AD-759 223

RIFLE

Army Test and Evaluation Command
Aberdeen Proving Ground, Maryland

27 December 1972

UNCLASSIFIED
Security Classification

AD-759223

DOCUMENT CONTROL DATA - R&D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1 ORIGINATING ACTIVITY (Corporate author)
U. S. Army Test and Evaluation Command
Aberdeen Proving Ground, Maryland 21005

2a REPORT SECURITY CLASSIFICATION
Unclassified

2b GROUP
NA

3 REPORT TITLE
U. S. Army Test and Evaluation Command Test Operations Procedure "Rifle"

4 DESCRIPTIVE NOTES (Type of report and inclusive dates)
Final

5 AUTHOR(S) (Last name, first name, initial)

6 REPORT DATE
27 December 1972

7a TOTAL NO OF PAGES
33

7b NO. OF REFS
17

8a CONTRACT OR GRANT NO.

b. PROJECT NO.

c AMCR 310-6

d

9a ORIGINATOR'S REPORT NUMBER(S)
TOP 3-3-065

9b OTHER REPORT NO(S) (Any other numbers that may be assigned this report)

10 AVAILABILITY LIMITATION NOTICES
Approved for public release; distribution unlimited.

11 SUPPLEMENTARY NOTES

12 SPONSORING MILITARY ACTIVITY
Headquarters
U.S. Army Test and Evaluation Command
Aberdeen Proving Ground, Maryland 21005

13 ABSTRACT

Describes a method for evaluation of rifle operational and functional performance characteristics. Identifies facilities and equipment required. Discusses supporting tests. Provides procedures for known distance accuracy, tactical firing, durability, reliability, maintenance evaluation, and value analysis. Applicable to hand held and shoulder fired weapon caliber .50 and less.

DD FORM 1 JAN 64 1473

UNCLASSIFIED
Security Classification

14 KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Rifle						
Infantry Weapon						
Small Arms						
Automatic Weapons						
Sniper Rifle						
Fire Power						

INSTRUCTIONS

1. ORIGINATING ACTIVITY: Enter the name and address of the contractor, subcontractor, grantee, Department of Defense activity or other organization *(corporate author)* issuing the report.

2a. REPORT SECURITY CLASSIFICATION: Enter the overall security classification of the report. Indicate whether "Restricted Data" is included. Marking is to be in accordance with appropriate security regulations.

2b. GROUP: Automatic downgrading is specified in DoD Directive 5200.10 and Armed Forces Industrial Manual. Enter the group number. Also, when applicable, show that optional markings have been used for Group 3 and Group 4 as authorized.

3. REPORT TITLE: Enter the complete report title in all capital letters. Titles in all cases should be unclassified. If a meaningful title cannot be selected without classification, show title classification in all capitals in parenthesis immediately following the title.

4 DESCRIPTIVE NOTES: If appropriate, enter the type of report, e.g., interim, progress, summary, annual, or final. Give the inclusive dates when a specific reporting period is covered.

5. AUTHOR(S): Enter the name(s) of author(s) as shown on or in the report. Enter last name, first name, middle initial. If military, show rank and branch of service. The name of the principal author is an absolute minimum requirement.

6. REPORT DATE: Enter the date of the report as day, month, year, or month, year. If more than one date appears on the report, use date of publication.

7a. TOTAL NUMBER OF PAGES: The total page count should follow normal pagination procedures, i.e., enter the number of pages containing information.

7b. NUMBER OF REFERENCES: Enter the total number of references cited in the report.

8a. CONTRACT OR GRANT NUMBER: If appropriate, enter the applicable number of the contract or grant under which the report was written.

8b, 8c, & 8d. PROJECT NUMBER: Enter the appropriate military department identification, such as project number, subproject number, system numbers, task number, etc.

9a. ORIGINATOR'S REPORT NUMBER(S): Enter the official report number by which the document will be identified and controlled by the originating activity. This number must be unique to this report.

9b. OTHER REPORT NUMBER(S): If the report has been assigned any other eport numbers *(either by the originator or by the sponsor)*, also enter this number(s).

10. AVAILABILITY/LIMITATION NOTICES: Enter any limitations on further dissemination of the report, other than those imposed by security classification, using standard statements such as:

(1) "Qualified requesters may obtain copies of this report from DDC."

(2) "Foreign announcement and dissemination of this report by DDC is not authorized."

(3) "U. S. Government agencies may obtain copies of this report directly from DDC. Other qualified DDC users shall request through _____."

(4) "U. S. military agencies may obtain copies of this report directly from DDC. Other qualified users shall request through _____."

(5) "All distribution of this report is controlled. Qualified DDC users shall request through _____."

If the report has been furnished to the Office of Technical Services, Department of Commerce, for sale to the public, indicate this fact and enter the price, if known.

11. SUPPLEMENTARY NOTES: Use for additional explanatory notes.

12. SPONSORING MILITARY ACTIVITY: Enter the name of the departmental project office or laboratory sponsoring *(paying for)* the research and development. Include address.

13. ABSTRACT: Enter an abstract giving a brief and factual summary of the document indicative of the report, even though it may also appear elsewhere in the body of the technical report. If additional space is required, a continuation sheet shall be attached.

It is highly desirable that the abstract of classified reports be unclassified. Each paragraph of the abstract shall end with an indication of the military security classification of the information in the paragraph, represented as *(TS)*, *(S)*, *(C)*, or *(U)*.

There is no limitation on the length of the abstract. However, the suggested length is from 150 to 225 words.

14. KEY WORDS: Key words are technically meaningful terms or short phrases that characterize a report and may be used as index entries for cataloging the report. Key words must be selected so that no security classification is required. Idenfiers, such as equipment model designation, trade name, military project code name, geographic location, may be used as key words but will be followed by an indication of technical context. The assignment of links, rules, and weights is optional.

U. S. ARMY TEST AND EVALUATION COMMAND
SERVICE TEST - SYSTEM TEST OPERATIONS PROCEDURES

AMSTE-RP-702-102
*Test Operations Procedure 3-3-065 27 December 1972

RIFLE

SECTION I
GENERAL

1. Purpose and Scope.

a. This Test Operations Procedure (TOP) is a guide to assist the test officer in preparing a plan to support the service test of a type rifle. It describes methods and techniques to be used in determining if a candidate rifle meets the criteria as established in the appropriate requirements documents and is suitable for use by the US Army.

Approved for public release; distribution unlimited.

*This TOP supersedes MTP 3-3-065, 26 September 1969.

b. These procedures address: (1) a preoperational inspection and check of safety and the characteristics of a candidate item, (2) an appropriate series of tests designed to evaluate functional responses and, (3) an examination of the human factors and value engineering aspects of the rifle offered for testing.

c. Applicable provisions of this document will apply to any hand-held, shoulder-fired rifle (generally less than cal. 50) designed for a point fire capability. Testing of a sniper rifle system requires methods and procedures not applicable to the testing of a general service rifle although some common approaches are addressed in this publication. However, additional procedures may be required for testing a specific sniper rifle system, depending on the performance requirements and characteristics of the particular sniper weapon/ammunition/sight combination offered for testing.

d. The procedures that follow do not address an area target capability (grenade launching) which is common to many military rifles. Adequate procedures to test such a capability will be found in TOP 3-3-032, Grenade Launcher, Shoulder-Fired Systems.

