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Materiel Test Procedure 6-3-011
U.S. Army Air Defense Board

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

AIR DEFENSE SYSTEMS, ELECTRONIC SIMULATORS

1. OBJECTIVE

The objective of this Materiel Test Procedure (MTP) is to describe the service test procedures required to determine the degree of compliance of air defense simulators with requirements of applicable Qualitative Materiel Requirements (QMR) or Small Development Requirements (SDR), and the suitability of such items for Army use.

2. BACKGROUND

Operating personnel of air defense weapons systems require constant proficiency practice in the performance of target engagement, fire distribution, and intercept operations with rapidity and precision. The ideal method of exercising against actual flight targets must be reserved for infrequent occasions, due to the cost and complexity of mounting such exercises at the many installations requiring them or of alternative unit moves to centralized facilities. Instead, electronic simulators are interconnected with the data portions of air defense systems, enabling simulated radar and command and coordination systems presentations of various scales of air attacks and making possible continuous upgrading of familiarity and capability on the part of crews.

Since air defense weapons systems may be deployed in active theaters of operation, and may be stationed there for long period of quiet, simulators must be capable of deployment and movement with combat elements, and they must be able to deliver reliable air defense exercise experiences throughout the time of deployment. Service tests of simulators are required to determine both functional and technical characteristics of such items.

3. REQUIRED EQUIPMENT

a. Test item maintenance test package

b. Appropriate air defense weapons system installation

c. Suitable maneuvering areas

d. Suitable maintenance support facilities

e. Cameras, still and motion picture and film

f. Magnetic tape recorders, voice, event, and video

g. Elapsed time recorders (stopwatches)

h. Meteorological instrumentation

i. Oscillograph recorders

j. Microwave radiation level recording equipment

k. Specified transport vehicles and aircraft

4. REFERENCES

a. AR 40-583, Control of Potential Hazards to Health from Microwave Energy.

b. AR 70-10, Test and Evaluation During Research and Development of Materiel.

c. AR 70-38, Research, Development, Test, and Evaluation of Materiel for Extreme Climatic Conditions.

d. AR 320-5, Dictionary of U.S. Army Terms.

e. USATECOM Regulation 385-6, Verification of Safety of Materiel.

f. USATECOM Regulation 705-4, Equipment Performance Reports (EPRs).

g. USATECOM Regulation 705-25, Reliability Program for Materiel and Equipment.

h. USATECOM Regulation 705-26, Maintainability Program for Materiel and Equipment.

i. USATECOM Regulation 705-35, Criteria for Air Portability and Air Drop of Materiel.

j. USATECOM Regulation 750-15, Maintenance Portion of the Service Test.

k. USAMC Regulation 385-12, Verification of Safety of Materiel from Development through Testing, Production, and Supply to Disposition.

l. USAMC Regulation 385-224, AMC Safety Manual.

m. USAMC Regulation 750-15, Maintenance Support Planning.

n. MIL-STD-721, Definitions of Effectiveness Terms for Reliability, Maintainability, Human Factors, and Safety.

o. MTP 3-1-002, Confidence Intervals and Sample Size.

p. MTP 5-3-501, Battlefield Mobility, Tactical Flexibility and Portability.

q. MTP 5-3-502, Manuals and Technical Literature.

r. MTP 5-3-509, Adequacy of Lighting, Ventilation, Air Conditioner, and Heating Equipment.

s. MTP 6-3-500, Physical Characteristics.

t. MTP 6-3-501, Pretest Inspection for Service Test.

u. MTP 6-3-502, Personnel Training Requirements.

v. MTP 6-3-505, Emplacement, Action, and March Order.

w. MTP 6-3-510, Transportability of Communication, Surveillance, and Electronic Equipment.

x. MTP 6-3-512, Compatibility with Related Equipment.

y. MTP 6-3-517, Electrical Power Requirements.

z. MTP 6-3-523, Safety, Electronic Equipment.

aa. MTP 6-3-525, Human Factors.

ab. MTP 7-3-512, Air Drop - Suitability of Supplies and Equipment for.

ac. MTP 7-3-515, Air Portability, Internal - Suitability of Supplies and Equipment for.

ad. MTP 7-3-516, Air Portability, External - Suitability of Supplies and Equipment for.

ae. MTP 10-3-501, Operator Training and Familiarization.

af. 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 air defense electronic simulators intended for proficiency practice in air defense engagements, in conjunction with associated air defense weapons systems installations, meet current military requirements relative to criteria expressed in applicable documentation. The cumulative test results, together with the results of appropriate common service tests, will permit an estimate to be made of the operational performance of the equipment under test and its suitability for military use.

