AD 718582

7 October 1968

Materiel Test Procedure 6-3-220
U. S. Army Artillery Board

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

3461

RADAR, FIELD ARTILLERY

1. OBJECTIVE

The purpose of this document is to outline test procedures to determine under actual field operating conditions the degree to which the test item conforms to the specifications of applicable Qualitative Materiel Requirements (QMR) and Technical Characteristics (TC), and to evaluate its suitability and adequacy for Army use.

2. BACKGROUND

Modification of surveillance radar equipment resulted in the development of devices to detect and locate hostile mortars, i.e., countermortar radar. As these instruments were perfected, counterbattery detection and location, long desirable, was found to be feasible.

In the counterbattery and countermortar applications, tracking radar units have been employed to provide present position data of elevation, azimuth and horizontal range to a hostile weapon while tracking a projectile fired by that weapon. Other radars have been the non-tracking, dual beam type locators and represent considerable improvement in accuracy and efficiency.

Continued improvement in radar for field artillery use is expected as the state-of-the-art advances, hence, the testing programs must be geared to reflect these improvements, particularly in:

a. Countermortar capabilities
b. Counterbattery capabilities
c. Sector coverage (surveillance)
d. Detection capability against short range rockets
e. Mobility

3. REQUIRED EQUIPMENT

a. Firing Ranges and Position Areas, as required for establishing the various range and aspect situations including:

1) "Target" Weapons and Batteries
2) Impact areas
3) "Target" personnel
4) Flash Ranging Base
5) Surveillance Areas

b. Vehicles for Towing or Transporting the test item, as required.
c. Maintenance Support Facilities.
d. Measuring and Inspection Equipment as required by MTP 6-3-500 and MTP 6-3-501.

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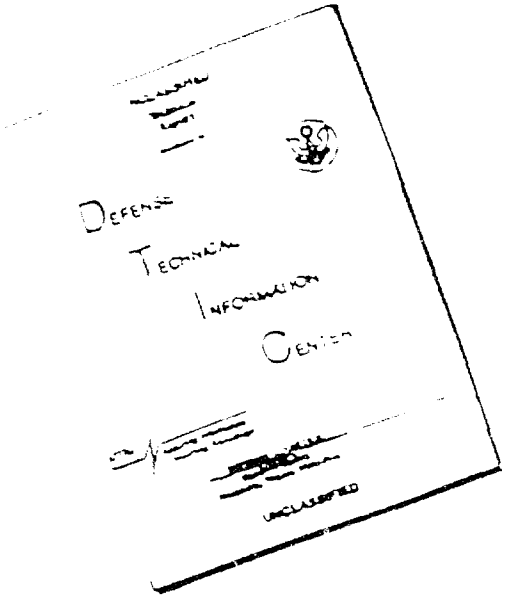

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e. Electrical Equipment as required by MTP 6-3-517.
f. "Standard" Item, for comparison, as required.
g. Temperature Measuring Devices, as required.
h. Weapons for Firing Problems, as follows:

1) 60 mm Mortars (6) with crews
2) 81 mm Mortars (3) with crews
3) 4.2 inch Mortars (3) with crews
4) 120 mm Mortar (1) with crew
5) 105 mm Howitzers (2) with crews
6) 155 mm Howitzers (2) with crews
7) 140 mm Rocket Launcher (1) with crew
8) 57 mm Recoilless Rifle (1) with crew
9) 75 mm Recoilless Rifle (1) with crew
10) 175 mm Gun (1) with crew
11) 8 inch Howitzer (1) with crew

i. Ammunition for Firing Missions, as required.
j. Timing Devices, as required.
k. Surveying Equipment for conducting fourth order surveys with crew.
l. Flash Ranging Base System with crew.
m. Surveillance Targets, as follows:

1) Personnel - individual
2) Personnel - platoon
3) Vehicle - 1/4-ton truck
4) Vehicle - 2½ ton truck
5) Vehicle - special purpose
6) Vehicle - heavy transport

n. Ground and Air Transportation Equipment as required by MTP 6-3-510. and MTP 7-3-515.
o. Communications and Electronic Equipment for Interference Tests, as required by MTP 6-3-513.
p. Acoustic Aids.
q. Optical Instruments.
r. Aerial Cameras with Film.
s. Aerial Photo Interpretation Facilities.
t. Road Test Courses, as follows:

1) Paved roads
2) Unpaved roads
3) Cross-country terrain
4) Stream-fording areas

u. Repair Parts, as required.
v. Maintenance Package for Direct and General Support Maintenance.
w. Communication Facilities, as required.

