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Materiel Test Procedure 4-3-070
U. S. Army Infantry BoardU. S. ARMY TEST AND EVALUATION COMMAND
COMMODITY SERVICE TEST PROCEDURE

FLAME WEAPON, PORTABLE

1. OBJECTIVE

The objective of the procedures outlined in this MTP is to provide a means of determining whether a test portable flame weapon, and its maintenance package, meet the criteria contained in applicable Qualitative Materiel Requirements (QMR); or Small Development Requirements (SDR), and if the test item is suitable for use by the U. S. Army.

2. BACKGROUND

Portable flame weapons are designed to give the individual soldier the capability of assaulting enemy personnel and fortified positions, when the use of an individual weapon is not suitable to accomplish the mission. Flame weapons are designed to produce casualties either by burning, or oxygen depletion, and to destroy materiel by ignition. They have the added advantage of having an adverse psychological effect on the enemy

Development of flame weapons is currently progressing on rocket launcher type weapons using pyrophoric agents as incendiaries.

The service test will determine the overall effectiveness and suitability of a test portable flame weapon when used in the field by instructors and troops representative of those who will use the weapon for combat. Results of the test provide a basis for recommendations on type classification.

3. REQUIRED EQUIPMENT

- a. Service Kit, Portable, Flame Thrower - Riot - Control Agent Dispenser.
- b. Service Unit, Flame Thrower, Truck Mounted.
- c. Gasoline.
- d. Fuel Thickener.
- e. 55 Gallon Drums, Mixing Paddles.
- f. Targets - Cloth, Plywood, Wood, Fortified Dug-in Positions.
- g. Photographic Equipment - Still and Motion Picture.
- h. Meteorological Equipment.
- i. Communications Equipment.
- j. Fire Fighting and First-aid Equipment.
- k. Vehicles.
- l. Liquid Measures, Gallon and Quart Capacity.
- m. Scales to weigh Thickener.
- n. Funnels.
- o. Nitrogen or Compressed Air Cylinder, 1700-2100 psi.
- p. Incendiary rocket ammunition.
- q. Necessary tools.

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r. Rocket Launcher.

4. REFERENCES

- A. DA Approved Small Development Requirement for Flame Launcher Assault, Shoulder or Hip Fired (FLASH), USACDC, Ft. Belvoir, Va. 31 July 1968.
- B. AR 385-63, Regulations for Firing Ammunition for Training, Target Practice, and Combat.
- C. AMCR 385-12, Verification of Safety of Materiel from Development Through Testing, Production, and Supply to Disposition.
- D. USATECOM Reg 385-6, Verification of Safety of Materiel During Testing.
- E. USATECOM Reg 750-15, Maintenance Portion of the Service Test.
- F. FM 3-8, Chemical Reference Handbook.
- G. FM 20-33, Combat Flame Operations.
- H. TM 3-1040-211-series, Flame Thrower, Portable ABCM9-7.
- I. TM 750-5-15, Chemical Weapons and Defense Equipment.
- J. TM 3-366, Flame Fuels.
- K. TM 3-300, Ground Chemical Munitions.
- L. DTB 3-1340-224-10, Operators Manual, Launcher and Rocket Incendiary, TPA, 66 mm, Portable, Multishot XM191, Edgewood Arsenal, Md., March 1968.
- M. MTP 2-3-502, Maintainability.
- N. MTP 3-1-002, Confidence Intervals and Sample Size.
- O. MTP 3-3-081, Sight, Direct Fire, Night, Imaging.
- P. MTP 3-3-500, Preoperational Inspection and Physical Characteristics.
- Q. MTP 3-3-501, Personnel Training.
- R. MTP 3-3-502, Battlefield Mobility/Man Portability, Man Transportability and Mode of Operations.
- S. MTP 3-3-514, Reliability.
- T. MTP 3-3-515, Position Disclosing Effects.
- U. MTP 3-3-517, Infantry Weapons and Ammunition Safety.
- V. MTP 3-3-521, Human Factors Engineering.
- W. MTP 3-3-522, Ease of Assembly and Disassembly.
- X. MTP 3-3-523, Troop Acceptability.
- Y. MTP 3-3-524, Adverse Conditions.
- Z. MTP 6-1-003, Determination of Sample Size.
- AA. MTP 7-3-511, Air Drop Operations - Personnel and Individual Equipment.
- AB. MTP 10-1-002, Field Combat Test Exercises.
- AC. MTP 10-3-060, Fuel Thickeners, Flame Throwers.

