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Materiel Test Procedure 6-3-063
U. S. Army Field Artillery BoardU. S. ARMY TEST AND EVALUATION COMMAND
COMMODITY SERVICE TEST PROCEDURE

COMPUTER, DIGITAL, FIELD ARTILLERY

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1. OBJECTIVE

The objective of this MTP is to outline the service testing techniques and methodology necessary to determine under field operating conditions, the degree to which the test item performs its mission as prescribed in Department of the Army approved Qualitative Military Requirements (QMR), Technical Characteristics (TC), and to evaluate the test item's suitability for use by the Army in the field.

2. BACKGROUND

The desirability and feasibility of solving field artillery problems through automatic data processing have been established by programs developed for the Computer, Gun Direction, M-18 (FADAC), and by experimental programs developed for the Command Control Information System, 1970 (CCIS-70). Digital system applications involving long distance transfer of data in quantity have been used effectively in numerous established commercial and military systems.

A computer is an operating entity composed of a central processor with one or more integral high speed memory unit(s), input-output converter(s), communication converter(s), and a computer control console. The computer incorporates connectors for attachment of peripheral devices. Input/output converters may or may not be built into the computer entity, depending on the design approach. The field artillery computer system may be developed on the block concept - that is, using small computers in combination to form larger computers with expanded capabilities to meet the demands at various echelons of command.

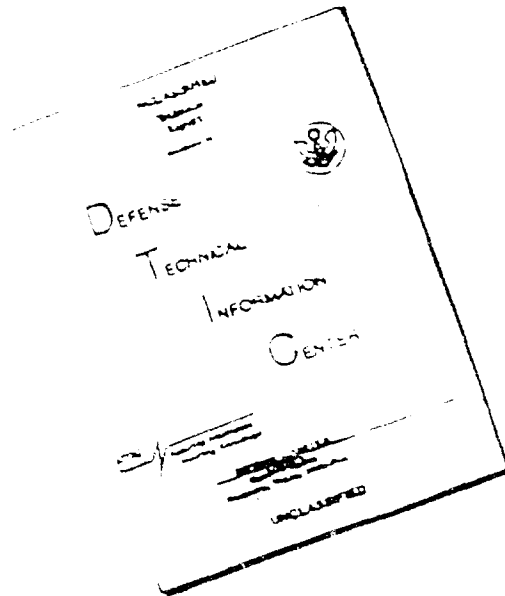
Artillery programs in being or under development, in addition to those relating to gunnery problems, include survey computations, meteorological data applications, intelligence information processing, ammunition and equipment status reporting, target analysis, fire planning, and processing complete fire commands for field artillery firing units.

The rapid development in computer technology and application emphasizes the requirement of service testing to provide an evaluation of the computer to meet the requirements of the Army in the field.

3. REQUIRED EQUIPMENT AND FACILITIES

- a. Fixed and Field Installations for operating the test item, as required.
- b. Vehicles for transporting and operating the test item, as required.
- c. Maintenance Support Facilities, as required.
- d. Special Tools and Equipment, as required.
- e. Power Generators and Commercial Electricity Outlets, as required.
- f. Radio and Wire Communications.

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- g. Representative Electronic Equipment, as required for electrical interference subtests.
- h. Still and Motion Picture Cameras, with Film.

4. REFERENCES

- A. USATECOM Regulation 70-23, Equipment Performance Report.
- B. USATECOM Regulation 385-6, Verification of Safety of Materiel During Testing.
- C. USATECOM Regulation 385-12, Verification of Safety of Materiel from Development through Testing and Supply to Disposition.
- D. USATECOM Regulation 705-13, Use of Trade Names in Test Reports.
- E. USATECOM Regulation 750-15, Maintenance Portion of the Service Test.
- F. USAMC Regulation 70-1, Responsibilities for Application of Human Factors Engineering (HFE) in the Evaluation of Army Materiel (subparagraphs 3a and 3b (7)).
- G. AR 705-16, Radio Frequency and Assignments for Equipment Under Development.
- H. AR 705-25, Reliability Program for Materiel and Equipment.
- I. DA Project No. 513-07-011.
- J. Combat Developments Objective Guide (CDOG, subparagraph 439).
- K. QMR (FSDR) for the test item.
- L. MTP 6-3-500, Physical Characteristics.
- M. MTP 6-3-501, Pre-Test Inspection for Service Test.
- N. MTP 6-3-502, Personnel Training Requirements.
- O. MTP 6-3-505, Emplacement, Action and March Order.
- P. MTP 6-3-506, Durability.
- Q. MTP 6-3-509, Effects of Weather.
- R. MTP 6-3-510, Transportability of Communications, Surveillance, and Electronic Equipment.
- S. MTP 6-3-512, Compatibility with Related Equipment.
- T. MTP 6-3-513, Qualitative Electromagnetic Interference.
- U. MTP 6-3-517, Electrical Power Requirement.
- V. MTP 6-3-523, Safety.
- W. MTP 6-3-524, Maintenance Evaluation.
- X. MTP 6-3-525, Human Factors.
- Y. MTP 7-3-512, Airdrop Capability (Suitability of Equipment for).
- Z. MTP 7-3-515, Air Transport, Internal (Suitability of Equipment for).
- AA. MTP 7-3-516, Air Transport, External (Suitability of Equipment for).