The specific tests to be performed 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 objectives of this subtest are to:
   1) Verify the arrival condition and physical characteristics of the test item, and to determine its completeness of the maintenance package (i.e., manuals, technical literature, tools, test equipment, and spare parts) is included.
   2) Verify the technical characteristics the test item is intended to exhibit
   3) Verifty that microwave radiation levels in and around the test item are not hazardous to personnel when it is installed with associated weapons system equipment, and in close proximity to strong radiation sources.

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, emplacement, operation, and maintenance of the equipment 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 that the test item can be emplaced and march ordered with its associated weapon system elements without undue difficulty and delay.

2) Determine the test item's capability for realistic simulations of various targets and countermeasures such as chaff and ECM, its capability for presentations of natural interference and clutter, and its ability to display tracks of air defense missiles.
3) Determine the capability of the test item for deployment and displacement with other elements of the basic weapons system.
4) Determine the power required to operate the test item, and whether power demands affect power sources in the basic weapons sytem.
5) Evaluate the adequacy of provisions for controlling lighting, temperature, and quality of the environment inside vans or trailers enclosing the test item equipment.

e. Transportability - The objective of this subtest is to determine the capability and suitability of the equipment under test for transportation by those modes common to the Army.
f. Maintenance - The objective os this subtest are to determine:
1) The capabibility of average trained personnel to maintaine the test item in the field.
2) The adequacy and suitability of manuals and technical literature, tools, and test equipment, and spare parts supplied with the test item.
3) The reliability characteristics of the item under test.
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 adverse factors exist which cuase undue stress, fatigue, and malfunctioning due to mental or physical errors.
h. Compatibility with Rlated Equipment - The objective of this subtest is to determine that the test item can be displaced, interconnected, and operated without difficulty from or interference with authorized vehicles, communications, and weapons sytem basic equipment in the practice or tactical modes.

5.1.2 Common Service Tests

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

a. MTP 6-3-509, Effects of Weather
b. MTP 6-3-513, Qualitative Electromagnetic Interference.
c. MTP 6-3-514, Qualitative Frequency Accuracy and Stability.
d. MTP 6-4-001, Desert Environmental Test of Communication, Surveillance, and Avionic Electronic Equipment.

e. MTP 6-4-003, Tropic Environmental Test of Communication, Surveillance, and Avionic Electronic Equipment.

f. MTP 6-4-005, Arctic Environmental Test of Survey, Surveillance,and Target Acquisition Systems.

5.2 LIMITATIONS

The tests in this MTP are limited to air defense electronic simulators, operating in conjunction with their associated air defense weapons system basic equipment. However, the tests may be adapted for electronic simulators associated with only portions of weapons systems equipment.

6. PROCEDURES

6.1 PREPARATION FOR TEST

a. Select and schedule suitable weapons system installations and maneuvering areas as required by Test Directive or weapons system use cycle and corresponding MTP.

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

1) Pertinent reports and data from Engineer Test, including engineering safety confirmation if available.
2) Maintenance support facilities and personnel.
3) On-site location of spare parts basic load.
4) Required equipment, 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.

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 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 material and data, as applicable, and that arrangements for supporting and participating agencies, activities, and

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 Preoperational Inspection and Physical Characteristics

a. Upon receipt of the air defense electronic simulator at the testing agency, carefully examine the equipment and associated items for completeness and obvious mechanical or electrical damage or deterioration such as cracked or broken parts, loose assemblies, bent fragile parts, corroded plugs and 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 equipment and associated items under test by photographing, weighing, and measuring the items in accordance with MTP 6-3-500.

