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14 November 1969

Materiel Test Procedure 3-4-001
Yuma Proving Ground

U. S. ARMY TEST AND EVALUATION COMMAND
ENVIRONMENTAL TEST PROCEDURE

DESERT ENVIRONMENTAL TESTING OF ARMAMENT & INDIVIDUAL WEAPONS

AD 867021

1. OBJECTIVE

The objective of the procedures outlined in this MTP is to provide a means of evaluating the capability of armament and individual weapons to function effectively against all known conditions in the desert which might have significant effects on the performance characteristics of these weapons.

2. BACKGROUND

Each item developed and produced for the Army must perform satisfactorily in any of the world's environments. Some of the most extreme natural environments are found in the desert.

Armament and individual weapons stored, transported, and used in the desert experience conditions and stresses peculiar to this type of environment. These conditions and the stresses arising from them are the results of the climatic and geophysical environments of a desert. For a detailed discussion on the terrain and its associated features, see MTP 10-1-003. Because of such unique stresses, the results of these types of desert environmental tests are not directly comparable to those made during prior engineering and service tests. Interactions of desert environmental factors affect armament & individual weapons in such a way that it is not always possible to predict their performances from the results of tests conducted in other climates or simulated hot-dry environments. These desert field tests are therefore indispensable for evaluation of the suitability of an item intended for use in desert areas of the world.

3. REQUIRED EQUIPMENT

a. Vehicles (cargo).
b. General and special tools and ancillary items required for inspection, reparis or maintenance on the test item.
c. Test equipment (to monitor environmental conditions and to test components and systems).
d. Still and motion picture cameras with associated photographic equipment (black and white or color).
e. Meteorological support instrumentation.

4. REFERENCES

A. AR 70-8, Human Factors and Social Sciences Research.
B. AR 70-10, Army Materiel Testing.
C. AR 705-5, Army Research and Development.
D. AR 750-6, Maintenance Support Planning.
E. AR 70-38, Research Development Test and Evaluation of Materiel for Extreme Climatic Conditions.

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F. USATECOM Regulation 350-6, Training in New or Modified Equipment and Training Devices.
G. USATECOM Regulation 705-4, Documenting Test Plans and Reports.
H. MTP 4-4-001, Desert Environmental Test of Ammunition and Explosives.
I. MTP 6-2-502, Human Factors Engineering.
J. MTP 6-2-507, Safety.
K. MTP 10-3-500, Preoperational Inspection and Physical Characteristics.
L. MTP 10-4-001, Desert Environmental Testing of General Supplies and Equipment.
M. MTP 10-1-003, Desert Terrain.

5. SCOPE

5.1 SUMMARY

This MTP describes in general terms the methods to be used for preparing, conducting, recording, and reporting desert environmental testing of armament and individual weapons. Four main classifications of armament and individual weapons are considered: (1) individual small arms (not crew-served), (2) light and medium weight crew-served weapons, (3) towed weapons, and (4) self-propelled weapons.

The subtests outlined in this MTP are intended to simulate the actual desert service environment of the test item. Storage tests simulating desert depot and supply point storage, and transportation tests simulating highway, secondary road, and cross-country travel in the desert are followed by functioning tests which simulate actual desert operations.

The specific tests to be performed, along with their intended objectives, are listed below:

a. Inspection - The objective of this subtest is to determine:

1) The overall physical condition of the test item arriving at the testing installation.
2) If the test items are complete. This includes ancillary equipment and maintenance packages.
3) If the test item is correctly assembled, properly labeled, and ready for test.

b. Exposure - The objective of this subtest is to determine the effects of desert environmental exposure to communication, surveillance, and avionic electronic components and subsystems during transport and storage phases.

c. Functioning - The objective of this subtest is to determine the capability of the test items to function satisfactorily when employed under actual tactical conditions in conjunction with associated equipment in a desert environment.

d. Security from Detection - The objective of this subtest is to

determine the capability of armament and individual weapons to avoid detection when operated in a desert (field) terrain.

e. Maintenance Evaluation - The objective of this subtest is to determine the maintenance requirements for the test items in a desert (field) environment.

f. Human Factors - The objective of this subtest is to determine the effectiveness of human factors aspects of armament and individual weapons.

g. Safety - The objective of this subtest is to determine if the test items are safe for use in a desert environment.

5.2 LIMITATIONS

This MTP deals with field testing and no specific instructions are provided for performing tests in simulated environments or other induced hot-dry conditions.

