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This report summarizes the research effort in TRAINFIRE III which provides background information prerequisite to the development of a program of instruction for training the squad sniper. The research is uncompleted and no final program of instruction was developed. However, preliminary development of the program resulted in several modifications and various investigations of specific problems. Some major problems which must be resolved prior to development of the final program are discussed.

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RESEARCH MEMORANDUM

TRAINFIRE III
The Development of a Program of Squad Sniper Training for Selected Riflemen

By

Staff, United States Army Infantry Human Research Unit

[redacted]

Approved:

PRESTON S. ABBOTT
Director of Research

U.S. Army Infantry
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Fort Benning, Georgia

December 1958

Number 2

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COMPOSITION OF THE RESEARCH TEAM

Howard H. McFann was Task Leader, Task TRAINFIRE, during the early research in this Subtask. He was succeeded by J. Daniel Lyons, who had been Subtask Leader, TRAINFIRE III. At that time, Thomas F. Nichols was appointed Subtask Leader. The staff included William Cummings, Robert R. Atkins, Jr., Robert F. Schroeder, Daniel S. Huntley, and John Byrd. The report was prepared by Harold G. Hunter and Robert F. Schroeder under the supervision of Thomas F. Nichols.

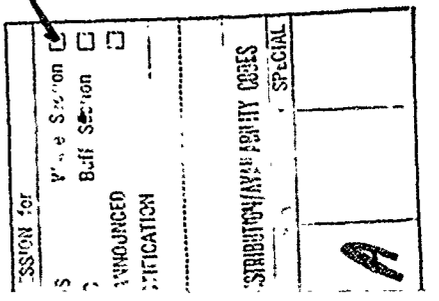
Francis E. Jones was Director of Research and Lt Col Edgar S. Sanders was Military Chief at the Infantry Human Research Unit while this study was being conducted.

CURRENT STATUS OF RESEARCH

On 10 March 1958, the USCONARC Personnel Research Advisory Committee recommended that research on Task TRAINFIRE be discontinued but that reports of research then in preparation be completed.[1/] The 1959 HumRRO Work Program, as approved by the Chief, Research and Development, did not include this Task.[2/]

1/ Memorandum for Record, 10 March 1958. Subject: "24th Meeting of USCONARC Personnel Research Advisory Committee."

2/ Letter: CRD/J 7266, 2 June 1958. From: Chief, Human Factors Research Division. To: Director, Human Resources Research Office. Subject: "FY 59 Work Program."



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INTRODUCTION

This report is one in a series from Infantry Human Research Unit which deals with Task TRAINFIRE: Experimental Development of Improved Proficiency Tests and Training Methods for Improving the Effectiveness of Combat Riflemen. TRAINFIRE research is oriented toward a more realistic approach to training for combat riflemen. The research encompasses:

1. Determining the specific skills and knowledges that the individual must acquire to utilize the rifle effectively in combat.

2. Developing a program for training the necessary skills and knowledges.

3. Constructing combat - oriented proficiency tests. Task TRAINFIRE consists of the following Subtasks:

TRAINFIRE I: Development of a course of basic individual rifle marksmanship.

TRAINFIRE II: Development of a program of day technique of rifle fire and squad tactical training.

TRAINFIRE III: Development of a program of squad sniper training for selected riflemen.

TRAINFIRE IV. Development of a training program for the sniper specialist.

TRAINFIRE V: Development of the final version of TRAINFIRE I: the individual rifle marksmanship course.

TRAINFIRE VI: Development of the final version of the program for day technique of rifle fire and squad tactical training.

This report presents the research conducted under TRAINFIRE III, the

development of special training for a particular member of the rifle squad, the squad sniper. As the Subtask was not completed, no final training program was developed. However, a preliminary version of the program is described and the results of several investigations of specific problems are discussed.

BACKGROUND

The initial scope of TRAINFIRE III was to develop training methods and proficiency tests for improving the effectiveness of the combat sniper.[1/] An analysis of Army tactical doctrine with regard to the employment of snipers indicated the presence of two distinct concepts of sniper roles. One, the squad sniper, is a member of the rifle squad who functions as an expert rifleman within the squad. The other, the sniper specialist, is a highly trained rifleman who possesses many skills not needed by the squad sniper and who is capable of functioning independent of the squad under the command of the company or battalion commander.[2/] Accordingly, the purpose and scope of TRAINFIRE III became the development of the techniques and facilities required to train the rifle squad sniper operating with currently issued weapons and equipment.[3/] A later subtask was concerned with the development of a training program for the sniper specialist.

1/ The research project was approved by the Commanding General, USCONARC, under a directive issued HRU Nr 3 on 13 April 1955.

2/ Explanation of this analysis is contained in Inclosure Nr 1, to Annex III, to the Technical Research Plan for TRAINFIRE III, dated 19 January 1956.

3/ The Infantry Section, USCONARC and G1, USCONARC concurred in this statement of the scope of TRAINFIRE III in a disposition form dated 16 August 1955.

TRAINFIRE III was to design an effective training program for the squad sniper utilizing the time and equipment employed in the standard course. ATP 7-200, dated 21 April 1954, provided for a 37-hour advanced rifle and sniper training course to be administered during the advanced individual phase of training, which follows the first eight weeks of basic combat training. This training was specifically designed to be administered to two men per M1C rifle; the M1C rifle was currently issued on the basis of one per rifle squad.

Although a master schedule, an outline of the scope of instruction, and lesson outlines for the 37-hour course in squad sniping were provided in Army training literature,[1/] such training had not been implemented. It was therefore necessary that the creation of conditions under which the problems in this area of training could be defined be included in the overall planning of TRAINFIRE III.