NOTE: Test item physical 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 test item.

c. Record the following:

1) Completeness of inventory and damage to the test item(s) sustained in transit and/or handling, supported by annotated photgraphs.
2) Weights and measurements taken.
3) Discrepancies in physical characteristics.

d. Carefully align the electronic simulator, if necessary, as specified in the draft technical manual, to ensure, insofar as possible, that it is representative of an average equipment in normal operating condition.

e. Prepare a checklist of functions and modes which are specified as test item characteristics and determine the test item's technical characteristics in accordance with applicable sections of MTP 6-3-501.

f. In addition to data required by MTP 6-3-501, enter "Yes" or "No" as each function and mode is verified.

g. Determine levels of microwave radiation with the test item installed in conjunction with weapons system basic equipment, including radars and any other strong source of radiation.

h. Record the following:
1) Distances from radiation sources to crew stations where dangerous radiation levels (10 mw/cm^2) exist.
2) Observations concerning any safety precautions required as a consequence of radiation hazards.

6.2.2 Safety

a. Review all safety precautions and possible hazards associated with the air defense electronic simulator under test, together with potential hazards in the overall testing environment. The review shall include, but need not be limited to, the following:
1) Electrical shock or burn hazards, prevention, and emergency action required.
2) Microwave radiation hazards, necessary restrictions, and provisions for emergency measures.

b. Examine the electronic simulator for the presence of necesaary guards, shields, interlocks, safety fuses, and warning plates.

c. Verify the operation of all safety devices provided on or with the test item 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 6-3-523.

f. In addition to the data required by MTP 6-3-523, 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 use of the electronic simulator under test by Safety Statements and/or Safety Release(s).
3) Evaluation of the safety control(s) of the test item with reference to convenience of location, ease of identification of safe position by sight and touch, ease and quietness of operation, and design to prevent accidental shifting of position.
4) Evaluation of any safety hazards observed by test personnel during storage, transportation, operation, and maintenance of the test item, to include:
a) Electrical hazards.
b) Radiation hazards.
c) Sharp edges, corners, or projections.
d) Dangerous moving parts.
e) Insecure or dangerous footings.
f) Necessity for additional footings, handholds, or lifting handles to avoid injury to personnel.

5) Operating techniques which appear to present potential safety hazards.
6) Recommendations for additions to the equipment's safety program and/or safety features.

6.2.3 Personnel Training

a. Orient and instruct all test personnel (soldiers) in the mission applications, capabilities, limitations, and maintenance aspects of the air defense electronic simulator in accordance with the Preliminary Operating and Maintenance Manual (POMM) and the Proposed Program of Instruction (POI). If no proposed POI is provided, develop one in coordination with the agency concerned with training. The proposed POI should include personnel operational training in the nomenclature and characteristics of the equipment under test, as well as techniques of proper employment.

b. After training, require user personnel to perform all functional operations related to electronic simulator 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 6-3-502 and 10-3-501.

d. In addition to the data required by MTP 6-3-502 and 10-3-501, record narrative comments concerning the following training factors:

1) Observations and alalyses relating to the clarity, completeness and general adequacy of the proposed POI and POMM.
2) For each member of the test team:
   a) MOS
   b) Training time in MOS
   c) Experience in MOS
   d) Training time on test item
   e) Team experience in test item crew
3) Extent of additional training required.

6.2.4 Operational Characteristics

NOTE: 1. Conduct operational tests of air defense electronic simulator roles under both blackout conditions and during daylight hours.
2. Ensure that operational tests include exposure to the full range of weather conditions prevailing at the test site. Testing shall not be interrupted by onset of adverse weather conditions unless hazards to test personnel are introduced.

3. Record ambient conditions at start and finish of each phase of operational testing, and at appropriate intervals during test, to include:
   a) Date and time of day.
   b) Illumination (daylight, moonlight, starlight, darkness).
   c) Weather conditions (clear, overcast, rain, snow, sleet, icing).
   d) Atmospheric conditions (elevation in feet, temperature in degrees C, relative humidity in percent, wind velocity in knots).
   e) Atmospheric contaminants (fog, dust, sand, smoke).