The material in this MTP does not constitute complete or detailed test plans but a test plan for desert environmental testing of specific armament and individual weapons may be developed from the general procedures outlined in this MTP.

Supplementary information may be obtained from MTP 4-4-001, and MTP 10-4-001.

6. PROCEDURES

6.1 PREPARATION FOR TEST

a. Select test equipment ideally having an accuracy 10 times greater than that of the function to be measured.

b. Record the following information:

1) Nomenclature, serial number(s), and manufacturer's name of the test item.
2) Nomenclature, serial number(s), accuracy tolerances, calibration requirements, and last date calibrated of the test equipment selected for the tests.
3) Date equipment was packed.

c. Ensure that all test personnel are familiar with the required technical and operational characteristics of the equipment under test, such as stipulated in Qualitative Materiel Requirements (QMR), Small Development Requirements (SDR), and Technical Characteristics (TC), and record this criteria in the test plan.

d. Prepare adequate safety precautions to provide safety for personnel and equipment, and ensure that all safety SOP's are observed throughout the test conduct.

e. Prepare record forms for systematic entry of data, chronology of tests, and analysis in final evaluation.

f. Review all instructional material issued with the test item by the

manufacturer, contractor, or government, as well as reports of previous tests conducted on the same type of equipment, and familiarize all test personnel with available references.

g. Record the grade, MOS, background, and training of all test personnel and ensure that all personnel receive new equipment training (NET).

h. Verify that test facilities, equipment and accessories are available, operational and properly calibrated. Power sources shall be checked to ensure correct outputs.

i. Select from each test lot a random sample of test items. The number selected shall be determined on a statistical basis using the method described in MTP 4-4-001, Appendix A.

j. Record the prevailing meteorological conditions as required, during test conduct, to include:

1) Temperature
2) Humidity, relative or absolute
3) Temperature gradient
4) Atmospheric pressure
5) Precipitation
6) Solar radiation
7) Wind speed and direction

6.2 TEST CONDUCT

NOTE: A detail discussion of desert test conditions is contained in MTP 10-1-003.

6.2.1 Inspection

NOTE: Unless otherwise defined by Technical Characteristics (TC's) QMR's, SDR's, the following inspection sequence should be performed. (Reference MTP 10-3-500).

a. Select an identification number before inspection.
b. Place identification number on the container.
c. Inspect the individual containers in accordance with Appendix D.
d. Remove the test item from the container.
e. Transfer the identification number to the test item.
f. Subject all test items, components and accessories to a thorough visual inspection to determine the existence of any damage or deficiency that precludes or degrades test item operation.
g. Correct as many deficiencies as possible. If a critical defect cannot be remedied, remove the test from test.
h. Repack test items in accordance with appropriate packaging procedures.

6.2.1.1 Operational Functions

a. Subject the test item to a basic operational test as required during the test cycle. The armament or weapon system under test should be

taken through a dry fire check and exercise. Handwheel efforts, boresight retention, linkage operation, etc., should be tested, and noticable changes in operating characteristics should be noted.

b. Perform such adjustments and inspections as may be required by the test item specifications.

6.2.2 Exposure

NOTE: The procedures described below are based on the movement of armament and weapons from the communication zone to the user. Figure 1 is a logical flow of material. Prior to the communication zone, it is assumed that material is maintained at a temperate environment while in CONUS and subsequently a maritime environment while transporting overseas. These prior conditions are not covered in this MTP.

6.2.2.1 Road Transportation

a. Instrument the test item to obtain the following information:

1) Container interior air temperatures.
2) Average test item skin temperatures.
3) Temperature of critical components.
4) Triaxial acceleration of test items.
5) Triaxial acceleration of critical components.
6) Input shock and vibration conditions (waveforms, amplitude, and duration).

b. Load the test item onto a suitable cargo transport vehicle.

NOTE: Test item shall be packaged according to normal practice.

c. Maintain a critical observation of handling experiences occurring during the various sequences of vehicle loading, unloading, unpacking, storage and emplacement.

d. Transport the test item from the communication zone to the forward depot storage area. (Reference mileage requirements in Appendix A).

e. Upon arrival at the forward depot storage perform the following on the test item:

1) Visual inspection for signs of damage.
2) Basic operational test to verify satisfactory operation of the test item. Repeat the dry fire exercise and other checks conducted in paragraph 6.2.1.1.a.

NOTE: Deficiencies shall be corrected before proceeding with the test.