RESEARCH METHOD

The research activities were programmed to include a literature survey and evaluation, premise formulation, training program development, and pilot-type experimentation.

A survey of the historical background, tactical concepts, equipment, and training literature on sniping was made.[2/] This information was

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1/ ATP 7-200, dated 21 April 1954, Army Training Program for Infantry Rifle Company and Airborne Rifle Company.
ASubjScd 7-11, dated 26 May 1955, Army Subject Schedule for Advanced Rifle and Sniper Training.

2/ "Unannotated Bibliography on Sniping," by J. D. Lyons and T. F. Nichols, U. S. Army Infantry Human Research Unit, 22 August 1957.

evaluated and translated into statements of the concepts, premises and objectives of TRAINFIRE III and TRAINFIRE IV.[1] The literature search and consultation with experts in the field of rifle marksmanship, weapons and sniping remained a continuing effort.

On the basis of the literature survey and consultation with experts in rifle marksmanship and tactics, the following premises[2] were formulated:

a. Most battlefield targets for the squad sniper will be similar to the targets confronted by the riflemen (men or objects arranged in a lateral manner which utilizes cover such as ground folds, hedges, borders of woods or ditches and similar topographical lines) with the exception that the squad sniper will be expected to be able to detect and neutralize point targets within these lineal targets at ranges up to 600 yards.

b. Enemy personnel targets are rarely visible except for fleeting indications such as smoke, flash, dust, noise and movement.

c. Such fleeting indications can best be engaged by marking their location on the ground with reference to an identifiable nearby object suitable for use as an aiming point.

d. The nature of the target and the terrain on which it is encountered, coupled with the fact that the defense will frequently be dug in, often precludes the use of the prone position but favors a supported position such as the foxhole standing or kneeling position.

e. Selection of an accurate aiming point in elevation is a difficult task because of the low outline and obscurity of battlefield targets. This problem is further complicated by the fact that the trajectory of rifle fire is not flat at the ranges at which the squad sniper is expected to operate.

f. The task of accurate range estimation is crucial to the effective operation of the squad sniper.

g. The squad sniper must be proficient in the use of night firing equipment so as to be able to halt the advance of personnel targets at close range (up to 125 yards).

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[1] "TRAINFIRE III and IV: The Sniper," by J. D. Lyons and William Cummings, U. S. Army Infantry Human Research Unit, 14 September 1955.

[2] Premises a, b, d, and e had been applicable to TRAINFIRE I and II. Premise c had been applicable to TRAINFIRE I.

1. Program of Instruction

The preliminary program of instruction developed for training in squad sniping is outlined in the Schedule of Instruction[1/] shown in Table 1. The 37-hour course called for 309 rounds of ball ammunition.

ATP 7-200 outlines a 37-hour program in sniping which is generally characterized by the following time allocations: preliminary instruction - 9 hours; known-distance firing - 8 hours; field firing - 20 hours. The 37-hour TRAINFIRE III preliminary program deviates from this outline in the following major respects:

a. Restriction in maximum range from 1000 to 500 yards. Training of the squad sniper beyond 500 yards is considered to be of dubious value for several reasons.

(1) Improbability of detecting targets beyond this range under most combat conditions using standard equipment available to the squad sniper.

(2) Dispersion of standard issue ammunition.

(3) Doubtful accuracy of standard issue rifle and telescopic sight at extreme ranges.

Concentration of available training time on the shorter ranges allows more emphasis on accuracy and on detection of obscure targets.

1/ Lesson plans used in this study are on file at the U.S. Army Infantry Human Research Unit.

Table 1

Schedule of Instruction
POI in Squad Sniping
37 hours; 309 Rounds Ball

Period	Instruction Presented	Scope of Instruction	Concurrent Training
One	Introduction to sniper equipment and marksmanship techniques	Introduction to sniping and sniping equipment, including the characteristics and nomenclature of the MLD rifle, M84 telescopic sight, test for parallax, clamp ring, flash hider, and cheek pad. Lecture on and demonstration of the use of sniper equipment, including aiming procedure, loop sling, prone position, sandbag support, and live firing. Firing of two four-round shot groups at 200 yards, in two 30-man orders. Lecture and demonstration or practical work in elevation and deflection setting, trigger let off, breathing, calling the shot, follow through, use of the firing data card and care of the telescopic sight.	
Two	Zero firing and battle sights	Zero fire at 200 yards from prone supported position; three 3-round shot groups each with M1 rifle and MLD rifle with M84 telescopic sight; interpolation of elevation to obtain 250-yard battle sight setting. Zero fire at 300 yards with M84 sight	Review and practical work in sight adjustment Lecture and practical work in windage correction

Table 1 (Cont.)

Period	Instruction Presented	Scope of Instruction	Concurrent Training
Two (cont.)	Zero firing and battle sights	Zero fire at 400 yards with M84 sight	Lecture on the effects of light, temperature, and mirage
		Zero fire at 500 yards with M84 sight; Total - 45 Rounds Ball	Lecture and practical work in rapid sight setting
		(Note: The administration of this period required five hours to complete.)	
Three	Firing positions and field firing	Demonstration of and practice in the prone supported and unsupported positions	Lecture and practice in the construction and use of range cards
		Field target firing from prone supported and unsupported positions at 200, 250, 300, and 350 yards; target exposure - one minute; 32 rounds ball	Demonstration of and practice in the sitting, squatting, and standing firing positions
			Practical work in rapid sight setting from the prone unsupported position
Four	Firing positions and field firing	Demonstration of and practice in the sitting or squatting, supported and unsupported, standing supported, and foxhole positions	Lecture, demonstration, and practical work in the construction and use of range cards; lecture on cover and concealment
		Field target firing from the above positions at 150 to 300 yards, ranges varying with the position; target exposure - 30 seconds; 32 rounds ball	Lecture, demonstration, and practical work in individual camouflage, movement and choosing of firing positions
			Practice in rapid sight setting from the prone unsupported position

Table 1 (Cont.)

