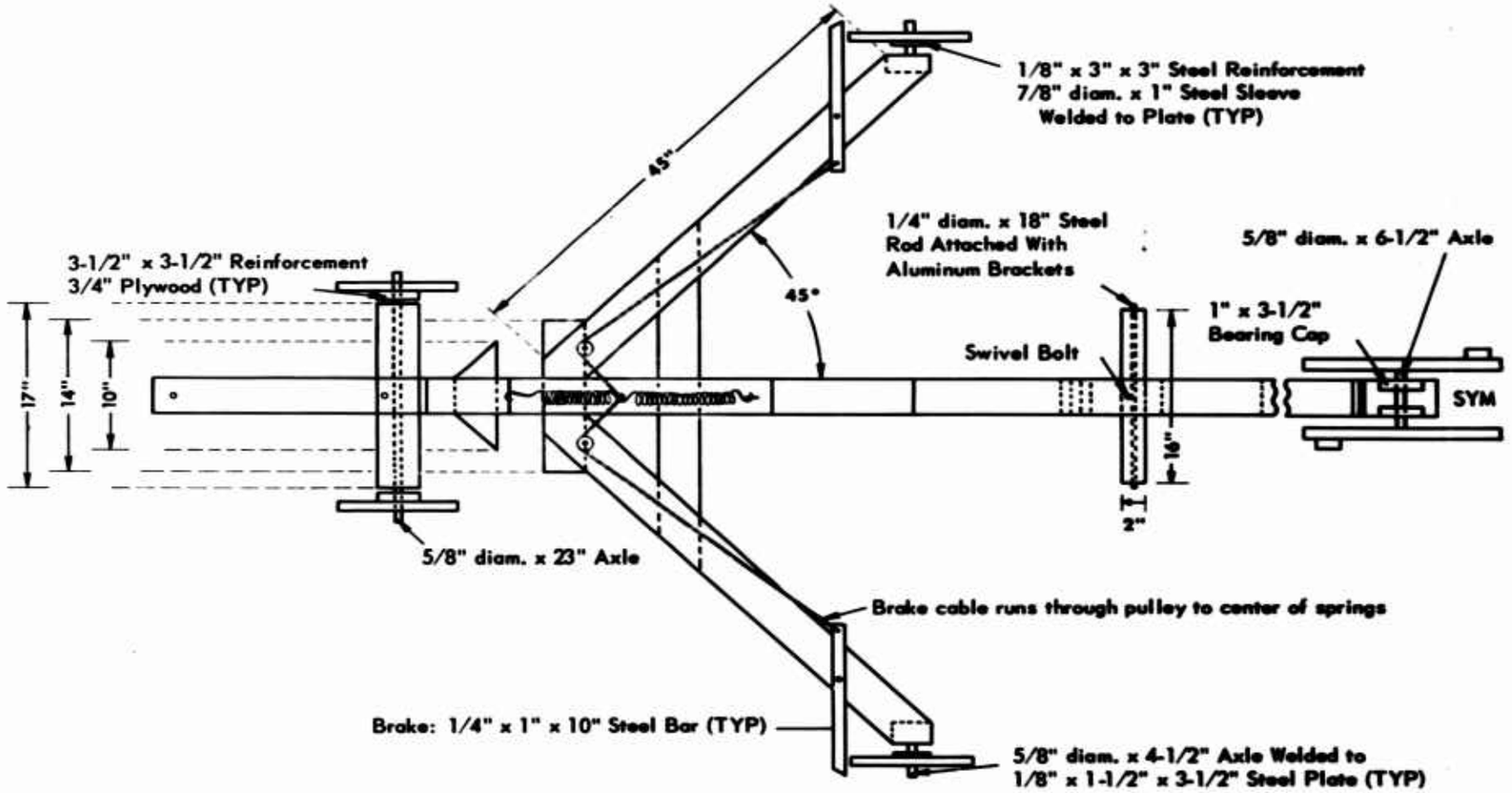
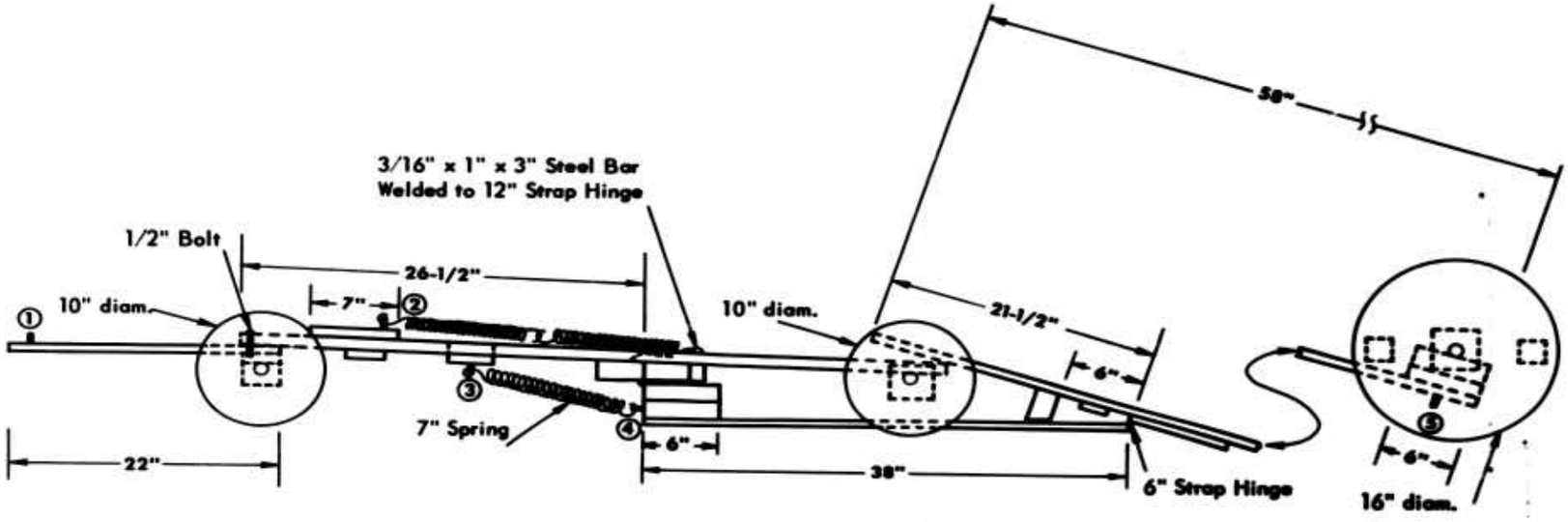