5. SCOPE

5.1 SUMMARY

This MTP outlines the methodology, techniques, and procedures necessary to determine the man-equipment compatibility and the capability and suitability of the test item as a computer entity performing separately or as part of a more extensive system under field operating conditions. The major areas of evaluation and their included subtests are:

- a. Pre-test Operations:

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- 1) Technical Inspection - A verification that the test item is complete and in satisfactory condition to undergo service testing.
 - 2) Physical Characteristics - A comparison of test item physical characteristics with required and desired specifications.
 - 3) Electrical Characteristics - An evaluation of the test item's electrical characteristics and a determination of its power requirements.
- b. Operational Characteristics - Evaluation of the following:
- 1) Emplacement, Preparation for Action, and March Order.
 - 2) Sample Problem Solution:
 - a) Hardware:
 - (1) Input-Output
 - (2) Central Processing Unit
 - b) Software applications programs
 - c) Problem analysis
- c. Electromagnetic Interference - A determination of the degree of and security against mutual interference from communications and other electromagnetic or electronic equipment operating in proximity to the test item.
- d. Compatibility with Related Equipment - An evaluation of the suitability of the test item for operations with its related equipment.
- e. Vulnerability to Detection - A determination of the degrees of security from aural and visual detection that the test item offers in its various configurations.
- f. Transportability:
- 1) Surface Transportability - An evaluation of transportation requirements and the effects of surface transportation on operation, accuracy, and maintenance of the test item.
 - 2) Air Transportability - An evaluation of the suitability of the test item for airdrop and for internal and external transport by helicopter and other types of aircraft.
- g. Durability - An evaluation of the capability of the test item to withstand handling, installation, operation, march orders and transportation under simulated combat conditions.
- h. Maintenance Evaluation - An evaluation of the maintainability and reliability of the test item and verification of the adequacy of its maintenance package.
- i. Communications and Data Transmission - An evaluation of the capability, suitability, and reliability of communications and data transmission components of the test items.
- j. Effects of weather - An evaluation of the effects of various weather conditions on the operability and accuracy of the test item.
- k. Human Factors - An evaluation of the suitability of the test item

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for operation, maintenance, handling and storage by service personnel without inducing undue fatigue or contributing to mental errors. Particular attention will be given to manual routines, selection and insertion of factors or data, and to output displays or printouts.

l. Personnel Training Requirements - A determination of training requirements to qualify personnel in operation and maintenance of the test item.

m. Safety - An evaluation of the safeness of the test item in its various configurations, under the varied conditions encountered during the service test, and any safety hazards to service personnel.

n. Value Analysis - Observations by qualified test personnel regarding possible ways and means to eliminate unnecessary costs at various stages of the design, development, and testing cycles.

o. Post-Test Inspection - A technical inspection of the test item to determine any deficiencies or shortcomings as a result of service testing.

5.2 LIMITATIONS

None

6. PROCEDURES

6.1 PREPARATION FOR TEST

6.1.1 Scheduling

6.1.1.1 Personnel

a. Ensure the availability of service personnel who have been or are being trained in operation and maintenance of the test item. Procedures outlined in MTP 6-3-502 will be used as training guidelines.

