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Materiel Test Procedure 5-3-045
U. S. Army Air Defense BoardU. S. ARMY TEST AND EVALUATION COMMAND
COMMODITY SERVICE TEST PROCEDURE

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LAUNCHER, GUIDED MISSILE

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1. OBJECTIVE

The objective of this Materiel Test Procedure (MTP) is to describe the service test procedures required to determine under simulated tactical conditions, whether the mission performance of the guided missile launcher under test satisfies the requirements of applicable Qualitative Materiel Requirements (QMR) or Small Development Requirements (SDR), and the suitability of such items for Army use.

2. BACKGROUND

Tactical guided missile systems may employ guided missile launchers in the capacity of transport, a twofold role: one or more missiles are restrained and stabilized in a ready-to-launch condition, and the missile's flight path axis is aligned with the desired trajectory prior to launch. Guided missile launchers must have tactical flexibility consistent with mission requirements of the respective weapons systems, and service tests of new or improved launchers will be required to demonstrate the full range of tactical and functional capabilities necessary for accomplishment of the mission.

3. REQUIRED EQUIPMENT

- a. Test Item Associated Activation Equipment.
- b. Associated Fire Control Equipment.
- c. Maintenance Test Package.
- d. Suitable Maintenance Support Facilities.
- e. Suitable Maneuver and Operational Areas, including Water Courses.
- f. Suitable Instrumented Firing Ranges.
- g. Aerial and Surface Targets and Support Facilities as required by Applicable MTP's.
- h. Meteorological Instrumentation.
- i. Cameras, and Film, Still and Motion Picture.
- j. Elapsed Time Recorders.
- k. Event Recorders.
- l. Voice Recorders and Recording Medium.
- m. Specified Transport Vehicles.
- n. Specified Transport Aircraft.
- o. Supply of Missiles.

4. REFERENCES

- A. U. S. Army Regulation 70-10, Army Materiel Testing.
- B. U. S. Army Regulation 705-35, Criteria for Air Portability and Air Drop of Materiel.
- C. U. S. Army Regulation 705-50, Army Materiel Maintainability and Reliability.

- D. USATECOM Regulation 70-23, Equipment Performance Reports (EPRs).
- E. USATECOM Regulation 385-6, Verification of Safety of Materiel During Testing.
- F. USATECOM Regulation 705-15, Operation of Equipment under Extreme Conditions of Environment.
- G. USATECOM Regulation 750-15, Maintenance Portion of the Service Test.
- H. USAMC Regulation 385-12, Verification of Safety of Materiel from Development through Testing, Production, and Supply to Disposition.
- I. USAMC Regulation 385-224, USAMC Safety Manual.
- J. MTP 2-3-507, Reliability.
- K. MTP 2-3-509, Fording.
- L. MTP 2-3-511, Security (Susceptibility to Detection).
- M. MTP 2-3-520, Logistics-Over-the-Shore (LOTS).
- N. MTP 3-1-002, Confidence Intervals and Sample Size.
- O. MTP 5-3-500, Preoperational Inspection and Physical Characteristics.
- P. MTP 5-3-502, Manuals and Technical Literature.
- Q. MTP 5-3-506, Compatibility with Related Equipment.
- R. MTP 5-3-507, Human Factors Engineering (Compatibility of Man/Machine by Observation.
- S. MTP 5-3-508, Engine Driven Electrical Power Requirements.
- T. MTP 5-3-510, Safety Hazards.
- U. MTP 5-3-512, Transportability.
- V. MTP 5-3-526, Emplacement, Action, and March Order.
- W. MTP 5-3-528, Accuracy.
- X. MTP 7-3-512, Air Drop - Suitability of Supplies and Equipment for.
- Y. MTP 7-3-515, Air Portability, Internal - Suitability of Supplies and Equipment for.
- Z. MTP 7-3-516, Air Portability, External - Suitability of Supplies and Equipment for.
- AA. MTP 10-3-501, Operator Training and Familiarization.
- AB. MTP 10-3-504, Maintenance Evaluation.

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 guided missile launcher (self-propelled or towed), and its associated equipment, under test meets current military requirements relative to the criteria expressed in applicable documentation. The cumulative test results, together with the results of appropriate Common Service Tests will allow an estimate to be made of the operational performance of the launcher and its suitability for military use.