2. Background.

a. Considerable research and development effort has been directed toward the development of lighter, hand-held, shoulder-fired, small arms weapons capable of providing the individual Infantry soldier with significantly increased combat effectiveness. The acceptability of a weapon for standardization and issue to troops is governed by various interdependent factors. These include the capability of delivering effective fire rapidly and accurately on targets, functional simplicity and reliability, man-portability, durability, ease of maintenance, and physical and technical design characteristics suited to the capabilities and limitations of the human operator.

b. The current sniper rifle system consists of a modified national match rifle (accurized) equipped with a variable power ranging telescopic sight. The sniper rifle system is intended to be used by sniper teams composed of highly qualified marksmen selected by their unit for this specialized duty. Each weapon system is tested and pre-zeroed by Army Marksmanship Unit personnel prior to shipment to the using unit.

c. The results of the service testing of future rifles will serve as a basis for recommendations relative to type classification of an accepted weapon.

3. Equipment and Facilities.

a. Equipment.

(1) Test weapon, its components, training, and maintenance packages.

(2) Control weapon with its components.

(3) Infantry TOE unit.

(4) Weighing equipment.

(5) Linear measuring equipment.

(6) Photographic equipment.

(7) Night television as appropriate.

(8) Communications equipment.

(9) Tactical vehicles, air and ground.

(10) Qualified parachutists.

(11) Meteorological equipment.

(12) Safety and first aid equipment.

(13) Ear plugs.

(14) Cleaning materials and lubricants.

(15) Ammunition (to include match grade for sniper system).

(16) Photometer.

(17) Stopwatch.

(18) Binoculars.

(19) Individual CB protective clothing and equipment.

(20) Other equipment prescribed in referenced MTP/TOP.

b. Facilities.

(1) Suitable firing ranges and appropriate targets.

(2) Range instrumentation and recording equipment.

(3) Classroom, office, and storage space.

(4) Airfield and drop zone.

(5) Other facilities prescribed in referenced MTP/TOP.

SECTION II
TEST PROCEDURES

4. Supporting Tests.

a. Although the proposed testing procedures are described in successive paragraphs, some will overlap or be performed concurrently. The arrangement of the supporting tests is flexible and allow the test officer an opportunity to tailor a test plan to the precise characteristics and requirements of a specific test item, methodology, and state-of-the-art at the time and place of testing.

b. Data should be collected in sufficient quantities to support valid conclusions. This objective may be constrained by limited numbers of test and/or control items; a limited time in which to accomplish testing; or limited funds, manpower, or support facilities. To identify the best means of securing meaningful data within the limitations imposed, the test officer must remain in close liaison with available statistical and human factors expertise. The statistician will contribute to selecting the overall experimental design or pattern and fixing such data as the number of test soldiers required, the number of items to be tested, and the number of repetitions or replications required for specific operations. The human factors representative will apply his training and experience in providing guidance in the development and presentation of questionnaires, interview techniques, and the human factors input required in tests, plans, and reports. Additional statistical guidance is contained in MTP/TOP 3-1-002, Confidence Intervals and Sample Size.

c. Whenever possible, the test item will be compared to an appropriate control item. The selected control item will usually be a standard inventory weapon, related as close characteristically to the candidate rifle as possible. To aid in obtaining a valid comparison, the control item should be in new or nearly new condition and subjected to the same care and maintenance considerations as the test item throughout the conduct of the test.

d. Ammunition will play a major role in the success or failure of a rifle. Every effort should be made to ensure that the ammunition furnished for the service test is representative of the service ammunition that will be available for a rifle recommended for general acceptance and use by the US Army. In the case of a

sniper rifle this will entail a supply of match grade cartridges, described in detail in paragraph 10, chapter 2, Training Circular 23-14, Sniper Training and Employment.

e. A log book should be maintained as a chronological record of remarks, observations, meteorological data, times, comparisons, and other pertinent events and data. An accurate compilation will expedite the collation of information required to support each test finding. Photographs, motion pictures, charts, graphs, and other pictorial or visual aids are suggested as supplementary evidence to narrative reports.

f. When risk analysis is directed, TECOM Reg 70-34, Risk Analysis for Suitability Tests, will be followed.

g. Meteorological data (temperature, temperature gradient, atmospheric pressure, relative humidity, precipitation, wind speed and direction) and light level reading in situations when such data will have a bearing on the test results will be collected.

h. Common Service and Environmental MTP/TOP, the tests described in Section III, and other published documents to be considered in formulating a test plan are as follows:

	TEST SUBJECT TITLE	PUBLICATION NO.
(1)	Preoperational Inspection and Physical Characteristics (refer to para 5)	3-3-500
(2)	Safety (refer to para 6)	3-3-517
(3)	Personnel Training (refer to para 7)	3-3-501
(4)	Sights (refer to para 8)	3-3-116
(5)	Known Distance Accuracy (refer to para 9)	
(6)	Tactical Firing (refer to para 10)	
(7)	Position Disclosing Effects (refer to para 11)	1-3-515

TEST SUBJECT TITLE	PUBLICATION NO.
(8) Portability/Transportability (refer to para 12)	10-3-506
(9) Durability and Reliability (refer to para 13)	
(10) Adverse Conditions (refer to para 14)	3-3-524, 3-4-001 3-4-003, 3-4-004
(11) Maintenance Evaluation (refer to para 15)	
(12) Human Factors Engineering (refer to para 16)	3-3-521
(13) Value Analysis (refer to para 17)	

SECTION III
SUPPLEMENTARY INSTRUCTIONS

5. Preoperational Inspection and Physical Characteristics.

a. The objectives of this subtest are: (1) to verify the completeness of the candidate rifle received for testing, (2) to compare its physical characteristics with the criteria established in the appropriate requirements documents and, (3) to determine that the test item and all its components are in a serviceable condition and suitable for subsequent testing.

b. In collecting data to support test findings, it is important to isolate the when and where of events in addition to the final judgment of what happened. It is possible that a shortcoming or failure, attributed to the rigors of service testing, may have originated as a fault of inadequate product control during manufacturing or poor shipping or handling processes. If these deficiencies exist at the time of their receipt at the test site the preoperational inspection must discover and record the fact.

c. The physical characteristics of the test item, as prescribed in the applicable requirements documents, will be verified during the preoperational inspection. Typical physical characteristics of a rifle include:

(1) Weight (loaded or unloaded, with or without sight, with or without accessories).

(2) Barrel length.

(3) Type of sights (fixed, attachable, telescopic).

(4) Type of action (single shot, semiautomatic, automatic).

(5) Trigger pull (measured in pounds).

(6) Overall length.

(7) Stock configuration (target type, service type, drop at comb).

d. The applicable procedures of MTP/TOP 3-3-500, Preoperational Inspection and Physical Characteristics, should be performed to accumulate appropriate data to support a judgment in the area described above.

6. Safety.

a. The applicable procedures of MTP/TOP 3-3-517, Infantry Weapons and Ammunition Safety, should be performed to determine the effectiveness of the safety features, and to confirm the safety of each component of the rifles received for testing.

b. Safety must be considered throughout the conduct of the service test and, to the extent possible, should be evaluated concurrently with or as an adjunct to other subtests. To be safe for troop use, a rifle must be free of those conditions or features which may cause personal injury or inadvertent property damage. The area of concern applies to the real and potential hazards of the test item itself, and to its relation to any combination of items with which it may be used.

c. Testing will not begin until the Safety Release is received. Prior to committing test items to field exposure, airdrop operations, or firing performance, the applicable Safety Release will be reviewed and the test item examined for conformity to safety requirements and for the presence of other hazardous conditions. The Safety Release should be reviewed to determine if it places undue restrictions on tactical use of the test item. Particular attention should be given to verifying safety limitations and compiling data pertinent to the safety confirmation required by TECOM Reg 385-6, Verification of Safety During Testing.