6.2.4.1 Emplacement and March Order

a. With the test item in travelling configuration, approach a designated operational site.

b. Utilizing an average trained, standard TOE crew, emplace and march order the air defense elctronic sumilator (in accordance with applicable sections of MTP 6-3-505), in conjunction with contiguous associated weapons system basic equipment; ADCP control stations, battery terminal equipment, Fire unit equipment, as applicable.

c. Observe and record the activities and times, as applicable, required to:

1) Prepare the site.
2) Dismount or otherwise make ready the test item, starting from the transportation configuration.
3) Level and align the equipment.
4) Interconnect power supplies and other components.
5) Install and connect applicable communication equipment.
6) Warm up, or otherwise prepare the test item for simulated action.
7) March order, or otherwise return the test item to the travelling configuration.

d, Record instances of difficulty or delay with emplacement and march ordering of the weapons system due to the test item or accompanying instructions in technical manuals.

6.2.4.2 Functional Performance

NOTE: Test project personnel will keep in mind that the mission of the test item is to bring about responses of weapons system operating personnel equivalent to responses desired under actual battle conditions. In testing for functional performance, priority attention should be focused on the end product; performance of operating personnel.

a. Consult the applicable QMR/SDR and technical literature for the test item and establish a schedule of simulated air defense operations as required to develop the item capability to accomplish the following:

1) Target Simulation
2) Countermeasures Simulation
3) Interference Simulation
4) Missile Track Simulation
5) Realism

b. Determine the capability of the test item to present single and multiple target indications and tracks in all applicable azimuths and altitudes, courses and speeds.

c. Determine the capability of the test item to simulate effects on the radars of ECM jamming and chaff or decoys.

d. Determine the capability of the test item to present simulations of ground clutter, obstacles, or other natural interference requiring operator responses.

e. Determine the capability of the test item to display single and multiple tracks of missiles as the simulated air battle proceeds, and whether the tracks can be controlled to simulate both hits and misses.

f. Determine the capability of the test item, operating in conjunction with associated weapons system basic equipment, to create authentic battle situations and stresses on operating personnel of the air defense system.

g. Record the following:

1) Photographs and videotapes of significant displays.
2) Times required to set up and conduct simulated air defense engagements.
3) Narrative comments concerning any difficulties encountered in generating the desired simulations, or in sequencing the simulations realistically as the action develops.
4) Narrative comments concerning the responses of air defense operating personnel, and whether the desired intensities of practice are obtained.

6.2.4.3 Mobility

a. Utilizing average trained test soldiers (dressed in full-field uniforms and personal equipment) Transport, tow, or drive the test item over a tactical course including open terrain, trails, secondary roads, and primary roads consistent with a plan for movement of the most forward elements of the basic weapons system with which the test item is associated, in accordance with applicable sections of MTP 5-3-501.

b. In addition to the data required by MTP 5-3-501, record the following:

1) Details of terrain, distances travelled, and safe speeds attained.
2) Adverse effects on the test item, including limitations of maneuverability and speed of movement of the weapons system introduced by the test item.

6.2.4.4 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 6-3-517 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) Electrical output and regulation characteristics of any separately supplied generator set associated with the test item.
2) Power demand imposed by the test item on power sources organic to the basic weapons system.
3) Excessive loads or regulation problems introduced by the test item and its environment control equipment.

b. In addition to the data required by applicable sections of MTP 6-3-517, record the following:

1) Power demand characteristics; KW,V, Cycles, Phase, Voltage, and frequency regulation, percent.
2) Narrative comments concerning any excessive power demand by the test item, or actual or potential overload of power generation equipment due to the test item.