4. REFERENCES

A. QMR for Radar, Mobile, Hostile Artillery and Mortar Location, CDOG subparagraphs 439c(1) and (4)(U).
B. FM 6-160 Radar Set, AN/MPQ-10.
C. FM 6-161 Radar Set, AN/MPQ-4A.
D. DA, USAMC, and USATECOM Regulations of the 705 series.
E. AR 70-10, Research and Development, Army Materiel Testing.
F. USAMC Regulation 385-12 Verification of Safety of Materiel from Development through Testing and Supply to Disposition.
G. USATECOM Regulation 385-6 Safety Release.
H. USATECOM Regulation 385-7 Safety Confirmation.
I. USATECOM Regulation 700-1 Value Engineering.
J. USATECOM Regulation 750-15 Maintenance of Supplies and Equipment, Maintenance Portion of the Service Test.
K. Applicable Technical Characteristics (TC's).
L. Applicable Small Development Requirements (SDR).
M. AR 385-63 Regulations for Firing Ammunition for Training Target Practice and Combat.
N. MTP 6-3-500 Physical Characteristics.
O. MTP 6-3-501 Technical Inspection.
P. MTP 6-3-502 Personnel Training Requirements.
Q. MTP 6-3-505 Emplacement, Preparation for Action and March Order.
R. MTP 6-3-506 Durability.
S. MTP 6-3-509 Effects of Weather.
T. MTP 6-3-510 Transportability of Communication, Surveillance, and Electronic Equipment.
U. MTP 6-3-512 Compatibility with Related Equipment.
V. MTP 6-3-513 Qualitative Electromagnetic Interference.
W. MTP 6-3-517 Electrical Power Requirements.
X. MTP 6-3-523 Safety.
Y. MTP 6-3-524 Maintenance Evaluation.
Z. MTP 6-3-525 Human Factors.
AA. MTP 7-3-515 Air Transport, Internal, (Suitability of Equipment For).

5. SCOPE

5.1 SUMMARY

This MTP describes the methods used to determine, under actual field conditions, the capability and suitability of the test item as a countermortar/counterbattery location device and as a surveillance radar. The major areas and their included subtests are:

a. Pre-Test Operations consisting of:

1) Technical Inspection - A check to verify that the test item is complete and in satisfactory condition prior to the start of testing.
2) Physical Characteristics - A verification of the physical characteristics of the test item.
3) Electrical Characteristics - A study to ascertain the test item's electrical characteristics and a determination of its power

requirements.

b. Operational Characteristics consisting of:

1) Emplacement, Preparation for Action and March Order Suitability - A study to determine the ability of service personnel to set up the test item for operation under various conditions and to restore it to its transport configuration.
2) Hostile Weapon Location Capability - A study to determine the ability of the test item to detect and locate various hostile weapons under a variety of firing conditions.
3) Range Capabilities - A determination of the maximum effective range that the test item can be operated as a countermortar/counterbattery device.
4) Detection of Hostile Mortar and Artillery Rounds - A study to determine the capability of the test item to assimilate initial round information in its countermortar/counterbattery role.
5) Adjustment of Artillery Fire - A study to determine the suitability of the test item to adjust and register friendly artillery fire.
6) Terrestrial Surveillance Capability - A study to determine the effectiveness of the test item as a surveillance device.

c. Special Operations consisting of:

1) Compatibility with Related Equipment - A study to determine the suitability of the test item for operations with its related equipment in various configurations.
2) Transportability - A study to determine the suitability of the test item for surface and air transport.
3) Communications, and Electronic Equipment Interference Effects - A determination of the degree and severity of mutual interference with and from communications and electronic equipment operating in proximity to the test item.
4) Vulnerability to Detection - A study to determine the degree of security from aural and visual detection that the test item has. Ground and aerial observations are included.