Figure B-2

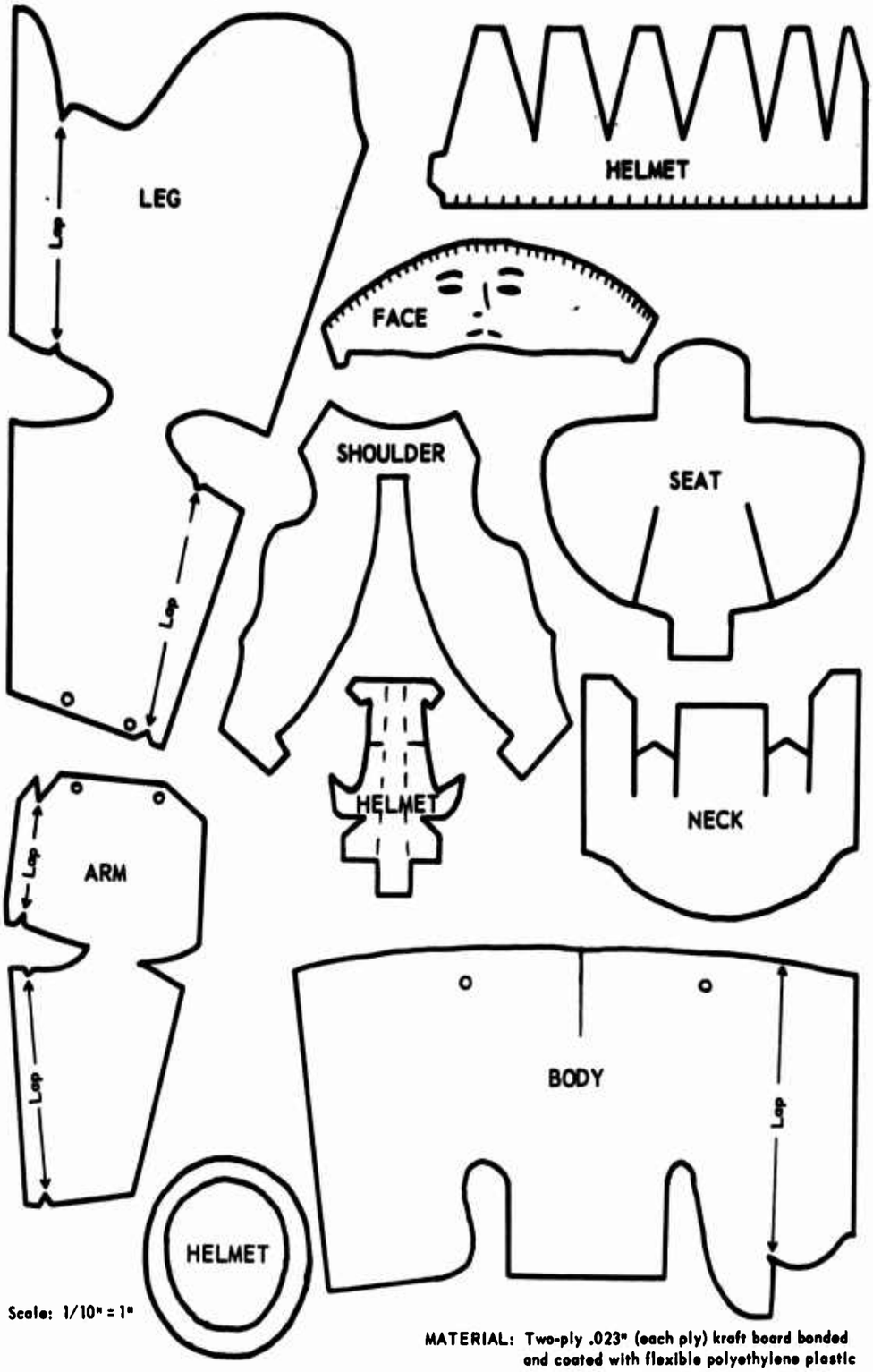
Side View of Running-Man Cart



NOTE: 1. Finished 2" x 4" & 1" x 4" lumber used except where noted
2. Wheels constructed from 3/4" plywood
3. 5 no. 106 eye screws used to guide tow cable at places noted by encircled numbers

Figure B-3

Pattern for Running-Man Figure



MATERIAL: Two-ply .023" (each ply) kraft board bonded and coated with flexible polyethylene plastic

Figure B-4

Electric Winch Unit for Running-Man Target

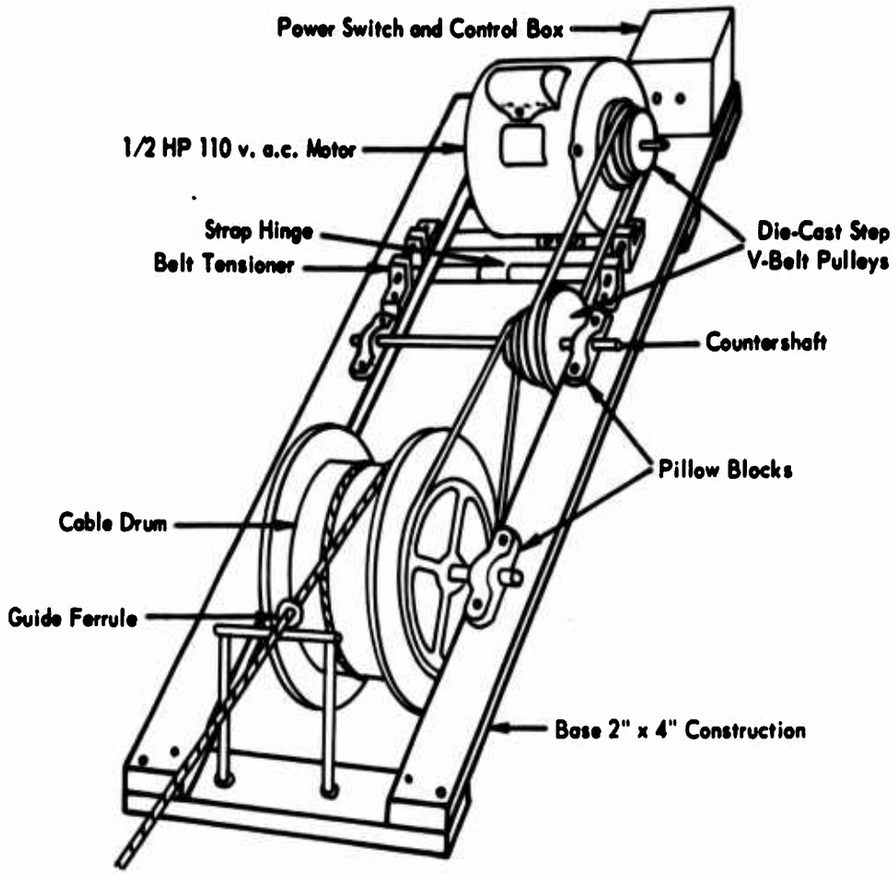


Figure B-5

(2) Silhouette targets. The conventional E- and F-type targets, used in the holding mechanism, were modified to present a three-dimensional effect in an attempt to add realism to a flat target surface. This modification was accomplished by the use of three colors—olive, black, and yellow—applied by means of a series of templates to create the shadows and the uniform of an aggressor. These targets are shown in Figure B-7, although they should be seen in color to ascertain the real effects. This target was attached to the holding mechanism by means of a silhouette mount.

Twelve of these targets, with the kill switches removed to prevent falling when hit, were used on the attack phase. Forty-eight targets that could be "killed" were located at the different ranges on the defense phase.

Fleeting Glimpses

Most of the targets seen in combat are fleeting and are exposed for an extremely short period of time. A target may be a puff of smoke, the movement of a head as the aggressor changes position, or any of the many fleeting glimpses presented by opposing forces. They serve