6.2.4.5 Enclosed Environment Control

a. During the performance of paragraphs 6.2.4.1, 6.2.4.2, and 6.2.4.4 above, conduct appropriate observations in accordance with applicable portions of MTP 5-3-509 to determine the adequacy of environment control in enclosed spaces of the test item. Special attention shall be given the following:

1) Adequacy of lighting: controllability, contrast, freedom from glare.
2) Ventilation equipment: air quality, freedom from noise.
3) Ability of air conditioning equipment to handle cooling loads from outside weather, heat rejection, crewmen, and normal traffic.
4) Ability of heating equipment to maintain comfort levels and avoid the use of heavy protective clothing.

b. In addition to the data required by applicable sections of MTP 5-3-509, record the following:

1) Narrative descriptions, supported by photographs,

relative to inadequacies in lighting; poor contrast with displays, weak local lighting intensity, reflections and glare.

2) Comments of operators concerning adequacy of ventilation, with attention to excessive drafts and objectionable odors or contamination.

3) Comments of operators concerning adequacy of air conditioning.

4) Comments of operators concerning adequacy of heating.

6.2.5 Transportability

a. Utilizing average trained test soldiers, dressed in full field uniforms and personal equipment, determine air transportability and air drop capability of the test item in accordance with applicable sections of MTP's 7-3-512, 7-3-515, and 7-3-516, with attention to the following:

1) Adequacy of provisions and instructions for lifting or otherwise loading the test item in or on transport aircraft

2) Suitability and adequacy of provisions and instructions for blocking and tie-down.

3) Suitability and adequacy of provisions, including materials and instructions, for rigging the test item for airdrop.

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) Narrative comments, supported by photographs, relative to experience with loading and tieing down the test item inside aircraft, or rigging the test item for external transportation by aircraft. Cover unloading from aircraft as well.

2) Narrative comments, supported by photographs, covering experience with air drop of the test item, including rigging, air drop operations, and final condition of the test item after drop.

c. Utilizing average trained test soldiers, dressed in full field uniforms and personal equipment, determine the surface transportability of the test item in accordance with applicable sections of MTP 6-3-510.

d. In addition to data required by applicable portions of MTP 6-3-510, record the following:

1) Availability and adequacy of means provided for lifting or otherwise loading the test item on transport vehicles.

2) Suitability of provisions for blocking and tie-down.
3) Dimensional clearance, referred to standards for shipping configurations (Berne tunnel, etc.).
4) Times required for performance.
5) Estimated transportation speed.

6.2.6 Maintenance

a. Throughout the conduct of all testing as outlined in this MTP, monitor and maintain a record of performance of all scheduled and unscheduled maintenance in accordance with applicable sections of MTP 10-3-504.

b. Compare all replacement parts and components provided with the test item with anticipated and actual requirements, evaluating spare parts requirements under actual operating conditions.

c. Evaluate the common and special tools and test equipment supplied for use with the test item, including need for special items not supplied, or excessive supplies, and the adequacy and simplicity of tools and test equipment used.

d. In addition to the data required by MTP 10-3-504, record the following:

1) Numbers of service personnel assigned, and the degree of success or difficulty experienced in performing organizational maintenance tasks on the test item.
2) Observations concerning the maintenance capability of the field support unit.
3) Adequacy and correctness of maintenance level assignments in the Maintenance Allocation Chart (MAC), and whether tools and equipment provided and listed are compatible with actual requirements.
4) Adequacy of spare parts load lists to support repair requirements with minimum delay.
5) Maintenance experiences necessary for determination of test item reliability parameters. Identify for each malfunction:
   a) Failing component and accumulated operating times on component and test item.
   b) Down time and corrective maintenance elapsed time and manhours.
   c) Other parameters as required by Test Directive.
   d) Repair parts usage and life in hours or cycles, time to obtain parts.

NOTE: Reliability parameters to be computed will include mean time between failures (MTBF), mean

time between maintenance, mean down time, availability - inherent, achieved, operational, and reliability.

e. Throughout the entire testing period, review all operation and maintenance manuals furnished with the test item for compliance with applicable Army Regulations in accordance with MTP 5-3-502. The manuals shall be used for classroom instruction and as references throughout the tests.

f. Record narrative comments and observations concerning the adequacy of manuals with respect to:

1) Accuracy
2) Completeness
3) Clarity
4) Ease of use
5) Effectiveness of prescribed methods

6.2.7 Human Factors

a. Throughout the conduct of all testing as outlined in this MTP, monitor and appriase the item under test and its associated equipment with respect to human factors in accordance with applicable sections of MTP 6-3-525.

b. In addition to the data required by MTP 6-3-525, record narrative comments, obtained from all test personnel through observation, interview, and questionnaire, concerning the following man-machine compatibility factors:

1) Dimensions of work spaces, affording ready access to equipment and ease of circulation of personnel.
2) Legibility of labels, dials, and indicators.
3) Convenient arrangement of switches, knobs, and handles.
4) Freedom from interference by vibration and noise.
5) Any other condition affecting human performance or cuaing fatigue, confusion, or errors.