The specific tests to be performed, and their objectives, are described in succeeding paragraphs. These tests need not be conducted in the

order presented; some may overlap or be performed concurrently.

a. Pre-operational Inspection and Physical Characteristics - The objective of this subtest is to verify physical dimensions, configuration and weights of the test item, and to determine its arrival condition, completeness, and readiness for testing. An examination of the completeness of the maintenance test package, tools and test equipment, and spare parts is included.

b. Safety - The objective of this subtest is to confirm the safety of the test item and to evaluate the inherent hazards to personnel and equipment associated with transportation, maneuvering, operation, and maintenance of the launcher under test.

c. Personnel Training - The objective of this subtest is to determine the type of instruction required and whether the proposed Program Of Instruction (POI) is adequate to ensure soldier proficiency in the use of the test item.

d. Operational Characteristics - The objectives of this subtest are to:

- 1) Determine the necessary crew activities and times required to emplace and interconnect the launcher to the weapon system, to prepare for action, and to march order the launcher.
- 2) Determine the ability of service personnel to accomplish the mission as assigned to the launcher.
- 3) Evaluate the capability of the test item for concealment, and for control of electromagnetic and acoustic radiations which could disclose its presence.
- 4) Determine the capability of power generation equipment to satisfy power demands and power regulation requirements.

e. Transportability - The objective of this subtest is to determine the capability and suitability of the launcher under test for transportation by those modes common to the Army.

f. Maintenance Evaluation - The objectives of this subtest are to:

- 1) Determine the capability of average trained crews to accomplish scheduled and corrective maintenance on the test item at the organizational and direct support levels.
- 2) Evaluate the adequacy of the maintenance package and spare parts basic load, including common and special tools and test equipment, and their suitability for the intended purpose and maintenance level.
- 3) Determine the test item's reliability characteristics, i.e., failure potential, Meantime Between Failures (MTBF), and Meantime to Repair (MTTR), leading to a determination of its availability for action in a given time period.
- 4) Determine the completeness, adequacy, and utility of the literature package supplied with the test item.

g. Human Factors - The objective of this subtest is to evaluate the

interactions between the test item and its operating and maintenance personnel to determine whether factors exist which cause undue stress, fatigue, and malfunctioning due to mental or physical errors.

h. Compatibility with Related Equipment - The objective of this subtest is to evaluate the launcher in conjunction with its interconnected equipment, and to determine its compatibility with the information processing networks within which it operates.

5.1.2 Common Service Tests

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

- a. MTP 2-3-514, Kit Installation and Evaluation.
- b. MTP 5-3-501, Battlefield Mobility, Tactical Flexibility and Portability.
- c. MTP 5-4-001, Desert Environmental Test of Missile and Rocket Systems.
- d. MTP 5-4-002, Arctic Environmental Test of Missile and Rocket Systems.
- e. MTP 5-4-003, Tropic Environmental Test of Missile and Rocket Systems.

5.2 LIMITATIONS

This procedure is limited to service tests of guided missile launchers, operating in conjunction with related elements of the associated guided missile weapons systems. However, the tests described herein may be adapted to cover service testing of such launchers operating independently.

6. PROCEDURES

6.1 PREPARATION FOR TEST

a. Select and schedule suitable emplacement sites, road courses, operational and maneuvering areas at representative environmental locations as required by Test Directive or other authorization and corresponding MTP.

b. Upon establishment of the scheduled availability of the guided missile launcher, coordinate the availability of the following:

- 1) Safety release and/or other applicable safety documents.
- 2) Maintenance support facilities and personnel.
- 3) On-site location of spare parts basic load.
- 4) Equipment - including practice missiles, special facilities, instrumentation, and supplies. All test equipment and instrumentation selected shall be in keeping with the state-of-the-art, with calibrations traceable to the National Bureau of Standards.
- 5) Assistance of cognizant Test Agencies for conduct of specialized test operations, or testing at their respective facilities.

c. Select test personnel (soldiers), with the exception of service test supervisors, who are representative of those expected to operate and maintain the test item in the field. Some should be left-handed, some should wear glasses, and some should represent the physical extremes of size.

d. Prepare record forms for systematic entry of data, chronology of test, test results, and such observations and measurements that would be of value in analysis and final evaluation of the test item.

e. Prepare a test item sample plan to ensure that enough samples of all measurements are taken to provide statistical confidence of final data in accordance with MTP 3-1-002. Provisions shall be made for sample plan modification during test progress as may be indicated by monitored test results.

f. Ensure that appropriate security measures are instituted to safeguard classified materiel and data, as applicable.

6.2 TEST CONDUCT

NOTE: Performance assessment shall be accomplished throughout this test primarily by observers equipped with the means of recording visual, aural, and judgmental observations and related time factors. Observer activities shall not interfere with or influence in any manner, the functions of the test item operators.

6.2.1 Pre-operational Inspection and Physical Characteristics

a. Upon receipt of the launcher at the testing agency, carefully examine the item undertest and associated equipment for completeness and obvious mechanical or electrical defects such as cracked or broken parts, loose assemblies, bent fragile parts, corroded plugs or jacks, etc., using the Preliminary Operating and Maintenance Manual (POMM) as a guide. All defects shall be noted and corrected before proceeding with the test.

b. Determine the physical characteristics of the launcher and associated equipment under test by photographing, weighing, and measuring the items in accordance with MTP 5-3-500, with attention to the following:

- 1) Shipping damage.
- 2) Dimensions and weights of launcher and separate components.
- 3) Inventory of equipment, and the Maintenance Test Package.
- 4) Condition of missile contact surfaces, electronic gear, and mechanisms in both the azimuth and elevation axes.