Period	Instruction Presented	Scope of Instruction	Concurrent Training
Five	Firing positions and field firing	Practice in the prone and sitting or squatting supported and unsupported positions	Lecture on the effects of weather on rifle and ammunition; practice in windage correction
		Field target firing from the prone and sitting or squatting supported and unsupported, standing unsupported, and foxhole positions at 100 to 400 yards, ranges varying with the position; target exposure - 30 seconds; 48 rounds ball	Lecture and practical work in camouflage of equipment; lecture on the role of the squad sniper Lecture and practice in hold off with the M84 telescopic sight
Six	Review of firing positions and field firing using hold off	Practice in the prone, sitting or squatting and standing supported and unsupported, and foxhole positions	Lecture and practice in the construction and use of range cards
		Field target firing using hold off based on the 400-yard sight setting from the above positions at 175 to 400 yards, ranges varying with the position; target exposure - 10 seconds; 56 rounds ball	Lecture on the use of field glasses. Lecture on the reasons for and method of zeroing the telescopic sight in the field.
Seven	Field firing	Field target firing from the prone supported and unsupported, sitting or squatting supported and foxhole positions at 300 to 500 yards, ranges varying with the position; target exposure - 20 seconds; 32 rounds ball	Lecture on movement and selection of firing positions Lecture on the care and use of binoculars Lecture on sniper targets and the principles of hold off

Table 1 (Cont.)

Period	Instruction Presented	Scope of Instruction	Concurrent Training
Eight	Aided target detection and field firing	Search for, using field glasses, and firing on field targets from the prone and sitting or squatting supported and unsupported positions at 300 to 500 yards, ranges varying with the position; target exposure - 20 seconds; 32 rounds ball	Lecture on the importance and collection of combat intelligence Lecture and practical work on the observer-killer sniper team Lecture on the role of the squad sniper
Nine	The squad sniper team	Field target firing by the sniper from the prone unsupported, squatting or sitting supported, and foxhole positions at 300 to 500 yards, ranges varying with the position; construction of range cards by the sniper team; target detection by the observer, using field glasses; sniper and observer reverse roles and repeat the course at different firing points; target exposure - 15 seconds; 24 rounds ball	Review by rear area instructors of all instruction previously administered

b. Reduction in familiarization and zero firing from 8 to 5 hours.

c. Increased emphasis on field firing. Of the 37 hours allotted to sniper training in ATP 7-200, 20 hours are specified for field firing. In TRAINFIRE III, 29 of the 37 hours are delegated to field firing. The additional nine hours are obtained by giving one hour less of introductory material, three hours less of preliminary (known-distance) firing, and by giving technique of sniping instruction (allotted 4 hours in ATP 7-200) in the rear areas during firing exercises.

d. Introduction of concurrent training, allowing for more complete coverage of technique of sniping subjects, smaller groups of trainees, and less time devoted to these topics in preliminary mass instruction.

e. Use of TRAINFIRE-type pop-up targets and firing positions, with slings added.

f. Introduction of a field expedient rezeroing range which allowed zeroing for 300 yards at 50 yards by calculating the 50-yard point of hit for a 300-yard point of aim. This range was constructed early in the program when it became apparent that the weapon/scope combinations would not long maintain their zero.

Though not included in the Schedule of Instruction, supplementary training in the sniperscope and related equipment, as prescribed by ATP 7-200, was administered to all trainees by the Special Purpose Weapons Committee, Weapons Department, Fort Benning, Georgia, during the third day. It consisted of four hours of introductory and mechanical training and 7 to 8 hours of night training. The latter included training in the use of binoculars and the metascope, as well as night firing. The Sniperscope Operator's Course was designed to be administered to three

men per sniperscope; the sniperscope is issued on the basis of three per rifle company. This training was considered not integral to the TRAINFIRE III program and was deleted from the revised program.

2. Administration of the POI in Squad Sniping

The preliminary program of instruction was administered to a selected group of trainees in the fall of 1955. The purpose of this administration was to gather preliminary information on the content and limitations of this program.

a. Subjects

A group of 60 trainees was selected, consisting of 30 men who had received basic rifle marksmanship training and training in technique of fire and squad tactics as specified in ATP 21-114, dated 2 November 1954, and 30 men who had been trained under the TRAINFIRE I and TRAINFIRE II programs.[1/] Those trainees were selected who obtained the highest scores on the rifle marksmanship proficiency test appropriate to the type of training they had received. All trainees were given the TRAINFIRE III POI and treated as a single group.

b. Administrative Organization

Three officers and twenty-one enlisted men from this company comprised the training cadre for the TRAINFIRE III program. The three officers were assigned to the firing line, control tower and the rear area instruction stations. The enlisted men performed various functions, including those of firing point assistant instructor, scorer, ammunition

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1/ A provisional company had been established at Fort Benning, Georgia, to administer instruction to newly inducted trainees as specified in ATP 21-114, and in addition, to administer the TRAINFIRE I and II programs.

handler, and rear area instructor and assistant instructor. The training cadre were instructed by Infantry Human Research Unit personnel on the M1D rifle-M84 telescopic sight combination and on the lesson plans and training content.

c. Physical Facilities

Training Ranges. A known-distance range, on which the trainees zeroed their weapons, was employed in periods one and two. All subsequent firing was performed on a field target range specially modified for this program.

