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AD870454

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AD870454

1 April 1970

U. S. ARMY TEST AND EVALUATION COMMAND
COMMODITY ENGINEERING TEST PROCEDURE

FLAMETHROWERS, MECHANIZED

A

1. OBJECTIVE

The objective of this Materiel Test Procedure (MTP) is to establish uniform procedures for determining and evaluating the technical performance and safety aspects of mechanized flamthrowers in terms of the criteria established by applicable Qualitative Materiel Requirements (QMR), Small Development Requirements (SDR), Technical Characteristics (TC), and other design requirements and specifications. These procedures will also permit evaluation of the relative safety of the test items in the hands of Army troops and the suitability of the items for service testing.

2. BACKGROUND

As a weapon, flame causes damage and destruction to men, equipment, and fortifications. It depletes the oxygen in enclosed spaces and has great psychological impact on enemy personnel. It has successfully reduced positions that had resisted other forms of attack.

Mechanized flamethrowers normally utilize the thickened and aged type of flame fuel. They are mounted on tracked vehicles or vehicles with amphibious capabilities and are supported by mobile flame fueling equipment to insure nearby and rapid refueling.

The primary mission of mechanized flamethrowers is to attack, by flame, fortified positions, caves, tunnels, underground installations, and buildings which resist assault by other weapons. Their main advantages are (1) mobility, (2) greater flame range than that of portable apparatus, (3) armored protection for themselves and supporting troops, (4) availability of auxiliary armament and communications equipment, and (5) ability to carry a large supply of flame fuel.

3. REQUIRED EQUIPMENT

a. Meteorological Equipment to measure and record:

   1) Temperature
   2) Wind direction and speed
   3) Relative humidity

b. Appropriate test site
c. Suitable fuel for flamethrowers
d. Protective equipment (mask, gloves, overgarment)
e. Laboratory facilities
f. Photographic equipment (color, black and white)

   1) Still
   2) Motion Picture

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g. Type cargo aircraft or simulated equivalent
h. Environmental chambers for:

1) Temperature-humidity testing
2) Fungus testing
3) Dust testing
4) Sunshine testing
5) Salt fog testing
6) Rain testing

i. Fire fighting equipment
j. First aid equipment
k. Vehicles, as appropriate
l. Accelerometers

4. REFERENCES

A. AR 70-38, Research, Development, Test and Evaluation of Materiel for Extreme Climatic Conditions.
B. MIL-STD-810B, Environmental Test Methods.
C. MIL-STD-1472, Human Engineering Design Criteria for Military Systems, Equipment and Facilities.
D. MIL-H-46855, Human Engineering Requirements for Military Systems, Equipment and Facilities.
E. USATECOM Regulation 385-6, Verification of Safety of Materiel During Testing.
F. USAMC Pamphlet 706-134, Engineering Design Handbook: Maintainability Guide for Design.
G. Woodson, W. E., and D. J. Conover, Human Engineering Guide for Equipment Designers, 2nd Edition, Berkeley: University of California Press, 1964.
H. MTP 7-1-002, Air Portability and Airdrop Service Testing.
I. MTP 7-2-509, Airdrop Capability of Material (General).
J. MTP 7-2-515, Air Transport (Suitability of Equipment For).
K. MTP 8-2-500, Receipt Inspection.
L. MTP 8-2-503, Rough Handling and Surface Transport.
M. MTP 8-2-512, Leak Testing of Agent-Filled Munitions and Containers.

5. SCOPE

5.1 SUMMARY

The procedure described in this MTP is divided into a series of subtests. The sequence may be modified by the test plan. The receipt inspection subtest must be performed first to ascertain the condition of test items as received from their manufacturer, the safety tests should be performed next to reveal any unforeseen hazards, and the outdoor performance tests should be performed last. In preparing the test plan, consideration should be given to the number of test items available, their susceptibility to damage, time available, availability of facilities, reliability and confidence limits set by QMR's and SDR's and budget limitations. Subtests deemed most likely to cause failure should be performed first so that the developing agency may have the earliest

possible notice of a deficiency.

NOTE: Some of the following tests may be omitted or modified depending on the type of installation and previous vehicle tests. If the flamethrower unit is in kit form and is to be installed in a mock up situation one method of testing is required, and if the unit is installed in a vehicle with the majority of the equipment internally mounted another method of testing is required. In some cases, prior testing of the vehicle itself may be enough to permit omission of a particular subtest. For example, if the vehicle has been subjected to rain and submersion tests and found to be substantially watertight, it is possible that the internally mounted flamethrower would not have to be subjected to the equivalent subtests of this MTP.