NOTE: Launcher characteristics obtained during the Engineering Test should not be re-determined here unless there is evidence that the data is not valid or not representative of the item.

c. Record the following:

- 1) Data as required by applicable portions of MTP 5-3-500.
- 2) Annotated photographs of test item configuration, instances of damage to shipping containers and/or parts of test item.

- 3) Lists of missing items of Maintenance Test Package, i.e., documents, spare parts, tools and test equipment.
- 4) Dimensions in centimeters/millimeters, weights in kilograms.
- 5) Times of operation accumulated on component items of the test item.

d. Carefully adjust the item under test, if necessary, as specified in the pertinent operating instructions to ensure, insofar as possible, it represents an average equipment in normal operating condition.

6.2.2 Safety

a. Review all safety precautions and possible hazards associated with the launcher under test and potential hazards of the overall testing environment. The review shall include, but need not be limited to, the following:

- 1) Fire hazards, fire fighting, and prevention.
- 2) Electrical shock hazards, prevention, and emergency action required.

b. Examine the launcher and associated equipment for the presence of necessary guards, shields, interlocks, safety fuzes, and warning plates.

c. Verify the operation of all safety devices provided in the launcher and associated equipment.

d. Record the following:

- 1) Non-operable safety features.
- 2) Inadequate warning statements.

e. Throughout the conduct of all testing as outlined in this MTP, monitor all safety aspects associated with the test item in accordance with MTP 5-3-510.

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

- 1) Confirmation of safety release under conditions as specified in USATECOM Regulation 385-6.
- 2) Any undue restrictions or limitations imposed on the tactical use of the launcher and associated equipment by Safety Release(s) and/or applicable safety documents.
- 3) Evaluation of the safety features of the test item with reference to convenience of location, ease of identification of safe positions by sight and touch, ease and quietness of operation, and design to prevent accidental shifting of position.
- 4) Evaluations of any safety hazards observed by test personnel during storage, transportation, operation, and maintenance of the test item to include:

a) Electrical hazards.

- b) Sharp edges, corners, or projections.
- c) Dangerous moving parts.
- d) Operating techniques which appear to present a potential hazard.

- 5) Recommendations for additions to the launcher's safety program and/or features.

6.2.3 Personnel Training

a. Orient and instruct all test personnel (soldiers) in guided missile launcher mission applications, capabilities, limitations, and associated equipment maintenance aspects in accordance with the POMM and the proposed POI. If no proposed POI is provided, develop one in coordination with the agency concerned with training. The proposed POI should include crew personnel operational training in the nomenclature and characteristics of the launcher under test as well as techniques of proper employment.

b. After training, require user personnel to perform all functional operations related to launcher usage as directed by the project officer.

c. Throughout the conduct of all testing as outlined in this MTP, monitor and evaluate all test item crew member training in accordance with the above POI and MTP 10-3-501.

d. In addition to the data required by MTP 10-3-501, record narrative comments concerning the following training factors:

- 1) Observations and analyses relative to the clarity, completeness, and general adequacy of the proposed POI and POMM.
- 2) For each member of test team:
 - a) MOS.
 - b) Training time in MOS, weeks.
 - c) Experience in MOS, months.
 - d) Training time on test item, weeks.
 - e) Team experience in test item crew, weeks.
 - f) Visual and aural acuity, if applicable.
- 3) Extent of additional training required.

6.2.4 Operational Characteristics

6.2.4.1 Mission Performance (Normal and Adverse Conditions)

a. With the test item in travelling configuration, approach a designated operational site (typical tactical terrain) during daylight hours and under prevailing weather conditions.

b. Utilizing an average trained, standard TOE crew (dressed in full field uniforms and personal equipment), emplace the launcher under test for launch operations in accordance with applicable sections of MTP 5-3-526, deploying any leveling and alignment means furnished.

c. Monitor activities and record the following:

- 1) Data as required by applicable sections of MTP 5-3-526.
- 2) Considerations relative to site selection and its influence on approach and displacement routes and procedures.
- 3) Times of performance for each phase of emplacement and preparation for action operations, including as applicable:
 - a) Site preparation, including excavation if applicable.
 - b) Alignment and leveling.
 - c) Interconnecting.
 - d) Energizing.

d. Utilizing the test crew, operate the launcher directing systems, conduct tracking operations, and initiate firing commands in accordance with applicable instructions.