The field target range represented typical combat terrain with natural features such as brush, grass and trees left undisturbed. The ground sloped gradually downhill from the firing line to a lateral swamp line at approximately 150 yards, rose slightly and continued out fairly level to approximately 400 yards, and then sloped off rather abruptly. Firing points for each of eight lanes were constructed above the ground and varied in height to compensate for the slope of the terrain. Target emplacements were similarly elevated in order that the exposed targets might be seen from the prone position. Each firing point was characterized by a flat surface for prone position firing, a vertically placed log to be utilized in leaning support firing positions, and a standing foxhole position with sandbag support. The firing lanes were relatively wide and clearly marked by numbered panels to indicate their boundaries for the corresponding firing points. TRAINFIRE-type pop-up targets were installed at 50-yard intervals in each lane from 150 to 500 yards. Since the targets were to simulate enemy personnel appearing as they might typically expose themselves in combat, "E" type silhouettes, olive drab

in color, were employed. In a given lane, the lateral positioning of targets was irregular so they would blend with natural terrain features. The order and duration of exposure of targets was controlled electrically from a tower.

An additional range 50 yards in length was constructed adjacent to the field firing range. This shorter range was used, as necessary, by the trainees for rezeroing their weapons according to the field expedient method of zeroing the battle sight.[1/]

Rear Area Stations. Three separate areas behind the field target range were set aside for the administration of concurrent training to those trainees not on the firing line.

d. Procedure

The weapons available for the administration of the program were test fired on a known-distance range by expert riflemen to determine the most accurate combinations of M1D rifle and M84 telescopic sight. Those rifle/scope combinations which resulted in the smallest shot groups on initial firing were refired to ascertain their stability and accuracy of zero over time. The most accurate of these were set aside for use by the trainees.

All 60 subjects were administered instruction in period one as a single group. Concurrent training was initiated with period two, in which the trainees were divided into two 30-man orders alternating between the firing lines and a rear area instruction station.

During the field target firing in period three, the trainees were

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1/ Field Manual 23-5, par 173.1

reassigned to two permanent platoons which trained independently for the remainder of the program. One platoon was composed of those men who had received the conventional known distance basic rifle marksmanship instruction, while the other consisted of men who had been trained under the TRAINFIRE I and II programs.

Both platoons were subdivided into four firing orders which remained fixed for periods three through eight. These orders rotated between the firing line and three rear area stations established to administer concurrent training. Each order spent one hour of every field firing period on the field target range and three hours rotating between the concurrent training stations. Although the sequence of rotation was fixed, the station first visited by a given order was varied from day to day. The firing procedure was established such that no trainees fired on the same targets two days in succession.

For period nine, the trainees were paired to form 15 two-man sniper teams per platoon. While eight of these teams fired the course, the remaining seven received a review of all previously administered concurrent training at one of the rear area stations. These seven teams then rotated with the eight who had concurrently fired.

Periods one through eight were each four hours in length; period nine was five hours long.

3. Discussion of the POI

This administration of the TRAINFIRE III training program indicated several problems. The major problems concerned the relative merits of iron sights and the standard 2-1/2 power M84 telescopic sight and the interrelationship of type of sight with length of training time. However,

other difficulties which were disclosed through the administration had to be solved prior to a thorough investigation of the more important problems. It was decided that the more serious problems would be tabled, pending the completion of small scale pilot studies concerned with the selection of firing positions and zeroing procedures and with the value of sling usage. Thus, a small study was conducted during the first quarter of calendar year 1956 to determine the relative advantage of firing with and without the loop sling with respect to (a) type of sight used, (b) firing position, and (c) distance of target.

4. A Study of the Relative Advantages of the Loop Sling

Three sling studies had previously been carried out at the Infantry Human Research Unit.[1/] However, none of these provided information on ranges beyond 300 yards, on the use of the telescopic sight, or on all of the firing positions used in TRAINFIRE III.

This preliminary study was therefore initiated to determine the comparative accuracy of fire with the loop sling under all combinations of the following three conditions:

a. Iron sight, M84 telescopic sight

b. Prone supported and unsupported, sitting supported and unsupported,

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1/ A Comparative Test of Accuracy and Speed of Fire with the Improved Loop Sling, with the Combat Rifle Sling and without a Sling, Interim Report by John A. Hammes, Howard H. McFann and Albert A. Ward, HRU Nr 3, OCAFF, Fort Benning, Georgia, 18 August 1954.

A Comparative Test of Accuracy of Fire with the Loop Sling, the Combat Rifle Sling, the Hasty Sling and without a Sling (Parts II and III), Interim Report by John A. Hammes, Howard H. McFann, John E. Taylor and John O. Cooper, HRU Nr 3, OCAFF, Fort Benning, Georgia, February 1955.

squatting supported and unsupported, and standing foxhole positions.

c. 300-, 500-, and 700-yard targets

Two experienced, expert riflemen, each equipped with an M1 rifle and an M1D rifle with M84 telescopic sight, were employed as subjects. "A"-type targets were employed at the 300-yard range, and "B"-type targets at 500 and 700 yards. Each subject fired two 8-round shot groups under all combinations of the first two conditions mentioned above at 300 yards. The study was s pended at this point because the military personnel being used as subjects were transferred from the Unit. Thus the relative accuracy at the other two firing ranges could not be determined.