The following subtests comprise the complete procedure:

a. Receipt inspection - An inspection of the test item as received to (1) determine its physical characteristics and condition, (2) locate any defects, and (3) identify damage received during transport. During this inspection the test items will also be serially numbered for subsequent identification.

b. Safety evaluation - The objective of this procedure is to check the safety statement issued by the developing agency and to identify the safety hazards, if any, which must be included in the safety release recommendation required by reference 4E (USATECOM Regulation 385-6).

c. Simulated environmental testing - A study to determine the effects of extreme temperatures, fungus, humidity, dust, sunshine, and fresh and salt water on the test item.

d. Rough handling and surface transport test - A study to determine the effects of rough handling and surface transport on the physical and operational characteristics of the test item.

e. Air transportability - A study to determine the effects of air transport conditions on the physical and operational characteristics of the test item.

f. Airdrop capability - A study to determine the effects on the test item resulting from its being subjected to airdrop conditions.

g. Leak testing - A study to determine if the test item leaks when subjected to standard leak tests and conditions.

h. Operational reliability - A study to determine if the test item meets specified reliability criteria.

i. Maintenance characteristics - A study to determine the maintenance required and to evaluate the test item design from the standpoint of maintainability.

j. Human factors aspects - A study to determine whether the equipment can be used effectively by Army personnel.

k. Agent-hardware compatibility - A study to determine if the flame fuel and flamethrower are compatible.

5.2 LIMITATIONS

None

6. PROCEDURES

6.1 PREPARATION FOR TEST

6.1.1 Prescheduling Conditions

a. A suitable test site must be available with firefighting and first aid equipment immediately available.

b. A meteorological forecast must be available before the conduct of each outdoor subtest to prevent wasted effort in unsuitable weather.

6.1.2 Safety Statement

The test officer will ensure that a safety statement has been received from the developing agency before testing is commenced and that it is understood by all test personnel. The safety statement includes information pertaining to the test item's operational limitations and specifies hazards peculiar to the item or components which are to be tested.

6.1.3 Safety Procedures

a. Test plans and procedures will ensure performance in the safest manner consistent with accomplishing the mission. Plans will include safety procedures, precautions, protections, and emergency procedures as necessary. Technical information on the hazards and safety characteristics of the test item as provided by the safety statement and other pertinent information will be included. Such information will include an evaluation of potential hazards, analysis of risks, limitations, and precautions, including special test equipment and techniques that should be incorporated in test plans and procedures.

b. One specific individual will be charged with responsibility for safety. He will be familiar with the construction and operation of the test item and its critical components, will have full knowledge of the hazards and safety aspects of the test, will review test procedures for evaluation of hazards, and will recommend control measures.

c. All personnel who participate in or observe the tests will be briefed on the proper test methods and procedures.

d. When dealing with flamethrowers, all test personnel must constantly consider not only the hazards which may be encountered during normal conditions, but also those which could be encountered under the worst conditions of malfunctioning, accidents, or emergencies.

e. A record will be kept of any injuries suffered by test personnel during testing, regardless of how minor they may be and regardless of their relevance to testing.

6.1.4 Security

Security considerations will be determined and provided for as applicable to each of the procedures described in this MTP.

6.1.5 Logistical Requirements

Prior to the conduct of any subtest, the test officer will insure that all logistical requirements are satisfied.

6.2 TEST CONDUCT

6.2.1 Receipt Inspection

Subject the test item to the applicable procedures of MTP 8-2-500 following its arrival at the test site, with emphasis on the following:

a. Visually inspect the shipment and record the following:

1) Materiel configuration (flamethrower completely installed on vehicle, installed on a skid or mock-up, disassembled and shipped in separate packages).
2) Damage (undone binding, dents, punctures, etc.).
3) Corroded or mildewed parts.
4) Illegible or missing markings.
5) Incorrect labeling.

b. Measure and record the external dimensions and weight of the packaged test item.

c. Unpack the test item and serially number and identify each test item to be used.

d. Visually inspect the test item, and record all deficiencies, specifically the following:

1) Missing components.
2) Incorrect assembly of components.
3) Body cracks or deformations.
4) Corrosion of metal parts.
5) Missing or outdated inspection records of pressure rating tests of tanks, hoses, etc.
6) Missing manuals, repair parts, etc.

e. Measure and record the external dimensions and weight of the ready-to-operate test item.

f. Subject the test item to the leak test procedures of paragraph 6.2.7.

g. Verify the operability of the test item by subjecting it to the procedures of paragraph 6.2.8.

h. Photograph:

1) A complete test item, including packages, showing scale
2) Any defective test items

6.2.2 Safety Evaluation

NOTE: This test will be conducted in accordance with all of the safety SOP's and local regulations pertaining to safety with special provisions applicable or peculiar to the specific item or class of items.