6.2.2.2 Forward Depot Storage

a. Place the test item in storage. (Reference Exposure Requirements

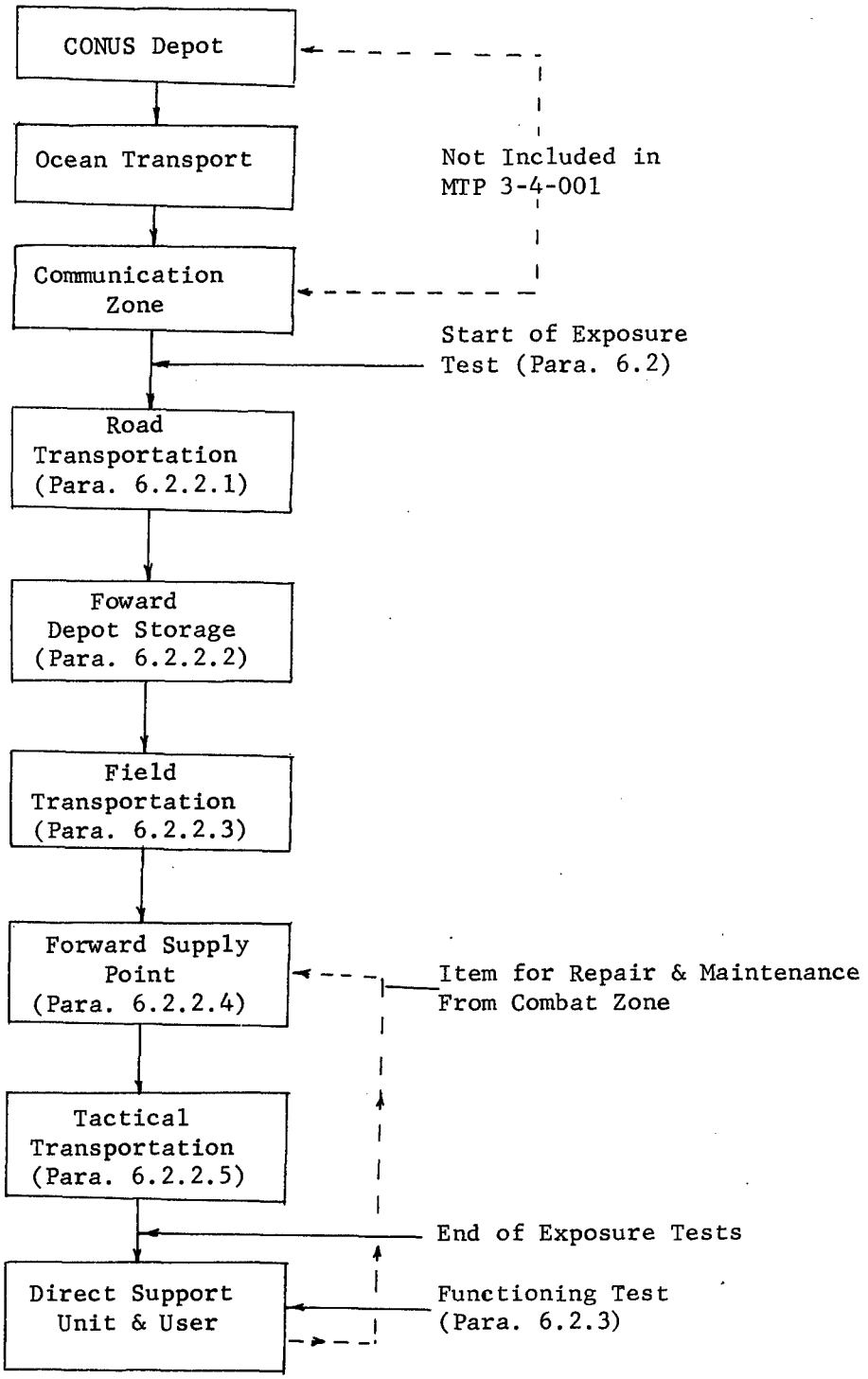

FIGURE 1 Stockpile-to-Use Flow of Armament and Individual Weapons

in Appendix A).

b. Note and record storage location and environment.

c. Instrument the test item to obtain the following information:

1) Overpack skin temperature
2) Container skin temperature
3) Container interior air temperature
4) Maximum test item skin temperature
5) Average test item skin temperature
6) Temperatures of critical components
7) Temperature of the ambient air
8) Ground temperature

d. Photograph the storage conditions and instrumentation set-up.

e. Upon removal from storage prior to field transport perform the following on the test item:

1) Visual inspection for signs of damage.
2) Basic operational test to verify satisfactory operation of the test item. Repeat the dry fire excercise and other checks conducted in paragraph 6.2.1.1.a.