In order to measure tightness of shot group, the scores were obtained in terms of the deviation of hits from the mean center of impact of the shot group. One subject did not fire from the sitting supported position; therefore, the comparable data for the other subject were deleted from the analysis.

The scores shown in Table 2 are expressed as deviation scores. Therefore, the smaller figures represent greater firing accuracy.

Table 2

Mean Deviation Scores for all Shot Groups Fired by Type of Sight and Sling Usage; All Firing Positions Combined

	Iron Sight	M84 Sight
Loop Sling	7.26	6.11
No Sling	8.34	6.25

Table 3 compares prone and squatting supported firing with prone and squatting unsupported firing for the various combinations of sling usage and type of sight.

Table 3

Mean Deviation Scores by Type of Sight, Sling Usage and Firing Position				
Prone and Squatting Positions	Iron Sight		M84 Sight	
	Sling	No Sling	Sling	No Sling
Supported	7.41	9.30	5.79	5.35
Unsupported	7.33	8.74	7.01	7.16

The principal findings of the study may be summarized as follows:

a. Greater accuracy was obtained with the M84 telescopic sight than with the iron sight under both sling conditions and for supported and unsupported firing positions.

b. The loop sling produced increased firing accuracy with the iron sight but had little or no effect when used with the M84 telescopic sight.

c. The effect of the loop sling on the accuracy of firing with the iron sight was approximately the same for both supported and unsupported positions.

d. Supported firing was more accurate than unsupported firing when the M84 telescopic sight was used; this did not hold true for the iron sight.

These findings may not, however, be generalized to squad snipers because of the level of skill of the subjects employed, the difference in type of target on which they fired as compared with TRAINFIRE III training targets, the small number of subjects and scores involved, and a lack of

data for firing scores at ranges of 500 and 700 yards. The findings of this experiment do suggest that further research on sights and sling usage would be profitable.

Since the results of the study were equivocal, it was decided to design an administration of a revised TRAINFIRE III program to yield information primarily on the firing accuracy of trainees equipped with the M1D rifle and M84 telescopic sight combination as compared with trainees firing the standard M1 rifle and to allow a similar comparison of loop sling versus no sling. Preliminary information on proficiency testing was to be obtained also. On the basis of the requirements of this administration and experience gained in the previous administration, the lesson plans were revised and administered to a group of selected trainees in the fall of 1956.

5. Revised Program of Instruction

The revised program of instruction for squad sniping is outlined in the Schedule of Instruction shown in Table 4. The 23-hour course called for 472 rounds of ball ammunition, exclusive of ammunition expended on the 75-yard field expedient rezeroing range and the terminal proficiency test. Deviations in implementation from the lesson plans are noted.

Since the primary intent of the revised program was to obtain information on the firing accuracy of trainees as related to firing equipment, it did not represent a complete 37-hour program. In addition to the four experimental conditions related to firing equipment (M84 telescopic sight, standard iron sight, loop sling, and no loop sling), the features distinguishing the revised program from the preliminary program included:

a. The introduction of the 75-yard field expedient rezeroing range. The importance of a correct zero to accurate field firing was given formal

Table 4

Schedule of Instruction
Revised POI in Squad Sniping
28 Hours; 472 Rounds Ball

Period	Instruction Presented	Scope of Instruction	Concurrent Training
One	Orientation, introduction to known-distance firing, and zeroing	Lecture on the role of the squad sniper and the outline of the course Groups 1 and 3: Use of squad sniper equipment, including the M84 telescopic sight. Groups 2 and 4: Use of squad sniper equipment. (Note: Instruction was administered concurrently to these two sets of groups.) Groups 1 and 2: Lecture and demonstration on use of the loop sling. Groups 3 and 4: Lecture, demonstration and practice in firing positions. (Note: Instruction was administered concurrently to these two sets of groups.) Lecture on trigger let off and use of firing data cards Zero fire at 400, 500, and 600 yards from the prone supported position in two 30-man orders; four 4-round shot groups at each range. (Note: Three 4-round shot groups were actually fired.)	
Two	Confirmation of zero	Unsupported fire at "B" type targets from the squatting, kneeling, and sitting positions at 400, 500, and 600 yards each; 8 rounds from each of the three positions at 400 and 500 yards, and 16 at 600 yards. (Note: Actual expenditure was 8 rounds from each position at 400 yards and 4 per position at 500 and 600 yards.)	

Table 4 (Cont.)

Period	Instruction Presented	Scope of Instruction	Concurrent Training
Three	Supported field firing	Supported field target firing from the foxhole, kneeling, and squatting positions at 250 to 500 yards; target exposures - 15 seconds from 250 to 400 yards, 20 seconds at 450 and 500 yards; 80 rounds ball. (Note: Although lesson plans had allowed up to two rounds per target, one round per target was issued. The target exposure durations were standard for all field firing periods.)	Confirmation of the 400-yard zero on the 75-yard field zeroing range; one to four four-round shot groups Lecture and practical work in range estimation Lecture and practice in sighting and aiming, trigger exercises, and use of the sling (when applicable)
Four	Unsupported field firing	Unsupported field target firing from the foxhole, kneeling, and squatting positions at 250 to 500 yards; 80 rounds ball. (Note: Two rounds per target were again authorized and one round issued.)	Confirmation of the 400-yard zero on the 75-yard field zeroing range; one to four four-round shot groups Lecture and discussion on zeroing procedure Lecture and practice in rapid sight setting
Five	Known-distance firing	Confirmation of 400-yard zero; two four-round shot groups Slow firing at "B"-type targets from the prone supported and unsupported, and choice of sitting, squatting, or kneeling positions at 400, 500, and 600 yards; 72 rounds ball. (Note: This period was rained out and not rescheduled.)	