Determine the test item's safety by performing the following:

a. Observe the handling and use of the test item in accordance with existing instructions, directives, and similiar guidance. Record hazardous conditions.

b. Observe for, and record information for inclusion in the safety release required by reference 4E (USATECOM Regulation 385-6).

c. Perform additional checks as required to verify all the safety aspects included in the safety statement. Record any deficiencies and/or recommended inclusions.

d. Determine if the safety devices will provide the protection they were designed for and if this protection is adequate.

e. In addition perform the following:

1) Record types of fire fighting equipment which are applicable for type of fuel used.
2) Record type of gas to be used in pressurizing tanks.
3) Verify pressure gage and regulator calibration.
4) Include verification that the developing agency has pressure checked the pressure equipment.
5) Verify that all safety devices on the flamethrower are in operable condition.

6.2.3 Simulated Environmental Testing

6.2.3.1 Extreme-Temperature Tests

Unless otherwise directed, the test item, fully fueled and pressurized, will be subjected to the following tests:

NOTE: Verify that the pressure increase and fuel expansion that will occur at the high temperatures required by some of the following tests will be within the safe limits of the gas and fuel containers and their related equipment.

6.2.3.1.1 Low-Temperature Tests - Place a minimum of 3 test items which have successfully passed the leak test of paragraph 6.2.7 in a temperature chamber and perform the following:

a. Measure and record tank pressure.

b. Reduce the chamber to the lowest temperature at which the test item may be stored, maintain it for a period of 72 hours, and perform the following:

1) Visually inspect the test items, and record damage
2) Measure tank pressure and record change

c. Raise the chamber temperature to the test item's minimum operating temperature as established by design requirements, and maintain this temperature until stabilization is reached. If stabilization is attained in less than 24 hours, maintain temperature for a complete 24 hour interval. Perform the following:

NOTE: Stabilization, unless otherwise specified, is considered to be reached when the temperature of the test item does not change more than 2°C (3.6°F) per hour.

1) Visually inspect the test items and record damage.
2) Measure the tank pressure and record change.
3) Remove 1/3 of the test items from the chamber and perform the leak test of paragraph 6.2.7.
4) Verify the operability of the test items by subjecting them to the procedures of paragraph 6.2.8.
5) Obtain photographs as required.

NOTE: Operability checks should be accomplished within 15 minutes of removing the test items from the chamber.

d. Remove the remaining test items from the chamber and allow the test items to stabilize at local ambient temperature, and perform the following:

1) Visually inspect the test items and record damage.
2) Obtain photographs as required.
3) Subject 1/2 of the test items to the leak test procedures of paragraph 6.2.7.
4) Verify the operability of the test item by subjecting it to the procedures of paragraph 6.2.8.

6.2.3.1.2 High-Temperature Tests - Place a minimum of 4 test items which have successfully passed the leak test of paragraph 6.2.7 in a temperature chamber and perform the following:

a. Measure and record tank pressure.
b. Adjust the temperature of the chamber to 68.3°C (155°F) and a relative humidity of 15 percent, and maintain these conditions for a minimum of 4 hours; and perform the following:

1) Visually inspect the test items and record any damage
2) Measure tank pressure record and change

c. Adjust the chamber to the highest temperature at which the test items are expected to operate, and maintain these conditions for a minimum of 24 hours, and perform the following:

1) Visually inspect the test items and record any damage.
2) Measure tank pressure and record any change.
3) Remove 1/2 of the test items from the chamber and perform the following:

a) Subject 1/2 of the test items to the leak test procedures of paragraph 6.2.7.
b) Verify the operability of the remaining test item by subjecting it to the procedures of paragraph 6.2.8.
c) Obtain photographs as required.

d. Remove the remaining test items from the chamber and allow the test items to stabilize at local ambient temperature and perform the following:

1) Visually inspect the test items and record damage.
2) Subject 1/2 of the test items to the leak test procedures of paragraph 6.2.7.
3) Verify the operability of the remaining test item by subjecting it to the procedures of paragraph 6.2.8.
4) Disassemble one of the test items and inspect gaskets and other components for deterioration.

6.2.3.2 Fungus Test

a. Subject a minimum of 2 test items to the fungus test of Procedure I, Method 508, reference 4B (MIL-STD-810B).

b. At the completion of the exposure period, perform the following:

1) Visually inspect the items, and record any signs of corrosion.
2) Disassemble 1/2 of the test items and record if any fungus growth is visible on the test item and/or components.
3) Verify the operability of the test item by subjecting the remaining test item to the procedures of paragraph 6.2.8.

6.2.3.3 Humidity Test

a. Subject a minimum of 2 test items to the humidity cycling of Procedure I, Method 507, reference 4B (MIL-STD-810B).

b. At the completion of the cycling period, perform the following:

1) Visually inspect the items, and record any signs of corrosion.
2) Disassemble 1/2 of the test items and inspect the components for corrosion and/or deterioration.
3) Verify the operability of the test items by subjecting the remaining test item to the procedures of paragraph 6.2.8.