Top and Side Views of Electric Winch Unit for Running-Man Target

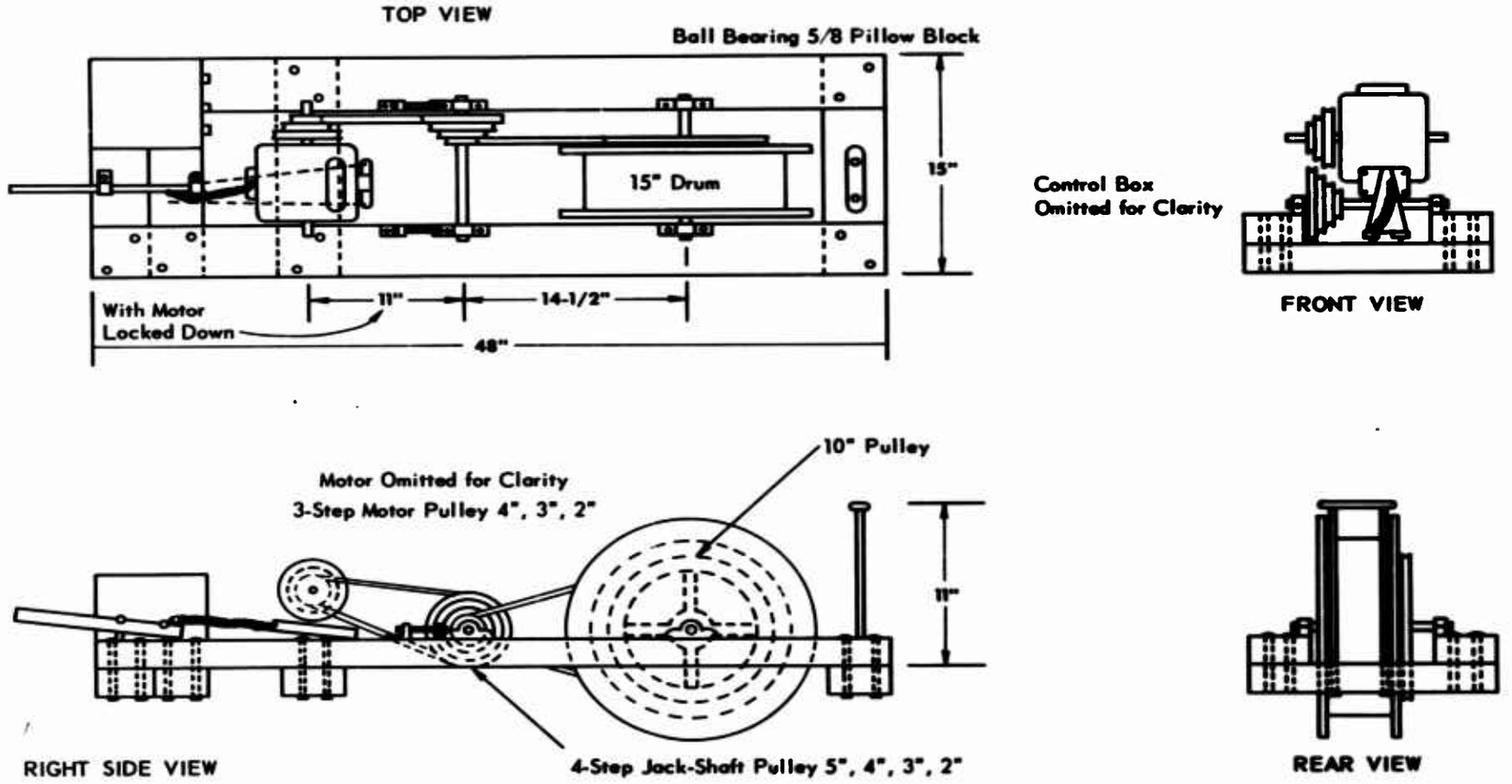


Figure B-6

Modified E- and F-Type Silhouette Targets

E-Type Silhouette

F-Type Silhouette

Figure B-7

more to alert the observer to enemy activity in a given area than to provide actual targets. The fleeting glimpses described below were developed to serve as "alerters" rather than as targets per se.

Dust Puffer. This device was designed to simulate the discharge of aggressor weapons by producing a puff of dust. A diagram is presented in Figure B-8. The dust puffer was constructed from an insecticide sprayer and equipped with a return spring. White talc placed in the spray container produced a white puff simulating smoke. The device was operated by a rope-pulley system. The speed with which the rope was pulled determined the size of the smoke puff produced. This device was used in front of the scoring panels on the attack and defense phases.