NOTE: This step shall be preferably conducted in conjunction with firing operations, as for accuracy tests. When circumstances require "dry" launching operations which do not terminate in an actual launch, suitably disarmed or inerted missiles, or practice missiles and boosters, shall be used.

e. Observe activities and record the following:

- 1) Times of performance in minutes for transfer of missiles from missile carriers to launcher.
- 2) Times of performance in minutes to prepare missiles for launching.
- 3) Times of performance in seconds for aiming or otherwise directing the launcher to azimuth and elevation for launching and command fire.
- 4) Rates of fire and reloading, minutes per round, where these characteristics are applicable for the weapons system, including obscuration effects.
- 5) Accuracy data, as influenced by the launcher, in accordance with MTP 5-3-528.
- 6) Narrative comments, supported by annotated photographs, concerning difficulties encountered during launching operations.

f. Monitor and appraise the ability of the launcher crew to march order or otherwise recover the test item from the emplaced tactical situation.

g. Record the following:

- 1) Times in minutes required to de-energize or otherwise inactivate the launcher.
- 2) Times in minutes required to remove missile from the launcher.
- 3) Times in minutes required to make ready for transportation.
- 4) Narrative comments, supported by annotated photographs, concerning difficulties encountered during march order operations.

h. Repeat steps a. through g. above, adding or subtracting one crew member for each trial, until the minimum and optimum crew sizes required to emplace, prepare for action, serve, and march order the launcher are established.

i. Record the following for each trial:

- 1) Date, site location, elevation in meters.
- 2) Times of day for start and finish of each phase of testing and for each meteorological observation.
- 3) Ambient conditions at start and finish of test, and at appropriate intervals during test, to include:
 - a) Illumination (daylight, moonlight, starlight, darkness).
 - b) Weather conditions (clear, overcast, rain, snow, sleet, icing).
 - c) Atmospheric conditions, as appropriate:
 - (1) Temperature, degrees F.
 - (2) Relative humidity, percent.
 - (3) Wind conditions when wind is a factor.
 - (4) Atmospheric contaminants: (fog, dust, blowing sand, smoke).

j. Repeat steps a. through i. above, under the following conditions:

- 1) Darkness (Blackout).
- 2) Conditions not previously encountered in the course of testing to include:
 - 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.

6.2.4.2 Security from Detection

a. During the performance of paragraph 6.2.4.1 above, conduct appropriate observations in accordance with applicable portions of MTP 2-3-511 to determine whether operations of the test item during the various phases of its mission result in audible or visible phenomena or detectable radiation, which severely compromise its security and would lead to premature detection by hostile forces. Special attention shall be given the following:

- 1) Adequacy of instructions and materials provided for camouflage and concealment.

- 2) Presence of strong signature emissions of electromagnetic radiation, including radio frequency and infrared.
- 3) Visible discharges and excessive noise from power generation equipment.

b. In addition to the data required by applicable sections of MTP 2-3-511, record the following:

- 1) Narrative descriptions, supported by aerial and surface photographs, of effectiveness of camouflage and adequacy of instructions and materials provided.
- 2) Qualitative observations of any strong signature electromagnetic radiations, with indications of detection ranges.
- 3) Annotated photographs and sound recordings of excessively visible or audible emissions: exhaust or vapor plumes, engine or gearbox noise.

6.2.4.3 Power Requirements

a. During the performance of paragraphs 6.2.4.1 and 6.2.4.2 above, conduct appropriate observations in accordance with applicable portions of MTP 5-3-508 to determine the capability of power generation equipment to satisfy the test item's power demand and power regulation requirements. Special consideration shall be given the following:

- 1) Power demand at steady state and transient conditions covering nominal loads, full load, and peak load.
- 2) Capability of the power supply equipment to furnish power at all conditions of demand.
- 3) Capability of power regulation equipment to satisfy requirements for voltage and frequency regulation.
- 4) Presence of undue noise or exhaust discharge which could adversely affect crew performance or compromise security of the weapons system.

b. In addition to the data required by applicable sections of MTP 5-3-508, record the following:

- 1) Power readings in watts or kilowatts, electrical potential in volts, current in amperes, frequency in cycles per second.
- 2) Voltage regulation in percent of nominal, plus or minus.
- 3) Frequency regulation in percent of nominal, plus or minus.
- 4) Comments, supported by photographs and sound recordings, concerning highly visible or audible smoke or vapor plume and engine noise.

6.2.5 Transportability

a. Utilizing average trained test soldiers, dressed in full field uniforms and personal equipment, determine air transportability and airdrop capability of the test item in accordance with applicable sections of MTPs

7-3-512, 7-3-515, and 7-3-516, with attention to the following:

- 1) Adequacy of instructions and suitability of means provided for lifting or otherwise loading the test item on transport aircraft, and means provided for blocking and tie-down.
- 2) Adequacy of instructions and suitability of means provided for rigging the test item for carrying externally on appropriate aircraft.
- 3) Adequacy of instructions and suitability of means provided for rigging the test item for airdrop, and capability of the test item for mission performance after participation in airdrop operations.

b. In addition to data required by applicable portions of MTP's 7-3-512, 7-3-515 and 7-3-516, record the following:

- 1) Nomenclature, model number and serial number of aircraft employed in the tests.
- 2) Narrative comments, supported by photographs, relative to experience with loading, tying down, and unloading the test item from aircraft interiors, or experience with rigging and releasing the test item for external transportation by aircraft, including adequacy of instructions in manuals.
- 3) Narrative comments, supported by photographs, covering experience with airdrop of the test item, including operations of rigging and ejecting, and containing observations concerning test item condition after airdrop. Include comments concerning the adequacy of instructions in manuals.