Table 4 (Cont.)

Period	Instruction Presented	Scope of Instruction	Concurrent Training
Six	Supported and unsupported field firing	Field target firing at 300 to 500 yards from the following positions: foxhole, prone and squatting unsupported, and squatting or kneeling supported; one round per target; 48 rounds ball.	Confirmation of the 400-yard zero on the 75-yard field zeroing range; one to four four-round shot groups Lecture and practice in range estimation and target detection Lecture and practice in sighting and aiming, trigger exercises, and the care and cleaning of rifles and sights
Seven	Supported and unsupported field firing	Field target firing at 350 to 500 yards from the following positions: squatting or kneeling supported, squatting or kneeling unsupported, prone supported and foxhole; one round per target; 48 rounds ball (Note: This period was deleted.)	Confirmation of the 400-yard zero on the 75-yard field zeroing range; one to four four-round shot groups Instruction and practice in the use and construction of range cards Lecture on trigger control
Eight	Proficiency Test	Confirmation of the 400-yard zero on the 75-yard field zeroing range; two or three four-round shot groups Field target firing at 400, 500, and 600 yards from the following positions: foxhole, prone unsupported, and choice of kneeling or squatting supported and unsupported; one round per target; 48 rounds ball	

recognition by requiring the trainees to confirm their 400-yard battlefield zero on this range prior to every field firing exercise including the final proficiency test. The number of rounds fired per shot group and the number of shot groups was left to the discretion of the instructor. This range replaced the 50-yard field expedient range used in the preliminary program.

b. Increased emphasis on known-distance firing. A total of 53 rounds and five hours (including concurrent training) had been allotted in the preliminary program for zero firing on the known-distance range. The revised program specified the expenditure of 216 rounds over the course of nine hours on the KD range, not including five zero confirmations on the field expedient range. These procedures were necessitated because of the ease with which the weapons, especially those equipped with telescopic sights, went out of zero.

c. Standardization of target exposure durations. Exposure durations of targets used in the preliminary program varied with the instructional periods from 10 seconds to one minute. Targets from 250 to 400 yards in the revised program were exposed for 15 seconds; those at 450 and 500 yards were exposed briefly, lowered, and re-exposed for 20 seconds.

d. Elimination of the 150- and 200-yard target ranges, and the unsupported standing firing position. The shorter ranges had been intended to serve in the preliminary program as transition ranges, introductory to firing at squad sniper distances. They were discarded, along with the standing unsupported firing position, as unnecessary and not consonant with the squad sniper's combat function.

e. Introduction of a terminal field proficiency test. The results

of all firing performed under the preliminary program, both known-distance and field target, were recorded by appointed personnel. This served as a check on the progress of trainee marksmanship proficiency and was utilized for suggestions during the drafting of lesson plans for the revised program. Measurement of marksmanship proficiency in the revised program was to have been in terms of scores on the known-distance range in period five, which was rained out, and the terminal field firing proficiency test. The field firing test introduced pop-up targets at 600 yards for the first time. Targets at this range were exposed for 20 seconds according to the same procedure used at 450 and 500 yards.

6. Administration of the Revised POI in Squad Sniping

a. Subjects

Those 60 trainees who obtained the highest scores on the TRAINFIRE I marksmanship proficiency test were selected for training under the revised TRAINFIRE III program. All subjects had received the TRAINFIRE I program of instruction; 25 had received a revised TRAINFIRE II program, and 35 had received the conventional second four weeks squad training as specified in ATP 21-114, dated 2 November 1954. The 60 subjects were assigned to four groups of 15 subjects each by means of a stratified random procedure. The stratification variables were type of squad training (revised TRAINFIRE II or conventional) and TRAINFIRE I marksmanship test scores. The groups are related to the combinations of training equipment described in the Procedure Section.

b. Administrative Organization

The source of procurement and organization of the administrative personnel was essentially the same as in the preliminary administration of

the program. Five days were originally requested, prior to the administration of the revised program, for familiarizing the training cadre with the course content and the duties they were to perform. The request was later reduced to three days and finally implemented in training totaling less than one day. This curtailment was necessitated by weather conditions and other circumstances beyond the control of the research personnel.

c. Physical Facilities

Training Ranges. The known-distance and field target ranges previously described were employed in the administration of the revised program. The latter range was repaired and modified by installing new targets at 50-yard intervals from 250 to 500 yards. This range as previously used included targets at 150 and 200 yards as well.

A field expedient zeroing range was constructed on the left flank of the field target range. This new range was 75 yards in length and was used for the periodic confirmation of the 400-yard battlefield zero.

A proficiency course was constructed on a new range. Four firing lanes were used with targets installed at 400, 500, and 600 yards, one target at each range for each lane. An additional 75-yard rezeroing range was superimposed on the proficiency test range to permit the trainees to rezero their rifles before firing the proficiency test.

Rear Area Stations. Concurrent training stations were established in three rear area locations and employed in a manner similar to that previously described under the preliminary program.

d. Procedure

Prior to the administration of the revised program, M1D rifles and M84 telescopic sights were test fired in various combinations by

expert riflemen. Those rifle scope combinations which yielded stable shot groups were tagged with the 400-yard elevation zero and adjusted in deflection setting to conform to a windless day.

