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Materiel Test Procedure 5-3-100
U. S. Army Air Defense Board

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

TRANSPORTER-LOADER, MISSILE

3871

1. OBJECTIVE

The objective of this Materiel Test Procedure (MTP) is to determine the ability of the missile transporter-loader, to perform its assigned mission in accordance with requirements specified in applicable Qualitative Materiel Requirements (QMR), Small Development Requirements (SDR), and Technical Characteristics (TC), while being operated under service test conditions.

2. BACKGROUND

Mobile air defense and assault missile launchers are capable of rapid deployment and may be placed on terrain arbitrarily selected by considerations of time and space. Such considerations may entail responses to threatened hostile action or activities necessary to exploit tactical advantage. In support of missile launcher operations, the corresponding self-propelled transporter-loaders must exhibit the same capabilities for functioning in and across arbitrary terrain and under all environmental conditions required of the system which is supports.

3. REQUIRED EQUIPMENT

- a. Matching Missile Launchers, Missile Carriers, Missile Pallets.
- b. Full Complement of Practice Missiles.
- c. Suitable Maneuver and Operational Areas, including Water Courses as applicable.
- d. Vehicle Maintenance and Repair Shop Facilities.
- e. Communication Facilities, Radio and Wire, as required.
- f. Motion Picture Cameras and Film.
- g. Still Cameras and Film.
- h. Elapsed Time Recorders.
- i. Voice Recorders and Recording Medium.
- j. Air Transport and Delivery Vehicles and Equipment.
- k. Surface Transport Vehicles and Equipment.
- l. Meteorological Instrumentation.
- m. Shock and Vibration Instrumentation.
- n. Digital Instrumentation Data Processing Equipment.

4. REFERENCES

- A. Applicable QMRs, SDRs or TCs for Test Item and Missile System.
- B. Army Regulation 70-10, Army Materiel Testing.
- C. Army Regulation 70-38, Research, Development Test and Evaluation of Materiel for Extreme Climatic Conditions.
- D. Army Regulation 320-5, Dictionary of United States Army Terms.
- E. USATECOM Regulation 385-6 Verification of Safety of Materiel During Testing.

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- F. USATECOM Regulation 705-4, Equipment Performance Report.
- G. USATECOM Regulation 705-24, Management of Test and Test Support Aircraft.
- H. USAMC Regulation 385-12, Safety Verification of Materiel from Development through Testing, Production, and Supply to Disposition.
- I. USAMC Regulation 385-224, AMC Safety Manual.
- J. USAMC Regulation 750-15, Maintenance of Supplies and Equipment.
- K. Army Regulation 705-35, Criteria for Air Portability and Airdrop of Materiel.
- L. Army Regulation 705-50, Army Materiel Reliability and Maintainability.
- M. MTP 2-3-501, Safety Hazards.
- N. MTP 2-3-507, Reliability.
- O. MTP 2-3-511, Security (Susceptibility to Detection).
- P. MTP 2-3-514, Kit Evaluation.
- Q. MTP 2-3-515, Kit Installation.
- R. MTP 2-3-520, Logistics Over-the-Shore.
- S. MTP 3-1-002, Confidence Intervals and Sample Size.
- T. MTP 5-3-003, Tropic Environmental Test of Missile Rocket Systems.
- U. MTP 5-3-501, Battlefield Mobility (Battlefield Mobility, Tactical Flexibility and Portability).
- V. MTP 5-3-506, Compatibility with Related Equipment.
- W. MTP 5-3-510, Safety Hazards.
- X. MTP 5-3-512, Transportability.
- Y. MTP 5-3-525, Blackout Conditions Test.
- Z. MTP 5-3-534, Vulnerability to Detection and Identification.
- AA. MTP 5-4-001, Desert Environmental Test of Missile and Rocket Systems.
- AB. MTP 5-4-002, Arctic Environmental Test of Missile and Rocketry Systems.
- AC. MTP 7-3-512, Airdrop Capability (Suitability of Equipment for).
- AD. MTP 7-3-515, Air Transport, Interval, (Suitability of Equipment for).
- AE. MTP 7-3-516, Air Transport, External, (Suitability of Equipment for).

5. SCOPE

5.1 SUMMARY

5.1.1 Technical Characteristics

The procedures outlined in this MTP provide general guidance for determining the degree to which the test item meets current military requirements for missile transporting and loading. The cumulative test results, together with the results of appropriate Common Service Tests will allow an evaluation to be made of the operational effectiveness of the item and suitability of the equipment to meet the required military needs.

