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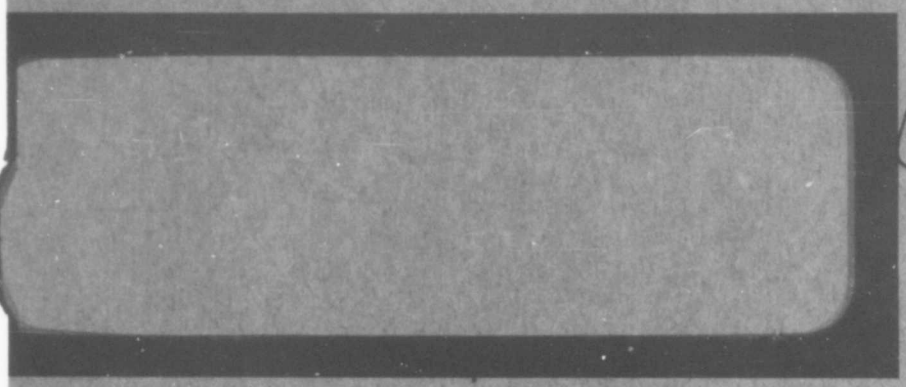

HUMAN RESEARCH UNIT NO. 3
OFFICE, CHIEF OF ARMY FIELD FORCES
Fort Benning, Georgia

Under the Technical Supervision of

The George Washington University
HUMAN RESOURCES RESEARCH OFFICE
operating under contract with
THE DEPARTMENT OF THE ARMY

INTERIM REPORT

(6) A COMPARATIVE TEST OF ACCURACY AND SPEED OF FIRE WITH THE IMPROVED LOOP SLING, WITH THE COMBAT RIFLE SLING AND WITHOUT A SLING,

by

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(11) 18 Aug 54

(12) 45p.

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Abstract

Human Research Unit No. 3, OCAFF, is now engaged in Task TRAINFIRE, "The Experimental Development of Proficiency Tests and Training Methods for Improving the Effectiveness of Combat Riflemen." One objective of this task is the investigation of certain weapon components which may have critical influence upon the effective use of the rifle in combat.

This report is Part I of a study on the use of a sling in M-1 rifle fire, and presents an evaluation of two new slings (the Improved Loop Sling and the Combat Rifle Sling) proposed for Army use.

Accuracy and speed of fire (1) with the Improved Loop Sling, (2) with the Combat Rifle Sling, and (3) without a sling, were measured at ranges of 200 and 300 yards, using the prone position. Analysis of test data resulted in the following conclusions:

1. The improved accuracy of fire obtained by the use of a sling warrants its use during conventional known distance marksmanship training.

2. The present Improved Loop Sling appears unsuitable for Army use.

3. The Combat Rifle Sling gives the same accuracy of fire as the Improved Loop Sling (prone fire).

4. For practical purposes, firing with the Combat Rifle Sling is as fast as firing without a sling.

5. Part II of the study, to be carried out during Project TRAINFIRE, will include comparative tests in regard to firing (a) with the Combat Rifle Sling, (b) with the hasty sling, and (c) without a sling. Test conditions will include firing from different positions upon silhouette targets at unknown distances on a transition type range.

I. AUTHORITY

A. Directive - Letter, OCAFF, ATDEV-4, 474 (24 Jun 53) 5th Ind. Subject: M-1 Rifle Sling Arrangement - Fort Dix Suggestion No. 1486, dated 21 June 1954.

B. Purpose - (1) To compare the Modified M-1 Gun Sling, Web, with the modified M1907 Rifle Sling, in terms of accuracy and speed of fire; (2) to compare the accuracy and speed of firing with and without sling.

II. REFERENCES

1. Letter, OCAFF, ATTNG-23 474 Subject: M-1 Rifle Sling Arrangement - Fort Dix Suggestion No. 1486, dated 24 June 1953.

2. Letter, TIS, GNKEAD-R 474 (24 Jun 53) 1st Ind, Subject: M-1 Rifle Sling Arrangement - Fort Dix Suggestion No. 1486, dated 29 July 1953.

3. Letter, OCAFF, ATORD-3 473 (24 Jun 53) 2nd Ind. Subject: M-1 Rifle Sling Arrangement - Fort Dix Suggestion No. 1486, dated 2 October 1953.

4. Letter, TIS, GNKEAD-R 474.8 (28 Apr 54) 1st Ind. Subject: Evaluation of Modified Rifle Sling, dated 12 May 1954.

5. Weapons Department, TIS, Subject: Report of Test of Modified M-1 Gun Sling, Web, dated 5 May 1954.

6. Letter, TIS, GNKEAD-R 474.8 (24 Jun 53) 4th Ind. Subject: M-1 Rifle Sling Arrangement - Fort Dix Suggestion No. 1486, dated 20 May 1954.

7. Technical Research Proposal, Human Research Unit No. 3

(8592th AAU), Ft. Benning, Ga. Task TRAINFIRE: "Experimental Development of Proficiency Tests and Training Methods for Improving the Effectiveness of Combat Riflemen."

8. Short, LCDR Melville K., USCGR. The Combat Rifle Sling. U.S. Naval Institute Proceedings, 76, No. 10, October, 1950.

III. DESCRIPTION OF MATERIEL

A. The Modified M-1 Gun Sling, Web.

This sling is a modification of the standard M-1 Web Sling (Figure 1). The modification consists of adding a second hook to the forward end of the sling to attach it to the stock ferrule swivel (reference 2). After the rifleman has put on the sling, he may detach the sling from the rifle by means of the hook, thus retaining the sling on his arm. The purpose of this design is to save training time on the firing line. For clarity of discussion, this sling will hereafter be designated the "Improved Loop Sling."

B. The Modified M1907 Rifle Sling.

This sling, termed by the inventor the "Combat Rifle Sling," was designed by LCDR Melville K. Short, USCGR. The sling consists of two components, one on the rifle and the other on the firer's arm (Figure 2). The latter component is an armband with a metal loop, which is engaged by a suitable hook on the rifle component. The rifle component is the present sling, leather or web, slightly modified by the addition of the hook (reference 8). The Combat Rifle Sling was designed for combat use, the proposed advantages being (a) the speed of getting in and out of