7. Personnel Training.

a. This subtest should be conducted in accordance with the applicable procedures of MTP/TOP 3-3-501, Personnel Training, to (1) determine the type and duration of instruction required to train soldiers in the use of the test rifle, (2) determine whether the proposed program of instruction is adequate, (3) determine whether the training criteria established in applicable requirements documents are met by the test item with its training package, and (4) orient participating soldiers to the objectives of the test and their individual responsibilities.

b. Test soldiers selected for conducting the tests of a new or improved rifle must be representative of those who will employ the weapon in a user environment. For the standard rifle test, the test soldiers should be representative of the 5th and 95th percentile in height, weight, and body configuration as determined in the applicable portions of Military Standard 1472A, Human Engineering Design Criteria. In addition, a representative number should wear eyeglasses, some should be left-handed shooters, and each qualification classification, i.e. marksman, sharpshooter, expert, should be represented. The sniper rifle, however, will be tested only by skilled marksmen representative of those envisioned by the doctrine governing sniper employment in combat. As a minimum criterion, personnel selected will have qualified as expert during documented record firing with the standard rifle. When available, a Army Marksmanship Unit will furnish the rifle shooters for the testing of a sniper rifle system.

c. To minimize bias and achieve a high degree of validity during a test that compares a new or improved rifle with the older and more familiar model, it is essential that this training period produce a test soldier as familiar with the test rifle as he is with the control item. This may require a considerable amount of mechanical training, preliminary rifle marksmanship exercises, and familiarization firing with the test item to attain the desired level.

d. An evaluation of the ease of assembly and disassembly will be made during this and other applicable subtests. Supervisory personnel should note the relative difficulties encountered, if any, and solicit comments and opinions from the test soldiers as the latter progress through familiarization, nomenclature, and mechanical functioning exercises.

8. Sights.

a. The sighting system will be considered an integral part of the rifle during all service testing. The system may appear as a simple fixed means of alignment, i.e., an open, or closed-type rear sight and an open, or closed-type front sight attached permanently to the

rifle barrel; or as an imaging or non-imaging telescope, fixed or mountable to the weapon. Regardless of its simplicity or complexity, the rifle-sight system will be jointly evaluated with the rifle as a single entity.

b. During the conduct of operational tests, particular attention will be given to the suitability of sight settings, ease of zeroing, retention of sight settings, ease of operation, and necessity and frequency of adjustment. Telescopic sights will require an additional evaluation of reticle patterns, stadia lines, ranging ability, and other features characteristic of a particular scope.

c. The applicable procedures of TOP 3-3-116, Sights, Direct Fire, should be performed to evaluate the sights of test rifles which use a type of night aid to vision system.

9. Known Distance Accuracy.

a. Objective. This phase of testing will determine and compare the accuracy of the test and control rifles against point targets at known distances. NOTE: The bench rest machine test, and environmental chamber(s) conditions of engineer type testing, will produce pure accuracy data, while known distance firing moves nearer to the ultimate combat environment by putting the rifle in the hands of a soldier. Subsequent firing under tactical and simulated combat conditions will produce additional field accuracy data.

b. Method.

(1) Subsequent to familiarization training and practice firing, both test and control weapons will be zeroed following the procedures prescribed in applicable publications. As an example of zeroing procedures, attention is invited to:

(a) FM 23-9, Chapter 3, the sight adjustment and battle-sight zeroing of the M16A1 Rifle.

(b) Training Circular 23-14, Chapter 3, sight adjustment and zeroing of the sniper rifle.

(2) The test and control rifles should be fired through a record marksmanship course at selected ranges appropriate to the design of the test rifle and its accompanying specifications. Detailed procedures for the conduct of record fire will be found in FM 23-71, Rifle Marksmanship. Distances will vary from a normal maximum range of 300-500 meters required for the standard rifle to the 600-900 meters required to test the average sniper rifle and scope.

(3) Subsequent to firing the record course, for standard rifles only, test soldiers will fire both test and control rifles in the semi-automatic, controlled burst, and automatic modes, as appropriate, from the prone-supported and standing firing positions at a known range. Firing will be in 10-round, or 10-trigger pull, groups to determine and compare the dispersion characteristics of the test and control rifles.

(4) If the rifles are equipped with a bipod, the exercises listed in (3) above will be repeated, using the bipod to support the weapon.

(5) Sniper rifles will be fired at known distances to test the accuracy of the rifle, and to confirm the ranging capability of the telescopic sight normal to the sniper rifle system. The test soldiers will fire each test and control weapon from appropriate supported positions at targets located at ranges of 300, 600, and 900 meters. Three 10-round groups will be fired to determine and compare the grouping characteristics of the rifle-sight-ammunition system. The first three rounds of each 10-round groups will be measured separately to determine any increased effectiveness of the man-weapon during succeeding rounds. The weapon will be cooled between groups. Two different lots of ammunition will be fired as a spot check of ammunition/test rifle consistency. If night vision sights are provided, appropriate accuracy firing will be repeated at night.

(6) Sufficient firing will be conducted at known distances and under the advantages afforded by large, fixed target surfaces (witness panels may be used to further the advantage inherent with finding a hole for each round fired) to obtain maximum usable data to support a man-weapon-ammunition accuracy evaluation.

c. Data Required. The following data will be recorded:

(1) Range at which firing is conducted.

(2) Type targets utilized.

(3) Number of test and control rifles fired.

(4) Type and lot number of ammunition used.

(5) Dispersion data (x and y coordinates, and linear standard deviations), extreme spread, center of impact, mean radius, offset, of each target fired. For burst fire, the impact of each round in each burst (10-trigger pulls) shall be recorded. Data to include identification of firer, rifle fired, sight used, and ammunition used.

(6) Scores achieved by number and shooter.

(7) Stoppages or malfunctions by man, rifle, and required immediate action undertaken to correct it.

(8) Time required to reduce stoppages and malfunctions.

(9) Comments and observations of test personnel related to the relative performance of test and control items on the same known distance range.

d. Analytical Plan.

(1) Collected data will be collated and reduced to a narrative report supported by pictorial evidence when appropriate.

(2) A subjective analysis of the observations, comments, and expressed opinions of test personnel should be performed.

(3) An appropriate analysis commensurate with the nature and relevancy of the usable accuracy data obtained should be prepared. A comparison of the test and control rifle performance data should be included.

10. Tactical Firing.

a. Objective. The objective of this phase of testing is to determine the effectiveness of the test item in a combat-oriented environment represented by a tactical disposition of targets at unknown ranges.

b. Method. Three instrumented, combat-mission oriented, tactical ranges will be fired an appropriate number of times to obtain data to support a judgment as to the operational suitability of the standard test rifle. In addition to using the applicable portions of these ranges, the sniper rifle will be fired on an additional facility designed for sniper rifle field firing, and a separate assault course may be fired at night. Each range will produce information commensurate with its functional responses and capabilities in effectiveness areas such as accuracy, responsiveness, sustainability, reliability, portability/transportability, and signature effects.

(1) Quick Fire (Type range shown in figure 1, appendix B). This instrumented range is designed to test the responsiveness and short range accuracy of the man-weapon system. A test soldier, equipped with any combination of fighting or existence load, will move through a course of combat-type targets which are exposed for a short

time at ranges varying from 20 to 80 meters. Targets will be randomly presented and the exposure times regulated. The number of rounds fired will not be limited but the firer must only fire while the targets are exposed. Each mode of fire, i.e., semiautomatic, controlled burst, and automatic, will be tested as appropriate. (The sniper rifle will not normally be fired on this range.)