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

a. Operational Characteristics - The objective of this subtest is to:

- 1) Evaluate the adequacy of missile loading and securing provisions and the adequacy of storage and tie-down provisions for necessary on-vehicle equipment (OVE).
- 2) Determine the missile transporter-loaders battlefield mobility, tactical flexibility and portability on roads and various terrains.
- 3) Evaluate the compatibility of the transporter-loader in conjunction with the missile launcher, missiles and with various items of equipment serving as sources of missiles.
- 4) Determine the vulnerability of the test item to detection by sight or sound; or detection from the air and the degree of security provided by camouflage means furnished with the test item.
- 5) Evaluate the transporter-loader's consumption of fuels and lubricants and times of performance of functions.

b. Special Operations - The objective of this subtest is to:

- 1) Evaluate the suitability of the test item for employment in logistics over-the-shore operations.
- 2) Determine the capability of the test item to be transported by various carriers.
- 3) Determine the effectiveness and adequacy of the various kits supplied for use with the test item.

c. Full-Test Evaluation - The objective of this subtest is to:

- 1) Evaluate the time in service, failure potential of components, and operational reliability of the test item during transportation, maneuvering and functioning.
- 2) Evaluate the susceptibility of the test item for accomplishment of scheduled and non-scheduled maintenance tasks over the entire period of service testing, and of the completeness and suitability of the maintenance package supplied.
- 3) Determine the suitability of the test item for operation by service personnel without causing them to experience undue stress fatigue and malfunctioning through mental or physical errors.
- 4) Determine the safety hazards encountered during transportation, maneuvering and functioning of the test throughout the period of testing.

5.1.2 Common Service Tests

Not included in this MTP are the following Common Service Tests which apply to these commodities:

- a. MTP 5-3-500, Preoperational Inspection and Physical

Characteristics.

- b. MTP 5-3-502, Manuals and Technical Literature.
- c. MTP 10-3-501, Operator Training and Familiarization.
- d. MTP 10-3-504, Maintenance Evaluation.

5.2 LIMITATIONS

The variety of missile transporter-loaders, and their associated equipment preclude detailed coverage of any particular item. The testing methods outlined are intentionally general to provide test coverage for various types of missile transporter-loaders, and may be adopted as necessary, to accommodate specific items. It is left as a task for the project engineer to select the applicable test procedures from those given herein in order to evaluate the complete system.

6. PROCEDURES

6.1 PREPARATION FOR TEST

a. Select and schedule suitable maneuvering and operational areas, representative environmental locations as required by applicable test procedure and corresponding MTP.

b. Upon establishing the schedule availability of the test item, coordinate the availability of the following:

- 1) Engineering safety release or other safety statement in accordance with USATECOM Regulation 385-6.
- 2) Maintenance support facilities and personnel.
- 3) On-site location of spare parts basic load.
- 4) Equipment, special facilities, instrumentation and supplies.
- 5) Assistance of U.S. Army Airborne, Electronics, and Special Warfare Board (USAAESWBD) in the conduct of airborne operations required in such tests.
- 6) Assistance of U.S. Army Electronic Proving Ground (USAEPG) for conduct of the security from detection evaluation.

c. Select test equipment having ideally an accuracy of at least ten orders of magnitude greater than that afforded by the item under test, that is in keeping with the state of the art, and with calibrations traceable to the National Bureau of Standards.

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

e. 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 types of equipment, and familiarize all test personnel with the content of such documents. These documents shall be kept readily available for reference.

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

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

h. Prior to beginning any subtest, verify correct power source, necessary test instrumentation and inter-connection cabling, and that the equipment is aligned, if necessary, as specified in the pertinent operating instructions to ensure, insofar as possible, it represents as average equipment in normal operating condition.

i. Prepare a test item sample plan sufficient to ensure that enough samples of all measurements are taken to provide statistical confidence of final data in accordance with MTP 3-1-002.

j. Prior to start of each phase of testing and at 2-hour intervals during the testing, record prevailing meteorological conditions to include:

- 1) Temperature
- 2) Humidity, relative or absolute
- 3) Temperature gradient
- 4) Atmospheric pressure
- 5) Precipitation
- 6) Wind speed and direction
- 7) Visibility
- 8) Source of data

6.2 TEST CONDUCT

NOTE: Modification of these procedures shall be made as required by technical design of the item under test and availability of test equipment but only to the extent that such modifications will not affect the validity of the test results.

6.2.1 Operational Characteristics

6.2.1.1 Battlefield Mobility

a. Determine the ability of average trained crews, equipped with necessary standard or special moving equipment, to traverse and maneuver the test item over paved and unpaved roads and cross-country terrain of varying degrees of adversity and among terrain features affording protection of concealment in accordance with applicable sections of MTP 5-3-501.

b. Record the following information:

- 1) Test item speeds, loaded and empty, across the following terrain (coordinate this test with environmental suitability under paragraph 6.2.2.5).
- 2) Fuel consumption of self-propelled test items.
- 3) Consumption of lubricants.
- 4) Record consumption of hydraulic fluid or other transfer medium.