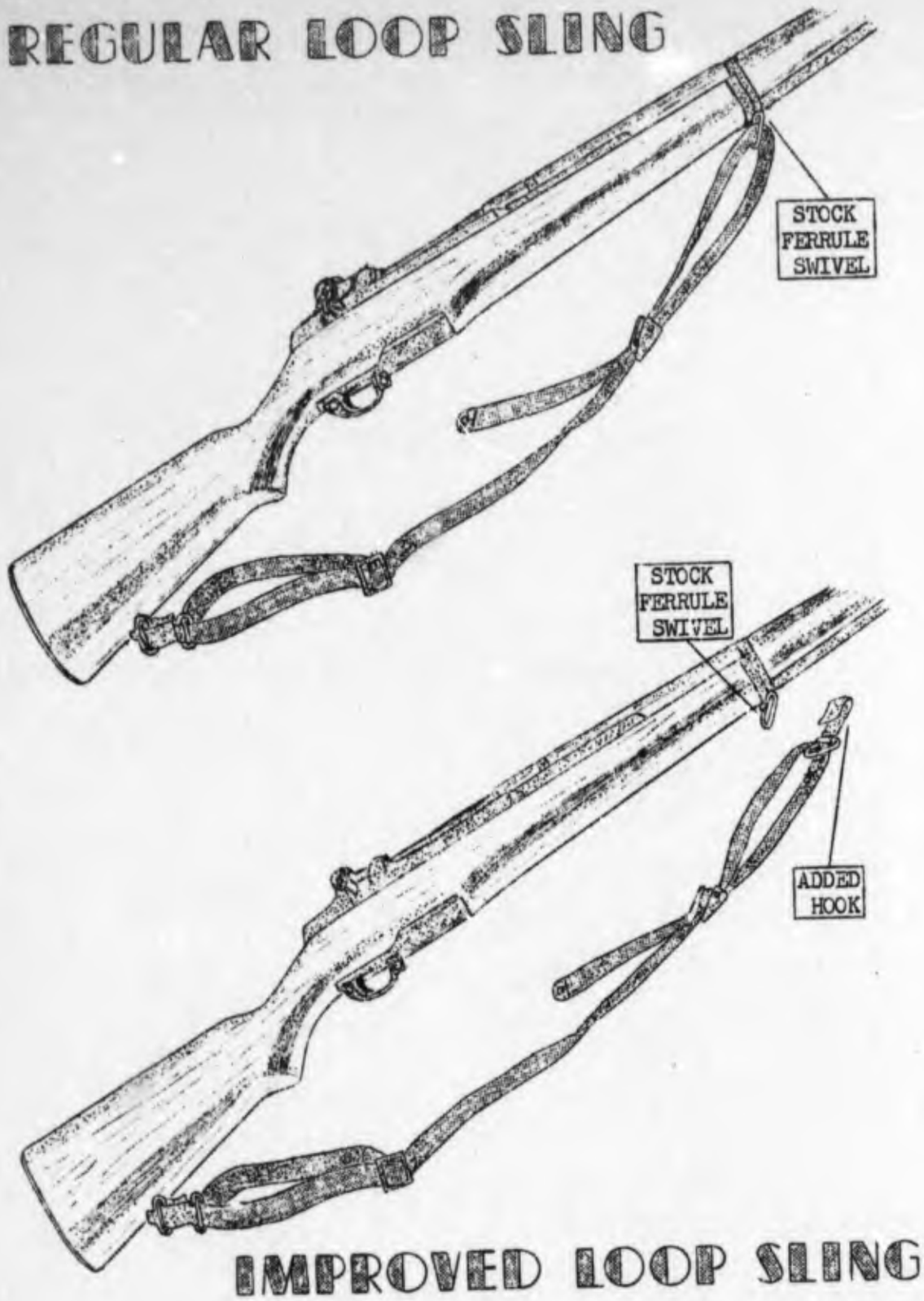
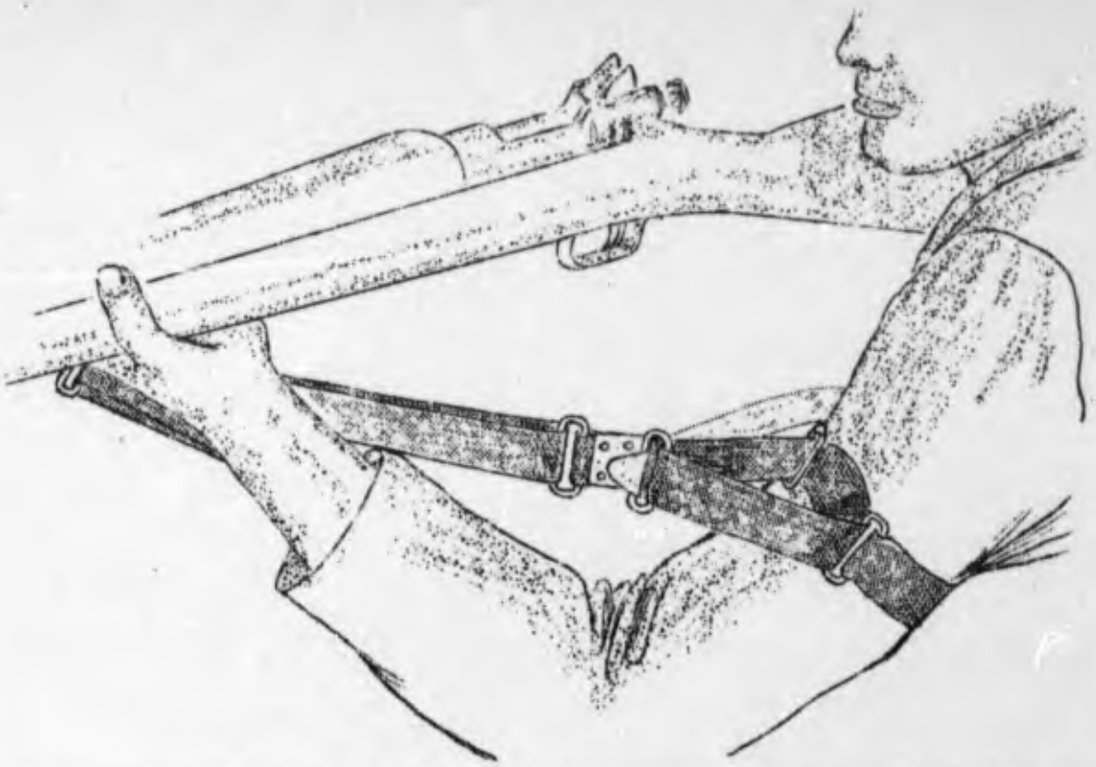

REGULAR LOOP SLING
STOCK FERRULE SWIVEL
STOCK FERRULE SWIVEL
ADDED HOOK
IMPROVED LOOP SLING

FIGURE 1

COMBAT RIFLE SLING



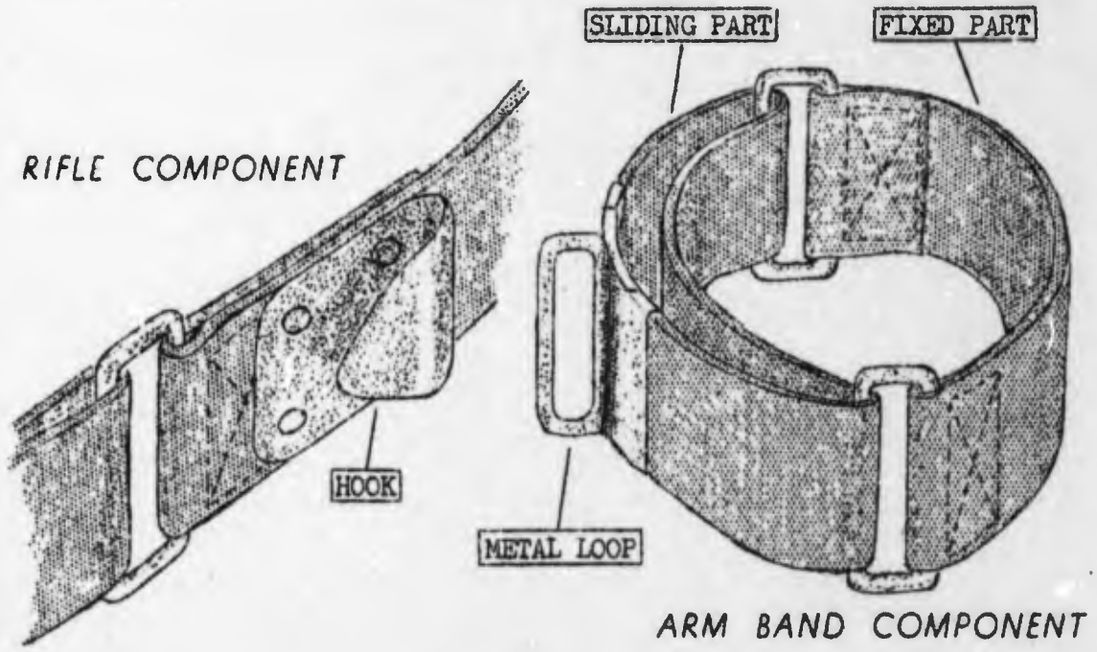


FIGURE 2

the sling, and (b) the retention of the full support of the standard loop sling.

IV. BACKGROUND

In June, 1953, OCAFF requested The Infantry School to evaluate a Fort Dix modification of the M-1 Gun Sling, Web (reference 1). The modification consisted of removing the hook from the butt end of the sling and using it to attach the forward end of the sling to the stock ferrule swivel. This arrangement allows the firer to leave the sling on his arm while hooking and unhooking the sling from the rifle, thus saving training time on the firing line.

The Infantry School recommended an improvement to the Fort Dix sling, which consisted of leaving the standard sling in its present form and adding a second hook to the forward end of the sling to attach it to the stock ferrule swivel (reference 2). The resultant "Improved Loop Sling" retained the advantages of the Fort Dix sling and eliminated the disadvantages.

OCAFF directed that the TIS improvement be tested (reference 3). The consequent comparison of the Improved Loop Sling with the present standard loop sling indicated an improvement in training time, and no detrimental effect on accuracy of sling fire (reference 5).

Human Research Unit No. 3, OCAFF, is currently investigating the improvement of rifle marksmanship training (Task TRAINFIRE, reference and as part of this task planned to test the Combat Rifle Sling, invented by LCDR Melville K. Short, USCGR (reference 8).

The Infantry School evaluated the Combat Rifle Sling (reference 4) and recommended to OCAFF (reference 6) that Human Research Unit No. 3, OCAFF, compare the Improved Loop Sling with the Combat Rifle Sling. On 21 June 1954, OCAFF requested Human Research Unit No. 3 to conduct a comparative test of the two slings, in coordination with The Infantry School, and Board 3 (OCAFF). (See directive). During the month of June, LCDR Short visited Human Research Unit No. 3, and demonstrated the Combat Rifle Sling to interested military personnel.

Part I

A Comparative Test of Accuracy and Speed of Fire with the Improved Loop Sling, with the Combat Rifle Sling and without a Sling

I. SUMMARY OF TESTS

A. Sling Instruction.

On the first day of the experiment, twenty-one (21) marksmen from the 1st Battalion, 30th Infantry Division, Fort Benning, were given instruction in the use of the two slings.

B. Test Firing.

The following day the men, using the M-1 rifle on a KD range, test fired with (a) the Improved Loop Sling, (b) the Combat Rifle Sling and (c) no sling. Six rounds of .30 caliber, M2 Ball ammunition were fired under each condition at ranges of 200 and 300 yards. The firers were also timed on the speed of (a) going from a standing position to a prone firing position, getting into sling and firing a well-aimed round, and (b) recovering to the original standing position. Thus measures were obtained on both accuracy and speed of fire under the three experimental conditions. Firers were not informed of accuracy scores during test firing. An opinion questionnaire was administered upon completion of the test.