Dust Puffer

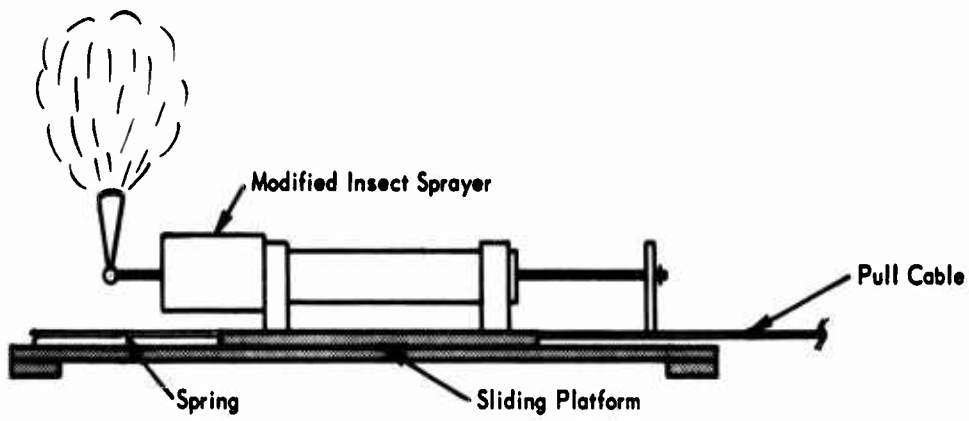


Figure B-8

Head and Shoulders. This device represented an aggressor who might be observing friendly positions or troops. It appears and disappears at the operator's discretion. This target, which is presented in Figure B-9, is operated by a rope-pulley system. When the rope is pulled, the target is raised up on the pipe standards; when the rope is released, the target drops out of sight by its own weight. On some devices, an actual steel helmet was used instead of a plywood silhouette. This device was used on the attack and defense phases in front of the scoring panels.

Head and Shoulders Target

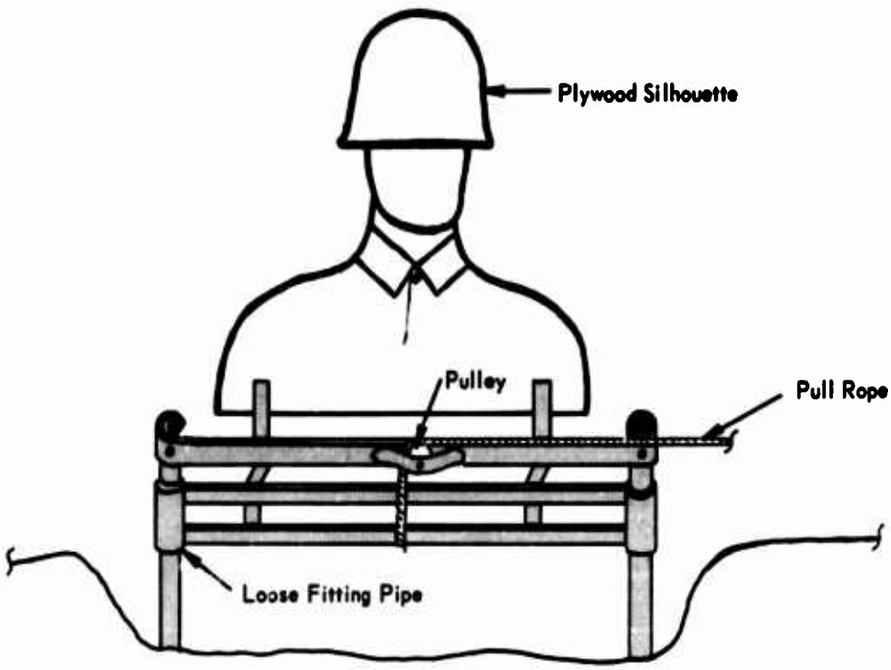


Figure B-9

Crawling Man. This device, representing an aggressor crawling from one position to another, is shown in Figure B-10. A special camming ramp causes the flat-target silhouette to swing to an exposed position when a rope-pulley system is operated. When the operator pulls the rope a small dolly advances a short distance along level base tracks. As the roller on the target holder engages the beveled two-by-four ramp, the entire holder is cammed on the dolly exposing the target silhouette. The silhouette remains exposed as it travels the length of the ramp and then pivots to its original position by gravity. A spring returns the dolly to its original position when the rope is released. This device was used in front of the scoring panels on the attack and defense phases.

Grenade Thrower. The grenade thrower interjects the surprise element of an enemy soldier who remains undetected until friendly fires are very near. To be effective, it is placed within realistic