6.2.1.2 Compatibility with Related Equipment

Determine the ability of average trained crews to operate the test item in conjunction with its related equipment; missiles, missile launcher, missile carrier, missile pallet and communications equipment, as described in applicable sections of MTP 5-3-506.

6.2.1.3 Security from Detection

a. Determine the features of the test item, observed under service test conditions, which disclose or betray the position or operation of the test item, individually or in combination with related equipment. Conduct the visual and aural surveillance sections on the ground and observations from the air in accordance with applicable sections of MTP 2-3-511.

b. Evaluate the effectiveness of camouflage in accordance with applicable sections of MTP 5-3-534.

6.2.1.4 Tactical Performance

a. Determine and record the capability of average trained crews to utilize the test item in the following phases of the transporter-loader mission:

- 1) Time to accomplish missile pickup from pallet or missile carrier.
- 2) Time to load missiles from test item to missile launcher.

b. Record comments of operators concerning ease and accuracy of missile pickup and loading operations.

6.2.1.5 Adverse Lighting Conditions

Repeat the tests of section 6.2.1 under conditions of darkness (black-out) in accordance with applicable sections of MTP 5-3-525.

6.2.1.6 Adverse Weather Conditions

Repeat the test of section 6.2.1 under the following conditions, as applicable, which have not been encountered previously in the course of testing:

- a. Moderate temperatures with rain
- b. Frigid temperatures with:

- 1) Snow
- 2) Sleet or icing conditions

- c. Hot temperatures with:

- 1) High humidity
- 2) Low humidity

6.2.2 Special Operations

Conduct the following special operational tests as required to evaluate characteristics specified in applicable QMR, SDR or TC.

6.2.2.1 Logistics Over-the-Shore

Determine the capability of test item to participate in logistics over-the-shore operations as described in the applicable portions of MTP 2-3-520.

6.2.2.2 Surface Transportability

Determine the capability of the test item for transportation by surface carriers in accordance with applicable sections of MTP 5-3-512.

6.2.2.3 Air Transportability and Airdrop Capability

Air transportability and airdrop capability shall be determined as described in MTP 7-3-515 and MTP 7-3-516.

6.2.2.4 Kit Installation and Evaluation

- a. Perform the installation of kits as required in accordance with MTP 2-3-515.
- b. Record observations of compatibility of kits with the test item and the level of difficulty involved in their installation.
- c. Evaluate the adequacy of kits in accordance with MTP 2-3-514.

6.2.2.5 Environmental Suitability

Determine the environmental suitability of the test item in accordance with applicable sections of MTP 5-4-001, MTP 5-4-002, and MTP 5-4-003.

6.2.3 Full-Test Performance

Over the full duration of the testing, conduct procedures and observations necessary to determine the test item's response to test exposures and its suitability for operation by service personnel.

6.2.3.1 Reliability

a. Throughout the entire period monitor the durability and reliability characteristics of the test item in accordance with the procedures described in MTP 2-3-507. Ensure that the test item carrying its normal combat load, has been subjected to the exposures required in the applicable QMR, SDR, TC, or where no other exposures or mileage limitations are specified, to the following:

- 1) Towed items - 2000 miles
- 2) Self-propelled items - 4000 miles
- 3) Self-propelled wheeled items - 10,000 miles

NOTE: Distribution of accumulated total mileage shall be approximately as follows, (1) 25% on paved roads, (2)

50% on secondary road, and (3) 25% on cross-country terrain.

b. In addition to the data specified above, observe and record at 200-mile intervals the incidence of defects in the test item and its components including:

- 1) Damage sustained from shock and vibration during tactical transport, field or functional operation.
- 2) Strain (deformation) and wear of parts resulting from handling and operating.
- 3) Parts which have cracks or loose, non-functioning, or missing with particular attention to locks, latches, and catches.

6.2.3.2 Safety

a. Throughout the conduct of all testing as outlined in this MTP, monitor all safety aspects associated with the test item in accordance with the procedures given in MTP 2-3-501 and MTP 5-3-510.

b. In addition to data required by MTP 2-3-501 and MTP 5-3-510, record narrative comments concerning the following:

- 1) The degree to which the safety requirements of the QMR are met and recommended safety limitations or precautions.
- 2) Analysis to establish that no foreseeable hazards are present during testing or operation of the test item.
- 3) Inspection for high voltage hazard control of electrical system circuit breaker switches, interrupters and interlocks, to check for adequacy of protective provisions including warnings.
- 4) Evaluation and analysis of any safety hazards associated with storage, transportation, operation and maintenance of the test item.