6.2.2.3 Field Transportation

a. Repeat the procedure outlined in steps a, b, and c of 6.2.2.1, above.

b. Transport the test equipment from the depot storage to the forward supply point. (Reference mileage requirements in Appendix A).

c. Repeat the procedure outlined in step e of 6.2.2.1.

6.2.2.4 Forward Supply Point

a. Place the test equipment in storage. (Reference Exposure Requirements in Appendix B).

b. Note and record storage location and environment, as in step b of 6.2.2.2.

c. Repeat the procedures outlined in steps c through e of 6.2.2.2.

6.2.2.5 Tactical Transportation

a. Repeat the procedures outlined in steps a, b, and c of 6.2.2.1, above.

b. Transport the test equipment from the forward supply point to the direct support unit and user. (Reference Transportation Considerations and Mileage Requirements in Appendix C).

c. Repeat the procedures outlined in steps c through e of 6.2.2.2 above.

6.2.3 <u>Functioning</u>

a. Inspect the test items for damage sustained in exposure tests in

accordance with Appendix D and paragraph 6.2.1, Inspection.

b. Assemble all units into their normal tactical configuration.

c. Perform such other preparatory steps as may be specified in the applicable commodity MTP's such as preliminary operational checks and/or self test operations.

d. Emplace the armament or individual weapon under test as it would be used in tactical conditions.

e. Fire or function (as applicable) the test item so that all operational states are exercised and observe the performance of the test item during these tests.

f. If the test item can be operated in several modes continue the testing, ensuring that all modes of operation have been completed and that performance has been observed and noted as in step e above.

g. Monitor the environmental conditions throughout the conduct of the functional tests and time correlate the environmental data with performance data.

6.2.4 Security From Detection

NOTE: The security from detection subtest may be conducted during the test item's emplacement while undergoing Functional Tests.

a. Select test sites typical of the worlds deserts and providing suitable background conditions, reference MTP 10-1-003.

b. Camouflage the test items in accordance with colors listed in Appendix E.

NOTE: 1. The dominant color should be tan, with earth brown used to break up shapes or patterns.
2. If netting is used for camouflage, garnish should be provided for desert terrain.

c. With the test equipment sited or emplaced, remove any sand or other displaced natural material and observe the camouflage and concealment qualities of the test equipment as situated in the following terrain types.

1) Open desert pavement, no cover
2) Rocky or boulder strewn desert, no vegetation
3) Terrain having xerophyte vegetation (non-succulent)
4) Surfaces composed of loose or drifted sand

d. Observe the extent to which blowing sand and surface finish changes associated with abrasion or solar radiation degrade or improve concealment in the above locations.

e. Observe signature effects such as tracks, operational noise, dust clouds, flash smoke, acoustic radiation shadows, etc., during transport, emplacement and actual use of the items under test.

NOTE: Observations concerning camouflage and concealment shall be made with observers positioned at ranges of 500, 1000, and 3000 meters, within line of sight. In cases of test item

emplacements greater than 4 sq. yards, observations shall be made from the ground and from elevated positions.

f. Monitor visibility conditions such as the following:

1) Atmospheric clarity (freedom from dust and haze)
2) Sky conditions (cloud cover)
3) Elevation of the sun (time of day and date)

NOTE: Observations taken during this subtest, shall be made utilizing color film and suitable still photographs, if possible.

6.2.5 Maintenance Evaluation

a. Investigate the effects of the desert environment on maintenance conditions and procedures during the cycles of organizational maintenance required in connection with exposure and functional performance tests.

b. Observe actions necessary to ensure serviceability of the equipment under test as the equipment is removed from storage, or off-loaded from transportation, or assembled for functional performance.

c. Investigate the requirements for non-standard tools, equipment, supplies and instructions needed to accomplish necessary maintenance, which were not furnished with the equipment under test.

6.2.6 Human Factors

a. Observe difficulties encountered in handling, operating, assembling, disassembling the equipment under test. (Refer to MTP 6-2-502).

b. Prepare a human factors questionnaire, see Appendix F.

6.2.7 Safety Tests

a. Prior to committing test items to exposure and performance, review applicable safety statement or safety release and examine all test items for conformity and for presence of other hazardous conditions (refer to MTP 6-2-507).

b. In addition to the above, prepare a safety checklist to include safety procedures, precautions, protection, see Appendix G and emergency procedures as necessary. Other pertinent information such as the technical information or the technical hazards and safety characteristics, analysis of risks, limitations, and precautions including special techniques and test equipment should be included in the safety checklist.

c. Ensure that all safety procedures are followed throughout the conduct of the test cycle in accordance with the safety plan, and note the observations during each of the subtests given in this MTP.