d. Full-Test Evaluations consisting of:

1) Durability - An evaluation of the capability of the test item to withstand being transported over various types of terrain for a specified number of miles.
2) Effects of Weather - An evaluation of the effects of various weather conditions on the operability of the test item.
3) Maintainability and Reliability - An evaluation to determine the suitability of the test item to be maintained, the adequacy of its maintenance package, and its overall ability to operate over long periods of time without adjustment or replacement of components.
4) Human Factors - An evaluation of the suitability of the test

item for operation, servicing, transport and storage by service personnel without causing undue fatigue and mental errors.

5) Safety - An evaluation of the safeness of the test item in its various configurations, under a variety of conditions, and the resultant safety hazards to service personnel.

e. Post-Test Inspection - A repetition of the technical inspection to determine any adverse effects of testing on the test item.

5.2 LIMITATIONS

None

6. PROCEDURES

6.1 PREPARATION FOR TEST

6.1.1 Scheduling

6.1.1.1 Personnel

a. Prior to the arrival of the test item, ensure that service personnel with appropriate background are adequately trained in the operation and maintenance of the test item and its associated equipment in accordance with the criteria established by MTP 6-3-502.

b. Record the following for all service personnel:

1) Rank
2) MOS
3) Training time
4) Experience

NOTE: Test personnel shall receive the minimum essential individual instruction in the operation of the test item and in the performance of maintenance on the test item at organizational, direct support and general support echelons.

The achievement of a skill level to operate the test item under simulated combat conditions shall be a requirement, assuming that the test item can achieve results as set forth in the QMR. Training shall include all aspects essential to test item operation, including safety. Observations of operations and maintenance shall be made by technically qualified personnel.

c. Adequate training literature for test item operation and maintenance shall be available as required.

d. Ensure that experienced personnel are available for the duration of testing.

6.1.1.2 Facilities and Equipment

a. Select and schedule the use of testing sites and facilities as required by the applicable test section and the corresponding MTP.

b. Upon notice of the arrival of the test item or estimated time of arrival, arrange for or secure the following:

1) Engineering safety release or a safety statement from the engineering agency as prescribed by references 4G and 4H.
2) Vehicles required for transporting or towing the test item equipment and personnel to the test sites.
3) Maintenance support facilities, organization, and personnel.
4) Assistance of the U. S. Army Airborne, Electronics and Special Warfare Board (USAAESWBD) of subtests involving airborne operations (See paragraphs 6.2.2.2 and 6.2.2.4).

6.1.2 Safety

a. Verify that the test item safety statement is valid and up-to-date.

b. Verify that all service personnel have been adequately trained in the safety requirements and the safety restrictions pertaining to the test item and the weapons and ammunition used in firing missions.

c. Conduct the testing under field conditions simulating tactical operations, but within the limitations imposed by the safety requirements.

d. Observe safety precautions during tests where firing takes place as prescribed by reference 4M.

6.1.3 Test Site Preparations

Whenever required:

a. Survey and record the positions for the following, as applicable, prior to testing:

1) Test item
2) Standard item (AN/MPQ 4A or AN/MPQ 10)
3) Artillery weapons
4) Mortars
5) Recoilless rifles
6) Target areas

NOTE: Survey data shall be taken only if such data is unavailable, particularly where new sites and item locations have been selected. Surveys shall be of fourth order.

b. Ensure that all preparations have been made at the selected test sites for carrying out of required range safety precautions.

6.1.4 Pre-Test Operations

6.1.4.1 Technical Inspection

Subject the test item to a technical inspection as described by the

applicable sections of MTP 6-3-501.

6.1.4.2 Physical Characteristics

Determine the physical characteristics of the test item as described by the applicable sections of MTP 6-3-500.

6.1.4.3 Electrical Characteristics

Determine the electrical characteristics and the power requirements of the test item as described by the applicable sections of MTP 6-3-517.