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 portions of MTP 6-3-512 regarding the compatibility of the test item with other elements of the basic weapons system.

b. In addition to data required by applicable sections of MTP 6-3-512, record the following:

1) Instances of physical mis-match of test item and inter-connecting equipment; passageways, cables and connectors, equipment mounts, and transport vehicles.

2) Instances of functional mis-match between test item and related equipment; frequencies, phasing, interference with data or communications transmissions.

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, part number, serial number(s), manufacturer, and function of the item(s) under test.

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

c. Identities of testing areas and details of site locations. Nomenclature, model number, serial number of vehicles or equipment used with the test item.

d. Sufficient narrative comments pertaining to training, logistical requirements, statistical considerations, etc., to provide background information for use in the analysis of test resulsts.

6.3.2 Test Conduct

Data to be recorded in addition to that specifically required for each subtest shall include:

a. A block diagram of the test setup employed in each specified test, where applicable. The block diagram shall identify by model and serial number all test equipment and interconnections (cable lengths, connectors, attenuators, etc.) and indicate control and dial settings where necessary.

b. Photgraphs and motion pictures, preferably using color film, sketches, charts, graphs, or other pictorial or graphic presentations which will support test observations or conclusions. Liberal use shall be made of magnetic recording of operator's voice responses and comments.

c. An engineering logbook containing, in chronological order, pertinent remarks and observations which would aid in subsequent analyses of the test data. This information may consist of descriptions of equipment or components, descriptions of functions, notes of deficiencies, theoretical bases for predictions or estimations, mathematical calculations, test conditions and test parameters, intermittent or persistent failures, and catastrophic failures encountered during the test.

d. Test sample size (number of repetitions).

e. Instrumentation or measurement system mean error and stated accuracy.

6.3.2.1 Preoperational Inspection and Physical Characteristics

The following shall be recorded:

a. Data as collected under applicable sections of MTP 6-3-500.

b. Inventory lists, with any shortages reported on the appropriate forms.

c. Photographs of shipping damage, including failures of protective provisions.

d. Dimensions in centimeters/millimeters, weights in kilograms.

e. Accumulated operating time, hours, on major components.

f. Data as collected under applicable sections of MTP 6-3-50.

g. Completed checklist of functions and modes.

h. Comments concerning any requirements for unusual procedures or special skills demanded to operate the test item.

i. Locations of crew stations or routes where dangerous levels of radiations are detected.

j. Radiation levels, in MW/CM^2, with notes identifing the origin of radiation.

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 6-3-523.

d. Confirmation of safety release under conditions as specified in the release and in USATECOM Regulation 385-6.

e. Any undue restrictions or limitations imposed on the use of the equipment under test by Safety Statements and/or Safety Release(s).

f. Evaluation of the safety control(s) of the test item with reference to convenience of location, ease of identification of safe position 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 potential safety hazards.

i. Recommendations for additions to the electronic simulator's safety program and/or safety features.

6.3.2.3 Personnel Training

The following shall be recorded:

a. Data as collected under applicable sections of MTP 6-3-502 and 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 the 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

d. Extent of additional training required.

6.3.2.4 Operational Characteristics

6.3.2.4.1 Emplacement and March Order

Record the following:

a. Data as collected under applicable sections of MTP 6-3-505.

b. Times in minutes for emplacement, preparation for action, and march ordering the test item.

c. Narrative comments, supported by photographs, concerning instances of difficulty during emplacement and march order operations, or delays in emplacing and march ordering elements of the basic weapons system in order to accomodate the test item.