C. Results

1. Accuracy of fire at 200 yards:

When compared by three scoring methods, firing with both the Improved Loop Sling and the Combat Rifle Sling was superior to firing without a sling. There was no significant difference between the firing accuracy of the two slings.

2. Accuracy of fire at 300 yards:

No significant differences were found among the three experimental conditions at this range.

3. Speed of fire at 200 and 300 yards:

At both ranges, firing without use of a sling was faster than firing with the Combat Rifle Sling, which in turn was faster than the Improved Loop Sling. This same relationship held for the time required to recover to a standing position, after the round was fired.

4. Firer opinion on the two slings:

The majority of the firers favored the Combat Rifle Sling over the Improved Loop Sling. The firers also designated the Combat Rifle Sling as their preference for combat.

II. CONCLUSIONS

A conference held 6 August 1954 with representatives of Board 3 (OCAFF), and the Small Arms Committee (TIS) resulted in the following conclusions:

1. The improved accuracy of fire obtained by the use of a sling at a range of 200 yards warrants its use during preliminary KD marksmanship training.

2. The present Improved Loop Sling appears unsuitable for Army use because of the following reasons:

(a) When the sling is attached to the firer's arm, there is no carrying component for the rifle.

(b) Speed of fire and recovery with the sling is markedly slower than speed of fire and recovery without the use of a sling.

(c) The sling is unsatisfactorily designed, with a loose, cumbersome end, and a buckle that causes discomfort to the hand supporting the rifle.

3. For the prone firing position, the Combat Rifle Sling gives the same accuracy of fire as the Improved Loop Sling.

4. Speed of fire and recovery with the Combat Rifle Sling, for practical purposes, is equivalent to the speed of fire and recovery without the use of a sling.

5. Present test results cannot be extended to decisions regarding the use of a sling (a) in firing positions other than prone, (b) in advanced marksmanship training on unknown distance ranges with silhouette targets.

III. DETAILS OF THE TEST

Research Group I of Human Research Unit No. 3 is presently engaged in Task TRAINFIRE, "The Experimental Development of Proficiency Tests and Training Methods for Improving the Effectiveness of Combat Riflemen" (reference 7). Phase 3 of this task is to investigate certain weapon components which may have critical effects upon the objectives of the project. The present study was an evaluation of two new slings proposed for Army use.

A. Purpose

The purpose of this study was (1) to compare the Improved Loop

Sling with the Combat Rifle Sling, and (2) to compare each sling with the use of no sling, in terms of accuracy and speed of fire.

B. Method

1. Materiel:

The two slings previously described in III A and B were used.

2. Subjects:

Forty-two (42) soldiers were obtained from the 1st Battalion, 30th Infantry Division, Fort Benning. Twenty-one (21) subjects were to be firers and twenty-one (21) were to serve as timers. It was requested that the subjects have qualified as marksmen on the standard M-1 course, within the previous six months. All qualification scores were between 160 and 185.

C. Procedure

1. Sling Instruction:

The forty-two (42) subjects were randomly divided into twenty-one (21) firers and twenty-one (21) timers. On the first day of the experiment the firers were given instructions in the use of the two slings, and the timers in the use of a stop watch (Appendix A). Upon completion of instructions there was a rehearsal of the test procedure, using blank ammunition.

2. Test Firing:

Test firing took place the second day on the KD range. Firers and timers were randomly assigned to twenty-one (21) alternate

firing points.[1] At ranges of 200 and 300 yards the following procedure was carried out: The firers zeroed nine (9) rounds prone with the standard loop sling, in 3-round shot groups. They then fired with the Improved Loop Sling, the Combat Rifle Sling and without sling, in accordance with the firing orders indicated in Table 1.

Table 1

Firing Plan

	Groups		
Firing Order	I (Points 1-14)	II (Points 15-28)	III (Points 29-42)
1	Improved Loop	No Sling	Combat Sling
2	No Sling	Combat Sling	Improved Loop
3	Combat Sling	Improved Loop	No Sling

Six (6) rounds were fired under each of the three conditions. The firing of the last three (3) of the six rounds was individually timed by stop watch. Targets were standard A type. The firing position was prone. However, the firer was required to begin from a standing position, and upon a signal was to drop quickly into the prone position and fire a well-aimed round. The purpose of this procedure was to measure the speed with which a man could get into his sling. The firer was

[1] One firer failed to appear for test firing because of sick call, reducing the number of firers to twenty.

also measured for the time required to get out of the firing position and sling, and up to the original standing position.

Targets were pit-scored and pasted after every three (3) rounds fired. Firers were not informed of scores during test firing. In the pits the scorers not only recorded absolute scores, e.g., 5, 4, and 3, but also plotted the hits on miniature target sheets, which were used to measure shot group dispersion (see Statistical Treatment).

Upon completion of firing at 200 and 300 yards, a questionnaire was administered to the firers to obtain their opinions on the slings (Appendix B).

D. Results

1. Statistical Controls:

Individual differences among subjects in regard to marksmanship ability were controlled by comparing each subject with himself, under the three experimental conditions. Practice effect in the order of presentation of the three conditions was controlled by counterbalancing the order in which the three groups fired under each condition (Table 1).[1]

2. Statistical Treatment:

Accuracy of fire was scored in three ways. The first method was the standard 5-4-3 system and such scores will be designated

[1] Counterbalancing is a technique which presents the conditions in all possible orders, e.g., the three conditions would be presented in the three orders of ABC, BCA, and CAB. This technique insures that each condition benefits equally from practice that occurs in the test firing.

as "Absolute Scores." The second method, designed by the Small Arms Committee, TIS, utilizes a transparent template, placed over the target sheet. Hits are marked on the template, then moved as a group into the center of the target. Hits are thereby scored in reference to a relative bull's-eye in the center of the shot group. Scores obtained by this method will be called "Relative Scores." The third scoring method, developed by Board 3, OCAFF, Fort Benning, measures the deviation of hits from the mean center of impact of the shot group. The location of the mean center of impact is obtained by computing the mean horizontal coordinate and mean vertical coordinate of the shots in the group, with reference to an arbitrary base line drawn on the target sheet. The distance of each shot from this mean center of impact is then measured, and the mean of these shot deviations computed. This measure gives an indication of the tightness of the shot group. Scores obtained thereby will be called "Dispersion Scores."

Speed of fire for the last three rounds fired under an experimental condition was individually timed. The firer was measured for (a) the time required to go from a standing position to a prone position, get into a sling and fire a well-aimed round, and (b) the time required to recover to the original standing position.

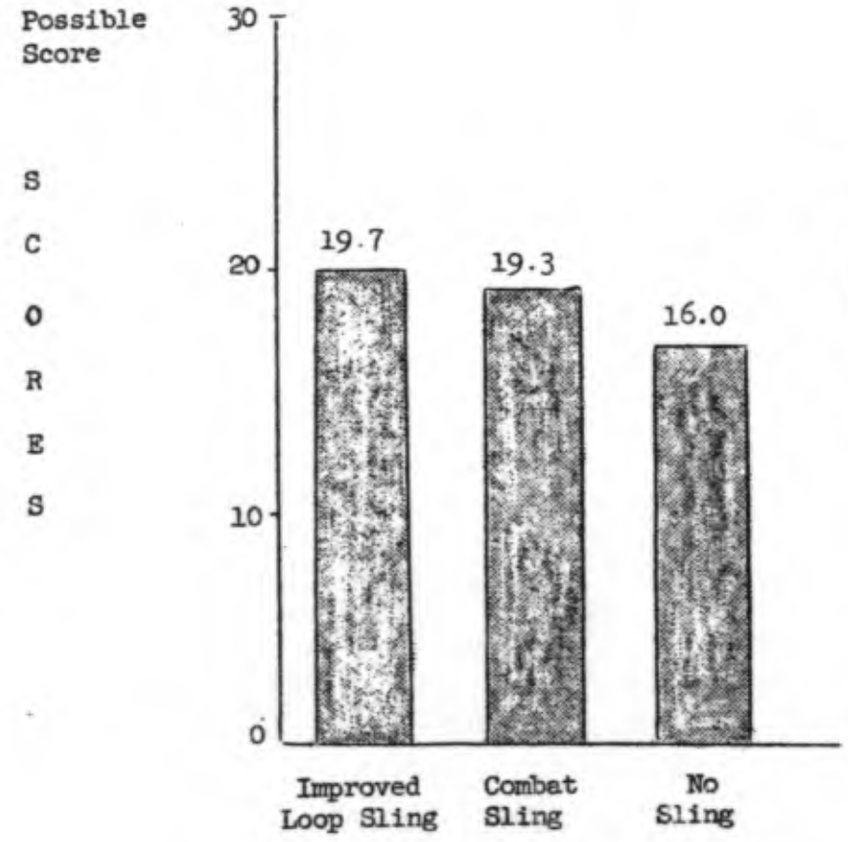
E. Statistical Results

1. Accuracy Scores at 200 yards:

(a) Absolute Scores: The mean Absolute Scores for the three experimental conditions are presented in Figure 3. Both the