NOTE: Where necessary, arrangements will be made for in-house on-the-job training to be conducted by the manufacturer. Criteria for such training will be according to CGUSATECOM guidance.

b. Record the following for all test personnel:

- 1) Rank
- 2) MOS
- 3) Training time in MOS
- 4) Experience in MOS
- 5) Formal education - highest grade completed

c. Ensure that experienced personnel are available for the duration of the service test. To meet this requirement, all key positions must be understudied as soon as practicable.

6.1.1.2 Equipment and Facilities

- a. Select and schedule the use of required test sites and facilities.
- b. Make arrangements for use of equipment and instruments listed in

paragraph 3 above.

c. Establish organizational, direct support and general support maintenance facilities as required.

d. Prior to receipt of the test item arrange for or secure the following:

- 1) Authorized operating frequencies for electronic equipment, (Refer to applicable SOI).
- 2) Required transportation.
- 3) Assistance of other agencies, as required (e.g., USAAESWBD for transportability subtests, and White Sands Missile Range for computer analyses, etc.).

6.1.2 Safety

a. Verify that the Safety Release or safety statement is up to date, and that the service test complies with safety demands.

b. Verify that all service test personnel are adequately trained in safety requirements and restrictions pertaining to the test item.

6.1.3 Pretest Operations

6.1.3.1 Technical Inspection

a. Perform a technical inspection (TI) of the test item according to applicable sections of MTP 6-3-501 and/or technical literature furnished.

b. Verify the completeness of the test item's maintenance package.

6.1.3.2 Physical Characteristics

Measure and record physical characteristics of test item according to applicable sections of MTP 6-3-500, to include:

- 1) Weight of test item
- 2) Size of test item
- 3) Photographs of test item

6.1.3.3 Electrical Characteristics

Determine the test item's electrical characteristics and power requirements, as outlined in the applicable sections of MTP 6-3-517, to include:

- a. Power cables
- b. Color coding
- c. Receptacles
- d. Generators
- e. Converter, if applicable
- f. Readout (display)

6.2 TEST CONDUCT

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6.2.1 Operational Characteristics

6.2.1.1 Emplacement, Preparation for Action, and March Order

Determine the time required, difficulties encountered, and optimum crew size to emplace, prepare for action and march order the test item, as outlined in applicable sections of MTP 6-3-505. Record pertinent data to include:

a. Time required:

- 1) From receipt of command to emplace until the test item is ready for action.
- 2) For attachment of ancillary equipment.
- 3) For equipment warmup.
- 4) To perform all preoperational checks and adjustments.
- 5) To march order the test item.

b. Difficulties encountered:

- 1) During emplacement (cable connections, etc.)
- 2) During warmup
- 3) In performing preoperational checks and adjustments
- 4) During march order of the test item

c. Adjustments required.

d. Suitability and adequacy of ancillary equipment and connectors.

e. Minimum and optimum crew size for emplacement, preparation for action, and march order of the test item.

NOTE: Subtests outlined above should be combined with other operational subtests.

6.2.1.2 Sample Problem Solutions

Hardware and software will be evaluated through a series of sample problem solutions, involving all programs and routines developed for test item application, and applied when test item is emplaced in tactical position. Sample problem solutions will be compared to manual solutions or other known control data.

NOTE: Arithmetic speed and accuracy, memory capacity, input-output compliance with required specifications, and overall central processing unit adequacy should be evaluated and verified during engineer tests. Similarly, artillery programs should be engineer tested for complete and proper sequence. The service test, therefore, will be organized to answer the question, "Does the test item adequately perform the mission for which it was developed?"

a. Program computer with sample program.

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- b. Insert sample data.
- c. Record problem solution and time to solve.
- d. Record malfunctions and cause if known.

NOTE: An error may be chargeable to the program, to electromechanical elements of the test item, or to human input or operation. If attributable to human error, appropriate corrective action may be taken or recommended by service test personnel. If, however, human error is ruled out, the program will be returned for further engineer testing and isolation of the cause.