NOTE: Observations regarding safety shall be observed continually during the entire test cycle. Photographs (black and white or color) shall be made of deficiencies whenever possible.

6.3 TEST DATA

6.3.1 Preparation for Test

Data to be recorded prior to testing shall include but not be limited to:

a. Nomenclature, serial number(s), manufacturer's name and function of the item(s) under test.

b. Nomenclature, serial number, accuracy tolerances, calibration requirements, and last date calibrated of the test equipment selected for the tests.

6.3.2 Test Conduct

In addition to the specific data requirements delineated in subsequent paragraphs, the following items shall be preserved as a part of the test records:

a. An engineering logbook containing in chronological order, pertinent remarks and observations which will augment test data and support, engineering evaluation and analysis of the technical performance of the test item.

b. Supporting photographs, calibration records, and recordings of test anomalies or deviations from the test plan made where necessary.

6.3.2.1 Inspection

a. Inspection data shall be recorded as described in MTP 10-3-500 paragraph 6.3.2 (arrival inspection).

b. Record the temperatures of the items under test as follows:

1) Container interior air temperatures
2) Average test item skin temperatures
3) Container skin temperatures
4) Temperature of critical components

c. Provide a description of the test site. Record the results of arrival inspection performed after each road, field and tactical transportation phase.

d. Record determinations of the following during the storage and system performance phase:

1) Location and extent of dust accumulation within the test item.
2) Deterioration, corrosion, or changes in performance tolerance limits of any components.

e. All significant damage shall be noted and photographed so as to show clearly its nature and extent.

6.3.2.1.1 Operational Functions

a. After each operational check conducted during or after exposure

perform a detailed visual inspection and record determinations of the following:

1) The ability of the test items to function properly during and after exposure.
2) Location and extent of dust accumulation within the equipment.
3) Degradation of bearings, grease seals, lubricants, cooling, systems, etc., resulting from exposure.
4) Deterioration, corrosion, or changes in performance tolerance limits of any component or exposed internal part.

6.3.2.2 Exposure

a. A full description of the test site is required.

b. Record all evidences of deterioration, including location on test item, probable effects of deterioration on test item performance, and action taken to alleviate the condition.

c. Record all deficiencies attributal to exposure.

6.3.2.3 Functioning

Record performance system data during tests. Record environmental data and correlate with performance data.

6.3.2.4 Security from Detection

Record the observed camouflage and concealment qualities possessed by the test equipment for each of the terrain types selected for the test.

6.3.2.5 Maintenance Evaluation

a. Record actions taken to ensure serviceability of the test equipment under test.

b. Record the following aspects of maintenance:

1) Ease of performing required maintenance
2) Special tools or skills required
3) Interchangeability of components
4) Adequacy of instructional manuals
5) Photographs as necessary

6.3.2.6 Human Factors

Complete Human Factors Questionnaire Appendix F after completion of approximately 1/3 of the total operating hours used on this test, and at the completion of the test.

6.3.2.7 Safety Tests

Safety data to be recorded for analysis shall include but not be limited to data as indicated in MTP 6-2-507.

Complete safety checklist in Appendix G.

6.4 DATA REDUCTION AND PRESENTATION

a. Processing of raw test data, in general, includes but is not limited to the following steps:

1) Marking test data for identification and correlation.
2) Organizing data into tabular and graphical form.
3) Modifying data to correct for nonstandard conditions.
4) Determining the statistical variation of the results in terms of the average value and standard deviation of the particular quantities, the correlation among two or more quantities, etc.

b. It is noted that the test directive (or operation) itself serves to define the types and characteristics of the raw test data, and the ultimate objective of the test program defines the form of the test data desired.

c. Specific instructions for the reduction and presentation of individual subtest data are outlined in subsequent paragraphs.

6.4.1 Inspection

a. Data recorded for individual components shall be retained for the evaluation of the test equipment after exposure and system performance tests.

b. Inspection data shall also be summarized and presented as:

1) Percent total defective

a) Overpacks (based on total number of overpacks)
b) Containers (based on total number of test subassemblies
c) Unassembled parts (based on total number of test items

2) Percent critical deficiencies
3) Percent major deficiencies
4) Percent equipment under test without any deficiencies

6.4.2 Exposure

a. Prepare graphic and narrative presentations, as required to illustrate circumstances relating to malfunctions and failures attributed to desert environmental stresses.

b. Compare values from presentations with prescribed or desired values, tolerances, etc., and determine the acceptability of the test item in this regard.