6.2.3.4 Dust Test

a. Subject a minimum of 2 test items to the exposure condition of Procedure I, Method 510, reference 4B (MIL-STD-810B).

NOTE: The 16-hour holding period in step 2 of Method 510 will be omitted.

b. At the completion of the exposure period, perform the following:

1) Visually inspect the test item and record surface damage.
2) Disassemble 1/2 of the test items and inspect the components for presence of dust.
3) Verify the operability of the test item by subjecting the remaining test item to the procedures of paragraph 6.2.8.

6.2.3.5 Sunshine Test

a. Subject a minimum of 2 test items to the sunshine conditions of Procedure I, Method 505, reference 4B (MIL-STD-810B).
b. Measure and record tank pressure.
c. At the completion of the exposure period, perform the following:

1) Measure tank pressure and record change.
2) Visually inspect the test items and record surface damage, such as deterioration of natural rubber and plastics.
3) Subject 1/2 of the test item to the leak test procedures of paragraph 6.2.7.
4) Verify the operability of the test item by subjecting the remaining test item to the procedures of paragraph 6.2.8.

6.2.3.6 Salt Fog Test

a. Subject a minimum of 3 test items to the salt fog exposure of Procedure I, Method 509, reference 4B (MIL-STD-810B).
b. At the completion of the exposure, perform the following:

1) Rinse the test items with clear water.
2) Visually inspect the test items for the presence of corrosion.
3) Disassemble 1/3 of the test items and inspect their components for evidence of water penetration and corrosion.
4) Subject 1/3 of the test items to the leakage test of paragraph 6.2.7.
5) Verify the operability of the test items by subjecting the remaining test item to the procedures of paragraph 6.2.8.

6.2.3.7 Rain Test

a. Subject a minimum of 3 test items to the rain conditions of Procedure I, Method 506, reference 4B (MIL-STD-810B).
b. At the completion of the rain exposure, perform the following:

1) Visually inspect the test items for the presence of corrosion.
2) Disassemble 1/3 of the test items and inspect the components for evidence of water penetration and corrosion.
3) Subject 1/3 of the test items to the leakage test of paragraph 6.2.7.
4) Verify the operability of the test items by subjecting the remaining test items to the procedures of paragraph 6.2.8.

6.2.4 Rough Handling and Surface Transport Test

a. Subject a minimum of 2 test items, packaged in their original container, to the following procedures of MTP 8-2-503.

1) The vibration test of paragraph 6.2.2.2a.2
2) The shock test of paragraph 6.2.2.1a.3

b. At the completion of testing, perform the following:

1) Examine the test item's mounting for cracks, breaks, etc.
2) Examine the test item for damage and deformation.
3) Subject 1/2 of the test items to the leak test of paragraph 6.2.7.
4) Verify the operability of the test item by subjecting the remaining test item to the procedures of paragraph 6.2.8.

6.2.5 Air Transportability

Determine the ease of loading and unloading aircraft as described in the applicable sections of MTP 7-2-515 or as follows:

NOTE: Background information on air transportability contained in MTP 7-1-002.

a. Load the test item aboard a typical cargo aircraft or simulated aircraft, using current standard loading equipment, and record the following:

1) Type of aircraft used or simulated
2) Description of transport configuration
3) Equipment used for loading
4) Difficulties encountered while loading
5) Method of tiedown
6) Damage sustained by the test item during loading

b. Unload the test item from the aircraft/simulated aircraft and record the following:

1) Equipment used in unloading
2) Difficulties encountered while unloading
3) Damage sustained by the test item during unloading

6.2.6 Airdrop Capability

Subject a minimum of 2 test items to the applicable sections of MTP 7-2-509 as follows:

a. Rig the test item, with attached accelerometers, in an appropriate airdrop container and drop from typical aircraft as instructed in MTP 7-2-509. Record the following:

1) Test item configuration during airdrop
2) Aircraft type(s) used
3) Aircraft airspeed
4) Altitude above ground
5) Meteorological conditions
6) Impact velocities
7) Deceleration magnitude at impact in g's

b. Cover the airdrop test procedures with still and motion cameras.
c. At completion of the test, perform the following:

1) Examine the test item's mounting for breaks and other damage.
2) Examine the test item for damage and deformation.
3) Subject the test items to the leak test of paragraph 6.2.7.
4) Verify the operability of the test item by subjecting it to the procedures of paragraph 6.2.8.