6.2 TEST CONDUCT

a. Subtests shall be conducted concurrently with or in conjunction with other subtests whenever possible so that the time taken to collect the required data can be minimized.

b. Subtests shall be conducted under conditions as close as possible to those specified by this MTP.

6.2.1 Operational Characteristics

NOTE:
1. Performance of the test item shall be evaluated with respect to its conformance to QMR specifications. All firing problems shall be controlled with both weapons and the test item in surveyed tactical type positions. Operational characteristic data obtained for the test item shall be compared to corresponding data from "standard" sound ranging systems which have been operated under the same, or very nearly the same, conditions.
2. At the completion of each subtest for the evaluation of its operational characteristics, the test item shall be subjected to a technical inspection as described by the applicable sections of MTP 6-3-501.
3. The test item shall be operated during all weather conditions pertaining for the duration of the test.
4. The test item shall be operated during daylight and darkness (blackout).

6.2.1.1 Emplacement, Preparation for Action and March Order Suitability

Determine the suitability of the test item to be emplaced, prepared for action and march ordered according to the conditions and the criteria of MTP 6-3-505.

6.2.1.2 Hostile Weapon Location Capability

a. Emplace the test item to detect and locate the following, as applicable:

1) 60mm mortars

2) 81mm mortars
3) 4.2 in. mortars
4) 120mm mortars
5) 105mm artillery
6) 155mm artillery
7) 140mm rocket
8) 57mm recoilless rifle
9) 75mm recoilless rifle

b. Fire the weapons of step a in the following combinations:

1) One weapon fires at sporadic rates of fire.
2) One weapon fires rapid sustained fire.
3) Two or more weapons fire rapid fire simultaneously.
5) Three or more weapons of different caliber firing simultaneously.

c. Determine and record the locations of the weapons of step a when fired in the combinations of step b under the following varied conditions:

1) Test item-weapon range and direction.
2) Test-item weapon altitude difference, to the maximum difference available at the test site.
3) Test item-weapon intervening mask.
4) Screening crest in front of the test item.
5) Test item camouflage and depth of emplacement.
6) Weapons quadrant elevation (QE) and charge. (In the case of artillery, low angle and high angle.)
7) Time between rounds from a single weapon, each caliber available.
8) Time between rounds from two, three, or more weapons at varied directions and ranges from the test item.

6.2.1.3 Range Capabilities

Determine and record the test item range capabilities using the condition specified in paragraph 6.2.1.2 in 500 meter increments until the maximum effective ranges are established at which each target weapon can be located and detected.

6.2.1.4 Detection of Hostile Mortar and Artillery Rounds

Determine and record the test item capability of obtaining first round information under the conditions of paragraph 6.2.1.2 but with the operator being furnished center of sector information only.

NOTE: If first round detection is not realized, search shall continue until a round is detected or until test item incapability to detect is proven. In each mission resulting in detection, the operator shall attempt to identify the target weapon by type and size.

6.2.1.5 Adjustment of Artillery Fire

a. Set up the required flash ranging base in the pre-surveyed positions.

b. Emplace the test item in the pre-surveyed position for adjustment capability testing.

c. Fire high and low angle problems of at least 10 rounds each from a 105mm howitzer in a pre-surveyed position including:

1) Ground impact problems
2) Time-fire problems

d. Determine the burst ranges from mid-range to maximum range (for the test item) using:

1) Test item
2) Flash ranging base system

e. Measure high burst and mean point of impact data to provide registration corrections. (Corrections so derived shall be applied to transfer data for selected targets.)

f. Repeat steps c through e for the following weapons:

1) 155mm howitzer
2) 8 inch howitzer
3) 175mm gun

6.2.1.6 Terrestrial Surveillance Capability

a. Position the following types of stationary and moving targets in an area selected for surveillance:

1) Personnel - individual
2) Personnel - platoon
3) Vehicle - 1/4 ton truck
4) Vehicle - 2½ ton truck
5) Vehicle - special purpose
6) Vehicle - heavy transport

6.2.2 Special Operations

6.2.2.1 Compatibility with Related Equipment

Determine the compatibility of the test item with its related equipment as described by the applicable sections of MTP 6-3-512.