(2) Defense, Day and Night (Type ranges shown in figure 2 and 3, appendix B).

(a) This instrumented range is designed to test the accuracy, responsiveness, sustainability, reliability, and signature effects of the man-rifle system. Test soldiers, organized as rifle units, fire from emplacements at short-exposure-time (pop-up) targets arranged in various formations at ranges out to the maximum effective range of the rifle. Stationery targets and moving type target arrays are also available at selected ranges. The range is equipped with signature devices to simulate enemy fire, thereby adding to the tactical realism of the range and assisting in the identification of targets during both daylight and night firing exercises. Instrumentation produces both hit and near miss data.

(b) The moving targets of this range are suitable for testing the mobile target capabilities of a test sniper rifle system. The sniper firing position should be from 200 to 400 meters from the target area and appropriate sniper targets should be used.

(3) Attack, Day and Night.

(a) Day (figure 4, appendix B). This instrumented range is designed to test accuracy, responsiveness, sustainability, reliability, portability, and signature effects. Test soldiers of fire-team size negotiate a selected attack course over varied terrain while firing and moving under conditions simulating combat. During the attack, the test troops are required to run, jump, hit the ground rapidly, and assume various firing positions. The course is appropriate for testing semiautomatic, controlled burst, or automatic fire from the standard rifle. It is not suited for testing the sniper rifle.

(b) Night (figure 5, appendix B). In addition to the assault phase of the attack range outlined in (a) above, a separate night assault range can be utilized by small units of combat-equipped test soldiers to provide an evaluation of a test rifle's compatibility with the equipment and tasks of a soldier during night operations. The categories of effectiveness as observed on the day attack range will be evaluated again, this time under the conditions dictated by darkness.

(4) Sniper Rifle Field Firing (type range shown in figure 6).

(a) The ideal field firing range to test the simulated tactical employment of a sniper rifle should be located on terrain as near to its natural state as possible. The range should be a minimum of 900 meters in depth and offer provisions along the firing line to accommodate several sniper posts, each affording a slightly different perspective of the target area.

(b) Standard "E" and "F" silhouette targets are used during sniper rifle field firing. (see TM 9-6920-210-4, Small Arms Targets and Target Materials). Targets (type F) will be placed at ranges of 100 through 250 meters, and the E type for the longer ranges (300-900 meters). Targets should be arranged, in logical locations, using varying degrees of concealment to depict an appropriate assortment of enemy personnel and positions suitable for sniping. The organization of targets should be irregular in relation to range in order to tax the capability of the sight ranging system. Specialized groupings of targets, representing enemy gun emplacements, observation posts, or other suitable targets, should be selectively engaged by the snipers, upon random command, to evaluate the systems responsiveness to change.

(c) The Army Marksmanship Training Unit (AMTU), Fort Benning, operates an ideal sniper field firing facility. This facility (MAERTENS Range) is a sniper rifle-oriented range and offers all the advantages of a facility tailored to meet the requirements of the specialized targets, distance, and instrumentation needed for an accurate evaluation. The range, and advice and assistance in its operation, are available to the test officer through coordination with the AMTU.

(d) A series of appropriate firing exercises to be conducted on a sniper range is defined in detail in paragraphs 70 and 71, DA Training Circular 23-14. The exercises address both individual and team employment under light conditions of day, dawn, dusk, and darkness. A combination of selected exercises using the MAERTENS (or a like type) Sniper Range and the moving targets of the Infantry Board's defense range will afford sufficient data to evaluate the tactical firing functions of the sniper rifle offered for test.

(e) If a night vision sight is furnished as a component of the test sniper rifle system, selected exercises will be fired during the hours of light conditions specified in the appropriate needs documents.

(f) A representative portion of all field firing will be conducted while wearing CB protective clothing and equipment.

(g) To obtain the maximum usable data, each sniper should fire each test and control rifle during the conduct of each separate phase of the tactical exercises selected.

c. Data Required.

(1) The following data will be recorded (by range used, weapon fired and test soldier-firer).

(a) Quick Fire Range.

1 Number of test and control rifles fired.

2 Mode of fire.

3 Type and lot number of ammunition.

4 Target distance.

5 Rounds fired, by individual, by rifle, and by target.

6 Target hits, by individual and by rifle, by range and mode of fire.

7 Targets hit, by individual, by rifle, by range and mode of fire.

8 Distribution of misses.

9 Total number of targets presented by range(s).

10 Time required to fire first round after exposure.

11 Time to shift fire.

12 Stoppages and malfunctions.

13 Time required to reduce stoppages and malfunctions.

14 Compatibility of the test rifle with the combat-related tasks of a soldier in quick-fire situation.

15 Target exposure times.

16 Trigger pulls by individual and rifle, and mode of fire.

17 Hits per trigger pull.

18 Time to first hit.

(b) Defense Range, Day and Night.

1 Number of test and control rifles fired.

2 Mode of fire.

3 Type and lot number of ammunition used.

4 Target distances.

5 Target exposure times.

6 Number of trigger pulls initiated.

7 Times required to fire first round after exposure.

8 Time to shift fire.

9 Total number of rounds fired, by individual and rifle.

10 Target hits, by individual and rifle, and by range and mode of fire.

11 Targets hit, by individual and rifle, and by range and mode of fire.

12 Total number of targets presented by range(s).

13 Feedback effect from bullet strikes in target areas (visual).

14 Distribution of near misses.

15 Muzzle obscuration effects (night tracer) on firer and adjacent firers.

16 Stoppages and malfunctions.

17 Time required to reduce stoppages and malfunctions.

18 Compatibility of the test rifle with the functions and combat-related tasks of a soldier in a defensive situation.

19 Hits per trigger pull.

20 Time to first hit.

(c) Attack Range, Day and Night.

1 Number of test and control rifles fired.

2 Mode of fire.

3 Type and lot number of ammunition used.

4 Total number of rounds fired, by individual and by rifle.

5 Targets hit, by individual and rifle, and by range and mode of fire.

6 Target hits, by individual and rifle, and by range and mode of fire.

7 Number of targets presented by range(s).

8 Distribution of near misses.

9 Stoppages and malfunctions.

10 Time required to reduce stoppages and malfunctions.

11 Compatibility of test rifle with functions and combat related tasks of a soldier in an attack situation.

12 Target exposure times.

13 Trigger pulls by individual and rifle, and mode of fire.

14 Hits per trigger pull.

15 Time to first round hit.

(d) Sniper Course.

1 A description of the exercises conducted.

2 Number of rounds fired at each range.

3 Type of target used at each range and location.

4 Number of first round hits, by range.

5 Time required to achieve first round hit, by range.

6 Time required to shift fires.

7 Time and number of rounds fired between hits on multiple target arrays (group targets).

8 An evaluation of night or limited visibility sight results.

9 Compatibility of rifle system with clothing and other equipment, and with the combat-related tasks of a sniper.

(2) The observation and comments of test participants on all matters related to the field firing functions of the test rifles should be solicited and recorded.

d. Analytical Plan.

(1) An appropriate subjective analysis of the comments, observations, and opinions expressed by the test participants should be prepared.

(2) The test officer, in consort with a statistician, will evaluate the data collected and establish the experimental design indicated. Collated data of significance will then be subjected to the type of statistical or comparison analysis commensurate with its pertinency to the measure of effectiveness sought.