c. Utilizing average trained test personnel, dressed in full field uniforms and personal equipment, determine the capability of the test item for transportation by surface carriers in accordance with applicable portions of MTP 5-3-512, with attention to the following:

- 1) Rail Transport - Railway car configurations applicable, dimensional clearances referred to standards for rail shipment (Berne tunnel, etc.), adequacy of instructions and suitability of means provided for loading and unloading the test item and for blocking and tiedown, times for loading and unloading, and safe transportation speeds.
- 2) Motor Transport - Highway vehicle configurations applicable, dimensional clearances referred to standards for highway shipments, adequacy of instructions and suitability of means provided for loading and unloading the test item and for blocking and tiedown, times for loading and unloading, and safe transportation speeds.

d. In addition to data required by applicable sections of MTP 5-3-512, record the following:

- 1) Nomenclature, model number, serial number, and mileage of

authorized carriers.

- 2) Narrative comments, supported by photographs, on the adequacy of loading and unloading means provided with the test item, the provisions for blocking and tiedown, and the adequacy of instructions in manuals.
- 3) Times of accomplishment of loading and unloading operations in minutes.
- 4) Dimensional clearances of travelling configurations, referred to appropriate standards, in centimeters.
- 5) Safe average rail and highway speeds, in km per hour.

e. Utilizing average trained test soldiers, dressed in full field uniforms and personal equipment, determine the capability of the test item to engage in fording operations in accordance with applicable portions of MTP 2-3-509.

f. In addition to data required by applicable portions of MTP 2-3-509, record the following:

- 1) Watercourse width and depth in meters, velocity of current in centimeters per second.
- 2) Slope of banks in degrees, average from bottom to top margins.
- 3) Times in minutes for accomplishment of fording operations.
- 4) Operational sequences on motion picture film.
- 5) Narrative comments, supported by photographs, concerning fording difficulties, limiting conditions, harmful water entry.

g. Utilizing average trained test personnel, dressed in full field uniforms and personal equipment, determine the capability of the test item to engage in landing operations over the beach, and the adequacy of procedures and materials required to waterproof the test item for beach operations, in accordance with applicable sections of MTP 2-3-520, with attention to the following:

- 1) Waterproofing the test item and loading aboard appropriate landing craft.
- 2) Necessity for and suitability of dunnage, ramps, or causeways required for landing operations of the test item.
- 3) Conduct of landing operations over beaches having various slopes and under different surf conditions.

h. In addition to data required by applicable sections of MTP 2-3-520, record the following:

- 1) Nomenclature and model number of landing craft used.
- 2) Limiting surf conditions in terms of breaker height in meters.
- 3) Times for accomplishment of each phase of landing operations in minutes.
- 4) Photographs of inadequate or defective waterproofing.
- 5) Motion picture coverage of LOTS operations.
- 6) Narrative comments, supported by photographs, concerning

difficulties with procedures for landing the test item or accomplishing its waterproofing, including any inadequacy of instructions furnished in technical manuals.

6.2.6 Maintenance Evaluation

a. During the conduct of all testing as outlined in this MTP, monitor and evaluate the test item's maintenance concept, and all scheduled and unscheduled maintenance operations in accordance with applicable sections of MTP 10-3-504.

b. Complete a Maintenance Data Sheet (ref. Appendix A, MTP 10-3-504) for each maintenance action taken, and record tape-recorded comments (supported by annotated photographs and/or motion pictures, as applicable) as appropriate to describe difficulties encountered during maintenance operations.

c. In addition to the data required by applicable portions of MTP 10-3-504, record observations concerning the following:

- 1) Adequacy of tools and test equipment, with attention to:
 - a) Availability of tools and test equipment at place and time of need.
 - b) Suitability of tools and test equipment for intended purpose.
 - c) Possibility of substitution of common items for special items.
- 2) Adequacy of repair parts basic load, including:
 - a) Availability of repair parts at place and time of need.
 - b) Consistency of repair parts stockage lists at organizational, direct support, and higher maintenance levels.
 - c) Evidence of maximum parts interchangeability.
 - d) Recommendations concerning repair parts standardization.
- 3) Experience of personnel at organizational and direct support levels during maintenance on the test item, including:
 - a) Appropriateness of maintenance levels assigned by MAC.
 - b) Levels of skills required by personnel to accomplish maintenance tasks as authorized.
 - c) Adequacy and suitability of maintenance procedures in technical manuals as applied on the test item.
 - d) Difficulties with maintenance operations arising from deficiencies in the test item which prevent or inhibit accomplishment.
 - e) Effects of sudden loss of power. If this condition is artificially induced, make certain that personnel are informed and protected from injury.