- e. Assess the control processing unit and record the following:
 - 1) Adequacy of control
 - 2) Difficulties in operation
 - 3) Adaptability to conversion to different operational modes
- f. Assess the input and output devices and record the following:
 - 1) Simplicity of input procedures
 - 2) Adequacy and simplicity of output to include:
 - a) Display
 - b) Readout
 - c) Word and figure printout
- g. Repeat a through e above until the series of sample problems is exhausted.
- h. Verify sample problem compliance with QMR required military characteristics. The following will be noted and recorded for each sample problem:
 - 1) Accuracy of results
 - 2) Time required to solve
 - 3) Human Factors data (see 6.2.10)
 - 4) Personnel and training implications (see 6.2.11)
 - 5) How do different types of failures affect problem results

6.2.2 Electromagnetic Interference

- a. Emplace and operate the test item in varying proximities to operating power generators, radio sets, and radar sets common to TOE organizations that will employ the test item.
- b. Evaluate the electromagnetic interference of the test item in accordance with applicable sections of MTP 6-3-513 and determine and record the following:
 - 1) The nature and degree of electromagnetic interference emanating from each associated electromagnetic transmission device.
 - 2) Critical distances for location of the test item in proximity to associated electromagnetic transmission devices, if applicable.

6.2.3 Compatibility with Related Equipment

Determine the compatibility of the test item with related equipment (to include FADAC or other standby system) as outlined in applicable sections of MTP 6-3-512.

6.2.4 Vulnerability to Detection

Under daylight and darkness (blackout) conditions, observations will be made to:

a. Determine and record the maximum distance at which the test item and its power source are audible:

- 1) To the unaided ear
- 2) With acoustic aids

b. Determine and record the maximum distance at which the test item is identifiable without camouflage and with camouflage from ground positions using:

- 1) Unaided vision
- 2) Optical instruments
- 3) Electronic instruments, when applicable

c. Determine and record the maximum altitudes at which the test item is identifiable, without camouflage and with camouflage, by aerial observation using:

- 1) Unaided vision
- 2) Optical instruments
- 3) Aerial photography
- 4) Electronic sensors

NOTE: The conduct of airborne operations will be coordinated with the U. S. Army Airborne, Electronics, and Special Warfare Board, as required.

6.2.5 Transportability

6.2.5.1 Surface Transportability

a. Determine the suitability of the test item for surface transportability as outlined in applicable sections of MTP 6-3-510.

b. Following each surface transportability test:

- 1) Determine and record any adverse effects on operability and accuracy of the test item attributable to surface transportation.
- 2) Determine and record adjustment, alignment and maintenance requirements on the test item attributable to surface trans-

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portation.

6.2.5.2 Air Transportability

NOTE: The conduct of air transportability sub-tests will be coordinated with the U. S. Army Airborne, Electronics, and Special Warfare Board, as required.

a. Determine the suitability of the test item for airdrop as outlined in applicable sections of MTP 7-3-512.

b. Determine the suitability of the test item for internal air transport (helicopter and fixed wing) as outlined in applicable sections of MTP 7-3-515.

c. Determine the suitability of the test item for external (helicopter) transport as outlined in applicable sections of MTP 7-3-516.

d. Following each air transportability test, determine and record:

- 1) Any adverse effects on operability or accuracy of the test item attributable to air transport.
- 2) Adjustment, alignment, and maintenance requirements attributable to air transport.

6.2.6 Durability

Determine the durability of the test item, in conjunction with transportability and other operational subtests, in accordance with applicable sections of MTP 6-3-506 and as follows:

a. Determine and record any failure of the test item to withstand the effects of air and ground transport, frequent displacement, and handling during sustained periods of operation in all environments of simulated combat.

b. Determine and record the effects of blast on the test item and ancillary equipment at the minimum distances from firing units prescribed (essential) in the QMR.

6.2.7 Maintenance Evaluation

6.2.7.1 Maintainability

a. Evaluate the test item to determine if it meets the maintenance and maintainability requirements specified in the QMR or other applicable documents, and if it is suitable for Army use from a maintainability standpoint and record the following:

- 1) Time required for each maintenance function.
- 2) Mean times required to perform individual maintenance tasks, to include:
 - a) Time to detect stoppage or malfunction
 - b) Time to isolate the fault

- c) Time to repair or replace the faulty component
 - d) Time to restore the test item to full operation
- 3) Mean time to repair.
 - 4) Nomenclature of repair parts (assemblies) used.
 - 5) Maintenance ratio (total maintenance time in man hours divided by total operating time).
 - 6) Maintenance responsibilities and capabilities at organizational, direct support, and general support levels.

b. Evaluate self-test routines, with intentional errors introduced in the test item. Capability of built-in self-test features to isolate the general areas of malfunctions will be verified and recorded.

c. If required by the QMR examine "Go-no-go", test capabilities to verify that essential QMR specifications are met and record results.

d. Evaluate adequacy of the test item's maintenance package and record results.