5. SCOPE

5.1 SUMMARY

The procedures outlined in this MTP provide general guidance for the conduct of service testing. Detailed specific procedures required will be dependent upon the nature of the item tested, and the stated requirements in

the applicable materiel requirements document(s).

Although the subtests below are described in successive paragraphs, they need not be conducted in the order presented; some may overlap or be performed simultaneously.

a. Preoperational Inspection and Physical Characteristics - The objectives of this subtest are to: (1) verify the completeness of the test portable flame weapon, (2) compare the physical characteristics of the test portable flame weapon with those stated in the materiel requirements documents, and (3) determine whether the test portable flame weapon is in operating condition.

b. Safety - The objectives of this subtest are to: (1) determine the effectiveness of the safety features, and (2) confirm the safety of the test portable flame weapon.

c. Personnel Training - The objectives of this subtest are to: (1) determine the type of instruction required, and (2) determine whether a proposed program of instruction (POI) will qualify personnel on the safe and proper use and maintenance of the test portable flame weapon.

d. Ease of Assembly and Disassembly - The objective of this subtest is to determine the simplicity, and ease of assembly and disassembly of the test portable flame weapon.

e. Functional Performance - The objective of this subtest is to determine whether the test portable flame weapon meets the operational characteristics as stated in the applicable materiel requirements documentation.

f. Position Disclosing Effects - The objective of this subtest is to determine firer exposure and signature effects (smoke, flash, blast, and reflections) resulting from day and night firing of the test portable flame weapon.

g. Sights - The objective of this subtest is to determine the operating characteristics, and effectiveness of the test portable flame weapon sight system.

h. Adverse Conditions - The objective of this subtest is to determine performance of the test portable flame weapon under the adverse environmental conditions encountered during service testing.

i. Battlefield Mobility - The objectives of this subtest are to determine (1) the man portability characteristics of the test portable flame weapon with ammunition and accessories necessary for combat, and (2) suitability for delivery by individual parachutists.

j. Reliability - The objective of this subtest is to determine the functional reliability of the test portable flame weapon.

k. Maintenance - The objectives of this subtest are to determine (1) whether the maintenance functions, contained in the maintenance package, can be accomplished, and (2) whether the maintenance manuals are accurate and adequate.

l. Troop Acceptability - The objective of this subtest is to obtain the subjective appraisal of the individual soldier as to the suitability of the test flame weapon for troop use.

m. Human Factors Engineering - The objective of this subtest is to determine the suitability of the test flame weapon with respect to the

capabilities and limitations of the individual soldier.

n. Value Analysis - The objective of this subtest is to determine whether the test flame weapon has any unnecessary, costly, or "nice-to-have" features which might be eliminated without adversely affecting its performance, reliability, or safety.

5.2 LIMITATIONS

None.

6. PROCEDURES

6.1 PREPARATION FOR TEST

a. Prepare a report listing all materials received for the test, and submit it to the appropriate USATECOM Materiel Testing Directorate.

b. Prepare forms to record the direct labor manhours and cost data throughout conduct of the test.

c. Prepare record forms for systematic entry of data, chronology of test, and analysis in final evaluation of the test item.

d. Record the following information:

- 1) Nomenclature, serial number(s), manufacturer's name and function of the item under test.
- 2) Nomenclature, serial number, accuracy tolerances, calibration requirements, and last date calibrated of the test equipment.

e. Ensure that all test supervisory personnel are familiar with the required technical and operational characteristics of the test items, as stipulated in QMRs or SDRs.

f. Select test soldiers who are representative of those expected to use and maintain the test item in the field.

g. Ensure that the test soldiers are informed of the objectives and purpose of the tests in which they will participate as well as the safety aspects of the test.

h. Prepare a test item sample plan sufficient to ensure that enough samples of all measurements are taken to provide statistical confidence in the final data. This objective may be constrained by (1) limited numbers of test flame weapons, (2) limited time to accomplish the test, (3) limited manpower and/or funds available, and (4) limited support and/or control equipment available. To identify the best means to collect the most meaningful data available, the test officer shall consult with a statistician when planning the test to insure sufficient data will be acquired to permit a statistically valid evaluation of the test flame weapon. Such data as the number of test soldiers required, the number of flame weapons to be tested, and the number of replications required for a specific operation shall be determined. Statistical guidance is found in MTP 3-1-002, Confidence Intervals and Sample Size.

i. Ensure that arrangements have been made for logistical support during the planning phase and in advance of actual service testing.

j. When control items are required for comparative data, ensure that they are the current standard issue item most comparable in mission to the intended mission of the test flame weapon.

k. Ensure that provisions have been made for the handling of a classified test in accordance with security regulations.

l. Prepare adequate safety precautions to provide safety for personnel and equipment, and ensure that all safety SOPs are observed throughout the test.

m. The test officer shall ensure that a safety release has been received from HQ, USATECOM in accordance with reference 4D and is understood before the test is started.