6.2.7 Leak Testing

a. Using procedures as described in the applicable portions of reference MTP 8-2-512 determine if the test item leaks after completing the following subtests:

1) Receipt inspection (paragraph 6.2.1)
2) Simulated environmental testing (paragraph 6.2.3)
3) Rough handling and surface transport test (paragraph 6.2.4)
4) Airdrop capability test (paragraph 6.2.6)

b. Photograph any evidence of damage, leakage or other failings that have a bearing on the evaluation of the test item.
c. When leakage is noted, make local repairs if possible, and retest the item. Record the following:

1) Location of leakage
2) Repairs made
3) Effectiveness of repairs

6.2.8 Operational Reliability

NOTE: 1. Testing will be in accordance with the conditions and instructions in the test criteria, technical manuals, and other applicable instructions, as required by the QMR, SDR, or TC.
2. The test item undergoing operational testing shall have been subjected previously to the following test procedures:

a) Simulated environmental testing (paragraph 6.2.3).
b) Rough handling and surface transport test (paragraph 6.2.4).
c) Air transportability test (paragraph 6.2.5).
d) Airdrop capability test (paragraph 6.2.6).

a. Select a suitable test site. The test site must meet all safety requirements and be of sufficient area to insure that the flame fuel is confined to it.
b. Operate the equipment; photograph the test item, the auxiliary equipment, and the flaming operations.
c. Record the following:

1) Test item identification number

2) Meteorological data, including the following:

a) Ambient temperature
b) Relative humidity
c) Wind direction and speed

3) Fuel data:

a) Flame fuel (type, percent gel, age)
b) Ignition fuel

4) Compressed gas data
5) Storage capacities:

a) Flame fuel
b) Ignition fuel
c) Compressed gas

6) Preliminary firing data:

a) Types of high pressure and fuel cutoff valves (automatic, manual, combination).
b) Method of ignition.
c) Traverse and elevation (also blocked areas).
d) Number of people required for operation of equipment.
e) Method of communication with driver.
f) Time required for fueling and pressurizing equipment.
g) Maximum holding time between fueling and firing.
h) Adequacy of instruction plates.
i) Adequacy of gages.
j) Type of operating valves (manual, electric, hydraulic).

7) Firing data:

a) Range:

1) Maximum possible
2) Minimum safe

b) Flame duration (continuous)
c) Number of one-second shots possible
d) Consistency of flow projection
e) Ability to fire wet shots
f) Method and adequacy of extinguishing flame
g) Final pressures

d. Evaluate the equipment and the vehicle with particular attention to the following:

1) Adequacy of sights and ranging devices.

2) Compatibility of test item with other vehicle armament.
3) Ability of flame equipment to operate independently of the vehicle engine.
4) Ability to operate the vehicle during flaming operations.
5) Extent of pressure adjustment during firing (automatic and manual).
6) Damage of flaming operations to vehicle.
7) Suitability for night operations.
8) Adequacy of fire fighting equipment.
9) Effect of flame unit on basic vehicle's amphibious and air transport capabilities.
10) Auxiliary equipment required to service the flame unit.
11) Major components of flame unit.

e. At the completion of the tests record the following:

1) Number of tests performed
2) Number of test items operated
3) Number of misfires
4) Number of nonfunctioning and malfunctioning items
5) Reasons for misfires if known

6.2.9 Maintenance Characteristics

NOTE: Background information on checking a test item to determine its maintenance aspects is contained in reference 4F (USAMC Pamphlet 706-134).

a. Inspect the test item for deficiencies which will require replacement of components before the item can be tested. Photograph all deficiencies.

b. Inspect the maintenance package for completeness and record deficiencies.

c. Perform preoperative maintenance tasks in accordance with the test item maintenance manuals, instructions, etc.

d. Perform authorized organizational maintenance operations listed in the Maintenance Allocation Chart and a sampling of higher-echelon and support maintenance to the extent feasible with the resources at hand.

e. Record the time and personnel required to perform scheduled and nonscheduled maintenance tasks throughout the period of testing.

f. Evaluate the adequacy of draft or final operation and maintenance manuals provided as parts of the maintenance package.

g. Evaluate the adequacy of the test item maintenance package.

h. Note special tools and equipment required.

i. Note which maintenance procedures require special skills and the level of personnel training that is required.

j. Evaluate the test item design from maintainability standpoint, as applicable:

1) Use of standardized parts
2) Corrosion resistant material and coatings
3) Minimum adjustments prior to firing

4) Simplified lubrication procedures and schedules
5) Safety devices satisfactory
6) Long-term storage life of components
7) Other

k. Record the following:

1) Test item down time (cumulative)
2) Time taken between repairs and reason, if appropriate
3) Frequency of repairs
4) Nomenclature of repair parts used

6.2.10 Human Factors Aspects

NOTE: Background information on human factors engineering testing is available in reference 4G (Woodson and Conover), reference 4C (MIL-STD-1472), and reference 4D (MIL-H-46855).

During conduct of the operational tests, observations will be made regarding the human factors engineering characteristics of the test item. Observe and record the following:

a. Adequacy of space in vehicle for operation of the flame unit.
b. Ease of operation.
c. Operator skill required.
d. Compatibility with outer clothing and other equipment.
e. Ease of operating and maintaining item in protective clothing, gloves, etc., including cold weather clothing.
f. Adequacy and simplicity of operating instructions.
g. Factors which caused frequent complaints from operators.