MEAN ABSOLUTE SCORES

200 YARDS



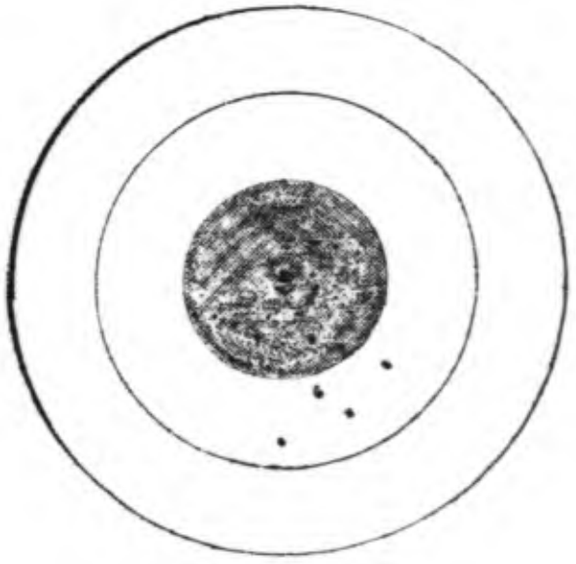


FIGURE 3

Improved Loop Sling and the Combat Rifle Sling scores were statistically superior to No Sling scores. The difference between the two sling scores was not statistically significant. (Statistical analyses will be found in Appendix C.)

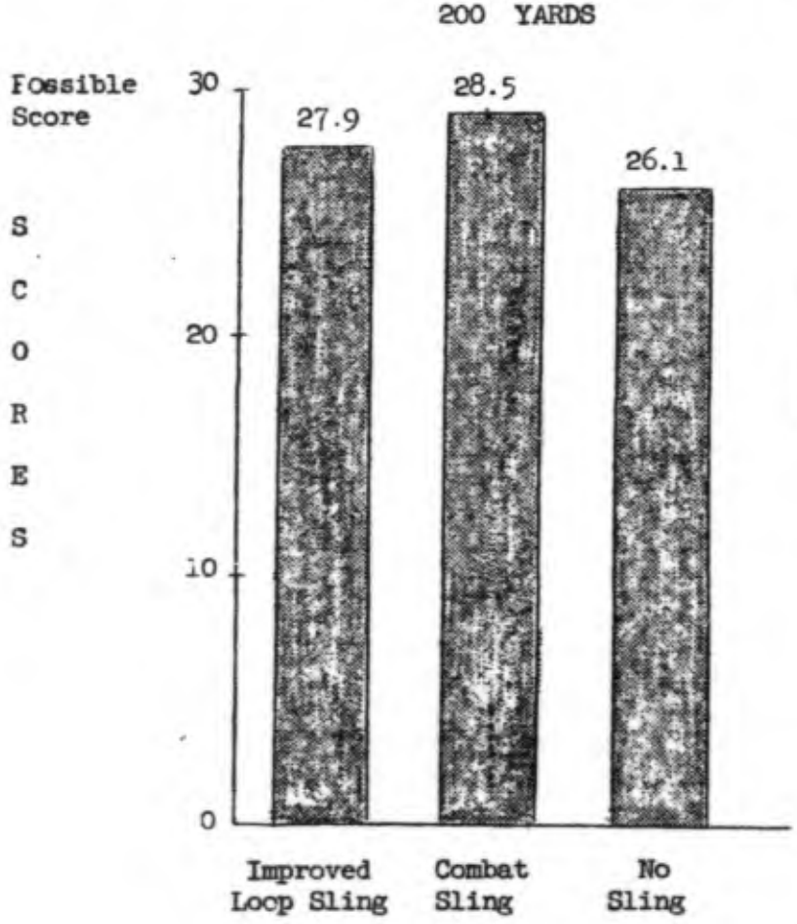
(b) Relative Scores: Mean Relative Scores are presented in Figure 4. Both slings were again found to be statistically superior to No Sling, but not significantly different from each other. It will be noted that the data are based on eleven subjects. To obtain a Relative Score, the firer must register all shots somewhere on the target frame, since the shot group is the determining scoring factor. Nine firers missed their target frames by at least one round; consequently the data are based on the remaining eleven firers.

(c) Dispersion Scores: In terms of the tightness of the shot grouping, both slings were found to be superior to No Sling, but not significantly different from each other (Figure 5). Again, the data are based on eleven firers.

2. Accuracy Scores at 300 yards:

Differences among the three experimental conditions at this range were not found statistically significant by any of the scoring methods. Mean scores are presented in Table 2. Data for Relative Scores and Dispersion Scores are based on the six firers who registered all of their shots somewhere on the target frame.

MEAN RELATIVE SCORES



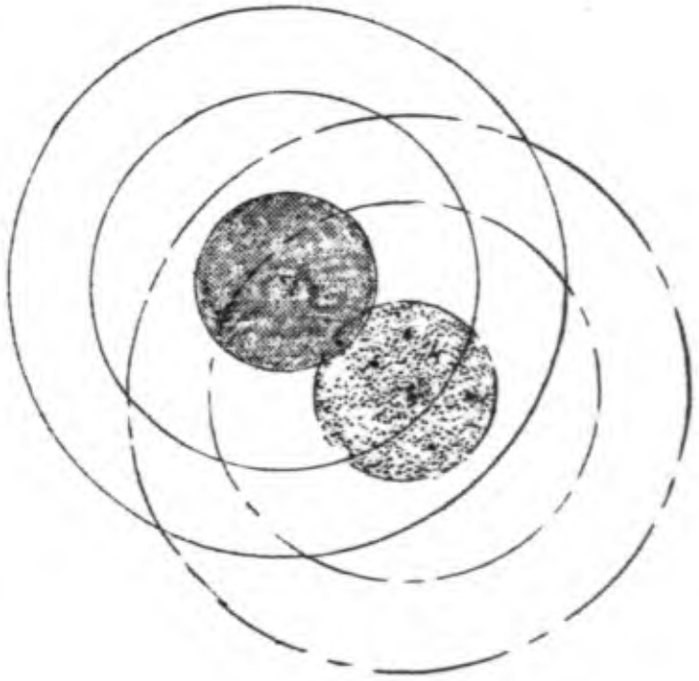
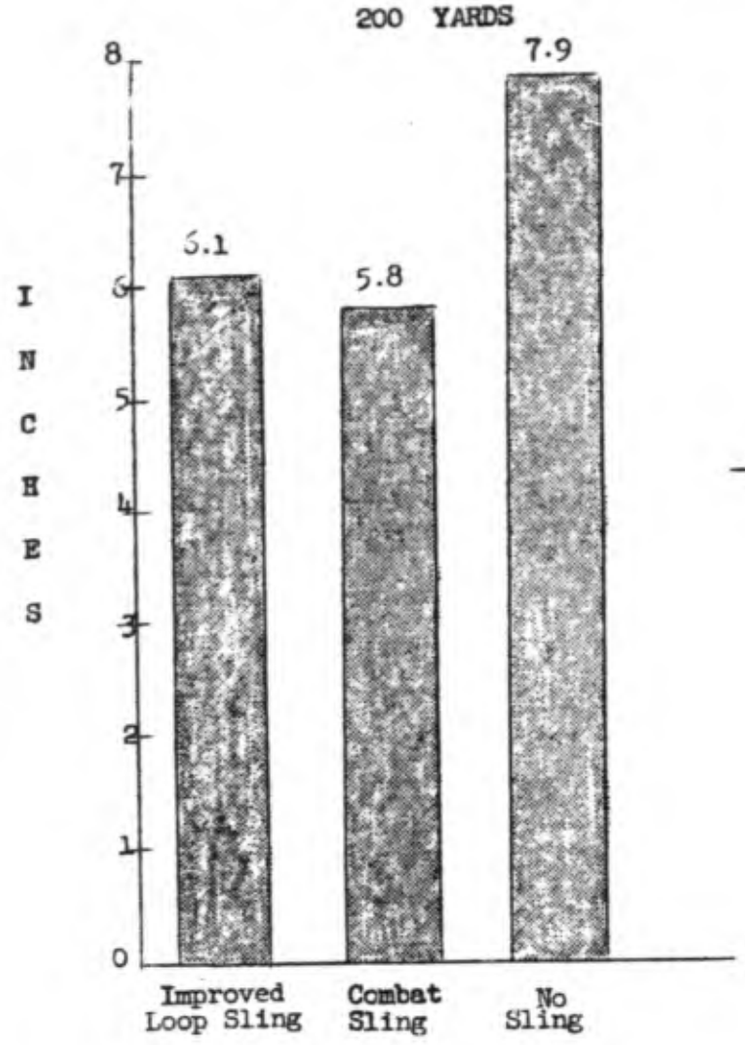