(3) The results will be presented in narrative form supplemented with tables, charts, graphs, photographs, and motion pictures as appropriate.

11. Position Disclosing Effects.

a. This subtest will be conducted in accordance with the applicable provisions of TOP 1-3-515, Security From Detection, to determine firer

exposure and signature effects (silhouette, smoke, flash, blast, noise, and reflections) resulting from day and night firing of the test rifle-ammunition combination.

b. The signature effects tests conducted during this phase will be of particular value to the overall evaluation of a sniper rifle system. The sniper team depends on stealth and an inconspicuous firing position to help it live in a combat environment where local protection is an exception not to be depended upon. Characteristically, the sniper rifle will also have a telescopic sight that will merit special attention in this area of evaluation because of its distinctive shape, bulk, and reflective surface potential.

12. Portability/Transportability.

a. The applicable procedures of MTP/TOP 10-3-506, Man Portability/Transportability, should be performed to determine the suitability of the test rifle to be carried as a component part of an individual's fighting and/or existence load while performing his assigned duties.

b. The combat-oriented field firing exercises of paragraph 10 above, will provide adequate opportunity to observe the test rifle in the hands of a soldier as he handles, carries, and transports it through a variety of conditions and circumstances. In addition, the Clothing and Equipment Test Facility (CETF) located at Fort Benning, Georgia, offers an opportunity to evaluate a test rifle's compatibility with combat-oriented tasks by means of exposing the man-rifle system to a variety of simulated combat conditions. Although the Fort Benning facility is highly instrumented, many of its exercises are adapted to improvisation at other locations if access to the CETF is not feasible. Details associated with the operation of the CETF are contained in appendix B, TOP 1-1-046, Field Combat Test Exercises.

c. The applicable procedures of TOP 7-3-511, Airdrop Operations, should be performed to determine the test rifle's adaptability to parachute descent as a part of an airborne Infantryman's equipment.

d. The provisions of portability/transportability examinations as described above may be applied to both standard and sniper rifles.

13. Durability and Reliability.

a. Objectives. The objectives of this subtest are to examine the ability of the test rifle to successfully survive a projected service life, remain serviceable, and continue to function in a satisfactory manner.

b. Method.

(1) The number of rounds, or trigger pulls, prescribed in the requirements documents will be used as the minimum for an acceptable performance, and from as large a sample of rifles as is feasible. Particular attention will be addressed to firing the designated amount of ammunition at the rate of fire and in the mode designated.

(2) Throughout the course of all subtests, a log book for each rifle will be maintained of malfunctions, equipment failures, and other occurrences having a bearing on durability and functional reliability. Particular attention shall be given to conditions that cause weapon stoppages or otherwise prevent or limit the firing capability of the test rifle. The time required to reduce stoppages and malfunctions will be noted and recorded throughout all testing.

(3) This subtest is suitable for evaluating both standard and sniper rifles.

c. Data Required.

The following should be recorded as the information becomes available in any subtest or phase of the service test.

(a) Total number of rounds fired from each test weapon.

(b) Number of rounds by mode of fire.

(c) Stoppages.

(d) Malfunctions.

(e) Time required to reduce stoppages and malfunctions.

(f) Breakage.

(g) Rifle and/or rifle component parts failures not listed above.

(h) Total number of trigger pulls.

(i) Ammunition lot number.

d. Analytical Plan.

(1) All durability/reliability information and data available during tests should be collected, collated, and reduced to a workable form.

(2) An analysis of comments, observations, and opinions expressed in relationship to durability or reliability should be prepared.

(3) An appropriate statistical analysis of times and comparison data obtained should also be prepared.

(4) Findings should be presented in narrative form supplemented by pictorial and graphic evidence when appropriate.

14. Adverse Conditions.

a. The applicable procedures of MTP/TOP 3-3-524, Adverse Conditions, should be accomplished to determine the performance level of the test rifle under adverse environmental conditions.

b. A candidate weapon, its ammunition, and ancillary equipment must be designed to function properly under the most rigorous environmental conditions likely to be encountered in combat. During the preliminary stages of development and engineering, a test rifle will be subjected to precisely controlled and instrumented environmental chamber tests under extremes of temperature, humidity, and other atmospheric conditions. However, the use of the rifle under actual climatic conditions, in a combat or simulated combat environment, and in the hands of representative troops may produce results undiscovered during engineer-type testing.

c. If needed, procedures for testing a rifle in a desert, tropic, and arctic environment may be found in the following:

(1) TOP 1-1-008, Tropic Environmental Considerations.

(2) MTP/TOP 3-4-001, Desert Environmental Test of Armament and Individual Weapons.

(3) MTP/TOP 3-4-003, Armament and Individual Weapons (Tropic).

(4) MTP/TOP 3-4-004, Arctic Environmental Test of Individual Weapons-Rifles (Semi-automatic and automatic) and Pistols.

15. Maintenance Evaluation.

a. Objectives. The objectives of this subtest are to determine (1) whether the maintenance functions, as listed on the maintenance allocation chart, can be readily accomplished using the manuals, tools, repair parts, and skills authorized, (2) whether the pertinent maintenance manuals are accurate and adequate, and (3) whether the test rifles maintenance requirements meet the criteria of requirements documents.

b. Method. An evaluation of maintainability in accordance with the applicable provisions of TECOM Reg 750-15, Maintenance Evaluation During Testing, will be conducted. The following will be emphasized:

(1) Throughout the conduct of each subtest, all scheduled and unscheduled maintenance functions shall be performed by using only authorized tools and procedures in accordance with instructions contained in the maintenance package.

(2) Operator maintenance shall be performed by test soldiers as the requirement arises.

(3) Direct and general support maintenance functions will be performed by soldier repairman with the MOS appropriate to the skill level required.

(4) Test soldiers and maintenance personnel will be observed while performing maintenance functions and questioned to determine whether any function is unduly difficult, requires excessive time, or reveals discrepancies prejudicial to the ease of maintenance.

(5) Maintenance manuals, issued with the test item, will be continually analyzed for clarity, errors, and/or omissions.

c. Data Required. The following will be recorded:

(1) Operator maintenance performed on each test rifle.

(2) All organization direct support and general support maintenance performed on each rifle.

(3) Observations of test supervisors, test soldiers, and maintenance personnel regarding ease or difficulty of performing maintenance.

(4) Data regarding errors or omissions in maintenance manuals.

(5) Specific observations regarding clarity and overall adequacy of the total maintenance package.

d. Analytical Plan.

All maintenance data collected throughout the conduct of the service test shall be collated and subjected to an appropriate analysis. Results will be presented in narrative form and supplemented with graphic and pictorial evidence as appropriate.

16. Human Factors Engineering.

a. The appropriate procedures of MTP/TOP 3-3-521, Human Factors Engineering, shall be applied to determine the degree to which the test rifle has incorporated features conducive to soldier acceptance and compatibility with user comfort and ease of operation.

b. The requirements documents in support of a new or improved rifle will normally provide detailed specifications related to human factors. The following have been extracted from past requirements and are typical of the type factors to be considered. The rifle should:

(1) Be capable of being fired from either the right or left shoulder in all normal firing positions.

(2) Be capable of being fired by soldier wearing field equipment and clothing appropriate to the environmental conditions of the test, and also while wearing CB protective mask and/or clothing.

(3) Not produce undue discomfort to the firer from the blast, noise, or recoil.