In order to test for the effects of the sight and sling variables on squad sniper marksmanship proficiency, equipment was issued to the four groups as follows:

Group 1 M1D rifle with M84 telescopic sight and loop sling

Group 2 M1 rifle and loop sling

Group 3 M1D rifle with M84 telescopic sight and no sling

Group 4 M1 rifle and no sling

Preliminary instruction appropriate to the equipment issued was administered to each group in period one. With the initiation of field target firing in period three, the men were organized into two platoons of 30 men each. Each platoon had represented in its composition approximately half of the trainees from each of the four equipment conditions These platoons trained independently during all field firing periods, as before. The following permanent firing orders were established within each platoon for the field firing periods:

Order A	8 men with slings
Order B	8 men without slings
Order C	7 men with slings
Order D	7 men without slings

Those orders not firing rotated among the three concurrent training stations according to the procedure outlined for the first administrati

For the terminal proficiency test, the subjects were reassigned into three teams of 20 trainees each. This arrangement was dictated by

considerations for control, scoring, and transportation. Each team fired the test course in five orders of four men each.

7. Discussion of the Revised POI

Circumstances beyond the control of research personnel, involving curtailment of necessary time to train cadre and bad weather coupled with an inflexible time schedule (resulting in the omission of two training periods) forced drastic reductions in the implementation of this training program. The questions it had been designed to answer remained largely unresolved.

However, observers of the two training programs had noted the rapidity with which the trainees' weapons, especially those equipped with telescopic sights, went out of zero. It was for this reason that they were required to rezero their rifles prior to every field firing exercise. A pilot study was conducted to compare the accuracy of zero as a function of type of aiming point employed. Another study was made on zeroing procedures in conjunction with an investigation of a proficiency standard. These two studies are discussed below.

8. A Comparison of Target Types

The aiming points investigated in a study conducted in January 1957 were as follows:

a. Six o'clock on the bull's eye of a Type "B" target

b. The center of the bottom edge of an 8-inch white square pasted on the center of a "B" target

c. The vertex of a black "V" pasted on the reverse side of a "B" target. This target was 7-1/2 inches wide with 34-inch arms set at an angle of 65 degrees.

All firing was performed at a range of 400 yards from the prone-with-sling position using M2 ball ammunition. Three expert marksmen were each assigned two MLD rifles with M84 telescopic sights. Each subject fired two 8-round shot groups at each of the three different targets using each of the two rifles assigned to him.

Targets were measured in terms of the radial distance of each shot hole from the center of the shot group of which it was a part.

The mean radial distance of all shot holes from the center of each shot group (combining data for all three firers on both days) was 3.5 inches for the six o'clock point on the bull's eye and the vertex of the black "V". For the center of the bottom edge of the white square, it was 4.0 inches. Although the difference between the target types as measured was not great, all firers reported difficulty using the white square. Therefore, the other two aiming points were considered preferable. The limited scope of this pilot study precludes drawing conclusions under conditions other than described here.

9. Determination of Proficiency Standard and Zeroing Procedures for the Squad Sniper

In July 1957 a pilot study was designed to provide an initial baseline of proficiency to be expected of TRAINFIRE III trainees and to yield more preliminary information on zeroing procedures and the characteristics of squad sniper equipment. The specific objectives and underlying rationale of this study were as follows:

a. To assess the ability of a group of trainees who had received TRAINFIRE I and TRAINFIRE II training and who had qualified as expert marksmen on the TRAINFIRE I Proficiency Test to obtain tight shot groups at ranges of 75, 300, 400, and 500 yards with the MLD rifle equipped with

the M84 telescopic sight and firing M2 ball ammunition. This information would indicate the level of skill of squad sniper trainees when first introduced to the TRAINFIRE III program and would provide a useful reference point in determining the optimal length of training time.

b. To gather preliminary data upon feasibility of point of aim zeroing for a firing range of 400 yards at a range of 75 yards with the M1D/M84/M2 ball weapon-ammunition combination. Field expedient zeroing had been shown to be practical in TRAINFIRE I, and was employed during the training programs of TRAINFIRE III. No information had been obtained, however, on the effects of the M84 telescopic sight on this procedure.

c. To gather preliminary data upon the feasibility of using the calibration method of obtaining 300-yard and 500-yard zeros based upon an actual 400-yard zero. If found sufficiently accurate, the use of this method would greatly reduce the necessity for known-distance firing and allow greater emphasis on field firing.

d. To gather preliminary data upon the stability of the M1D/M84/M2 ball weapon-ammunition combination in maintaining a 400-yard zero. The weapon-ammunition combination described had been observed to exhibit marked variability in successive days' firing. Quantification of this variability would be relevant to decisions having to do with equipment and zeroing procedures to be employed in the training program.

On the first day of firing, a sample of 30 expert right-handed marksmen was selected from the 48 trainees qualifying with a score of 70 or above on the TRAINFIRE I Proficiency Test. All trainees fired five 5-round shot groups at a range of 400 yards. Those 30 selected for subsequent firing were the firers who obtained the smallest mean extreme

spread scores, calculated from the four tightest shot groups fired.

Trainees selected on the basis of the first day's firing then fired on the second and third day according to the following schedule:

Second Day. Firing conducted at a range of 400 yards to obtain a point of aim zero at that range was followed by firing at a range of 75 yards in order to determine the distance above point of aim at which groups fired with a 400-yard zero tend to center. Four 5-round shot groups were fired at 400 yards and two at 75 yards.

Third Day. The last, and therefore most accurate, 400-yard zero used on the previous day was confirmed by firing two 5-round shot groups at 400 yards. Two 5-round groups were then fired at 300 yards, 400 yards, 500 yards, and 400 yards respectively using the calibration method to obtain the correct zeros for the various ranges.

On each day, trainees fired from the prone-supported position in orders of 6 trainees each. All shot groups were fired at Type "B" rifle targets. Measures were taken of the size and center of each shot group.

