

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

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Test Operations Procedure 3-3-066

AD 750104

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RIFLE, RECOILLESS

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SECTION I GENERAL

1. Purpose and Scope.

a. This Test Operations Procedure (TOP) is offered as a guide to assist in the preparation of a test plan to support the conduct of an Expanded Service Test (EST) of a type recoilless rifle. It provides test methods and techniques designed to determine if a candidate recoilless rifle meets the criteria established in a materiel needs document and is suitable for use by the U.S. Army.

b. As outlined, the testing procedures are broad in scope. Selected subtests offer a method of satisfying requirements in the areas of preoperational inspection; safety; training; evaluating the functional responses of the weapon during operational employment; and examining the test item in human factors and value analysis areas. The procedures address both man-portable and/or vehicular-transportable type recoilless rifles.

2. Background.

a. With the advent of armor plate, military men began a continuing search for a means of penetrating and destroying that protective shield. During the past two decades, the U.S. Army developed and achieved a measure of success in the field through employment of a series of recoilless rifles. The first family produced (57-mm and 75-mm) served well in World War II and Korea, and was later replaced by the present standard 90-mm and 106-mm models. This recoilless family of weapons, characterized by a high ratio of firepower to launcher weight, has provided the front-line soldier with an ability to deliver accurate and lethal fire against enemy armor, fortifications, and personnel.

b. As the armored hide of potential adversaries grows thicker and tougher, the requirement for counteracting weaponry development will continue. Barring an unforeseen breakthrough, the recoilless rifle system will continue to serve the Infantryman as an anti-armor protection. Precedent indicates the present models will be improved by design and production techniques as the search for optimum weaponry goes on, and that these improved models will be offered for expanded service testing.

c. For the purposes of these procedures, a candidate recoilless rifle is assumed to be a lightweight recoilless weapon designed for both anti-tank and anti-personnel roles. Characteristically, it will

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be an air-cooled, breech-loaded, single-shot weapon which will fire a fixed round of ammunition. It will be equipped with a manually operated breech mechanism and a percussion-type firing mechanism. The weapon might be man-portable or one employing vehicular transport, and might be fired from the shoulder, a ground mount, or from a vehicle.

3. Equipment and Facilities.

a. Equipment.

- (1) Test item with components.
- (2) Control item with components.
- (3) TOE Infantry unit.
- (4) Airborne Infantry unit.
- (5) Weighing equipment.
- (6) Linear measurement equipment.
- (7) Photographic equipment.
- (8) Communications equipment.
- (9) Tactical vehicles, Air and Ground.
- (10) Meteorological equipment.
- (11) CB protective equipment.
- (12) Safety and First Aid equipment.
- (13) Ear plugs.
- (14) Air delivery equipment.
- (15) Cleaning equipment.
- (16) Ammunition.
- (17) Pyrotechnics.
- (18) Other equipment prescribed by referenced MTP/TOP.

b. Facilities.

- (1) Firing ranges and appropriate targets.
- (2) Field training area.
- (3) Maintenance facilities.
- (4) Classroom, office, and storage space.
- (5) Air field and drop zone.
- (6) Other facilities as prescribed in referenced MTP/TOPs.

SECTION II TEST PROCEDURES

4. Supporting Tests.

a. Proposed testing procedures are described in successive paragraphs, but there is no requirement that subtests be conducted in the sequence in which they are listed. Most will be performed simultaneously with or overlapping the conduct of other phases of testing. The subtests are broad, flexible, and are not intended to usurp the prerogative of the test officer. His exact and detailed plan of test should reflect the expertise and experience of available advisors and the 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 frame in which to accomplish the test, or limitations on funds, manpower, or general support facilities. To identify the best means of securing meaningful data within the limitations imposed, the tester should solicit the assistance of a statistician. The statistician may also assist in determining the overall experimental design to include fixing the statistically optimum number of test personnel required, the number of test and control systems needed for each phase, the number of rounds to be fired to obtain adequate results, and the number of repetitions or replications required to produce statistically sound data. Additional guidance may be found in MTP/TOP 3-1-002, Confidence Intervals and Sample Size.