(4) Not produce a cartridge ejection pattern that interferes with the firer or an adjacent firer.

(5) Produce a minimum heat transfer from weapon to firer, (combustion, or reflected sun induced).

(6) Be equipped with a safety(s), control, and sights positioned so as to permit maximum ease of operation with a minimum of unnatural effort.

(7) Be of such configuration, sight silhouette, and balance with respect to eye relief to produce the most favorable viewing, aiming, and firing.

(8) Be of such overall configuration and length to facilitate ease of operation in all firing positions for the 5th through 95th percentile of the user population.

17. Value Analysis.

a. Objective. The objective of this subtest is to identify fruitful areas for subsequent value engineering.

b. Method. Throughout testing, note will be taken of any unnecessary, costly, or nice-to-have features which might be modified or eliminated without compromising the effectiveness or safety of the test rifle. (Attention is directed to TECOM Reg 700-1, Value Engineering.)

c. Data Required. The comments, observations, and reports of areas detected and identified as potential areas for an applicable value engineering effort should be recorded.

d. Analytical Plan. The data collected should be analyzed and a narrative recommendation prepared for developer improvement in the appropriate areas.

Recommended changes to this publication should be forwarded to Commanding General, US Army Test and Evaluation Command, ATTN: AMSTE-ME, Aberdeen Proving Ground, Maryland 21005. Technical information related to this publication may be obtained from US Army Infantry Board, ATTN: STEBC-MO-M, Fort Benning, Georgia 31905. Additional copies of this document are available from the Defense Documentation Center, Cameron Station, Alexandria, Virginia 22314. This document is identified by the accession number (AD No) printed on the first page.