FIGURE 4

MEAN DISPERSION SCORES



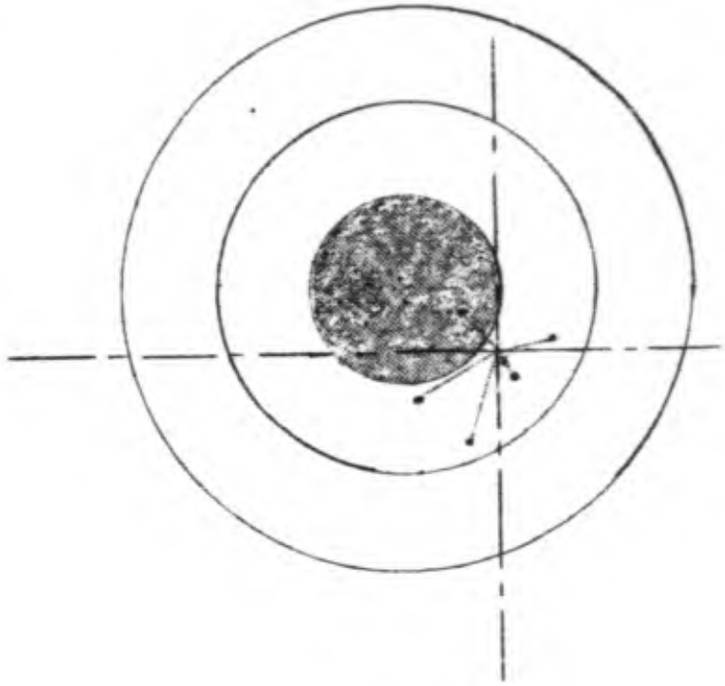


FIGURE 5

Table 2

Mean Accuracy Scores at 300 Yards

Type of Score	Number of Firers	Sling Condition		
		Improved Loop	Combat	None
Absolute	20	13.8	13.0	13.4
Relative	6	26.0	26.0	25.3
Dispersion (in inches)	6	8.2	8.0	8.3

3. Time Scores for 200 and 300 Yards[1]

(a) Speed in Assuming Sling: The time required for a firer to go from a standing position to a prone position, get into a sling if he had one, and fire a well-aimed round will be designated a FIRE Time Score.

The mean FIRE Time Score for the No Sling condition was found to be faster than that for the Combat Rifle Sling, which in turn was faster than the Improved Loop Sling (Figure 6). These differences held at both 200 and 300 yards, and were statistically significant.

(b) Speed in Recovering: The time required for the firer to get out of his sling and prone firing position and up to his original

[1] One timer used his stop watch incorrectly and consequently his data were of no use. The following data are based on the time scores of the remaining nineteen firers.

MEAN FIRE TIME SCORE IN SECONDS

200 YARDS		300 YARDS
11.3	IMPROVED LOOP SLING	11.9
9.9	COMBAT SLING	10.7
7.8	NO SLING	8.2

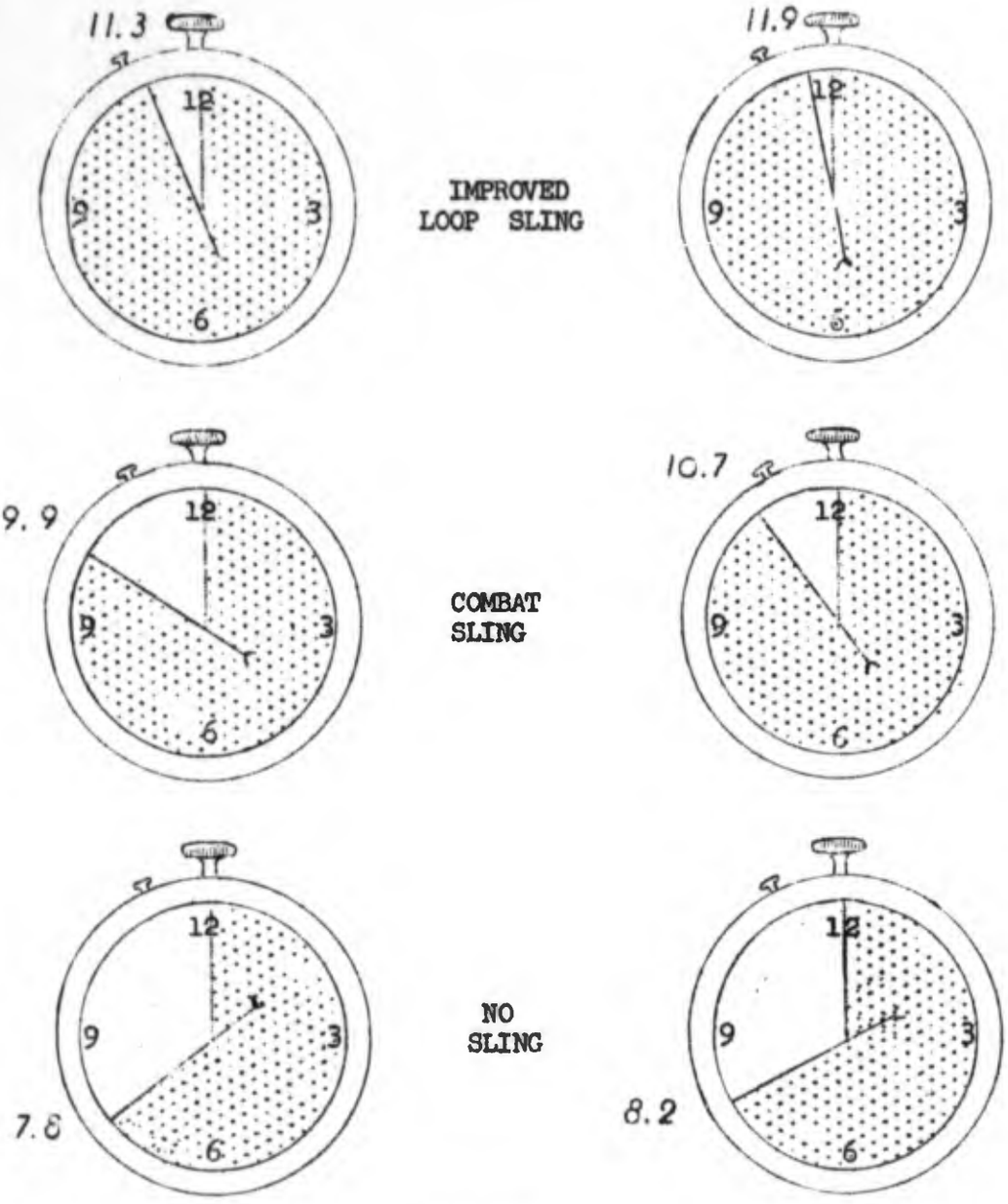


FIGURE 6

standing position will be designated a RECOVER Time Score. The mean score for the No Sling condition was again faster than that for the Combat Rifle Sling, which in turn was faster than the Improved Loop Sling. All differences were statistically significant at both 200 and 300 yards (Figure 7).

4. Questionnaire Opinion on the Two Slings:

Sixteen (16) firers preferred the Combat Rifle Sling to the Improved Loop Sling (Figure 8), and fourteen (14) of them preferred the Combat Rifle Sling for combat use (Figure 9). These preferences are statistically significant.(Detailed analyses will be found in Appendix C,) Of the two firers who had been in combat, one preferred the Combat Rifle Sling and the other the Improved Loop Sling.

An examination of responses to questions 2 and 4, probing reasons for opinions, indicated that those who liked the Combat Rifle Sling stated generally that it was fast, easy to get in and out of, and comfortable. The sole negative criticism of the Combat Sling came from one firer who said the sling was uncomfortable. Comments by those who liked the Improved Loop Sling indicated that it also was considered fast to use, and an improvement over the present loop sling. Seven firers who negatively appraised the Improved Loop Sling stated that it was uncomfortable, slow,hard on the hand,[1] and had too many loose ends.

---

[1] When the supporting hand is well forward into the stock ferrule swivel, the knuckles press against the metal hook at the end of the sling.