6.2.7.2 Reliability

a. Evaluate the ability of the test item to meet reliability specifications listed in the QMR or other applicable documents during extended periods of operation. Unless otherwise specified, normal essential criterion will be 23 hours/day.

b. Determine and record:

- 1) Total operating time.
- 2) Each failure of a test item component.
- 3) Degree of each failure (i.e., total failure of the system or degradation of capability).
- 4) Time to repair each failure, in man-hours and in clock hours.
- 5) Total maintenance time, in man-hours and in clock hours.
- 6) Detected errors in computation or transfer of data.
- 7) Mean time between failures (MTBF)

c. Record classification of test item failure.

NOTE: Failures will be classified as:

- 1) Deficiencies - a defect or malfunction that constitutes a safety hazard to personnel; will result in serious damage to equipment if operation is continued; seriously impairs the equipments operational capability. A deficiency normally disables or immobilizes the equipment. A deficiency serves as a bar to type classification action.
- 2) Shortcomings - an imperfection or malfunction which should be reported and must be corrected to increase the efficiency and render the equipment completely serviceable.
- 3) Defective from stores.
- 4) Workmanship or design deficiency.
- 5) Human Error.

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6.2.8 Communications and Data Transmission

a. Check the test item's communications and data transmission component using voice and digital data transmissions and determine or verify the following:

- 1) That the test item and remoted input-output devices can authenticate transmitted messages.
- 2) That insertion of the authentication code can be done readily by operating personnel, without jeopardizing security.
- 3) That control of transmitting devices can be exercised reliably within and between computer centers and between computer centers and remote devices.

b. Differentiate between and record transmission errors classified as follows:

- 1) Detected - uncorrected
- 2) Detected - corrected
- 3) Undetected

c. Verify the correctness of wiring and cabling diagrams.

6.2.9 Effects of Weather

Evaluate the effects of weather on the operability, accuracy, maintainability, and reliability as described in the applicable sections of MTP 6-3-509.

6.2.10 Human Factors

Throughout the service test, evaluate the human factors engineering of the test item as described in the applicable sections of MTP 6-3-525 with particular attention given to:

- a. Displays and printouts.
- b. Work place organization.
- c. Noise levels.
- d. Operator comfort.
- e. Use of CBR protective clothing during operation.
- f. Potential loss of data or damage to equipment as a result of improper action of personnel or improper interconnection of components.
- g. Fatigue inducing procedures.

6.2.11 Personnel Training Requirements

a. The type and amount of training required to qualify personnel to operate and maintain the test item will be determined as outlined in appropriate sections of MTP 6-3-502.

NOTE: Training should be geared to personnel with no more than high

school level of schooling.

b. Determine the adequacy of training literature furnished with the test item.

6.2.12 Safety

Safeness of the test item will be evaluated and any safety hazards noted, according to applicable sections of MTP 6-3-523.

6.2.13 Value Analysis

Record observations concerning possible ways to eliminate unnecessary costs during the design, development, and procurement of the test item without compromise of the following:

- a. Quality of components
- b. Reliability (overall)
- c. Maintainability
- d. Operational performance
- e. Mission accomplishment

NOTE: Observations will include, but not necessarily be limited to, non-essential or nice-to-have features, components or accessories.

6.2.14 Post-Test Inspection

Upon completion of testing the test item will be given a technical inspection as outlined in applicable sections of MTP 6-3-501. Any deleterious effects on the test item occurring during the service test will be recorded.

6.3 TEST DATA

6.3.1 Preparation for Test

6.3.1.1 Personnel

Record the following for all test personnel:

- a. Rank
- b. MOS
- c. Training time in MOS, in weeks
- d. Experience in MOS, in years
- e. Formal education - highest grade completed

6.3.1.2 Pretest Operation

6.3.1.2.1 Technical Inspection -

- a. Record data as collected under the application sections of MTP

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6-3-501.

b. Record any incompleteness noted in the test item's maintenance package.