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.
- b. Nomenclature, serial number, accuracy tolerances, calibration requirements and last date calibrated of test equipment selected for test.
- c. Damages to the test incurred during transit and manufacturing defects.
- d. Prevailing meteorological conditions prior to start of test at 2-hour intervals thereafter to include:

- 1) Temperature
- 2) Humidity, relative and absolute

- 3) Temperature gradient
- 4) Atmospheric pressure
- 5) Illumination (Daylight, Moonlight, Starlight, Darkness)
- 6) Weather conditions (Clear, Rain, Snow, Sleet, Icing)
- 7) Wind velocity and direction
- 8) Source of data

6.3.2 Test Conduct

Data to be recorded in addition to the specific instructions listed below for each subtest shall include:

- a. Photographs or motion pictures (black and white or color), sketches, charts, graphs, or other pictorial or graphic presentations which will support test results or conclusions.
- b. An engineering logbook containing in chronological order, pertinent remarks and observations which would aid in a subsequent analysis.

6.3.2.1 Operational Characteristics

6.3.2.1.1 Battlefield Mobility

Record data as described in MTP 5-3-501, to include the following:

- a. Nature of terrain traversed (Rocky, Sandy, Slopes in degrees).
- b. Fuel consumption in gallons.
- c. Lubricating oil consumption in quarts, lubricating grease consumption in pounds, and hydraulic fluid consumption in pints.

6.3.2.1.2 Compatibility with Related Equipment

Record data as described in MTP 5-3-506

6.3.2.1.3 Security From Detection

- a. Record detection data as described in MTP 2-3-511
- b. Record camouflage effectiveness data as described in MTP 5-3-524
- c. Record observer comments concerning aerial detection of:
 - 1) Uncamouflaged test item
 - 2) Camouflaged test item

6.3.2.1.4 Tactical Performance

Record the following:

- a. Time in seconds to pick up, from pallet or missile carrier, as applicable:

- 1) One missile
- 2) The full complement of missiles

- b. Distances traversed from source of missiles to launcher, miles and tenths.
- c. Times in minutes to load missiles from test item to launcher:
 - 1) One missile
 - 2) The full load of missiles
- d. Operators comments as to:
 - 1) Ease of missile pickup and loading
 - 2) Accuracy of alignment for loading

6.3.2.1.5 Adverse Lighting Conditions

Record data as described in MTP 5-3-525

6.3.2.1.6 Adverse Weather Conditions

Record the following:

- a. Ambient weather conditions.
- b. Operator's comments concerning adverse effects of weather on capabilities of the test item and its crew.

6.3.2.2 Special Operations

6.3.2.2.1 Logistics Over-the-Shore

Record data as described in MTP 2-3-520

6.3.2.2.2 Surface Transportability

Record data as described in MTP 5-3-512

6.3.2.2.3 Air Transportability and Airdrop Capability

Record data as described in MTP 7-3-515 and MTP 7-3-516

6.3.2.2.4 Kit Installation and Evaluation

Record data as described in MTP 2-3-514

6.3.2.2.5 Environmental Suitability

Record data as described in MTP 5-4-001, MTP 5-4-002, and MTP 5-4-003

6.3.2.3 Full-Test Performance

6.3.2.3.1 Reliability

Record data as described in MTP 2-3-507

6.3.2.3.2 Safety

Record data as follows and as described in MTP 2-3-501 and MTP 5-3-510:

- a. Deviations from safety requirements of QMR's
- b. Recommended safety limitations or precautions
- c. Foreseeable hazards
- d. Inadequate electrical protective devices

6.4 DATA REDUCTION AND PRESENTATION

Data, including observations and comments of operators, obtained from each section under Test Conduct, shall be summarized, compared, and evaluated according to procedures described in the individual referenced MTPs, or equivalent current practice where not covered by MTPs. Appropriate charts, graphs and tables shall be used to display summaries and comparisons of test data. Coordinates and other features of graphs and tables will be selected for clarity and uniformity with like presentations in other reports. Special consideration in data presentation shall be given to any conditions or circumstance which may have significantly influenced the test results.

Efforts will be maintained to take advantage of digital data recording automatic processing and automatic data read-out.

Calculations shall be performed as specified by the individual referenced MTPs, or in accordance with equivalent current practice where not covered by MTPs. All photographs, motion pictures, audio tapes and other records shall be explicitly identified and referenced; significant frames, transcriptions and samples shall be selected for illustrative purposes. All illustrations shall be completely identified.

All qualitative data accumulated shall be evaluated against the QMR, SDR, or TC to determine the degree of fulfillment demonstrated, compared with performance specifications.

Data collected under adverse weather conditions shall be separately compared with data collected during normal weather conditions.

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