MEAN RECOVER TIME SCORES IN SECONDS

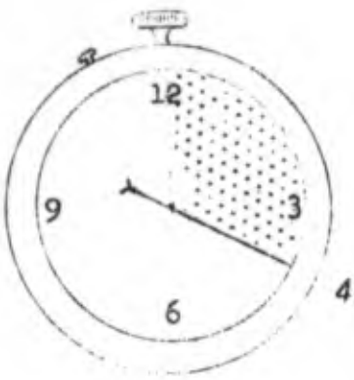
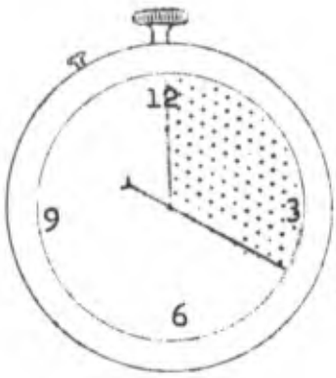
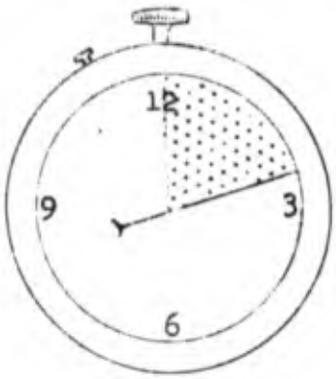
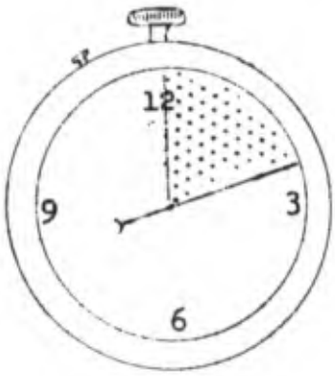
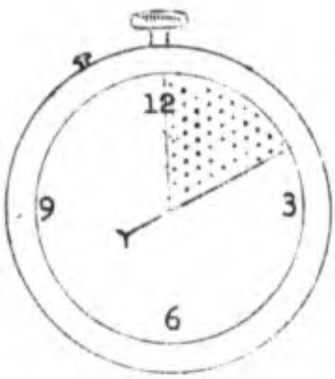
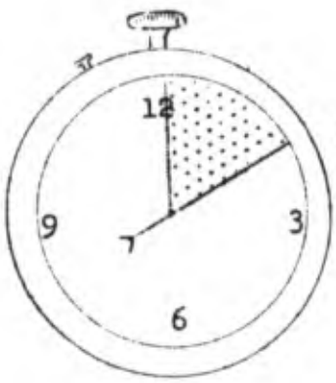
200 YARDS		300 YARDS
 4.1	IMPROVED LOOP SLING	 4.0
 2.7	COMBAT SLING	 2.7
 2.2	NO SLING	 2.1

FIGURE 7

PREFERENCE FOR SLINGS TESTED

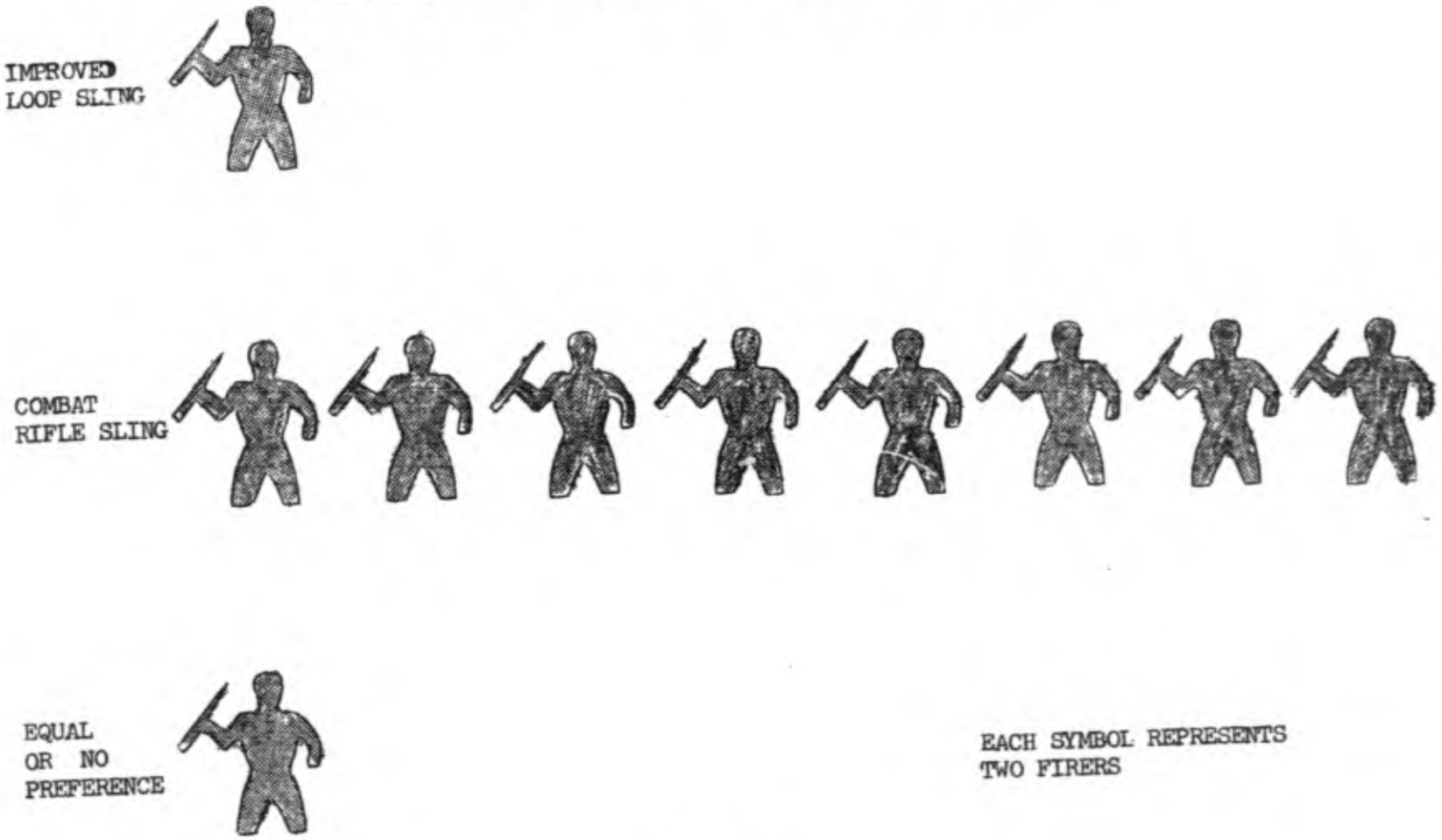


FIGURE 8

SLING PREFERRED FOR USE IN COMBAT

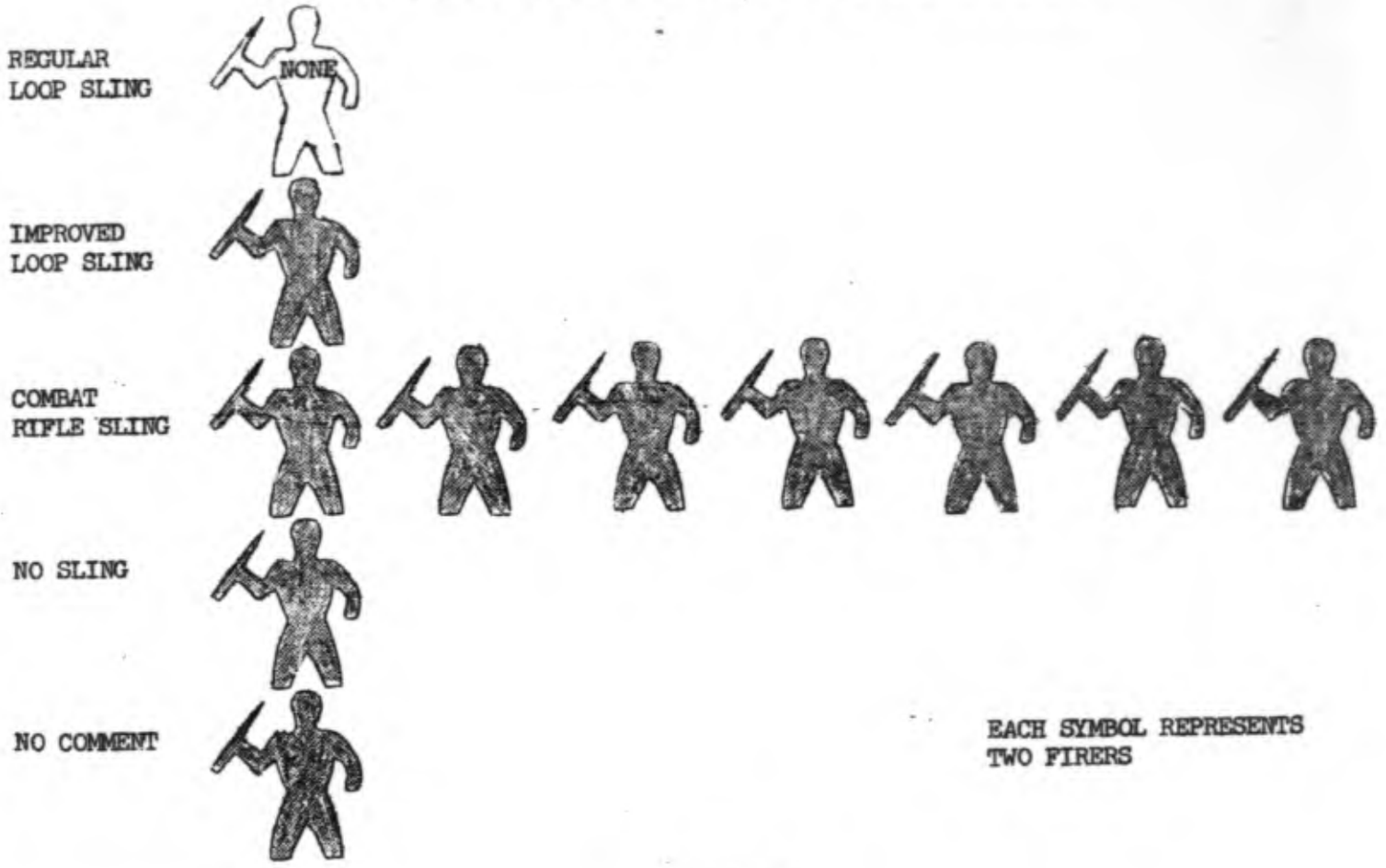


FIGURE 9

APPENDIX A

Sling and Stop Watch Instruction (First Day)

Part I - Summary of the First Day

The forty-two subjects were assembled at the control point and oriented on (1) the purpose of the study, (2) the importance of their cooperation, (3) the use of the results, and (4) a brief outline of the two days' proceedings.