6.3.2.4.2 Functional Performance

Record the following:

1) Photographs and videotapes of significant displays.
2) Times required to set up and conduct simulated air defense engagements.
3) Narrative comments concerning any difficulties encountered in generating the desired simulations, or in sequencing the simulation realistically as the action develops.
4) Narrative comments concerning the responses of air defense operating personnel, and whether the desired intensities of practice are obtained.

6.3.2.4.3 Mobility

Record the following:

a. Data as collected under applicable sections of MTP 5-3-501.

b. Profiles of courses travelled, including photographs of typical terrain features.

c. Distances in km, speeds in km per hour.

d. Narrative comments, supported by photographs, concerning any difficulties, delays, or interference with movement of the basic weapons system due to the test item.

6.3.2.4.4 Power Requirements

Record the following:

a. Data as collected under applicable sections of MTP 6-3-517.

b. Power demand characteristics; KW, V, Cycles, Phase, Voltage and frequency regulation, percent.

c. Comments concerning any excessive power demand by the test item, or actual or potential overload of power generation equipment due to the test item.

6.3.2.4.5 Enclosed Environment Control

Record the following:

a. Data as collected under applicable sections of MTP 5-3-509.

b. Narrative comments, supported by instrument readings only as required to define the condition, concerning shortcomings or suggested improvements in lighting, ventilation, air conditioning, and heating in the test item.

6.3.2.5 Transportability

The following shall be recorded:

a. Data as collected under applicable portions of MTPs 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, tieing 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 air drop of the test item, including operations of rigging and ejecting, and containing observations concerning test item condition after air drop. Include comments concerning the adequacy of instructions in manuals.

e. Data as collected under applicable portions of MTP 6-3-510.

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 tie-down, 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.

6.3.2.6 Maintenance

The following shall be recorded:

a. Data as collected under applicable sections of MTP 10-3-504.

b. A completed Maintenance Data Sheet (Appendix A, MTP 10-3-504) for each maintenance task. Record malfunctions or failures on AMSTE Form 1025.

c. Comments on the adequacy of tools and test equipment.

d. Narrative comments concerning completeness and adequacy of manuals and technical literature, including appropriateness of assignment of tasks to the various maintenance levels, clarity of instructions and lists.

e. Narrative comments concerning the adequacy of repair parts supplied, and whether delays are caused by missing parts or lack of interchangeability.

f. Reliability parameters; times in hours, work effort in man-hours, life in hours or number of cycles.

6.3.2.7 Human Factors

The following shall be recorded:

a. Data as collected under applicable sections of MTP 6-3-525.

b. Photographs of features of the test item which cause difficulties or problems for personnel.

c. Narrative comments concerning any systematic interference with human performance due to design, arrangement, or functioning of the test item.

6.3.2.8 Compatibility with Related Equipment

The following shall be recorded:

a. Data as collected under applicable section of MTP 6-3-512.

b. Annotated photographs of physical mis-match.

c. Tape-recorded comments and sample traces of functional mis-match.

6.4 Data Reduction and Presentation

Data will be organized to portray the capability of the test item as a device for facilitating proficiency training of air defense crews, and as an item of Army equipment. The former requirement is met by data on the responses and evaluations of the personnel being exercised; the latter by data on the performance and condition of the test item.

Data including observations and comments of operators will be summarized, compared, and evaluated according to procedure described in the referenced MTPs, or equivalent current practice when not otherwise covered. Appropriate charts, graphs, and tables will be used to display summaries and comparisons of test data. Coordinates and other features of charts, graphs, and table will be selected for clarity and

uniformity with like presentations in other reports. Special consideration will be given to presenting data on any condition or circumstance which may have significantly influenced the test results. Data collected under adverse weather or terrain conditions will be separately compared with data collected during normal conditions.

Calculations will be performed as specified in referenced MTPs, or according to equivalent current practice when not otherwise covered. All photographs, motion pictures, recorder tapes, and other records will be explicitly identified and referenced; significant frames, transcription, and samples will be selected for illustration purposes. All illustrations will be completely identified.