6.4.3 Functioning

Present the data in narrative or tabular form as appropriate.

6.4.4 Security From Detection

Present the data in a narrative statement of results of the observations relating to security from detection.

6.4.5 Maintenance Evaluation

Observations shall be summarized and presented in narrative form. Where necessary, the narrative shall be supplemented by line drawings and photographs.

6.4.6 Human Factors

a. Present in narrative form evaluation of questionnaire.
b. Utilize still and motion picture frame illustrations, and graphical summaries as applicable.

6.4.7 Safety Tests

Observations and deficiencies shall be presented in narrative form, supplemented as required by line drawings and photographs.

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APPENDIX A

Exposure Requirements

Road Trans (mi)	Fwd Depot Storage (days)	Field Trans (mi)	Fwd Supply Point (days)	Tactical (mi) Movement (max)		
				Sandy Desert	Gravelly Desert	Rocky Desert
50 paved plus 150 Secondary	70	35	10	70	130	75
	120	35	30	70	130	75

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APPENDIX B

Forward Supply Point Exposure Requirements

Minimum number of days storage to include days with temperature in excess of:

Forward Supply Point (days)	Air Temperature	Ground Temperature	
	105°F for 4 hr	110°F for 2 hr	135°F for 4 hr
10	7	3	7
30	25	5	20

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APPENDIX C

TRANSPORTATION CONSIDERATIONS AND MILEAGE REQUIREMENTS

1. TRANSPORTATION

For many armament and individual weapon systems, the transportation environment is much more severe than the storage environment. Since many weapons systems are frequenty carried in open trucks or trailers, the harshest combination of climatic and geophysical factors are brought to bear on the test item. (Refer to MTP 10-1-003, for a discussion of the desert geophysical parameters.)

It is important to determine when and why failures occur. Hence, the item or system under test should be checked periodically during the transport phases to attempt to pinpoint the particular subtest, or phase thereof, that caused the failure. After each of the transportation cycles, the test item shall be inspected for damage in accordance with the procedures described in this MTP.

The effects of handling of materiel during loading or unloading, movement of equipment and supplies, and operations are discussed in paragraph 1.8. However, it should be noted that handling subtests may be conducted concurrently with the following transportation subtests.

1.1 ROAD TRANSPORTATION

The road transportation test is intended to simulate the shipment of materiel from the base depot to the forward area depot in the theater administrative zone. The methods of packaging and transporting the item will conform to standard practice for the commodity involved. Test conduct will be during the daylight hours of the hot summer months. The item will be transported over paved roads for 150 miles and then in convoy over secondary roads with dust exposure (e.g. the YPG Truck Gravel Course) for 450 miles.

1.2 FIELD TRANSPORTATION

The movement of armament and individual weapons from the forward area depot to the field supply point is covered by the field transportation subtest. Again, the methods of packaging and transporting the item will conform to standard practice for the commodity involved. The item will be driven over 70 miles of trail, or pioneered road (e.g. the YPG Desert March Trail). Vehicle speeds will be as high as possible without jeopardizing the safety of the crew. If the use of overpacks is optional, the test will be conducted without overpacks.

1.3 TACTICAL DEPLOYMENT

The tactical deployment test is the final and most severe transpor-

tation subtest. It represents the movement of materiel from the field supply point to the direct support unit or user. These units must maintain the same mobility as the user of the item and must, therefore, be physically located with or very near the user. After the item reaches its user destination, it leaves its transportation/storage environment and enters its functioning environment.

The criteria for this subtest is dependent upon the particular item involved and the means by which it is to be transported. In other words, armament and individual weapons can be broken down into four general classifications: (a) individual small arms (not crew-served), (b) light and medium weight crew-served weapons, (c) towed artillery, (d) self-propelled artillery.

The mode of tactical deployment for any one item depends upon the classification under which the item falls. (A fifth classification, extremely heavy artillery, railway guns, etc., is not considered because the items in this category are not tactically deployed as defined above due to their excessive size and weight.)

1.4 INDIVIDUAL SMALL ARMS (Not Crew-Served)

Ordinarily, non-crew-served small arms are hand carried by the individual soldier during tactical deployment. However, this is not always the case. In certain instances small arm weapons may be mounted in or on some combat vehicle such as a tank, APC, or self-propelled gun. For example, a 175-mm self-propelled gun is equipped with mounting brackets for M14 rifles for its crew.