6.2.2.2 Transportability

a. Determine the surface and air transportability of the test item as described by the applicable sections of MTP 6-3-510 and MTP 7-3-515.

b. Conduct a technical inspection of the test item at the completion of the surface and air transportability tests, as described by the applicable sections of MTP 6-3-501.

6.2.2.3 Communications and Electronic Equipment Interference Effects

Determine the effects of operating the test item in positions near wire and electronic communications and ranging devices according to the criteria of the applicable sections of MTP 6-3-513.

6.2.2.4 Vulnerability to Detection

6.2.2.4.1 Daylight Conditions - Perform the following:

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

1) Unaided ear
2) Acoustic aids

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

1) Unaided eye
2) Optical instruments
3) Electronic instruments

c. Determine and record the maximum altitudes at which the test item is discernible without camouflage and with camouflage from aerial observations using:

1) Unaided eye
2) Optical instruments
3) Aerial photography

6.2.2.4.2 Darkness (Blackout) Conditions - Repeat paragraph 6.2.2.4 1 under conditions of darkness (blackout).

6.2.3 Full-Test Evaluation

Evaluations are to be conducted during the entire period of testing, under the various conditions specified in this MTP and those applicable to the various subtests.

6.2.3.1 Durability

Determine the durability of the test item as described by the applicable sections of MTP 6-3-506.

NOTE: The test item and its supporting equipment shall be transported a minimum of 200 miles each over paved roads, unpaved roads, and cross-country terrain. Fording capability shall be tested.

6.2.3.2 Effects of Weather

Determine the effects of weather on the test item as described by the applicable sections of MTP 6-3-509.

6.2.3.3 Maintainability and Reliability

Test item maintainability and reliability shall be evaluated in accordance with USATECOM Regulation 750-15, Appendix II.

a. Determine the maintainability of the test item as described by the applicable sections of MTP 6-3-524.

b. Complete the authorized maintenance tasks in accordance with the test item maintenance allocation chart and technical literature.

c. Record the following:

1) Time and number of personnel required to perform each maintenance task on the test item, scheduled and non-scheduled.
2) Frequency of repairs over period of testing.
3) Test item down-time (cumulative).
4) Nomenclature of repair parts used.

6.2.3.4 Human Factors

a. Determine the suitability of the test item design with respect to the man-equipment relationship, as described by the applicable sections of MTP 6-3-525.

b. Determine and record the suitability and the compatibility of the test item with the service personnel who shall operate and maintain it, with respect to their skills, aptitudes, and physical limitations.

NOTE: Each test item detail requiring human attention and/or manipulation shall be observed and evaluated.

6.2.3.5 Safety

a. Determine the test item safety hazards resulting from storage, transport, operation and maintenance as described by the applicable sections of MTP 6-3-523.

b. Develop a safety confirmation in accordance with USATECOM Regulation 385-7.

6.2.4 Post-Test Inspection

Upon completion of testing, the test item shall be subjected to a final technical inspection as described by the applicable sections of MTP 6-3-501 and any deleterious effects of the testing program on the test item shall be recorded.

6.3 TEST DATA

6.3.1 Preparation for Test

6.3.1.1 Personnel

Record the following for all service personnel:

a. Rank
b. MOS
c. Training time, in months
d. Experience, in years

6.3.1.2 Test Site Preparation

As required, record the positions for the following in UTM grid coordinates:

a. Test item
b. Standard item (if necessary)
c. Mortars
e. Recoilless rifle(s)
f. Target areas

6.3.1.3 Pre-Test Operations

6.3.1.3.1 Technical Inspection -

Record data as collected under the applicable sections of MTP 6-3-501.

6.3.1.3.2 Physical Characteristics -

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

6.3.1.3.3 Electrical Characteristics -

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

6.3.2 Test Conduct

6.3.2.1 Operational Characteristics

Record the following for each subtest conducted:

a. Visibility condition (daylight, darkness)
b. Ambient temperature, in °F
c. Weather condition (clear, rain, snow, sleet, etc.)
d. Test item nomenclature
e. Standard item nomenclature, if required

6.3.2.1.1 Emplacement, Preparation for Action and March Order Suitability -

a. Record data as collected under the applicable sections of MTP 6-3-505.
b. Record technical inspection data collected as described in the applicable sections of MTP 6-3-501.