6.2.11 Agent-Hardware Compatibility

a. Empty, disassemble and clean the flamethrower.
b. Inspect all inside surfaces for evidence of corrosion, pitting, rust, peeling paint, or other damage caused by the fuel. Record findings.
c. Use photomicrographic techniques to compare the inside surfaces of the empty flamethrower with a similar surface of an unused flamethrower as obtained from the manufacturer. Record differences.

6.3 TEST DATA

6.3.1 Receipt Inspection

a. Record the data collected as described in applicable sections of MTP 8-2-500 and the following:

1) For the test item package:

a) Materiel configuration (flamethrower completely installed on vehicle, installed on a skid or mockup, disassembled

and shipped in separate packages).
b) Indications of damage (undone bindings, dents, puncture, etc.).
c) Corroded or mildewed parts.
d) Illegible or missing markings.
e) Incorrect labeling.
f) Length, width, height, in feet and inches.
g) Weight, in pounds.

2) For the test item:

a) All deficiencies to the test item, specifically the following:

(1) Missing components.
(2) Incorrect assembly of components.
(3) Body cracks or deformations.
(4) Corrosion of metal parts.
(5) Missing or outdated inspection records for pressure rating tests of tanks, hose, etc.
(6) Missing manuals, repair parts, etc.
(7) Materiel configuration (flamethrower completely installed on vehicle, installed on a skid or mock-up, disassembled and shipped in separate packages).
(8) Height, width, and length, in feet and inches.
(9) Weight, in pounds

3) Leakage data collected as described in paragraph 6.2.7.
4) Operability data collected as described in paragraph 6.2.8.

b. Retain all photographs.

6.3.2 Safety Evaluation

Record the following:

a. Hazardous features:

1) Physical
2) Operational
3) Action taken to reduce or eliminate

b. Data collected for inclusion in safety release recommendation
c. Deficiencies in safety devices
d. Types of fire fighting equipment
e. Type of gas used in pressurizing tanks.

6.3.3 Simulated Environmental Testing

6.3.3.1 Extreme Temperature Tests

6.3.3.1.1 Low Temperature Tests

a. Record the following:

1) Test item identification number
2) For the lowest temperature:

a) Damages incurred
b) Tank pressure before test
c) Any change in tank pressure during or after test
d) Temperature in °C

3) For test item minimum operating temperature:

a) Damages incurred
b) Any change in tank pressure during and/or after test
c) Leakage data collected as described in paragraph 6.2.7
d) Operability data collected as described in paragraph 6.2.8
e) Temperature in°C

4) For ambient temperature:

a) Damages incurred
b) Leakage data collected as described in paragraph 6.2.7
c) Operability data collected as described in paragraph 6.2.8
d) Temperature in °C

b. Retain all photographs

6.3.3.1.2 High Temperature Tests

a. Record the following:

1) Test item identification number
2) For temperature of 68.3°C (155°F):

a) Damages incurred
b) Tank pressure before and after test
c) Any change in tank pressure

3) For highest temperature:

a) Damages incurred
b) Any change in tank pressure
c) Leakage data collected as described in paragraph 6.2.7
d) Operability data collected as described in paragraph 6.2.8
e) Temperature in °C

4) For ambient temperature:

a) Damages incurred

b) Leakage data collected as described in paragraph 6.2.7
c) Operability data collected as described in paragraph 6.2.8
d) Temperature in °C
e) Evidence of damage to gaskets and other components

b. Retain all photographs

6.3.3.2 Fungus Test

Record the following for each test item:

a. Test item identification number
b. Presence of fungus growth on:

1) Test item
2) Test item components

c. Operability data collected as described in paragraph 6.2.8

6.3.3.3 Humidity Test

Record the following for each test item:

a. Test item identification number
b. Evidence of corrosion and/or deterioration on:

1) Test item
2) Test item components

c. Operability data collected as described in paragraph 6.2.8

6.3.3.4 Dust Test

Record the following for each test item:

a. Test item identification number
b. Damage to:

1) External surface
2) Test item components

c. Presence of dust on test item components
d. Operability data collected as described in paragraph 6.2.8

6.3.3.5 Sunshine Test

Record the following for each test item:

a. Test item identification number
b. Damages to:

1) External surface
2) Test item components

c. Leakage data collected as described in paragraph 6.2.7
d. Operability data collected as described in paragraph 6.2.8
e. Tank pressure before test
f. Any change in tank pressure during and/or after test

6.3.3.6 Salt Fog Test

Record the following for each test item:

a. Test item identification number
b. Evidence of corrosion:

1) Test item
2) Test item components

c. Evidence of water penetration
d. Leakage data collected as described in paragraph 6.2.7
e. Operability data collected as described in paragraph 6.2.8