Names of firers and timers were then called. The firers were divided into three groups for instruction in the exercises of the Improved Loop Sling, the Combat Rifle Sling, and No Sling. The No Sling exercises were given to keep amount of practice constant for the three experimental conditions. While the firers received sling instructions (Parts II, III, IV) the timers received stop watch instruction (Part V).

Four HRU No. 3 personnel gave the sling and stop watch instructions.

Upon completion of the exercises, a blank ammo practice was carried out, as a rehearsal for the next day's test firing. This rehearsal followed the test firing plan, with the exception of using blank ammo. Three rounds were fired under each experimental condition.

Part II - Exercises for the Improved Loop Sling

Materiel:

1. Roster of firers and group assignments

2. Seven (7) Improved Loop Slings

Procedure:

The instructor will first check the names of the seven (7) men of the group he is about to instruct.

The exercises will then begin.

Exercise I - Explaining the Use of the Sling

The Improved Loop Sling, with its additional hook at the stock ferrule swivel, will be demonstrated to the class. After the demonstration, the men will be given slings and will carry out the following exercises.

1. Men will be shown how to attach the sling to the rifle.

2. Men will get into their slings, assume the prone position, and make sling adjustments necessary for optimal sling support.

3. While in prone position, men will practice engaging and disengaging the sling hook from the stock ferrule swivel. Instructions: "Place left hand about two inches behind the stock ferrule swivel (this will keep left hand clear while fastening the hook) and turn rifle sideways so that stock ferrule swivel is plainly seen. Put right arm around the rifle, grab sling hook with right hand, and snap it into the stock ferrule swivel. Put rifle butt to shoulder and roll into firing position. To get out of sling, roll over to left side and unhook sling with right hand."

Exercise II - Practice in Assuming Prone Position from a Standing Position, Getting into Sling, and Recovering to a Standing Position

Instructions will be demonstrated to the class prior to the exercises. Exercise will begin from a standing position, with left hand at balance of rifle, right hand at the small of the stock, and rifle pointed down-range. The men will be in sling, but with sling unattached to the rifle. The free end of the sling will be hooked into the loop on the arm. Instructions:

1. "At the command LOCK, ONE ROUND LOAD, you will lock rifle and simulate loading one round. Then place the right hand on the heel of the butt."

2. "At the command DOWN, shift your weight slightly to the rear and drop to your knees. Fall forward, placing the toe of the rifle butt on the ground in front of you. Then roll forward onto your left side and await next command."

3. "At the command SLING, place left hand two inches behind the stock ferrule swivel, and turn rifle sideways so that the stock ferrule swivel is plainly seen. Put right arm around rifle, grab sling hook with right hand, and snap it into the stock ferrule swivel."

4. "At the command ON TARGET, place rifle butt in the hollow of the shoulder, roll into prone firing position, unlock your rifle, and squeeze the trigger."

5. "At the command RECOVER, roll over on left side, then unhook sling with right hand and rise to original standing position."

NOTE: Men will practice Exercise II for 5 trials. The sequence of instruction will be:
Group I
Group III
Group II

Upon completion of exercises for a group, collect the slings and wait for instructions to move on to the next group.

Check the roster of each group prior to carrying out the exercises.

Part III - Exercises for the Combat Rifle Sling

Materiel:

1. Roster of firers and group assignments.

2. Seven (7) Combat Rifle Slings, consisting of seven (7) rifle components and seven (7) arm-bands.

Procedure:

The instructor will first check the names of the seven (7) men of the group he is about to instruct.

The exercises will then begin.

Exercise I - Explaining the Use of the Sling

The use of the Combat Rifle Sling with its component parts will be demonstrated to the class. After the demonstration the following adjustments will be made:

1. Men will be shown how to attach rifle component of sling to the rifle.

2. The arm-band will be securely placed high on the left arm, just below the arm pit. The steel ring should face forward.

3. The men will assume a prone position and make the sling adjustments necessary to insure optimal sling support. (NOTE: Rifle sling component must be loose, as in sling arms, in order to give enough slack to facilitate engaging hook and ring.)

4. While in prone position, the men will practice engaging and disengaging the hook from the ring. Instructions: "Put right arm around rifle, grab the sling hook with right hand, and put it through the steel ring on the left arm. Pulling the rifle forward with left hand will help to pull the hook through the ring. Then put rifle butt to shoulder and roll into firing position. To get out of sling, roll over to left side, grab sling behind hook with right hand, pull hook smartly to rear."

Exercise II - Practice in Assuming Prone Position from a Standing Position, Getting into Sling, and Recovering to a Standing Position

Instructions will be demonstrated to the class prior to the exercise. Exercise will begin from a standing position, with left hand at balance of rifle, right hand at the small of the stock, and rifle pointed down-range. Instructions:

1. "At the command LOCK, ONE ROUND LOAD, you will lock rifle and simulate loading one round. Then place the right hand on heel of the butt."

2. "At the command DOWN, shift your weight slightly to the rear and drop to your knees. Fall forward, placing the toe of the rifle butt on the ground in front of you. Then roll forward onto your left side and await next command."

3. "At the command SLING, put right arm around rifle, grab the sling hook with right hand and put it through the steel ring on your left arm. Pulling the rifle forward with left hand will help to pull the hook through the ring."

4. "At the command ON TARGET, place rifle butt in the hollow of the shoulder, roll into prone firing position, unlock your rifle and squeeze the trigger."

5. "At the command RECOVER, roll over on left side, grab sling behind hook with right hand and pull hook smartly to rear, unhooking sling, and rise to original standing position."

NOTE: Men will practice Exercise II for 5 trials. The sequence of instruction will be:
Group III
Group II
Group I

Upon completion of exercises for a group, collect the slings and wait for instructions to move on to the next group.

Check the roster of each group prior to carrying out the exercises.

Part IV - No Sling Exercises

Materiel:

1. Roster of firers and group assignments.

Procedure:

The instructor will first check the names of the seven (7) men of the group he is about to instruct. The exercise will then begin.

Exercise I - Practice in Assuming Prone Position from a Standing Position, and Recovering to a Standing Position

Instructions will be demonstrated to the class prior to the exercise. All slings will then be removed from rifles. The exercise will begin from a standing position, with left hand at the balance of the rifle, right hand at the small of the stock, and rifle pointed downrange. All slings will be removed from rifles prior to practice.
Instructions:

1. "At the command LOCK, ONE ROUND LOAD, you will lock your rifle and simulate loading one round. Then place right hand on the heel of the butt."

2. "At the command DOWN, shift your weight slightly to the rear and drop to your knees. Then roll forward into the prone firing position, unlock your rifle, and squeeze the trigger."

3. "At the command ON TARGET, assume the firing position again."

4. "At the command RECOVER, get out of firing position and rise to original standing position."

NOTE: Men will practice the above exercise for 5 trials. The sequence of instruction will be:
Group II
Group I
Group III

Upon completion of the exercise, wait for instructions to move on to the next group.

Check the roster of each group prior to carrying out the exercise.

Part V - Instructions to Timers on the Use of Stop Watches

Materiel:

1. Roster of the twenty-one (21) timers.
2. Twenty-one (21) stop watches.
3. Twenty-one (21) time cards.

Procedure:

While the firers are receiving instruction on the use of the slings, the timers will receive instructions on the use of a stop watch.

Exercise I - Explaining the Use of the Stop Watch

The instructor shall issue the stop watches and have the men put the safety cord around the neck. He will then explain how the face of the watch is divided into tenths of seconds, and how to start, stop, and reset the watches.

Exercise II - Practice in Using a Stop Watch

The actual procedure to be used during test firing will be used for stop watch practice. A demonstrator will assume a standing position, with his left hand at the balance of the rifle, his right hand at the small of the stock, and the rifle pointed down-range. When the instructor gives the command LOCK, ONE ROUND LOAD, the demonstrator will simulate loading. At the command COMMENCE FIRE the demonstrator will drop to his knees, fall forward to the prone firing position, unlock his rifle, and squeeze the trigger. He will then drop the rifle from his shoulder. Instructor: "You have just seen the procedure which will be used on the firing line. We are going to measure how fast a man can go into a firing position, with or without a sling, and fire a well-aimed round. When you hear the command COMMENCE FIRE, you will start your watches on the word 'COMMENCE'. You will stop your watches when the demonstrator has fired, which will be when you hear the strike of the trigger."