c. A technique used throughout these subtests will require comparing the test item with a control item. The control item will usually be a standard inventory weapon, related characteristically as close to the candidate weapon as possible. To aid in obtaining a valid comparison, the control item should be in new or nearly new condition and be subjected throughout the conduct of the testing, to the same care and maintenance procedures as the test item.

d. A log book should be maintained as a chronological record of remarks, observations, meteorological data, times, comparisons, and other pertinent data as it occurs. An accurate compilation will expedite the collation of data and information required to support the test findings. Photographs, motion pictures, charts, and graphs are recommended supplements to narrative presentation.

e. When risk analysis is directed, TECOM Regulation 70-34, Risk Analysis for Suitability Tests, should provide adequate guidance.

f. Common Service MTP/TOP, the test described in Section III, and other published documents to be considered in formulating and expanded service test plan are as follows:

	<u>TEST SUBJECT TITLE</u>	<u>PUBLICATION NO.</u>
(1)	Preoperational Inspection and Physical Characteristics (para 5, this TOP)	3-3-500
(2)	Infantry Weapons and Ammunition Safety (para 6, this TOP)	3-3-517
(3)	Personnel Training (para 7, this TOP)	3-3-501
(4)	Boresight and Zero (para 8, this TOP)	3-3-503
(5)	Speed and Precision of Lay (para 9, this TOP)	3-3-505
(6)	First and Subsequent Round Hitting (para 10, this TOP)	3-3-513
(7)	Round-to-Round Dispersion (para 11, this TOP)	3-3-512
(8)	Tracking and Hitting Performance, Stationary Gun Mount, Moving Target (para 12, this TOP)	3-3-507

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	<u>TEST SUBJECT TITLE</u>	<u>PUBLICATION NO.</u>
(9)	Antipersonnel and Antimateriel Capability (para 13, this TOP)	4-3-104
(10)	Obscuration and Security from Detection (para 14, this TOP)	3-3-516 1-3-515
(11)	Battlefield Mobility (para 15, this TOP)	
(12)	Air Delivery (para 16, this TOP)	7-3-512 7-3-515 7-3-516
(13)	Adverse Conditions (para 17, this TOP)	3-3-524
(14)	Durability (para 18, this TOP)	
(15)	Maintainability (para 19, this TOP)	
(16)	Human Factors Engineering (para 20, this TOP)	3-3-521
(17)	Value Analysis (para 21, this TOP)	

SECTION III
SUPPLEMENTARY INSTRUCTIONS

5. Preoperational Inspection and Physical Characteristics.

a. The objectives of this test are to verify the completeness of the candidate recoilless rifle received for service testing and to compare its physical characteristics with criteria established in appropriate materiel needs documents. A further objective is to determine that each component furnished for the test is in a serviceable condition and suitable for testing.

b. The applicable procedures of MTP/TOP 3-3-500, Preoperational Inspection and Physical Characteristics, Armor and Individual Weapons, should be performed to satisfy the requirements of this phase.

c. In collecting data to support test findings, it is important to isolate the when, where, and why of events, in addition to the final judgement of what happened. It is possible that a failure attributed to service testing may actually have been a by-product of poor shipping practices or improper handling of the test item prior to its arrival at the test site. Data of this nature, in order to assure valid reporting, must be discovered and recorded during this preoperational inspection phase.

6. Safety.

a. The appropriate 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 weapons received for testing.

b. During this phase, the test officer should identify any restrictions imposed by the safety release, directives, or local rulings which might influence the test results. Final reports should include a judgement of the test officer as to the extent of any such influence.

7. Personnel Training.

a. Training as outlined in applicable procedures of MTP/TOP 3-3-501, Personnel Training, should be conducted to determine (1) the type and duration of instruction required to train test soldiers in the use of the test item, (2) whether the proposed program of instruction is adequate to develop proficiency in the use of the item, and (3) whether the item meets the training criteria contained in the applicable requirements documents.

b. During this phase, test personnel should be thoroughly familiarized with:

- (1) The recoilless rifle offered for expanded service testing.
- (2) The conduct, procedures, and objectives of the test.
- (3) Their individual assignment and responsibilities.

c. In order to achieve a high degree of validity in tests of comparison, it is essential that the test soldier be equally as familiar with the test item as he is with the control item.