6.3.3.7 Rain Test

Record the following for each test item:

a. Test item identification number
b. Presence of corrosion:

1) Test item
2) Test item components

c. Evidence of water penetration
d. Leakage data collected as described in paragraph 6.2.7
e. Operability data collected as described in paragraph 6.2.8

6.3.4 Rough Handling and Surface Transport Tests

Record the following for each test item:

a. Test item identification number
b. Data collected as described in applicable sections of MTP 8-2-503
c. Damage to the test items mounting (cracks, breaks, etc.)
d. Damage and deformation to test item exterior
e. Leakage data collected as described in paragraph 6.2.7
f. Operability data as described in paragraph 6.2.8

6.3.5 Air Transportability

Record the following:

a. Data collected as described in applicable sections of MTP 7-2-515
b. Type of aircraft used or simulated
c. Description of transport configuration

1) Length, width and height, in inches
2) Weight, in pounds
3) Material

d. Equipment used in loading
e. Difficulties encountered while loading
f. Damage incurred to the package while loading
g. Method of tiedown
h. Equipment used in unloading
i. Difficulties incurred in unloading
j. Damage incurred to the package while unloading

6.3.6 Airdrop Capability

a. Record the following:

1) Data collected as described in applicable sections of MTP 7-2-509
2) Test item identification number
3) Altitude in feet
4) For test item's mounting:

a) Presence of cracks, breaks, etc.
b) Undone binding, if applicable

5) Damage and deformation to the test item's exterior
6) Leakage data collected as described in paragraph 6.2.7
7) Operability data collected as described in paragraph 6.2.8
8) Aircraft type(s) used
9) Aircraft airspeed
10) Meteorological conditions
11) Test item configuration during airdrop
12) Impact velocities
13) Accelerometer data

b. Retain all photographs

6.3.7 Leak Testing

a. Record the following information:

1) Location of leakage
2) Repairs made
3) Effectiveness of repairs

b. Retain all photographs

6.3.8 Operational Reliability

a. Record the following information

1) For each test item performance:

a) Test item identification number
b) Meteorological data:

(1) Ambient temperature
(2) Relative humidity
(3) Wind direction and speed

c) Fuel data:

(1) Flame fuel (type, percent gel, age)
(2) Ignition fuel

d) Compressed gas data
e) Storage capacities:

(1) Flame fuel
(2) Ignition fuel
(3) Compressed gas

f) Preliminary firing data:

(1) Types of high pressure and fuel cutoff valves (automatic, manual, combination).
(2) Method of ignition.
(3) Traverse and elevation (also blocked areas).
(4) Number of people required for operation of equipment.
(5) Method of communication with driver.
(6) Time required for fueling and pressurizing equipment.
(7) Maximum holding time between fueling and firing.
(8) Adequacy of instruction plates.
(9) Adequacy of gages.
(10) Type of operating valves (manual, electric, hydraulic).

g) Firing data:

(1) Range:

(a) Maximum possible
(b) Minimum safe

(2) Flame duration (continuous)
(3) Number of one-second shots possible
(4) Consistency of flow projection
(5) Ability to fire wet shots
(6) Method and adequacy of extinguishing flame
(7) Final pressures

2) At the completion of operational tests:

a) Total number of test items tested
b) Number of tests
c) Number of nonfunctioning test items
d) Number of malfunctioning test items
e) Reason for nonfunctioning or malfunctioning, if known

b. Retain all photographs

6.3.9 Maintenance Characteristics

a. Record the following information:

1) Any deficiencies:

a) In maintenance package
b) Of test item requiring component replacement

2) The time required to perform scheduled and unscheduled maintenance.
3) Special tools required.
4) Features of design enhancing maintenance by personnel of average skill.
5) Component interchangeability.
6) Adequacy and accuracy of maintenance documentations.
7) Adequacy of safety devices.
8) Maintenance category of the test item.
9) Nomenclature of repair parts used
10) Test item down time (cumulative)
11) Time taken between repairs and reasons, if appropriate.
12) Frequency of repairs.

b. Retain all photographs.

6.3.10 Human Factors Aspects

Record the following information:

a. Adequacy of space in vehicle for operation of the flame unit.
b. Ease of handling and operating the test item.
c. Ease of handling test item when wearing protective clothing, gloves (including cold-weather clothing).
d. Level of operating skill required.
e Compatibility with outer clothing and equipment.
f. Adequacy and simplicity of operating instructions.
g. Factors causing frequent complaints from operators.