6.3.1.2.2 Physical Characteristics -

Record data as collected under the applicable section of MTP 6-3-500

6.3.1.2.3 Electrical Characteristics -

Record data as collected under applicable sections of MTP 6-3-517

6.3.2 Test Conduct

6.3.2.1 Operational Characteristics

6.3.2.1.1 Emplacement, Preparation for Action, and March Order -

Record the following:

a. Time required to emplace the test item and prepare for action in each tactical configuration used during the test, including times:

- 1) From receipt of command to emplace until the test item is ready for action.
- 2) For attachment of ancillary equipment.
- 3) For equipment warmup.
- 4) To perform all preoperational checks and adjustments.

b. Times required to march order the test item in each tactical configuration used during the service test.

c. Difficulties encountered:

- 1) During emplacement (cable connectors, etc.)
- 2) During warmup
- 3) In performing preoperational checks and adjustments
- 4) During march order

d. Adjustments required.

e. Suitability and adequacy of ancillary equipment and connectors.

f. Minimum and optimum crew sizes for emplacement, preparation for action, and march order of the test item at each simulated command level (battery, battalion, corps, etc.).

6.3.2.1.2 Sample Problem Solutions -

Record the following:

- a. Problem solution and time to solve
- b. Malfunctions and cause as required
- c. Adequacy of control in central processing unit

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- d. Difficulties in operation of central processing unit.
- e. Adaptability to conversion to different operational modes of the central processing unit.
- f. Simplicity of input procedures.
- g. Adequacy and simplicity of output to include:
 - 1) Display
 - 2) Readout
 - 3) Word and figure printout
- h. Human Factors data (under 6.3.2.10).
- i. Personnel and training implications (under 6.3.2.11).
- j. How different types of failure affect problem results.

6.3.2.2 Electromagnetic Interferences

Record data as collected under applicable sections of MTP 6-3-513, to include:

- a. The nature and degree of electromagnetic interference emanating from each associated electromagnetic transmission device.
- b. Critical distances for location of the test item in proximity to associated electromagnetic transmission devices, if applicable.

6.3.2.3 Compatibility with Related Equipment

Record data as collected under applicable sections of MTP 6-3-512

6.3.2.4 Vulnerability to Detection

- a. Record the following for each aural observation:
 - 1) Visibility condition (bright daylight, dusty, darkness, etc.).
 - 2) Maximum distances, in meters, at which the test item and its power can be detected by:
 - a) Unaided ear
 - b) Use of acoustic aids
 - 3) Test item operational condition (in operation, standby, etc.).
- b. Record the following for each visual observation from ground positions:
 - 1) Visibility condition (bright daylight, dusty, darkness, etc.).
 - 2) Test item emplacement condition (camouflaged, uncamouflaged).
 - 3) Maximum distances, in meters, at which the test item is discernible by:
 - a) Unaided vision
 - b) Use of optical instruments

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- c) Electronic detection devices, when applicable
- c. Record the following for each visual observation from aircraft:
 - 1) Visibility conditions (bright daylight, dusty, darkness, etc.).
 - 2) Test item emplacement condition (camouflaged, uncamouflaged).
 - 3) Maximum slant ranges, in meters, at which the test item can be detected by:
 - a) Unaided vision
 - b) Use of optical instruments
 - c) Aerial photography
 - d) Electronic sensors

6.3.2.5 Transportability

6.3.2.5.1 Surface Transportability

Record data as collected under applicable sections of MTP 6-3-510 to include:

- a. Any adverse effects on operability and accuracy of the test item attributable to surface transportation.
- b. Adjustments and alignment required after each movement by surface transport.
- c. Maintenance requirements attributable to surface transport.

6.3.2.5.2 Air Transportability

- a. Record data as collected under applicable sections of MTP 7-3-512.
- b. Record data as collected under applicable sections of MTP 7-3-515, pertaining to internal transport in helicopters.
- c. Record data as collected under applicable sections of MTP 7-3-516, pertaining to external transport in helicopters.
- d. For each air transportability test, record:
 - 1) Any adverse effect on operability or accuracy of the test item attributable to air transport.
 - 2) Adjustments and alignments required after each air movement.
 - 3) Maintenance requirements attributable to air transport.

6.3.2.6 Durability

Record the following:

- a. Data as collected under applicable sections of MTP 6-3-506.
- b. Any failure of the test item to withstand the effects of air and ground transport, frequent displacement, and ordinary troop handling during sustained periods of operation in all environments of simulated combat experienced during the service test.
- c. The effects of blast on the test item and ancillary equipment

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at the minimum distances from firing units prescribed (essential) in the QMR.