APPENDIX A
REFERENCES

1. AR 70-10, Research and Development, Test and Evaluation During Development and Acquisition of Materiel.

2. MIL STD 1472A, Human Engineering Design.

3. TM 9-6920-210-14, Small Arms Targets and Target Materials.

4. FM 21-75, Combat Training of the Individual Soldier and Patrolling.

5. FM 23-5, Rifles (cal. 30) M1.

6. FM 23-8, Rifles, US (7.62mm) M14; M14A1.

7. FM 23-9, Rifles, (5.56mm) M16A1.

8. FM 23-12, Rifle Squads (Techniques of Fire and Tactical Application).

9. FM 23-71, Rifle Marksmanship.

10. Training Circular 23-14, Sniper Training and Employment.

11. TECOM Reg 70-24, Documenting Test Plans and Reports.

12. TECOM Reg 70-34, Risk Analysis for Suitability Tests.

13. TECOM Reg 385-6, Verification of Safety of Materiel During Testing.

14. TECOM Reg 700-1, Value Engineering.

15. TECOM Reg 750-15, Maintenance Evaluation During Testing.

16. TOP 1-1-012, Classification of Deficiencies and Shortcomings.

17. TOP 1-1-019, Testing Armament and Individual Weapons.

APPENDIX B
TYPE RANGE DIAGRAMS

F gure 1
Type Quick Fire Range

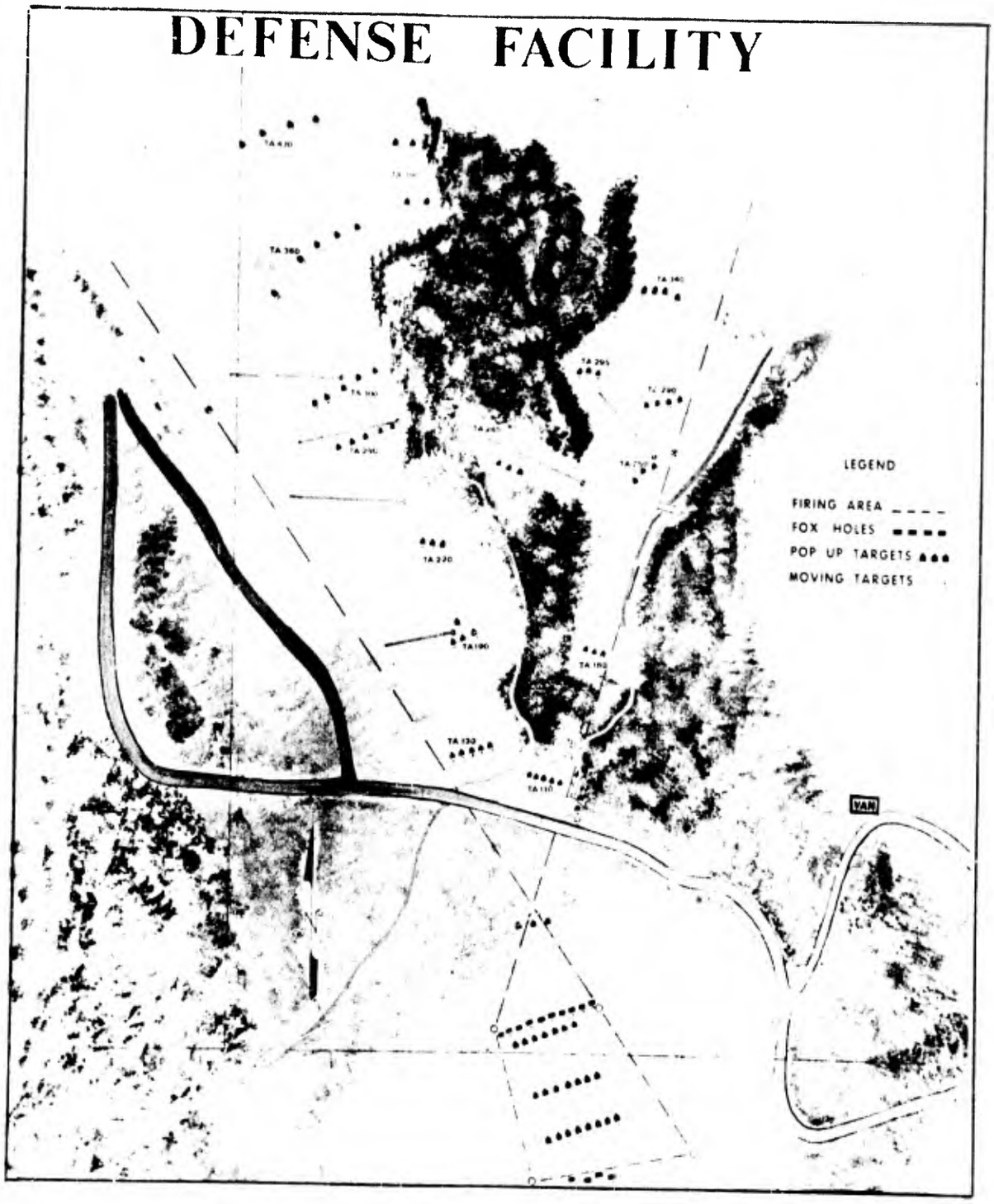

Figure 2
Type Defense Range

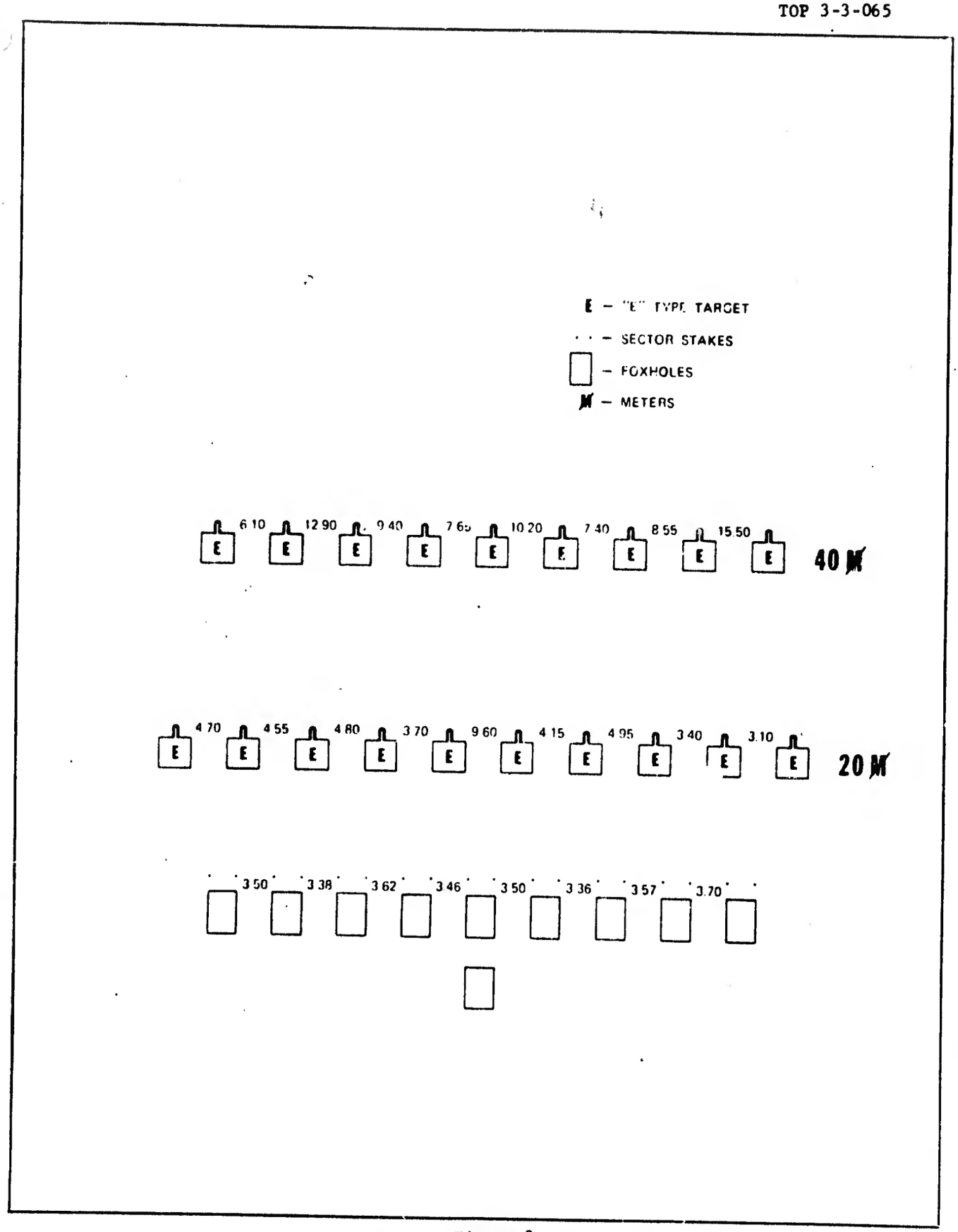

Figure 3
Type Night Defense Range

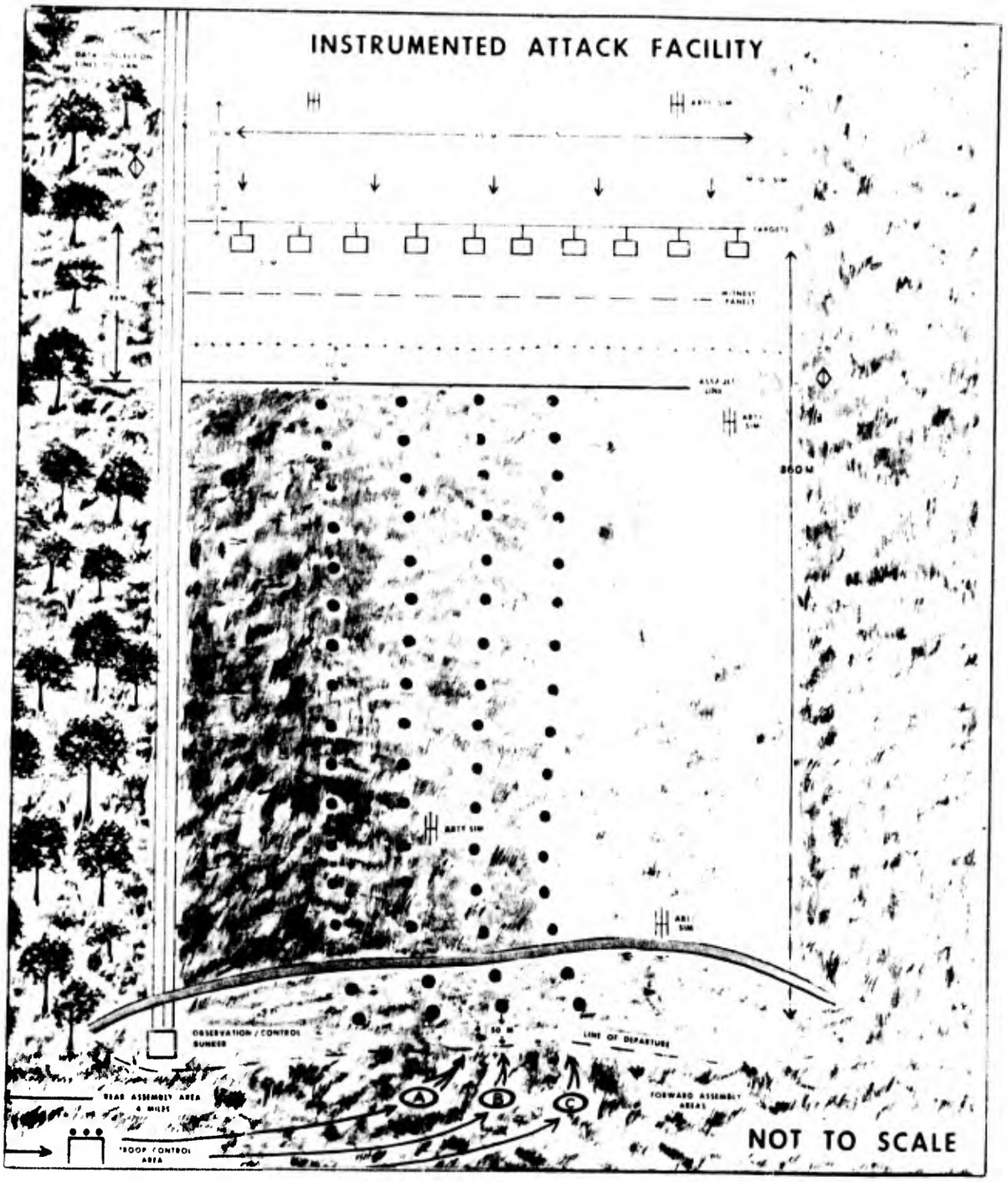

Figure 4
Type Day Attack Course

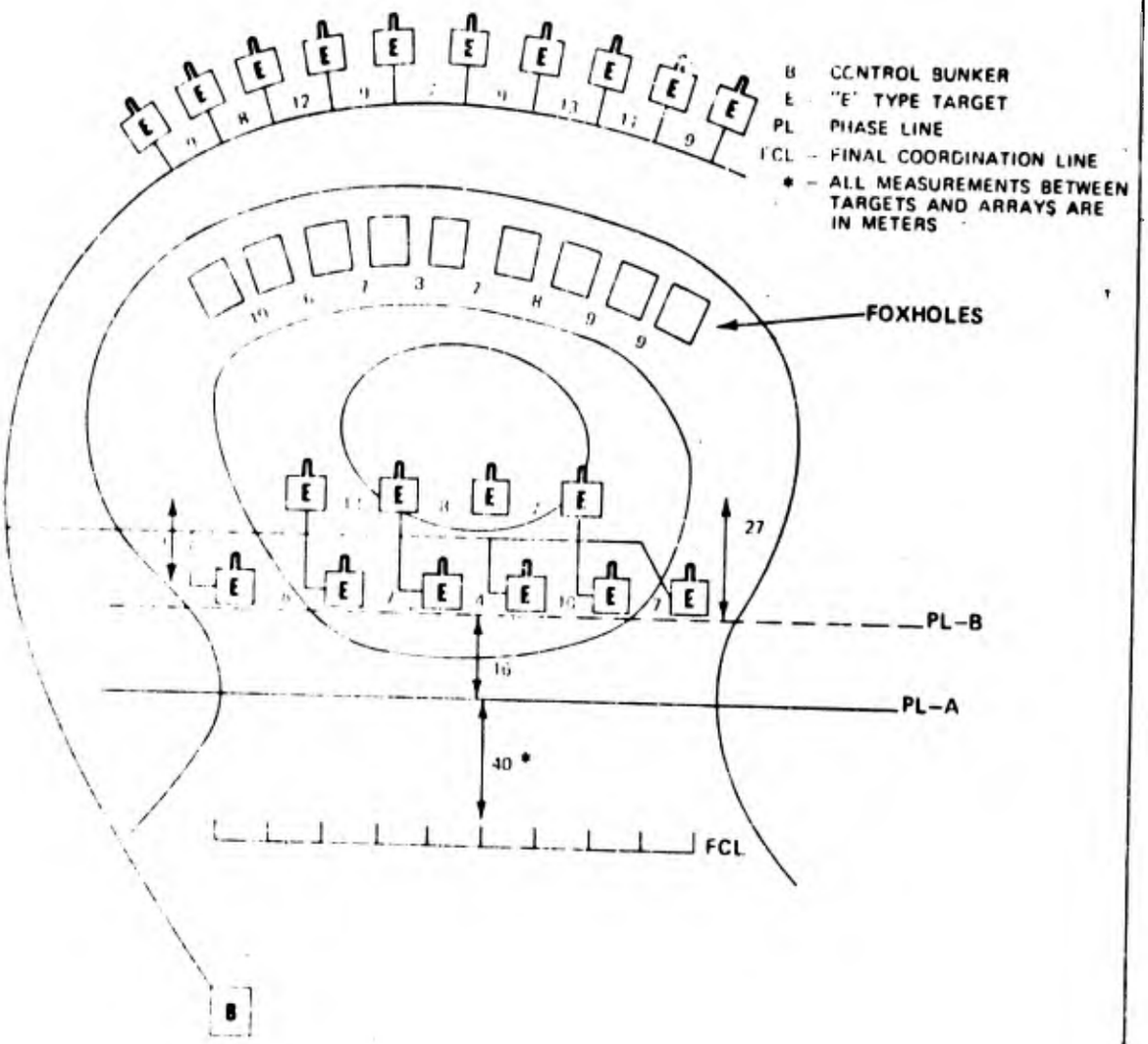

Figure 5
Type Night Assault Range

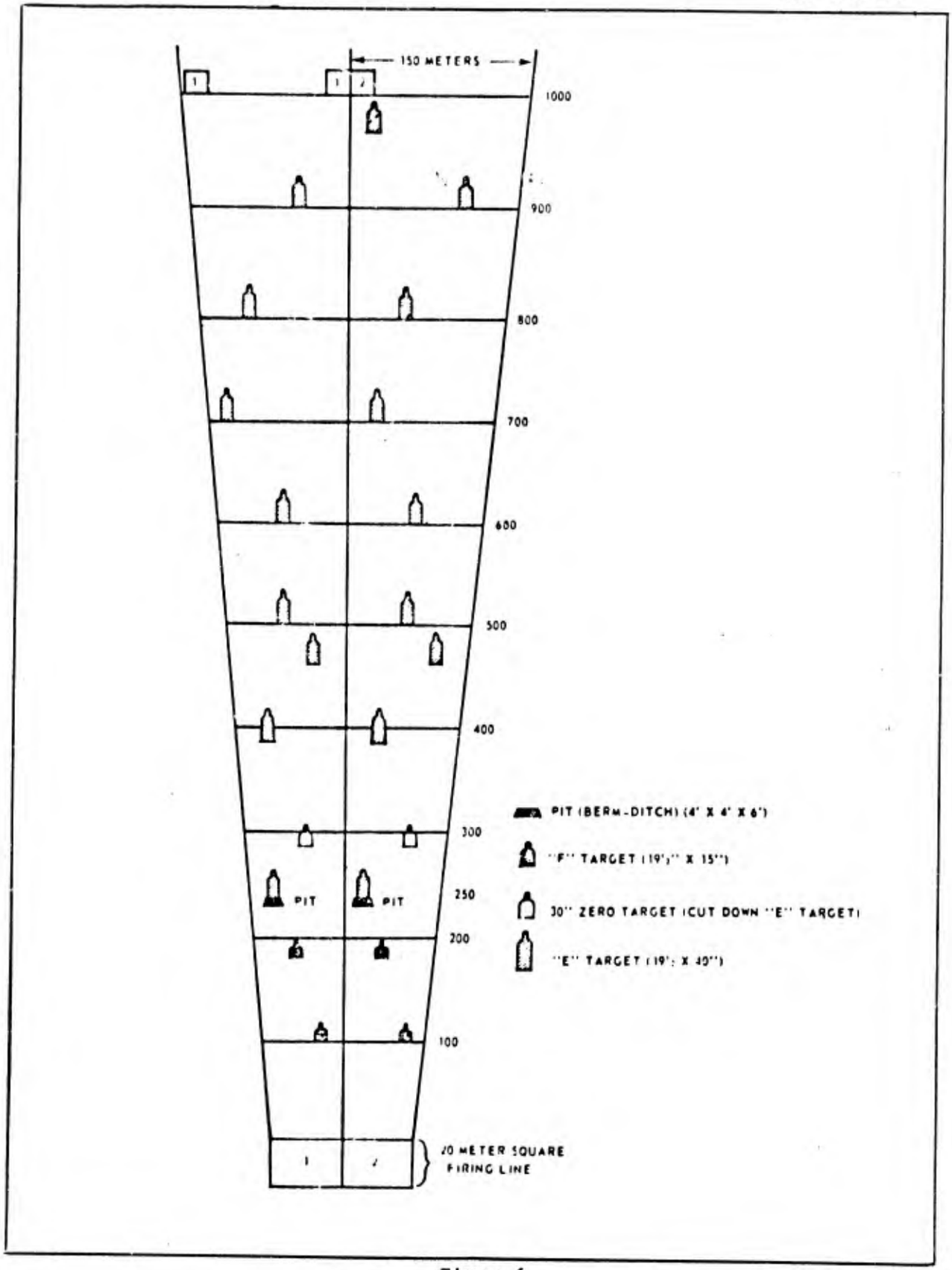

Figure 6
Type Field Firing Sniper Range