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8. Boresight and Zero.

a. The applicable procedures of MTP/TOP 3-3-503, Boresight and Zero, should be performed to fulfill the preoperational requirements of gun-sight alignment essential to the conduct of subsequent tests.

b. Boresighting provides a basis for all sight adjustment. It is performed to establish a definite relationship between the axis of the weapon and its sight and is accomplished to facilitate zeroing. The zero of the recoilless rifle will be obtained by firing the weapon and adjusting the sight so that the point of aim and the point of strike of the projectile coincide as nearly as possible at a given range. Boresighting and zeroing are not one-time exercises but continuing requirements preceding most major phases of live firing. Test personnel should become proficient in the techniques before progressing to the live firing prescribed in subsequent tests.

9. Speed and Precision of Lay.

a. The applicable procedures of MTP/TOP 3-3-505, Speed and Precision of Lay, should be accomplished to determine the time required for a representative gunner to accurately lay the weapon's sight on a clearly defined target.

b. The procedures of the referenced MTP/TOP describe exercises designed to prepare personnel, materiel, and facilities to conduct speed and precision-of-lay crew drills with any direct fire weapon. Test officers should adapt the procedures to suit his requirements as dictated by the characteristics of the weapon he is testing.

10. First and Subsequent Round Hitting.

a. The ultimate goal of direct fire gunnery systems is destruction of targets in the shortest possible time. For anti-tank weapons in general, and the recoilless rifle in particular, the time element is nearly as important as hitting the target. However, the probability of a first round hit at an unknown range of most direct fire weapons is such that heavy reliance must be placed on effective hitting with a second or even subsequent rounds in order for a recoilless rifle to be suited for Army use, it should have the inherent capability of getting a high percentage of first round hits. Additionally, the skills required to operate the weapon and obtain second or third round hits after initial misses must be within the capabilities of the personnel who use it.

b. MTP/TOP 3-3-513, First and Subsequent Round Hitting, is a document prepared for direct fire, large caliber, vehicle-mounted weapons systems. By proper selection of procedures and minor

alterations in methodology, the document can serve as a valuable guide to the test officer conducting an expanded service test of a recoilless rifle. The preliminary work of preparing for testing is applicable in its entirety. Firing tests can apply with only minor adjustments, and data reduction presentation instructions will require only those adjustments resulting from the methodology selected.

11. Round-to-Round Dispersion.

a. The appropriate procedures of MTP/TOP 3-3-512, Round-to-Round Dispersion, should be performed to determine the candidate recoilless rifles' dispersion characteristics and hit probability against vertical targets.

b. The final and determining factors of a weapon's acceptability is its ability to deliver effective fire rapidly and accurately upon a target. No dispersion is the ultimate objective. In simple terms, a good hit probability is achieved when dispersion is small and the mean of the points of impact (center of impact) is near the point of aim. MTP/TOP 3-3-512 addresses the preparations for conducting a test of dispersion, a series of firing exercises designed to provide conclusive results, and a detailed system of computation designed to provide ample data for an appropriate analysis.

12. Tracking and Hitting Performance, Stationary Gun Mount, Moving Target.

a. The applicable procedures of MTP/TOP 3-3-507, Tracking and Hitting Performance, Stationary Gun Mount, Moving Target, should be performed to determine (1) how well the test weapon's sight and manipulation system facilitates tracking and hitting a moving target, and (2) the degree to which the candidate recoilless rifle meets the requirements of appropriate materiel needs documents.

b. MTP/TOP 3-3-507 prescribes the preparation for and the conduct of a series of both non-firing and firing exercises designed to test a weapon's capability to hit a moving target. It describes the details of data collection and recording, and offers guidance in the process of reducing the collected data and presenting it in an appropriate report.