6.3.2.7 Maintenance Evaluation

6.3.2.7.1 Maintainability -

a. Record the following information gathered during scheduled and unscheduled maintenance of the test item:

- 1) Time required for each maintenance function.
- 2) Mean times required to perform individual maintenance tasks:
 - a) Time to detect stoppage or malfunction
 - b) Time to isolate the fault
 - c) Time to locate the cause
 - d) Time to repair or replace the faulty component
 - e) Time to restore the test item to full operation
- 3) Mean time to repair.
- 4) Nomenclature of repair parts (assemblies) used.
- 5) Maintenance ratio (total maintenance time in man hours, divided by total operating time).
- 6) Maintenance responsibilities and capabilities at organizational, direct support, and general support levels.

b. Record results produced through test item self-test routines:

- 1) Report failure of the self-test routines to react to intentionally introduced errors.
- 2) Report any failure of the test item self-test routines to isolate the general area of a malfunction.

c. Record any "go-no-go" test failure to meet essential QMR specifications.

d. Record the adequacy or shortcomings of the test item's maintenance package.

6.3.2.7.2 Reliability -

Record the following:

- a. Total operating time.
- b. Each failure of a test item component.
- c. Degree of each failure (i.e., 100%, 50% of capacity, etc.).
- d. Time to repair each failure, in man hours.
- e. Total maintenance time, including scheduled maintenance, in man hours.
- f. Errors in computation or transfer of data.
- g. Mean time between failures (MTBF).
- h. Classification of failure (deficiency, shortcoming, etc.).

6.3.2.8 Communications and Data Transmission

Record test data and observations as follows:

- a. Failure of the test item and remote input-output devices to authenticate transmitted messages.
- b. Problems encountered by test personnel during insertion of authentication codes.
- c. Problems of control of transmitting devices:
 - 1) Within computer centers
 - 2) Between computer centers
 - 3) Between computer centers and remote devices
- d. Detected - uncorrected transmission errors.
- e. Detected - corrected transmission errors.
- f. Correctness and completeness of wiring and cabling diagram.

6.3.2.9 Effects of Weather

Record data required by appropriate sections of MTP 6-3-509

6.3.2.10 Human Factors

Record data called for in applicable sections of MTP 6-3-525, and the following:

- a. Adequacy or shortcomings of displays and printouts.
- b. Adequacy of work plan organization.
- c. Uncommon or distracting noise levels.
- d. Operator discomfort.
- e. Problems of operation with personnel in CBR protective clothing.
- f. Loss of data or damage to equipment attributable to improper action of personnel or improper interconnection of components.
- g. Fatigue inducing motions or procedures.

6.3.2.11 Personnel Training Requirements

- a. Record data collected in accordance with applicable sections of MTP 6-3-502.
- b. Record any inadequacy of training literature furnished with the test item.

6.3.2.12 Safety

Record data collected in accordance with applicable sections of MTP 6-3-523.

6.3.2.13 Value Analysis

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Record observations concerning possible ways to eliminate costs during design, development, and procurement of the test item without compromise of the following:

- a. Quality of components
- b. Reliability (overall)
- c. Maintainability
- d. Operational performance
- e. Mission accomplishment

6.3.2.14 Post-Test Inspection

- a. Record data collected according to applicable sections of MTP 6-3-501.
- b. Record any deleterious effects of the test program on the test item.

6.4 DATA REDUCTION AND PRESENTATION

Data obtained from subtests covered by applicable MTP's will be summarized and evaluated according to procedures set forth in those MTP's. Appropriate charts, graphs, and tabulated summaries will be used to present the data in a clear manner.

The physical characteristics of the test item will be compared to the characteristics specified in QMR or other applicable documents.

Calculations will be performed as specified in the individual MTP's and references, wherever applicable, and all photographs, motion pictures and illustrative material will be suitably identified.

Sample problem solutions will be checked against manually computed solutions. Data will be presented in summary form for ready analysis of the accuracy and repeatability of the computer/tape output.

For the evaluation of the test item's vulnerability to detection, average distances and altitudes will be computed, tabulated and compared for the various observation methods under the various conditions.

A Safety Confirmation based on data of sub-paragraph 6.3.2.12 will be prepared and presented in accordance with USATECOM Regulation 385-6.

4 May 1970

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

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