d. Throughout the entire test period, monitor the durability and reliability characteristics of the test item in accordance with applicable

sections of MTP 2-3-507. Ensure that the test item has been subjected to at least the following exposures:

- 1) Transport vehicles, paved roads - 500 miles.
- 2) Transport vehicles, secondary roads - 1000 miles.
- 3) Tactical vehicles, cross-country - 100 miles.

e. In addition to the data specified in MTP 2-3-507, observe and record at 100-mile intervals, or at the end of the exposure, the defect or failure experience of the test item and its components, to include:

- 1) Inoperable electronic equipment (damaged enclosures, loose or broken connections, foreign material accumulations, damaged components, etc.).
- 2) Damaged or worn mechanical parts, to include component packaging, bent or broken handles and fasteners, defective seals, sluggish or restrained mechanical action, etc.
- 3) Reliability parameters, including:
 - a) Types and seriousness of malfunctions.
 - b) Times of occurrence of failures, including operating time accumulated on test item and failing component.
 - c) Amount of downtime and corrective maintenance effort in clock hours and man-hours.
 - d) Repair parts usage and part life.
 - e) Any other parameters required by Test Directive or to enable computation of mean time between maintenance, mean time between failures, mean time to repair, mean downtime, availability (inherent, achieved, operational), and reliability.

f. Throughout the entire testing period, review all operating and maintenance manuals and technical literature (including Maintenance Allocation Chart (MAC), Basic Issue Items List (BIIL), Lubrication Orders (LO), and Repair Parts Stockage List) furnished with the test item for compliance with applicable Army Regulations in accordance with applicable portions of MTP 5-3-502.

g. In addition to the data required by applicable sections of MTP 5-3-502, record narrative comments and observations concerning adequacy of the manuals and technical publications with respect to:

- 1) Accuracy.
- 2) Completeness.
- 3) Clarity.
- 4) Ease of use.
- 5) Effectiveness.

6.2.7 Human Factors

a. Throughout the conduct of all testing as outlined in this MTP, monitor and appraise the item under test and its associated equipment with respect to human factors in accordance with applicable portions of MTP 5-3-507.

Special attention shall be given the following:

- 1) Accessibility of equipment for operation and maintenance.
- 2) Arrangement of equipment to minimize movements of operators.
- 3) Adequacy of nomenclature and suitability as to arrangement of components requiring manipulation, such as handles, knobs, switches, latches, and connectors.
- 4) Visibility and clarity of displays, dials, meters, and indicators.
- 5) Dimensions of working spaces affording freedom of action of crewmen, including room for necessary use of protective clothing.
- 6) Causes of stress and/or fatigue and errors of personnel engaged in operation or maintenance of the test item, including causes associated with authorized instructions contained in technical manuals.

b. In addition to the data required by MTP 5-3-507, record the following:

- 1) Narrative comments, supported by photographs, of instances of inaccessible equipment for operation or maintenance, or of equipment so arranged as to inhibit circulation of operators.
- 2) Photographs of inadequately designated equipment items and improperly arranged or shaped handles, knobs, switches, latches, or connectors; or marginally visible or unclear displays, dials, meters or indicators.
- 3) Photographs of narrow or cramped working space conditions which inhibit accomplishment of operations or maintenance.
- 4) Comments concerning factors in the test item or accompanying instructions which may be responsible for defective human performance due to fatigue or stress.

6.2.8 Compatibility with Related Equipment

a. Throughout the conduct of all testing as outlined in this MTP, monitor all operations in accordance with applicable sections of MTP 5-3-506 concerning the suitability, functionability, and compatibility of the launcher with the operational missile system with which it is employed. The following types of compatibilities with the test item shall be given special attention:

- 1) Missiles and suspension points.
- 2) Loading equipment.
- 3) Power generation equipment.
- 4) Cables and connectors.
- 5) Applicable fire control equipment.

b. In addition to data required by applicable portions of MTP 5-3-506, record the following:

- 1) Descriptions, supported by photographs, of missile/launcher

interfacing, including contiguous missile handling equipment such as transporter-loaders, hoisting or unloading units, etc.

- 2) Descriptions, supported by photographs, of any physical interfacing problems (e.g., receptacles, connectors, etc.).
- 3) Shortages in equipment, supplies, or instructions for operating in conjunction with related equipment.
- 4) Comments concerning problems or potential difficulties involved in the use of the launcher with missiles, boosters, fire control, and communication equipment.

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.
- c. Sufficient narrative comments pertaining to training, logistical requirements, statistical considerations, etc., to provide background information to be used in the analysis of test results.

6.3.2 Test Conduct

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

- a. Photographs or motion pictures (black and white or color), sketches, 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 of the test data. This information may consist of descriptions of equipment or components, and functions and deficiencies, as well as theoretical estimations, mathematical calculations, test conditions, intermittent or catastrophic failures, test parameters, etc., that were obtained during the test.
- c. Test item sample size (number of measurement repetitions).
- d. Instrumentation or measurement system mean error stated accuracy.