13. Antipersonnel/Antimateriel Capabilities.

a. The ancillary role of a recoilless rifle employed against enemy personnel and materiel should be evaluated during this phase of testing. A recoilless weapon assumes this role with the selection and utilization of an appropriate round of antipersonnel/antimateriel

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ammunition. Because of its blast, fragmentation, and concussion effect, this type ammunition may be employed against field fortifications, bunkers, pill boxes, personnel, buildings, lightly or unarmored vehicles, built-up areas, and crew served weapons.

b. The capability of a type recoilless rifle to fire a designated antipersonnel/antimateriel round of ammunition will be determined by performing the applicable procedures of MTP/TOP 4-3-104, Projectile, Antipersonnel/Antimateriel. The document addresses the following types of ammunition:

- (1) Canister (any antipersonnel (APERS) projectile not fuzed).
- (2) APERS (antipersonnel incorporating a fuze).
- (3) High explosive (HE).
- (4) High Explosive Plastic (HEP).
- (5) High Explosive Antitank-Multipurpose (HEAT-MP).
- (6) White Phosphorus (WP).

c. The document also contains detailed procedures which outline firing exercises, target arrangement, scoring, and the collection and processing of data to support an appropriate evaluation.

14. Obscuration and Security from Detection.

a. Two common service test procedures, 1-3-515, Security from Detection, and 3-3-516, Obscuration, should provide the test officer with sufficient procedures for him to determine:

- (1) The degree to which the test item produces signature characteristics which will aid an enemy to locate the friendly position by sight, sound, or instruments.
- (2) The degree to which targets may be obscured from a friendly view by signature characteristics of smoke, flash, dust, and blast.

b. Successful combat operations dictate minimum signature effects from a weapon. Every effort must be made to ensure that noise, flash, reflection, blast, smoke, and heat radiation are thoroughly tested, measured, and properly evaluated for each new candidate recoilless rifle. MTP/TOP 1-3-515 outlines a series of subtests designed to fulfill the requirement.

c. Obscuration of the target immediately after firing is a phenomenon typically caused by smoke discharged or by dust raised by muzzle blast. Muzzle blast is a generic term used frequently in conjunction with direct fire weaponry to describe the physical effects of the release of propellant gases at high pressure upon the ground. This normally lifts dust, dried vegetation, and/or small debris. Further, the flash of the weapon may momentarily destroy a gunner's line of sight, thereby obscuring the target and obstructing the sensing required for firing adjustments.

d. The techniques of testing described in the two common service procedures referenced above allow the combining of their subtests to obtain common results. The principle difference, that of objective, is generated only by perspective: position disclosing effects are initiated from an enemy point of observation, while obscuration is a friendly gun position consideration. Most of the requirements may be achieved concurrently with the live-fire exercises of other subtests by means of observers and picture taking from different locations.

15. Battlefield Mobility.

a. Objectives.

This subtest should evaluate the man-portability of the test item, examine the extent to which the test weapon is adapted to vehicles proposed as prime movers or carriers, and determine the ease and speed with which the candidate recoilless rifle can be mounted and dismounted from a carry position.

b. Method.

(1) The test item with all components, including a representative ammunition load, should be issued to the appropriate individuals or crews of an infantry unit. The test item should be subjected to the activities of other man carried weapons and equipment as the unit participates in tactical exercises over varying terrain under the conditions of a combat environment. Appropriate field exercises can be found in TOP 1-1-046, Field Combat Test Exercises.

(2) The complete test system, on its vehicular mount, should be transported through heavily wooded areas, mud, marsh, sandy soil, rocky roads, and up and down steep grades. If the test weapon is mounted on a vehicle with an inherent swimming capability, the system should be transported across water.

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(3) Repetitive time trials should be conducted during which an appropriate crew should mount and dismount the test item from its designated place of transport. In addition to on and off-loading, the test weapon should be man-moved by its crew to a firing position established at distances up to 500 meters from the dismount point.

(4) The control item should be subjected to the same exercises and treatment as the test system in each of the above situations.

c. Data Required.

(1) Comments and observations of test personnel related to the performance of the test and control systems during vehicular moves. This information should be supported by photographs and motion pictures.

(2) The average time required for crews to mount and dismount the test weapon and the control item. Times should be recorded from a starting position of the weapon in its locked-for-transport configuration to a finishing position of locked in ground-mount and ready to fire. The reverse procedure should also be timed.

(3) The average distance traveled and the average times required to unload the test and control weapons and emplace them in a firing posture.

(4) Comments and observations related to the compatibility of the test item's movement characteristics with the combat associated tasks of the infantryman, his clothing, his equipment, and other weapons.

d. Analytical Plan.