6.3.2.1.2 Hostile Weapon Location Capability -

a. Record the following for each mission fired during this subtest:

1) Test item-weapon range, in meters.
2) Test item-weapon azimuth, in mils.
3) Test item-weapon altitude difference, in meters.
4) Azimuth of weapon firing, in mils.
5) Quadrant and charge of weapon firing.
6) Weapon caliber and type (105m howitzer, 60mm mortar, etc.).
7) Number of weapons firing and rates of fire (1, 2, 3, and rounds per minute).
8) Number of rounds fired for each weapon (1, 2, 3, etc.).
9) Number of rounds detected for each weapon (1, 2, 3, etc.).
10) Number of weapons detected and located by the test item (1, 2, 3, 4, etc.).
11) Computed radial error of locations made by the test item.
12) Test item screening crest and antenna elevation, in degrees and minutes.
13) Test item-weapon intervening terrain (hills, woods, etc.).
14) Type of test item emplacement (e.g., at ground level, dug in, camouflaged, or uncamouflaged).

b. Record technical inspection data collected as described in the applicable sections of MTP 6-3-501.

6.3.2.1.3 Range Capabilities -

Record the following for each mission fired:

a. Type and caliber of weapon(s) (105mm howitzer, 60mm mortar, etc.).
b. Maximum range at which weapon(s) can be detected, in meters.
c. Test item-weapon azimuth(s), in mils.
d. Number of rounds fired (1, 2, 3, etc.).
e. Test item-weapon altitude difference, in meters.
f. Type of weapon fire (sporadic, sustained).
g. Type of multiple weapon fire (single rounds, two or more, three or more different weapons).

6.3.2.1.4 Detection of Hostile Mortar and Artillery Rounds -

Record the following for each mission fired:

a. Type and caliber of weapon(s) (105mm howitzer, 60mm mortar, etc.).
b. Number of rounds fired (1, 2, 3, etc.).
c. Number of initial rounds detected for each weapon fired.
d. Angle of weapon fire (high angle, low angle).
e. Type of weapon fire (sporadic, sustained).
f. Number of rounds required to detect each weapon, if not initial round.
g. Type of multiple weapon fire (single rounds, two or more, three or more different weapons).

6.3.2.1.5 Adjustment of Artillery Fire -

a. Record the following for each artillery adjustment and registration mission:

1) Type and caliber of weapon fired (105mm howitzer, 175mm gun, etc.).
2) Test item emplacement conditions (ground level, dug in, camouflaged, etc.).
3) Burst ranges, in meters, using the test item.
4) Burst ranges, in meters, using the flash ranging system.
5) Angle of fire (high angle, low angle).
6) Type of burst (air burst, impact burst).
7) Test item to screening crest (if applicable), in meters.
8) Data corrections applied to transfer data for selected targets.
9) Number of rounds required to complete each adjustment and registration mission.

b. Record technical information data collected as described in the applicable sections of MTP 6-3-501.

6.3.2.1.6 Terrestrial Surveillance -

a. Record the following for each surveillance mission:

1) For stationary targets:

a) Number of targets detected (1, 2, 3, etc.).
b) Test item-target range, in meters.
c) Test item-target azimuth, in mils.
d) Test item-target difference in elevation, in mils.
e) Target identity (personnel-platoon, vehicle-2½ ton truck, etc.).
f) Effect of clutter on test item surveillance capabilities.

2) For moving targets:

a) Number of targets detected (1, 2, 3, 4, etc.)
b) Test item-target ranges, in meters (at regular time intervals).
c) Test item-target azimuths, in mils (coinciding with range data).
d) Test item-target differences in elevation, in mils (coinciding with range and azimuth data).
e) Target identity (personnel-platoon, vehicle 2½ ton truck).
f) Maximum test item-target range of detection capability, in meters.
g) Effects of clutter on test item surveillance capabilities.

b. Record technical inspection data collected as described in the applicable sections of MTP 6-3-501.