The information obtained from this study relevant to each objective can be considered specific to the conditions of this experiment. A complete record of the data could not be obtained for all subjects because some of the rounds fired did not hit the target. An important caution in analyzing these data is that poorer firers are not always included in the analyses. If a shot group was incomplete, e.g., if only three shots of a 5-round group hit the target, the tightness of the group could not be measured. It could be argued that perhaps the shots were on the edge of the target and actually were close together. However, the data indicate that the 14 firers who had 14 complete shot groups at 400 yards over all three days of firing had tighter groups (on the basis of extreme spread,

extreme horizontal spread, and extreme vertical spread) than those firers who had less than 14 complete shot groups at 400 yards over all three days of firing. Therefore, the spread scores reported probably are an underestimate of the true spread. It is felt that any interpretation of the results could have generality for only a limited group of firers. Therefore, no conclusions are drawn on the basis of these results. The preliminary information obtained for each objective follows.

Objective a

As shown in Table 5, the average extreme spread scores (based on each

Table 5

Means and Standard Deviations (in Inches) for Average Extreme Spread,[a/] Average Extreme Vertical Spread,[b/] and Average Extreme Horizontal Spread[c/] by Range

Range	N	Average Extreme Spread		Average Extreme Vertical Spread		Average Extreme Horizontal Spread	
		m	s	m	s	m	s
400 yards	30	14.4	2.1	10.6	2.5	11.1	1.7
	17	22.6	3.2	16.2	2.9	17.4	4.5
75 yards	30	3.3	1.0	2.7	.9	2.4	.7
300 yards	28	13.2	4.0	9.4	3.7	10.6	3.6
500 yards	22	21.7	7.8	17.0	7.2	15.6	6.0

a/ Extreme Spread is the distance between centers of the two shot holes farthest from each other.

b/ Extreme Vertical Spread is the vertical component of the distance between the centers of the holes made by the highest and lowest shots on the target.

c/ Extreme Horizontal Spread is the horizontal component of the distance between the shot farthest to the right on the target and the one farthest to the left, measured between centers of the holes.

using the same elevation sight setting they had used for the last two shot groups fired at 400 yards. The average elevation deviations around the point of aim at 75 yards was 6.9 inches. The constant error was also 6.9 inches, since all deviations were above the point of aim. The average elevation deviation around the point of aim for the same men firing at a range of 400 yards was 2.2 inches. The constant error was -1.0 inches.

Objective c

On the third day of firing, the calibration method was used to adjust the sight setting from the 400-yard zero to the 300-yard zero and the 500-yard zero as shown in Table 6. The average elevation deviation around the

Table 6

Elevation and Windage Deviation Scores (in Inches) Around the Point of Aim by Range

	Elevation Deviation Scores			Windage Deviation Scores		
	2 shot groups		6 shot groups	2 shot groups		6 shot groups
	300 yds	500 yds	400 yds	300 yds	500 yds	400 yds
Average Deviation	3.2	5.7	3.0	3.3	6.6	4.1
Constant Deviation	-.6	+.1	+.3	+1.6	+2.8	+2.0
N	28	22	17	28	22	17

point of aim for the 28 firers having 2 complete shot groups at 300 yards was 3.2 inches. The constant error was -.6 inches. The average elevation deviation around the point of aim for the 22 firers having 2 complete shot groups at 500 yards was 5.7 inches. The constant error was +.1 inches. The 17 firers who had 6 complete shot groups at 400 yards had an average

elevation deviation of 3.0 inches and a constant error of +.3 inches. Comparable scores for windage deviations are also shown in Table 6. Constant errors to the right are indicated by a positive sign.

Objective d

Since the firers were permitted to adjust their sight settings on the first and second days' firing, the fourth objective can be discussed only on the basis of the third day's firing, when the sight settings were held constant and the calibration method was used to obtain the 300- and 500-yard zeros from the 400-yard zero. Table 7 shows the average elevation

Table 7

Average Elevation and Windage Changes from the Center of Each Shot Group to the Next Following Shot Group 400-yard Firing

	Change from Group 1 to 2		Change from Group 2 to 3		Change from Group 3 to 4		Change from Group 4 to 5		Change from Group 5 to 6	
	m	s	m	s	m	s	m	s	m	s
Elevation	4.0	2.9	6.3	4.6	3.1	3.3	4.8	2.6	3.8	3.6
Windage	4.1	3.5	4.3	3.3	3.3	3.8	3.7	2.7	3.2	2.6

and windage changes from the center of each shot group at 400 yards to t ext following shot group at 400 yards for the 17 firers having all 6 shot groups complete. It should be noted that 300-yard firing intervened between shot groups 2 and 3, and 500-yard firing intervened between shot groups 4 and 5.

Table 8 shows the average elevation and windage changes from the center of the first shot group to the center of the second shot group for 300- and 500-yard firing.

Table 8

Average Elevation and Windage Changes from the Center of Shot Group 1 to the Center of Shot Group 2, 300- and 500-Yard Firing

	300-Yard Firing			500-Yard Firing		
	N	M	s	N	M	s
Elevation	28	3.9	2.1	22	4.8	3.5
Windage	28	3.4	1.9	22	5.9	5.2

SUMMARY

This report summarizes the research effort in TRAINFIRE III which provides background information prerequisite to the development of a program of instruction for training the squad sniper. The research is uncompleted and no final program of instruction was developed. However, preliminary development of the program resulted in several modifications and various investigations of specific problems. Some major problems which must be resolved prior to development of the final program are discussed.