(1) A subjective analysis of comments, opinions, and observations collected throughout the test phase should be performed. The narrative results should be supported by pictures, movies, charts, or graphic illustrations, where appropriate.

(2) An appropriate statistical analysis of the measures of effectiveness should be conducted to determine any significant differences between the test and control items' effects on performance during trials conducted. A study of significant findings as a result of mean-time comparisons should be included.

16. Air Delivery.

a. The applicable procedures of MTP/TOP 7-3-512, Airdrop; MTP/TOP 7-3-515, Air Portability, Internal; and MTP/TOP 7-3-516, Air Portability, External, should be conducted to determine the degree to which the candidate recoilless rifle lends itself to air delivery.

b. Depending upon the characteristics of size, weight, and configuration, a candidate recoilless rifle might lend itself to an individual-carried airdrop; to a packaged drop; to internal; or to external air movement/delivery employment.

c. Each of the referenced MTP/TOPs contains detailed procedures to test the suitability of a test item for delivery by the means, methods, and techniques their subjects address. Each document outlines the equipment and facilities required, pre-test operations, subtests to be conducted, and data collection, reduction, and presentation.

17. Adverse Conditions.

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

b. A candidate weapon, its ammunition, and its 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, weapons are subjected to precisely controlled and instrumented environmental chamber tests under extremes of temperature, humidity, and other atmospheric conditions. However, the actual use of the test item under severe climatic conditions, in a combat or simulated combat environment, and in the hands of representative troops may produce results undiscovered during controlled testing. This phase of the service test, following the guidance of MTP/TOP 3-3-524, will test that possibility.

18. Durability.

a. Objective. To determine the degree to which the test item will survive a projected service-life, in a serviceable condition, while performing its intended function.

b. Method.

(1) The durability characteristics of a test item are determined during the course of an expanded service test by conducting varied and representative testing for a sufficient time to develop a test item history of deterioration, degradation, weakness, malfunction, and/or other failures. Throughout all testing, a record should be maintained, covering each major component of the test recoilless rifle and its ancillary equipment, to accurately document the time and circumstances of events bearing on the subject.

(2) The test weapon (and the control item) should be transported in its authorized configuration and/or positions of mount over tank trails, cross country, up and down steep slopes, and through woods and underbrush for the distance prescribed in the appropriate requirements documents. An appropriate portion of each phase of transport will be conducted with the test weapons loaded and locked if safety tolerances will permit. Both test and control items will be inspected prior to, during, and at the completion of each phase of transport.

(3) Man-carried test items should be subjected to a series of field exercises, emphasizing tactical employment in a combat environment, with the test soldiers performing combat related tasks. The exercises should be of sufficient duration to determine if the life expectancy of the test item as stated in materiel needs documents is affected by normal employment. Test officers should refer to TOP 1-1-046, Field Combat Test Exercises, for assistance in the selection and conduct of appropriate field exercises.

c. Data Required.

(1) The comments, observations, and recorded findings of failures, weaknesses, or malfunction discerned during the conduct of all test phases. Particular emphasis should be placed on scrutinizing information obtained during the conduct of firing exercises, mobility testing, adverse conditions, and air delivery phases of testing.

(2) The results of inspection conducted prior to, during, and following the transport phase of field tests.

(3) Statistics related to time, distance, and comparisons of the test item and control item.

(4) Pictorial evidence applicable to test findings.

d. Analytical Plan.

(1) A narrative report of significant findings resulting from the collection of comments, opinions, and observations should be prepared, and supported with pictorial evidence, where appropriate.

(2) An appropriate statistical analysis of the measures of effectiveness should be conducted to determine any significant differences between test and control items, and test item and stated criteria. A study of significant findings resultant to the mean-time comparison tests of test and control items should be included.

19. Maintainability.

a. Objective.

To determine if the candidate weapon can be properly maintained at the directed levels of maintenance expertise, and to determine the adequacy of the maintenance package.

b. Method.

(1) The evaluation of the test item's maintainability characteristics should be a continuing process conducted concurrently with all phases of the expanded service test.

(2) First echelon maintenance responsibility should be assigned to normal crew members, their performances closely supervised, and the reaction of the test item to their care accurately recorded. Higher echelon maintenance requirements should be performed by personnel representative of the skills and capabilities normal to the level of operation.