6.3.2.2 Special Operations

6.3.2.2.1 Compatibility with Related Equipment -

Record data collected as described in applicable sections of MTP 6-3-512.

6.3.2.2.2 Transportability -

a. Record data as collected under the applicable sections of MTP 6-3-510 and MTP 7-3-515.
b. Record data as collected under the applicable sections of MTP 6-3-501.

6.3.2.2.3 Communications and Electronic Equipment Interference Effects -

Record data as collected under the applicable sections of MTP 6-3-513.

6.3.2.2.4 Vulnerability to Detection -

a. Record the following for each aural observation:

1) Visibility condition (daylight, darkness).
2) Maximum distances, in meters, at which the test item and associated equipment can be detected by:

a) Unaided ear
b) Acoustic aids

b. Record the following for each visual observation from ground positions:

1) Visibility condition (daylight, darkness).
2) Test item emplacement condition (camouflaged, uncamouflaged).
3) Maximum distances, in meters, at which the test item is discernible by:

a) Unaided eye
b) Optical instruments
c) Electronic instruments

c. Record the following for each visual observation from aircraft:

1) Visibility condition (daylight, darkness).
2) Test item emplacement condition (camouflaged, uncamouflaged).
3) Maximum altitudes, in feet, at which the test item can be detected by:

a) Unaided eye
b) Optical instruments
c) Aerial photography

6.3.2.3 Full-Test Evaluations

6.3.2.3.1 Durability -

Record data as collected under the applicable sections of MTP 6-3-506.

6.3.2.3.2 Effects of Weather -

Record data as collected under the applicable sections of MTP 6-3-509.

6.3.2.3.3 Maintainability and Reliability -

Record the following:

a. Data as collected under the applicable sections of MTP 6-3-524
b. Type of maintenance performed (scheduled, non-scheduled)
c. Time required to perform each maintenance task, in hours
e. Frequency of repairs over period of testing (record dates)
f. Test item down-time (cumulative), in hours
g. Nomenclature of repair parts used

6.3.2.3.4 Human Factors -

Record the following:

a. Data as collected under the applicable sections of MTP 6-3-525.
b. Observations of service personnel during testing and the suitability of the test item with respect to their:

1) Skills
2) Aptitudes
3) Physical limitations

6.3.2.3.5 Safety -

Record data as collected under the applicable sections of MTP 6-3-523.

6.3.2.4 Post-Test Inspection

a. Record data as collected under the 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 all subtests covered by applicable MTP's shall be summarized, compared with "standard" data and evaluated according to procedures described in those applicable MTP's. Appropriate charts, graphs, and tabulated summaries shall be used to present the data in a clear manner. Special consideration shall be given to any condition or circumstance contributing to any test result.

Calculations shall be performed as specified by the individual MTP's wherever applicable, and all photographs, motion pictures, and illustrative

material shall be suitably identified.

In order to carry out the necessary missions under various sections of the operational characteristics evaluations, calculations must necessarily be made in the field by the test item operating personnel. These computations shall be recorded along with the collected data required under paragraph 6.3 and utilized in the final evaluation.

Comparisons concerning the operational characteristics of the test item shall utilize the survey data and available "standard" data. Final comparison presentations shall include:

a. The computed coordinate locations of all detected weapons, projectile bursts, and targets.
b. Computed elevations for weapons projectile bursts, targets and the like.
c. Tabulated test results according to visibility conditions.
d. Coordinate locations and elevations of the various moving targets at the specified times.

In the adjustment of artillery fire, the mean radial error of each mission mean point of impact shall be computed. The test item ranging results shall be compared with those gathered by the flash base instruments. The results shall be presented in tabular form.

In the subtests where hostile mortar and artillery rounds are detected, the evaluation shall include the average radial error of initial round detection compared to the average radial error of the ultimate test item location data to targets at mid-range to maximum range.

Final evaluation of the test item capabilities shall be a comparison of the test results with the requirements defined by the QMR's, SDR's, TC's, MC's, and other established criteria.