6.2 TEST CONDUCT

NOTE: Field Combat Test Exercises - In order to provide as realistic a combat environment as possible, and to insure adequate preconditioning (stressing) of the test flame weapon and test soldiers, all field testing and range firing will be integrated into appropriate combat exercises described in MTP 10-1-002.

6.2.1 Preoperational Inspection and Physical Characteristics

a. Examine the test flame weapon, components, and accessories for completeness, using the Preliminary Operating and Maintenance Manual (POMM) and current instructional material as guides.

b. Weigh, measure, and photograph the test portable flame weapon, components, and accessories.

c. Compare the physical characteristics of the test portable flame weapon with the criteria stated in the materiel documents.

d. Test fire the portable flame weapon in each of its design modes to determine if it is in operating condition.

6.2.2 Safety

a. This subtest will be conducted under applicable procedures of MTP 3-3-517. Particular emphasis will be placed on verification of safety limitations cited in the Safety Release, and compilation of safety data pertinent to the Safety Confirmation required by USATECOM Reg. 385-6.

b. The safety controls of the test portable flame weapon shall be specifically examined, and tested with reference to convenience of location, ease of identification of safe and fire positions by sight and touch, ease and quietness of operation, and design to prevent accidental shifting of position.

c. The Safety Release will be reviewed to determine whether it places undue restrictions on the tactical use of the flame weapon.

6.2.3 Personnel Training

a. This subtest will be conducted under applicable procedures of MTP 3-3-501. The test will include an evaluation of the clarity, completeness,

and general adequacy of pertinent parts of the Operator's Instruction Manual.

b. The POI developed for training of test soldiers shall be evaluated throughout all phases of the service test. This evaluation should result in recommendations concerning the adequacy of the proposed POI.

6.2.4 Ease of Assembly and Disassembly

This subtest will be conducted under applicable procedures of MTP 3-3-522. The test will include an evaluation of the clarity, completeness, and general adequacy of pertinent parts of the Operator's Instruction Manual.

6.2.5 Functional Performance

6.2.5.1 Portable Flame Throwers

a. This subtest will be conducted in two phases.

1) Phase I - Known Distance Firing.

- a) Test Soldiers will fire the test and the control flame throwers at various known ranges including designed range of the test flame weapon. Firings will include single bursts, intermittent bursts, wet (unignited fuel) and lit (ignited fuel) shots. Firing positions shall be varied to include standing, kneeling, and prone positions. Tests will be conducted using thickened and unthickened fuel. The percentage of thickener will be varied.
- b) During known distance firings, observations will be made of (1) efficiency of preignition, (2) drooling (leaking of unignited fuel) if any, (3) ranges achieved, (4) length of time for rod to reach target, (5) ease of zeroing flame rod on the target, (6) stability of flame rod in flight, (7) length of time to empty flame thrower, (8) amount of unexpended fuel remaining, and (9) effects of meteorological conditions on the flame rod.

2) Phase II - Simulated Combat Firing

- a) All test soldiers will fire the test and control flame thrower against simulated combat targets. The targets will be engaged at different locations and different unknown ranges. Wet and lit shots will be employed; fired from the standing, kneeling, and prone positions. Thickened and unthickened fuel will be used, with the amount of thickener varying in the thickened fuel. A portion of the subtest will include an Infantry squad assault of a simulated enemy position. Testing an assault element will provide an evaluation of the individual action between the test flame weapon and other individual and crew served weapons.

- b) During this substest, observations as listed in a. 1), b) above will be made. In addition, the efficiency of the weapon to ignite the target will be noted.

b. During these two phases, comparison will be made of the performance of the test flame thrower with the stated criteria. Test soldiers will be questioned for their opinion on the performance of the test flame thrower, as well as the ease with which the test item was refilled and recharged.