6.3.2.1 Pre-operational Inspection and Physical Characteristics

The following shall be recorded:

- a. Data as required by applicable portions of MTP 5-3-500.
- b. Critical dimensions (meters, centimeters) and weights (kilograms).
- c. Annotated photographs of test item configurations, instances of

- damage.
- d. Lists of missing documents, spare parts, tools, and test equipment.
- e. Discrepancies in physical characteristics.
- f. Times of operation accumulated on component items.

6.3.2.2 Safety

The following shall be recorded:

- a. Non-operable safety features.
- b. Inadequate warning statements.
- c. Data as collected under applicable sections of MTP 5-3-510.
- d. Confirmation of safety release under conditions as specified in USATECOM Regulation 385-6.
- e. Any undue restrictions or limitations imposed on the tactical use of the test item by safety documentation.
- f. Evaluation of the safety control(s) of the test item with reference to convenience of location, ease of identification of safe positions by sight and touch, ease and quietness of operation, and design to prevent accidental shifting of position.
- g. Evaluations of any safety hazards observed by test personnel during storage, transportation, operation, and maintenance of the test item.
- h. Operating techniques which appear to present a potential safety hazard.
- i. Recommendations for additions to the test item's safety program and/or safety features.
- j. Photographs of potentially hazardous conditions encountered during operation or inspection, including deficiencies in high voltage hazard control.

6.3.2.3 Personnel Training

The following shall be recorded:

- a. Data as collected under applicable portions of MTP 10-3-501.
- b. Observations and analyses relative to the clarity, completeness, and general adequacy of the proposed POI and POMM.
- c. For each member of test team:
 - 1) MOS.
 - 2) Training time in MOS, weeks.
 - 3) Experience in MOS, months.
 - 4) Training time on test item, weeks.
 - 5) Team experience in test item crew, weeks.
 - 6) Visual and aural acuity, if applicable.

6.3.2.4 Operational Characteristics -

6.3.2.4.1 Mission Performance

Record the following:

- a. Data as required by applicable portions of MTP 5-3-526.
- b. Considerations relative to site selection and its influence on approach and displacement routes and procedures.
- c. Times of performance for each phase of emplacement and preparation for action operations.
- d. Data as required by applicable missile launching instructions.
- e. Time in minutes required to:
 - 1) Transfer missiles from missile carrier to launcher.
 - 2) Prepare missiles for launching.
- f. Time in seconds required for aiming or otherwise directing the launcher to azimuth and elevation for launching and command fire.
- g. Rates of fire and reloading, minutes per round, where applicable.
- h. Accuracy data, where influenced by the launcher.
- i. Observations concerning ability of average trained crews to march order or otherwise reconstitute the test item.
- j. Time in minutes required to:
 - 1) De-energize or otherwise inactivate the launcher.
 - 2) Remove missile from launcher.
 - 3) Make ready for transportation.
- k. Minimum and optimum crew sizes required to emplace, prepare for action, serve, and march order the launcher.
 - l. Observations and comments concerning ease or difficulty of operations.
 - m. Date, site location, elevation in meters.
 - n. Time of day for start and finish of each phase of testing and for each meteorological observation.
 - o. Ambient conditions at start and finish of test, and at intervals during test.

6.3.2.4.2 Security from Detection -

Record the following:

- a. Data as required by applicable portions of MTP 2-3-511.
- b. Narrative descriptions of effectiveness of camouflage and adequacy of instructions and materials provided.
- c. Qualitative observations of any strong signature electromagnetic radiations, with indications of detection ranges.
- d. Photographs and sound recordings of excessively visible or audible emissions.

6.3.2.4.3 Power Requirements -

Record the following:

- a. Data as required by applicable portions of MTP 5-3-504.
- b. Power readings in watts or kilowatts, electrical potential in volts, current in amperes, frequency in cycles per second.
- c. Voltage regulation in percent of nominal, plus or minus.
- d. Frequency regulation in percent of nominal, plus or minus.
- e. Comments concerning highly visible or audible smoke or vapor plumes and engine noise.

6.3.2.5 Transportability

The following shall be recorded:

- a. Data as required by applicable portions of MTP's 7-3-512, 7-3-515 and 7-3-516.
- b. Nomenclature, model number, and serial number of aircraft employed in the tests.
- c. Narrative comments relative to experience with loading, tying down, and unloading the test item from aircraft interiors, or experience with rigging and releasing the test item for external transportation by aircraft, including adequacy of instructions in manuals.
- d. Narrative comments covering experience with airdrop of the test item, including operations of rigging and ejecting, and containing observations concerning test item condition after airdrop. Include comments concerning the adequacy of instructions in manuals.
- e. Data as required by applicable portions of MTP 5-3-512.
- f. Nomenclature, model number, serial number, and mileage of authorized carriers.
- g. Narrative comments on the adequacy of loading and unloading means provided with the test item, the provisions for blocking and tiedown, and the adequacy of instructions in manuals.
- h. Times of accomplishment of loading and unloading operations in minutes.
- i. Dimensional clearances of travelling configurations, referred to appropriate standards, in centimeters.
- j. Safe average rail and highway speeds, in km per hour.
- k. Data as required by applicable portions of MTP 2-3-509.
- l. Watercourse width and depth in meters, velocity of current in centimeters per second.
- m. Slope of banks in degrees, average from bottom to top margins.
- n. Times in minutes for accomplishment of fording operations.
- o. Operational sequences on motion picture film.
- p. Narrative comments concerning fording difficulties, limiting conditions, harmful water entry.
- q. Data as required by applicable portions of MTP 2-3-520.
- r. Nomenclature and model number of landing craft used.
- s. Limiting surf conditions in terms of breaker height in meters.
- t. Times for accomplishment of each phase of landing operations in minutes.
- u. Photographs of inadequate or defective waterproofing.
- v. Motion picture coverage of LOTS operations.
- w. Narrative comments concerning difficulties with procedures for

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landing the test item or accomplishing its waterproofing, including any inadequacy of instructions furnished in technical manuals.

6.3.2.6 Maintenance Evaluation

The following shall be recorded:

- a. Data as required by applicable portions of MTP 2-3-502 and MTP 10-3-504.
- b. A completed Maintenance Data Sheet for each maintenance action taken.
- c. Tape-recorded comments of operators, as appropriate to describe difficulties encountered during maintenance operations.
- d. Observations concerning the availability and adequacy of authorized tools and test equipment for accomplishment of maintenance tasks.
- e. Observations concerning the completeness and adequacy of spare parts basic load supplied.
- f. Observations concerning experience of personnel during maintenance on the test item.
- g. Data as required by applicable portions of MTP 2-3-507.
- h. Narrative or tabular reliability descriptions of defects or damage noted upon inspections during mobility and functional tests, with detailed reference to nomenclature and location of faulty parts.
- i. Times of occurrence (day, hour, minute) of failures, for computing MTBF, and relative terrain characteristics at time of failure.
- j. Times in hours and minutes required to effect repairs, for computations of MTTR.
- k. Data as required by applicable portions of MTP 5-3-502.
- l. Narrative comments and observations concerning adequacy of the literature package.

6.3.2.7 Human Factors

The following shall be recorded:

- a. Data as required by applicable portions of MTP 5-3-507.
- b. Narrative comments of instances of inaccessible equipment for operation or maintenance, or of equipment so arranged as to inhibit circulation of operators.
- c. Annotated photographs of inadequately designated equipment items and improperly arranged or shaped handles, knobs, switches, latches, or connectors; or marginally visible or unclear displays, dials, meters or indicators.
- d. Annotated photographs of narrow or cramped working space conditions which inhibit accomplishment of operations or maintenance.
- e. Comments concerning factors in the test item or accompanying instructions which may be responsible for defective human performance due to fatigue or stress.

6.3.2.8 Compatibility with Related Equipment

The following shall be recorded:

- a. Data as required by applicable portions of MTP 5-3-506.
- b. Shortages of equipment, supplies, or instructions for operating in conjunction with related equipment.
- c. Annotated photographs of missile/launcher interfacing, including contiguous missile handling equipment such as transporter-loaders, hoisting or unloading units.
- d. Comments concerning problems or potential difficulties involved in the use of the launcher with missiles, boosters, fire control, and communications equipment.

6.4 DATA REDUCTION AND PRESENTATION

Summaries of service test data will be organized to portray the capabilities of the guided missile launcher as an element of its respective guided missile weapons system. Times of performance of operational functions, maintenance and reliability data, and factors concerned with the field environment will be evaluated to present a summary of the availability of missiles to be launched on demand during an operational cycle.

Data, including observations and comments of operators, obtained under each Test Data Section (paragraph heading 6.3) of this procedure, will be summarized, compared, and evaluated according to procedures described in the individual referenced MTPs, or equivalent current practice where not covered by MTP. Appropriate charts, graphs, and tables shall be used to display summaries, comparisons, and correlations of test data. Coordinates and other features of charts, graphs, and tables will be selected for clarity and uniformity with like presentation in other reports. Special consideration in data presentation shall be given to any condition or circumstance which may have significantly influenced test results. In the analysis for such conditions or circumstances, the influence of test personnel themselves will be considered.

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

Summaries will be included of deficiencies, shortcomings, suggested improvements, and failures as reported in accordance with USATECOM Regulation 705-4 on STE Form 1025.

Calculations will be performed as specified by the individual referenced MTPs, or in accordance with current practice where not covered by MTP.

All photographs, motion pictures, audio and other tapes, and other records will be explicitly identified and referenced; significant frames, transcriptions, and samples shall be selected for illustrative purposes. All illustrations will be completely identified.

All Qualitative data accumulated will be evaluated against requirements set forth in the applicable QMR or SDR and TC to determine the degree of fulfillment demonstrated, compared with performance requirements.

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