Test items will be transported via their normal mode of tactical deployment. In the case cited above, the M14 rifle is usually hand carried during tactical deployment, but in a limited number of instances it is deployed by other means. When this situation occurs, the mode of deployment that is most commonly encountered by the item will be used. If a sufficient number of samples can be obtained, the item will be tactically deployed in each mode. The terrain criteria and corresponding mileage breakdowns together with the total mileage requirements for this subtest are given in Table I. (Order of testing in Table I is flexible and may be determined by convenience.)

1.5 LIGHT AND MEDIUM WEIGHT CREW-SERVED WEAPONS (Except towed and self-propelled)

Test items will be loaded on a tactical vehicle and secured for secondary road and cross-country travel. The modes of packaging and shipment will be consistent with normal practice for the item involved. Terrain criteria and mileage requirements for the test are given in Table I. (Testing order is optional.)

After completion of the transportation requirements listed in Table I, the item will be unloaded on either sandy, rocky, or gravelly terrain and emplaced in a ready-for-use condition. Light camouflage protection will be

provided.

Then, after at least 1/2-hour of emplacement, the item will be loaded back on the carrier and taken over the tactical transportation phase a second time. This will be followed by a second 1/2-hour emplacement period, a third transportation cycle, a third 1/2-hour emplacement, and, finally, a fourth transportation cycle, in that order. Each of the three emplacement phases should be conducted on a different type of terrain as listed above.

1.6 TOWED WEAPONS

The test item will be placed in its normal traveling configuration and towed over the required terrain and mileage combinations listed in Table I in any convenient order.

Having completed the tactical transportation phase (Table I) the item will be emplaced on either sandy, rocky, or gravelly terrain and made ready for functioning. Light cover camouflage will be provided, and the installation will be allowed to remain for at least 24 hours.

The tactical transportation phase together with the emplacement phase can be considered as one cycle of the subtest. This cycle, then, will be repeated two more times, with each of the emplacement installations being on a different type of terrain, either sandy, rocky, or gravelly. Following the third cycle, the item will again be placed in its traveling configuration and taken back over the transportation phase only.

1.7 SELF-PROPELLED WEAPONS

The tactical deployment subtest for self-propelled weapons will be the same as that for towed weapons except that the test item will be drive (self-propelled) rather than towed over the required terrain and mileage combinations listed in Table I.

1.8 HANDLING

An important factor to be considered in desert testing is the effect that environmental conditions will have on the people who must handle and transport equipment and meteriel. Personnel fatigued by extreme heat, dust, etc., can seriously damage parts and equipment through careless or hurried handling.

The environmental tests described herein are conducted by experienced personnel working under controlled conditions; so the "test" human stress factor does not simulate the "actual" human stress factor in field operations. For this reason, it is important that all handling operations during the exposure tests be carefully observed to determine which operations would have a significant probability of resulting in damage to materiel when the human stress factor is added. A record of these operations should be made and, if necessary, illustrated by still and/or motion picture photography.

2. MILEAGE REQUIREMENTS

The mileage requirements for exposure testing is shown in Appendix A. Mileage requirements for tactical deployment subtests are shown below in Table I.

TABLE I

Group Classification of Armament and Individual Weapons

Desert Terrain Component	Individual Small Arms (Not Crew-Served)	Light and Medium Weight Crew-Served Weapons** Hand Carried	Light and Medium Weight Crew-Served Weapons** Vehicle Carried	Towed Weapons	Self-Propelled Weapons
Secondary Roads*	10	10	50	70	20
Mountains	8	8	12	21	22
Badlands/Hills	3	3	5	8	9
Fans/Washes	8	8	11	19	20
Plains/Flats	19	19	27	47	49
Dunes/Fields	7	7	10	20	20
Dust	10	10	10	10	10
Totals*[3] (Not including Secondary Roads)	55	55	75	125	130

*First deployment cycle only; not to be included in second and third cycles.

**Some crew-served weapons are hand carried (e.g. the 90-mm recoilless rifle), and others are vehicle carried (e.g. the 106-mm recoilless rifle). A particular weapon will either be hand carried or vehicle carried during tactical deployment, as applicable. In other words, one case or the other will apply -- not both.

*[3] The total mileages given in this table are generally arbitrary. However, deviation should be avoided so that subsequent tests may be effectively compared.