6.2.5.2 Launcher Type Flame Weapons

All test soldiers will fire the test flame weapon at point targets out to the designed maximum effective range of the weapon. Tests will be fired from the standing, sitting, kneeling, and prone position.

b. During the test, observations will be made of the following: (1) length of time to go from the carrying mode to firing mode, and fire for effect (the length of time to reload will be noted); (2) the percentile reliability of each round launching and functioning; (3) range attained; (4) casualty radius; (5) length of time to remove faulty round and fire remaining rounds; and (6) effectiveness against automatic weapons emplacements, field fortifications, caves, tunnels, wheeled vehicles, tracked vehicles (tanks and APCs), and personnel.

c. Tests will be fired to determine the maximum range when used as an area weapon.

d. During all test firing performance will be compared to the established criteria, including an evaluation of the self-igniting capability of the fuel.

6.2.6 Position Disclosing Effects

a. This substest will be conducted under applicable procedures of MTP 3-3-515.

b. Smoke, flash, blast, reflection, and peculiarities of physical signature will be evaluated during daylight and darkness.

6.2.7 Sights

a. This substest will be conducted under applicable procedures of MTP 3-3-081.

b. During the conduct of operational substests, particular attention will be given to suitability of sight settings, and the ease and necessity for adjustment.

6.2.8 Adverse Conditions

This substest will be conducted under applicable procedures of MTP 3-3-524. In the design of specific test procedures, consideration shall be given to results of environmental chamber tests made during engineering testing.

6.2.9 Battlefield Mobility

This subtest shall be conducted under applicable procedures of MTP 3-3-502 and MTP 7-3-511. Ease of portability by the combat-equipped soldier shall be emphasized. Test soldiers will execute a parachute jump with the test portable flame weapon and ammunition.

6.2.10 Reliability

a. This subtest shall be conducted under applicable procedures of MTP 3-3-514.

b. Throughout the course of other subtests, note shall be made of all malfunctions, equipment failures, and other occurrences having a bearing on durability and functional reliability. Particular attention shall be given to conditions which cause weapon stoppage, or otherwise prevent or limit firing capability.

6.2.11 Maintenance

a. The maintenance portion of the service test will be conducted as indicated in USATECOM Reg 750-15 and MTP 3-3-518.

b. Throughout the conduct of each subtest, all scheduled and unscheduled maintenance functions will be performed by using only authorized tools and procedures in accordance with instructions contained in the maintenance manual. A record will be kept of all scheduled and unscheduled maintenance. Operator maintenance will be performed by test soldiers as the requirement arises. Direct and general support maintenance functions will be performed by soldier mechanics with an MOS appropriate to the level of maintenance performed.

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

d. All maintenance manuals issued with the test equipment will be analyzed for clarity, errors and omissions.

6.2.12 Troop Acceptability

This subtest will be conducted under applicable procedures of MTP 3-3-523. The test will be performed in coordination with MTP 3-3-521.

6.2.13 Human Factors Engineering

This subtest will be conducted under applicable procedures of MTP 3-3-521. Particular attention will be given the following:

a. Capability of being fired from either the right or left shoulder in all normal firing positions.

b. Capability of being fired by soldiers wearing field equipment and clothing appropriate to the environmental conditions of the test to include CBR equipment.

- c. Undue discomfort to the firer from blast, noise, and recoil.
- d. Number, location, and design of safety(s), controls, and sights with respect to ease of location, identification, and operation, with minimum motion by soldiers wearing field equipment and clothing, appropriate to the environmental conditions of the test, and CB protective clothing.
- e. Configuration, sight design, and balance of the flame weapon with respect to pointing characteristics.
- f. Configuration and length with respect to ease of use in all normal firing positions by the 5th and 95th percentile of the user population, and ease of use for first and last 5th percentile.

6.2.14 Value Analysis

During the conduct of other subtests, observations will be made of any nonessential features which might be modified or eliminated without compromising the effectiveness or safety of the test flame weapon.

6.3 TEST DATA

6.3.1 Data Common to All Subtests

- a. A gun book shall be maintained for each test and control flame weapon.
- b. A log book shall be maintained for entries in chronological order of pertinent remarks and observations, such as weather, test soldier uniform and equipment, and time of day, which will aid in subsequent analysis of test data.
- c. Extensive use shall be made of photographs, motion pictures, and/or video tape to support test findings. Fast frame photography, when available, should be used to evaluate human engineering aspects of test.