(3) All maintenance should be performed with maintenance package tools, equipment, and parts, and should follow maintenance package instructions.

(4) If needed, TECOM Regulation 750-15, Maintenance Portion of Service Test, should be consulted for detailed maintenance procedure instructions.

c. Data Required.

(1) The comments, observations, and opinions of test personnel as pertain to the care and cleaning, repair, parts usage, and ease of keeping the test item in a serviceable condition. Any features of the test item which require complex, frequent, and time consuming maintenance or repair should be recorded.

(2) Remarks and supporting data to judge the adequacy of the maintenance package.

(3) Comparison maintenance data on test versus control items. This should include down-time, repair-time, and availability of parts information.

d. Analytical Plan.

(1) Significant data should be collated and a subjective analysis prepared from the information obtained from comments, observations, and opinions of test personnel. The analysis should be supported with appropriate pictorial evidence where appropriate.

(2) An appropriate statistical analysis of the measures of effectiveness should be conducted to determine any significant differences between test and control item, or between the test item and the stated criteria.

20. Human Factors Engineering.

a. The applicable procedures of MTP/TOP 3-3-521, Human Factors Engineering, should be accomplished to determine if the test item meets the human factors requirements as expressed in materiel needs documents, is in accordance with basic human factors principles, and to the degree the test weapon meets with troop approval.

b. In recommending a new weapon as suitable for Army use, considerable care must be given to evaluation the man-machine relationship which affects compatibility with skills, aptitudes, and the limitations of the soldier who will employ it. The MTP/TOP referenced above addresses the subject in a series of tests which produce both subjective and quantitative data.

c. A human factor checklist should be prepared, using the criteria provided in the MN document as well as applicable design criteria from MIL-STD 1472A. In addition to specific design criteria, the checklist should also incorporate quantitative mission performance criteria (time, accuracy, etc.) which relate to and are effected by the man-machine relationship).

d. Human factors personnel should be consulted prior to beginning the expanded service test for assistance in preparing pertinent portions of the plan and reports, and to aid the development of interview and questionnaire items.

21. Value Analysis.

a. Objective.

To determine if the test item has any features which might be eliminated without adversely affecting its performance, functioning, serviceability, or safety.

b. Method.

A value analysis should be part of each phase of the expanded service test. During the initial orientations, personnel should be alerted to be cost conscious in their approach to each facet of testing within their sphere of influence. Further, they should be made aware of the requirements for, and the means and methods of reporting, their opinions and observations.

c. Data Required.

The comments, observations, and opinions of test personnel should be obtained, recorded, and supported by photographs or charts where appropriate.

d. Analytical Plan.

An appropriate analysis of data collected should be performed and the narrative report supported with graphic or pictorial evidence, when appropriate.

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.) stamped on the first page.

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APPENDIX
REFERENCES

1. AR 70-10, "Research and Development, Test and Evaluation During Development and Acquisition of Materiel."
2. FM 23-11, "90-mm Recoilless Rifle, M67."
3. FM 23-82, "106-mm Recoilless Rifle, M40A1."
4. TECOM Regulation 70-24, "Documenting Test Plans and Reports".
5. TECOM Regulation 70-34, "Risk Analysis for Suitability Tests."
6. TECOM Regulation 385-6, "Verification of Safety of Materiel During Testing."
7. TECOM Regulation 750-15, "Maintenance Evaluation During Testing."
8. TOP 1-1-012, "Classification of Deficiencies and Shortcomings."
9. TOP 1-1-046, "Field Combat Test Exercises."
10. MTP/TOP 3-1-002, "Confidence Intervals and Sample Size."

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13. ABSTRACT Describes a method for evaluation of recoilless rifle operational and functional performance characteristics. Identifies supporting test, facilities, and equipment required. Provides procedures for preoperational inspection, physical characteristics, safety, personnel training, boresight, zero, speed and precision of lay, first and subsequent round hitting, round-to-round dispersion, tracking and hitting performance, antipersonnel and antimateriel capability, obscuration, security from detection, battlefield mobility, air delivery, adverse conditions, durability, maintainability, human factors, and value analysis. Applicable to man and vehicular transported type recoilless rifles.			

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