Fleeting-Glimpse Crawling-Man Target

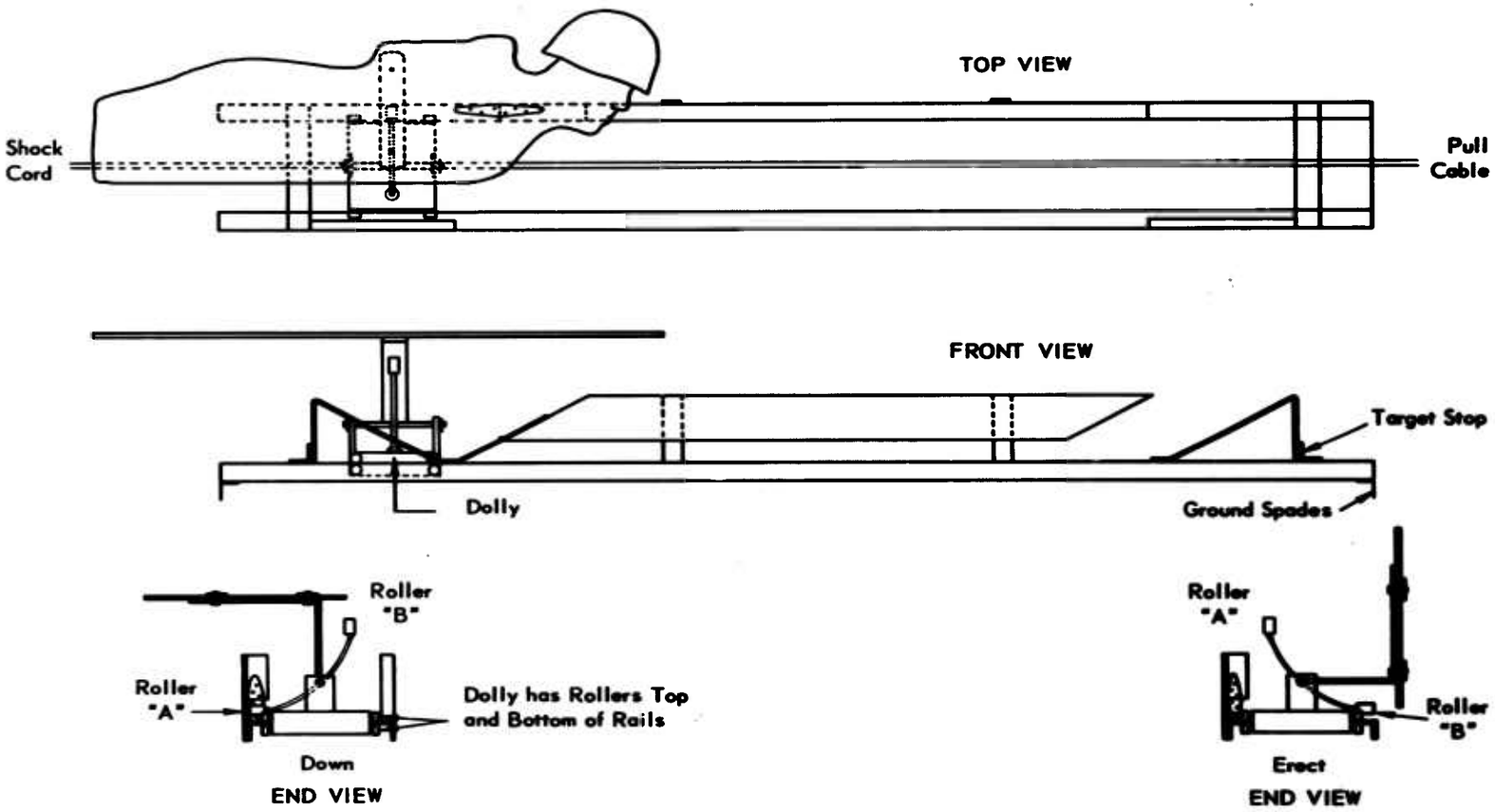


Figure B-10

Grenade-Thrower

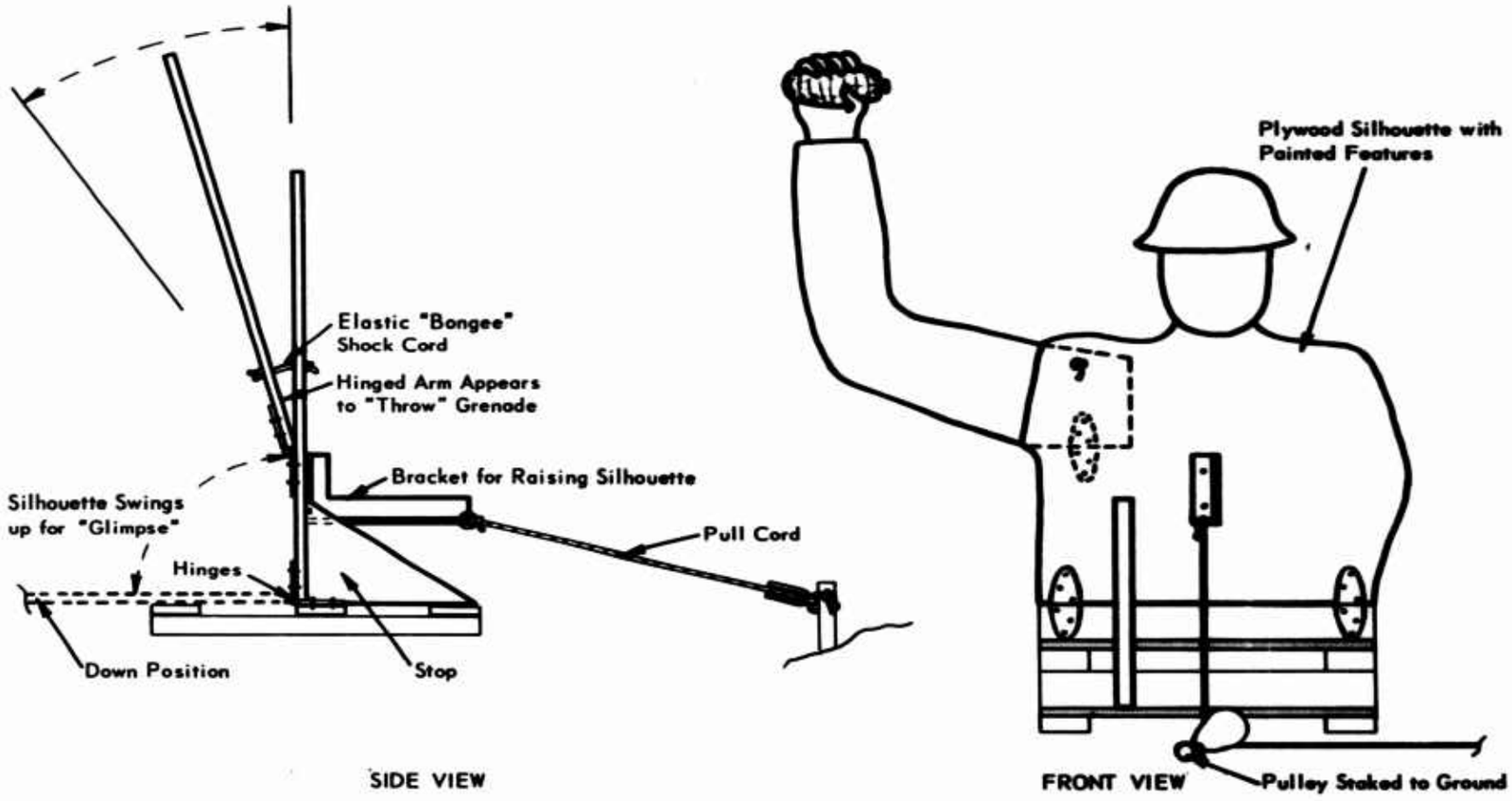


Figure B-11

grenade range, so that only the roughly placed but extremely fast shots will score hits. This target is a modified E-type silhouette, painted to simulate an aggressor, with a flexible arm attached. It is operated by a rope-pulley system. As the target is raised, the hinged arm proceeds forward as if throwing a grenade. When the arm falls back, it pulls the target down with it. This movement exposes the target to the firer for approximately the same time period as that during which an aggressor grenade thrower would be exposed. This device is presented in Figure B-11.

Scoring Panels

There were some performances which required the subjects to distribute their rounds in a specified area and to place "effective" fire on areas of enemy activity (fleeting glimpses). Panels were designed to record all "effective" rounds in these areas. They were not targets in themselves and were not designed to catch all rounds. They consisted of 2 × 8-foot panels mounted in a steel frame, as represented in Figure B-12. These panels projected only 18 inches above the ground when installed in a low trench. They were installed in series across the terrain, making a huge panel for recording hits. Camouflage paint was applied to break up the flat appearance of panels in the attack phase; the panels were painted to simulate a brick wall in the defense phase. An operator, located in a bunker to one side of the panel area, raised and lowered these panels, as required, by means of a rope-pulley system. Series of panels were used on the attack and defense phases of the problem.

Tank Target

The services of a target tank and a tank crew were required to conduct performances with the rifle grenade and the rocket launcher, to test the LWI's ability to fire these weapons at a laterally moving vehicle approximately 80 meters away. The tank and the crew facilities were provided by existing training units at Fort Benning. The tank movements were controlled by radio communication from a position to the rear of the LWI subjects.

SPECIAL PROCEDURES

Fire Simulation Procedures

Special fire simulation procedures were used to create the sounds and the effects of actual combat. Although these varied with the particular phase of the problem, the effects created had to be a feasible aspect of the problem from considerations of friendly and aggressor positions, actions, and terrain.

Demolition Pits. Special procedures were used to produce simulated friendly and aggressor artillery and mortar fires. These fires were produced with Explosive C-4 according to standard military