Several trials will follow, until the men fully understand. Then the instructor will say: "We are also interested in how fast a man can get out of his firing position, with or without a sling, and onto his feet. After men have completed firing, the command ON TARGET will be given. The firers will then get into their firing positions, with

weapons cleared. At the command RECOVER, they will get to their feet as quickly as possible. When you hear the word RECOVER you will start your watches." Commands are given to demonstrator, and several trials are conducted.

After the timers have learned the above procedure, the instructor will divide them into one group of 10 men and another of 11 men. While one group acts as demonstrators, the other group will practice timing them with a stop watch. Each group will practice for nine trials.

APPENDIX B

Questionnaire

Name _____

1. How do you feel about the Improved Loop Sling?

- ☐ Like it very much
- ☐ Like it
- ☐ No opinion
- ☐ Dislike it
- ☐ Dislike it very much

2. Why do you feel this way?

3. How do you feel about the Combat Rifle Sling?

- ☐ Like it very much
- ☐ Like it
- ☐ No opinion
- ☐ Dislike it
- ☐ Dislike it very much

4. Why do you feel this way?

5. Which would you prefer to use in combat?

- ☐ The regular loop sling
- ☐ The Improved Loop Sling
- ☐ The Combat Rifle Sling
- ☐ No sling at all

6. Have you ever been in combat?

- ☐ Yes
- ☐ No

APPENDIX C

Statistical Analyses

When a difference is obtained between the means of two experimental treatments, e.g., the Improved Loop Sling and the Combat Rifle Sling, this difference can be tested statistically to establish whether it is due to "chance" or due to a "real" difference between the slings. The employed statistical test yields a "level of confidence," which states the probability of the difference occuring as a result of chance. For example, a level of confidence of .05 indicates that the difference could be expected to occur by chance only five times out of a hundred. A level of .01 infers that the obtained difference would be expected to occur by chance only one time in a hundred.

Standard procedure demands that the experimental investigator choose his "level of confidence" prior to obtaining the test results. The selected level of confidence in this study was .05, which means that any difference between two means that could occur by chance only five times in a hundred is accepted as "statistically significant."

In the following tables the level of confidence is indicated by the letter "p." The symbol ">" indicates "greater than," and the symbol "<" indicates "less than." For example, the expression "$p < .01$" means that the probability that the obtained difference would occur by chance is less than one time out of a hundred.

Table 1(a)

Analysis of Variance of Absolute Scores for 200 Yards

Source	SS	df	MS	F	p
Treatments	178	2	89.0	5.30	< .01
Subjects	2467	20	123.4	7.35	< .01
T x S	673	40	16.8		
Total	3318	62			

Table 1(b)

Comparisons among Mean Absolute Scores for 200 Yards

Treatment	Mean Score	Comparison	t	p
Improved Loop Sling	19.7	Loop/Combat	.26	n.s.*
Combat Rifle Sling	19.3	Loop/No Sling	2.94	< .01
No Sling	16.0	Combat/No Sling	2.68	< .02

*Not Significant

Table 2

Analysis of Variance of Absolute Scores for 300 Yards

Source	SS	df	MS	F	p
Treatments	7.23	2	3.62	.16	n.s.
Subjects	2635.26	19	138.70	6.16	< .001
T x S	855.44	38	22.51		
Total	3497.93	59			

Table 3(a)

Analysis of Variance of Relative Scores for 200 Yards

Source	SS	df	MS	F	p
Treatments	33.69	2	16.84	5.91	<.01
Subjects	83.57	10	8.36	2.93	<.05
T x S	56.98	20	2.85		
Total	174.24	32			

Table 3(b)

Comparisons among Mean Relative Scores at 200 Yards

Treatment	Mean Score	Comparison	t	p
Improved Loop Sling	27.9	Loop/Combat	.83	n.s.
Combat Rifle Sling	28.5	Loop/No Sling	2.50	<.05
No Sling	26.1	Combat/No Sling	3.33	<.01

Table 4

Analysis of Variance of Relative Scores at 300 Yards

Source	SS	df	MS	F	p
Treatments	1.78	2	.89	.07	n.s.
Subjects	6.44	5	1.29	.10	n.s.
T x S	120.89	10	12.09		
Total	129.11	17			

Table 5(a)

Analysis of Variance of Dispersion Scores at 200 Yards

Source	SS	df	MS	F	p
Treatments	28.4	2	14.20	5.50	$< .02$
Subjects	67.9	10	6.79	2.63	$> .05$
T x S	51.6	20	2.58		
Total	147.9	32			

Table 5(b)

Comparisons among Mean Dispersion Scores at 200 Yards

Treatment	Mean Score	Comparison	t	p
Improved Loop Sling	6.1	Loop/Combat	.44	n.s.
Combat Rifle Sling	5.8	Loop/No Sling	2.63	$< .02$
No Sling	7.9	Combat/No Sling	3.07	$< .01$

Table 6

Analysis of Variance of Dispersion Scores at 300 Yards

Source	SS	df	MS	F	p
Treatments	.3	2	.15	-	n.s.
Subjects	7.2	5	1.44	-	n.s.
T x S	103.0	10	10.3		
Total	110.5	17			

Table 7(a)

Analysis of Variance of FIRE Time Scores at 200 Yards

Source	SS	df	MS	F	p
Treatments	117.47	2	58.74	55.94	< .001
Subjects	109.04	18	6.06	5.77	< .001
T x S	37.63	36	1.05		
Total	264.14	56			

Table 7(b)

Comparisons among Mean FIRE Time Scores at 200 Yards

Treatment	Mean Score	Comparison	t	p
Improved Loop Sling	11.3	Loop/Combat	4.24	< .001
Combat Rifle Sling	9.9	Loop/No Sling	10.61	< .001
No Sling	7.8	Combat/No Sling	6.36	< .001

Table 8(a)

Analysis of Variance of FIRE Time Scores at 300 Yards

Source	SS	df	MS	F	p
Treatments	129.32	2	64.66	37.81	< .001
Subjects	108.90	18	6.05	3.54	< .01
T x S	61.46	36	1.71		
Total	299.68	56			

Table 8(b)

Comparisons among Mean FIRE Time Scores at 300 Yards

Treatment	Mean Score	Comparison	t	p
Improved Loop Sling	11.9	Loop/Combat	1.94	.05
Combat Rifle Sling	10.7	Loop/No Sling	6.01	<.001
No Sling	8.2	Combat/No Sling	4.06	<.001

Table 9(a)

Analysis of Variance of RECOVER Time Scores at 200 Yards

Source	SS	df	MS	F	p
Treatments	35.55	2	17.78	52.29	<.001
Subjects	18.10	18	1.01	2.97	<.01
T x S	12.22	36	.34		
Total	65.87	56			

Table 9(b)

Comparisons among Mean RECOVER Time Scores at 200 Yards

Treatment	Mean Score	Comparison	t	p
Improved Loop Sling	4.1	Loop/Combat	7.41	<.001
Combat Rifle Sling	2.7	Loop/No Sling	10.05	<.001
No Sling	2.2	Combat/No Sling	2.65	<.02

Table 10(a)

Analysis of Variance of RECOVER Time Scores at 300 Yards

Source	SS	df	MS	F	p
Treatments	37.04	2	18.52	44.10	<.001
Subjects	13.03	18	.72	1.71	n.s.
T x S	15.21	36	.42		
Total	65.28	56	1.17		

Table 10(b)

Comparisons among Mean RECOVER Time Scores at 300 Yards

Treatment	Mean Score	Comparison	t	p
Improved Loop Sling	4.0	Loop/Combat	6.19	<.001
Combat Rifle Sling	2.7	Loop/No Sling	9.05	<.001
No Sling	2.1	Combat/No Sling	2.86	<.01

Table 11(a)

Comparative Breakdown of Firer Opinion Data of Figure 8

Combat Rifle Sling	Improved Loop Sling: Like it very much	Like it	No Opinion	Dislike it	Dislike it very much
Like it very much	2	4	5	4	1
Like it	-	-	1	1	-
No Opinion	-	1	-	-	-
Dislike it	-	-	-	-	-
Dislike it very much	-	1	-	-	-

NOTE: Preference for the Combat Rifle Sling = 4+5+4+1+1+1 = 16
Preference for the Improved Loop Sling = 1+1 = 2
Equal or no preference = 2

Table 11(b)

Chi-Square Test of Firer Preference Data of Table 11(a), Tested Against the Hypothesis of Equal Preference for the Two Slings

Preference	Number of Firers
Improved Loop Sling	2
Combat Rifle Sling	16
Total	18

Chi-Square = 9.36 $p<.01$

Table 12

Chi-Square Test of Combat Preference of the Combat Rifle Sling over the Improved Loop Sling on Data Presented in Figure 9

Preference	Number of Firers
Improved Loop Sling	2
Combat Rifle Sling	14
Total	16
Chi-Square = 7.54	$p < .01$

Table 13

Chi-Square Test of Combat Preference of the Combat Rifle Sling over No Sling on Data Presented in Figure 9

Preference	Number of Firers
Combat Rifle Sling	14
No Sling	2
Total	16
Chi-Square = 7.54	$p < .01$