6.3.2 Pretest Data

The following shall be recorded:

- a. Personnel data.
 - 1) Name, rank, and service number of each test soldier.
 - 2) MOS.
 - 3) Length of service (and combat experience, if any).
 - 4) Length of time in MOS.
 - 5) Qualification in arms.
 - 6) Physical characteristics.
- b. Test and control flame weapons.
 - 1) Nomenclature.
 - 2) Manufacturer.
 - 3) Serial Number.
 - 4) Photographs of assembled and disassembled test flame weapon.

c. Ammunition.

- 1) Nomenclature.
- 2) Manufacturer.
- 3) Lot number.
- 4) Photographs.

6.3.3 Preoperational Inspection and Physical Characteristics

The following shall be recorded concerning the test, and the control flame weapon:

- a. A description of the test flame weapon, components, and accessories, including completeness when compared to POMMs and other pertinent manuals.
- b. The weight and dimensions of the test flame weapon, component parts, and accessories.
- c. A comparison of the physical characteristics of the test flame weapon with those stated in the criteria.
- d. Results of the operational test.
- e. Any additional data required by MTP 3-3-500.

6.3.4 Safety

The following shall be recorded:

- a. The results of studying the Safety Release, and any safety limitations which may place undue restrictions on the tactical use of the flame weapon.
- b. A comparison of the safety features of the test flame weapon with those stated in the criteria.
- c. Any safety hazard reported or observed during conduct of the test.
- d. Any additional data required by MTP 3-3-517 which will serve as input to the Safety Confirmation required by USATECOM Reg 385-6.

6.3.5 Personnel Training

Test data shall be as indicated in MTP 3-3-501.

6.3.6 Ease of Assembly and Disassembly

Test data shall be as indicated in MTP 3-3-522.

6.3.7 Functional Performance

The following will be recorded:

- a. All data relative to observations made during firing tests.
- b. Opinions of test soldiers relative to the suitability of the test flame weapon for U. S. Army use.

6.3.8 Position Disclosing Effects

The test data shall be as indicated in MTP 3-3-515.

6.3.9 Sights

The test data shall be as indicated in MTP 3-3-081.

6.3.10 Adverse Conditions

The test data shall be as indicated in MTP 3-3-524.

6.3.11 Battlefield Mobility

The test data shall be as indicated in MTPs 3-3-502, and 7-3-511.

6.3.12 Reliability

The test data will be the record of weapon stoppages, malfunctions, breakage, and equipment failures noted throughout conduct of other subtests, and any additional data required by MTP 3-3-514.

6.3.13 Maintenance

Record the following:

- a. Operator maintenance performed on each test flame weapon.
- b. All organizational, direct support, and general support maintenance performed on each test flame weapon in accordance with USATECOM Reg 750-15 and MTP 2-3-502.
- c. Observations of test supervisors, test soldiers, and maintenance personnel regarding ease or difficulty of performing maintenance.
- d. Data regarding errors and omissions in maintenance manuals.
- e. Specific observations regarding clarity and overall adequacy of maintenance manuals.

6.3.14 Troop Acceptability

The test data shall be as indicated in MTP 3-3-523.

6.3.15 Human Factors Engineering

The test data shall be as indicated in MTP 3-3-521, and will include factual data and observations on the specific human factors aspects listed in paragraph 6.2.13.

6.3.16 Value Analysis

The test data shall be the value analysis observations regarding nonessential features of the test flame weapon noted by test personnel throughout the conduct of other subtests.

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6.4 DATA REDUCTION AND PRESENTATION

a. Statisticians will be present to observe or participate in operational subtests to the extent necessary to become familiar with the actual data collection methods, and to advise on the validity of data being collected.

b. All data collected during the test shall be collated and reduced to a concise, workable form. These data will be analyzed to determine whether (1) the test objectives were met, and (2) the test flame weapon meets the established criteria.

c. The results of testing will be presented in narrative form supplemented with tables, charts, graphs, photographs, and motion pictures as required. The results of questionnaires will be tabulated and presented. Where opinions of test soldiers or judgments of test supervisory personnel are presented, they will be identified as such, and separated from factual data.

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13. ABSTRACT This Army Service Test Procedure describes test methods and techniques for evaluating the performance and characteristics of Flame Weapons (Portable Type), and for determining their suitability for service use by the U. S. Army. The evaluation is related to criteria expressed in applicable Qualitative Materiel Requirements (QMR), Small Development Requirements (SDR), Technical Characteristics (TC), or other appropriate design requirements and specifications.			

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