The dust course mileages are subtracted from the total mileages, and the remainder is divided among the world's principle desert terrain components according to the percentage of total world desert area that each component occupies. (See MTP 10-1-003)

APPENDIX D

INSPECTION CHECKLIST

Receiving	Exposure		Functioning	
	Before	After	Before	After
Integrity of: Overpack Packing Packaging Legibility of Markings Source Records Condition of items: Conformance with Specifications Weights Critical Dimensions	Integrity of: Packing Packaging Condition of Items: Identifying Number Serviceability	Integrity of: Packaging Condition of Items: Loose Parts Separated Parts Dents Fractures Accumulations of dust or other foreign matter Identifying Number	Conditions of Items: Serviceability Safe Condition Weights, Critical Dimensions Identifying Number	Condition of Failed Items; Observable Causes of Failure Condition of Spent Items: Signs of Abnormal Functioning

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APPENDIX E

LANDSCAPE TYPES FOR DESERT TESTING

Desert Flats
Hills/Badlands
Fan/Wash Complex
Mountains
Sand Fields and Dunes

DOMINANT COLORS IN DESERT TERRAIN

Terrain Type	Color USA Std.	Munsell Symbol	ISCC-NBS No./Desig.
Barren areas, bare rock shallow high mountain soils	Earth Brown	1.0 yr, 3/2	81 d. gy. y Br
Desert alluvial and sedimentary deposits, sand, and thin mountain soils	Tan	7.5 yr, 6/6	57 I. Br
Mountain soils of desert highlands	Earth Red	2.5 yr, 4/6	54. Br 0

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APPENDIX F

HUMAN FACTORS QUESTIONNAIRE

GENERAL: This form is to be completed by each individual after completion of approximately 1/3 of the total operating time of this test, and again at the completion of the test.

NAME: _____ DATE: _____

TEMPERATURE RANGE: _____

1. Did you encounter any of the following conditions (circle one phase sub-number if you encountered it).

HUMAN FACTOR	POSSIBLE CONDITION
2.1 Heat Stress	Any symptoms of incipient heat stroke? Any symptoms of incipient heat exhaustion? Any occasions when heat-induced fatigue delayed or curtailed operations? Rate heat encountered in operation of the test item as compared with a similar standard: Cooler, hotter, much hotter? Comfortable, uncomfortable, severe, intolerable? What standard vehicle?
2.2 Burning Temperatures	Any encounters with painfully hot parts? What parts? Specify. Classify as frequently used controls, occasionally used controls or handholds, normally accessible parts, or infrequently touched parts. Any burns suffered: First, Second, or Third degree?
2.3 Ventilation	Does air become uncomfortable dusty, bad enough to require dust mask or goggles? Do objectionable fumes generate by test items cause any problems: Explain. Do fumes irritate eyes, respiratory tract, skin?
2.4 Noise	Does noise interfere with vocal communication? Any painful or uncomfortable noise levels? Any after effects from noise?

HUMAN FACTOR	POSSIBLE CONDITION
	Any need for ear plugs, etc?
2.5 Visibility	Any visibility problems in operation of the test item? Any difficult reading gages, indicators, instruction plates? Any problems due to contrasting brightness levels, glare, reflections? Does airborne dust interfere with visibility? Do dust accumulations affect vision? Does not-climate operating mode alter visibility?

3. Record below any comments to paragraph 2 above.

Paragraph No.	Comment

APPENDIX G

SAFETY CHECKLIST

	Adequate	Inadequate	Ambiguous	Hazardous	Unnecessary
Item Characteristics					
Clear identification of item					
Presence of safety warnings					
Adequacy of handling instructions					
Safety of handling procedures					
Presence of safety devices					
Sharp projecting edges, controls, etc.					
Access to emergency cut-off controls					
Replaceable safety devices					
Adequate instructions for dealing with emergency actions					
Adequacy of personnel operating instructions (from point of view of safety with respect to heating conditions present during desert testing)					
Interior and exterior temperatures of test equipment relative to ambient conditions.					

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13. ABSTRACT

This Environmental Test Procedure outlines the methods of evaluating the capability of Armament and Individual Weapons to function effectively under all known conditions in the desert which might have significant effects on the performance characteristics of these weapons. The methods are described in general terms, for preparing, conducting, recording, and reporting desert environmental testing of armament and individual weapons: (1) individual small arms (not crew-served); (2) light and medium weight crew-served weapons; (3) towed weapons, and (4) self-propelled weapons.

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Test Procedure						
Test Methods						