Scoring Panels as Seen From the Rear

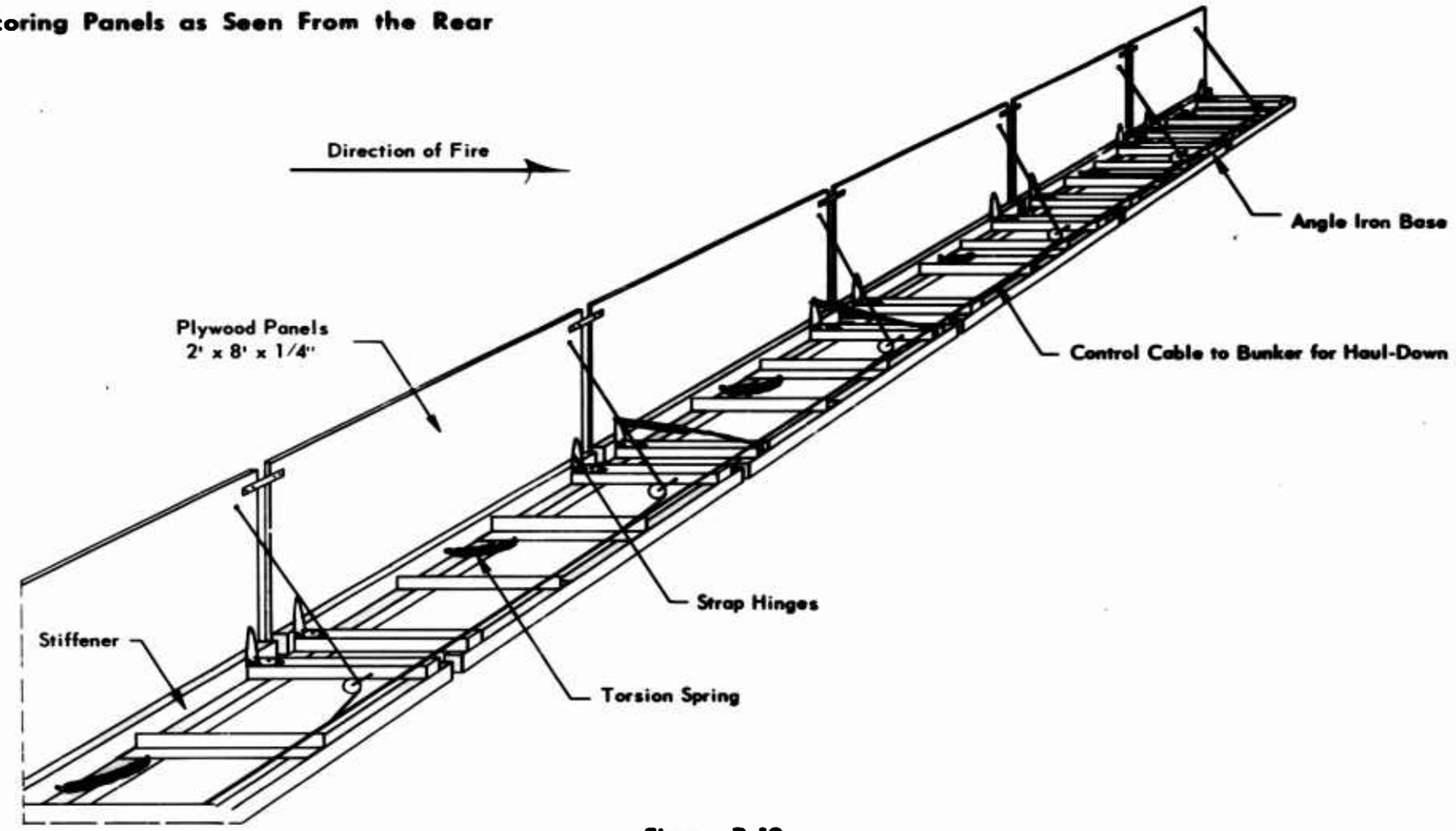


Figure B-12

procedures. The selection of sites for demolition pits was determined by the requirements for that particular phase of the test. Construction, preparation, and firing of the demolition pits were in accordance with Army Safety Regulations AR 385-63, Par. 11b(7), (8) and Par. 310(2) in "Use of Explosives to Simulate Detonating Mines and Incoming Artillery Mortars and Bombs in Training and Tactical Exercises." The use of demolitions exploded in the test also conformed to USAIC, Fort Benning, Georgia, Directives FB-P-210-4, "Installations, Range and Terrain Regulations," FB-P-710-3, "Standing Operating Procedures, Ordnance and Chemical Ammunition and Explosive Ordnance Disposal Policies and Procedures." These pits were used on all phases of the test with the exception of the bivouac phase.

Machinegun Simulators. This simulator consisted of a standard Army A-4 machinegun with a blank adapter. This was secured in a specially dug-in position below ground level. It was operated by a rope-pulley system according to predetermined instructions. The operator was able to fire long or short bursts and even single shots as required by the situation. Personnel safety and firing of the caliber .30 blank ammunition was in accordance with AR 385-63 and Par. 27a of FB-P-210-4. These simulators were used on all phases of the test.

Bullet-Marking Procedures

Bullet-marking procedures, with a different color for each subject, seemed the easiest and most feasible means of measuring the number of hits achieved by each individual. Subjects' rounds were colored by dipping bullets in a solution made by dissolving grease pencils in carbon tetrachloride. These rounds left a distinctly colored hole when they passed through a panel or a silhouette target, so that it was possible to determine which of the subjects should be credited with the hits on a target.

The following procedures are recommended for marking bullets:

(1) Remove pencil covering and break cores into 1/4-inch pieces.
(2) Place cores in small, shallow, pure aluminum pan.
(3) Add carbon tetrachloride until cores are covered.
(4) Cores will dissolve in carbon tetrachloride; however, for faster dissolution, heat mixture over low flame ("Sterno" canned heat).

WARNING: Carbon tetrachloride releases very toxic fumes which may be fatal if inhaled. Care should be taken to use it in a well-ventilated area and to avoid breathing the vapors. Heating greatly increases this danger, as its boiling point is only 76°C.

(5) When solution is complete, pour into a wide open-mouth bottle; add carbon tetrachloride, if necessary, until desired viscosity is reached.
(6) Dip bullet points 5/8-inch deep and let dry.

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