6.3.11 Agent-Hardware Compatibility

a. Record the following data:

1) Test item identification
2) Presence of the following on the test item inner surface:

a) Corrosion
b) Pitting
c) Rust
d) Peeling Paint
e) Other damaged caused by fuel

3) Effects of fill on flamethrower surface

b. Retain all photographs
c. Retain all laboratory analysis

6.4 DATA REDUCTION AND PRESENTATION

6.4.1 Receipt Inspection

a. Data collected as a result of this procedure shall be presented as indicated in the applicable portions of MTP 8-2-500.
b. The description of the test item, number of items tested, and conditions upon receipt shall be presented in tabular form.
c. Photographs shall be used to substantiate results.
d. The results of the leak and operational check tests shall be presented in narrative or other convenient form.

6.4.2 Safety Evaluation

a. A Safety Release Recommendation as required by USATECOM Regulation 385-6 shall be forwarded to the U. S. Army Test and Evaluation Command within 30 days of the beginning of the test. The Safety Release Recommendation shall describe special safety considerations or hazards to personnel and materiel including development types of equipment as well as standard components used in assemblage of item being tested.
b. Report data and comments relative to the safety hazards observed during any phase of testing.
c. Report comments relative to suggested safety improvements.

6.4.3 Simulated Environmental Testing

a. The results of the subtests conducted shall be presented in tabular or other suitable form.
b. The results of the leak and/or operational check tests performed at the conclusion of the various environmental tests shall be presented in narrative or other suitable form.

6.4.4 Rough Handling and Surface Transport Tests

a. Rough handling and surface transport data shall be presented as prescribed in MTP 8-2-503.
b. Vibration and shock data will be presented in tabular form to

indicate test times, distances dropped, shock levels, vibration frequencies etc., and significant findings of the test. Include photographs of damage.

c. Present data on operation of test item after subjection to rough handling and surface transport conditions, vibration and shock.

6.4.5 Air Transportability

Data shall be presented in summary form as indicated in the applicable portions of MTP 7-1-002, MTP 7-2-515 and other pertinent testing instructions.

6.4.6 Airdrop Capability

Data shall be presented in summary form as indicated in the applicable portions of MTP 7-2-509.

6.4.7 Leak Testing

a. The results of leak testing shall be presented as prescribed in MTP 8-2-512.

b. Narrative comments, photos, etc., shall be included as required.

6.4.8 Operational Reliability

Data derived from this subtest shall be presented in narrative form supplemented by drawings, photographs, charts, tables, graphs, or any other suitable means of displaying information. The report shall clearly conclude whether the test item meets the reliability criteria established in applicable specifications. Recommendations relative to further testing and methods to overcome malfunctions will also be included.

6.4.9 Maintenance Characteristics

Data from this subtest shall be presented in narrative form. The report shall be supplemented by photos, drawings, or other devices to substantiate the conclusions and recommendations.

6.4.10 Human Factors Aspects

a. Data from this subtest shall be presented in tabular, narrative or other suitable form supplemented by photographs and graphic or art presentations as required.

b. A summary of comments regarding shortcomings and recommended improvements shall be presented.

6.4.11 Agent-Hardware Compatibility

Data from this subtest shall be presented in narrative form and shall clearly indicate whether a type of fuel has an effect on the test item, its components or vice versa. The report will be supplemented by photographs, drawings, or other devices required to support the conclusions.

UNCLASSIFIED
Security Classification

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) US Army Test and Evaluation Command (USATECOM) Aberdeen Proving Ground, Maryland 21005	2a. REPORT SECURITY CLASSIFICATION Unclassified 2b. GROUP ----------

3. REPORT TITLE
U. S. Army Test and Evaluation Command Materiel Test Procedure 4-2-071, Commodity Engineering Test Procedure - "Flamethrowers, Mechanized".

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

5. AUTHOR(S) (First name, middle initial, last name)
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6. REPORT DATE 1 April 1970	7a. TOTAL NO. OF PAGES 26	7b. NO. OF REFS 13
8a. CONTRACT OR GRANT NO. DA-18-001-AMC-1045(R) b. PROJECT NO. AMCR 310-6 c. d.	9a. ORIGINATOR'S REPORT NUMBER(S) MTP 4-2-071 9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report) ----------	

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11. SUPPLEMENTARY NOTES ----------	12. SPONSORING MILITARY ACTIVITY Headquarters US Army Test and Evaluation Command Aberdeen Proving Ground, Maryland 21005

13. ABSTRACT
This Engineering Test Procedure describes test methods and techniques for evaluating the technical performance and characteristics of Mechanized Flamethrowers and for determining their suitability to be subjected to test for service use in the U. S. Army. The evaluation is related to criteria expressed in applicable Qualitative Material Requirements (QMR), Small Development Requirements (SDR), Technical Characteristics (TC), or other appropriate design requirements and specifications.

DD FORM 1 NOV 68 1473 (PAGE 1)
S/N 0101-807-6811

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UNCLASSIFIED
Security Classification

A-31408

14 KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Engineering Test						
Mechanized Flamethrowers						
Test Procedures						
Test Methods and Techniques						

DD FORM 1 NOV 68 1473 (BACK)
S/N 0101-807-6821