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Materiel Test Procedure 4-3-519
U. S. Army Armor and Engineer Board

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

COMPATIBILITY WITH FIRE CONTROL EQUIPMENT

1. OBJECTIVE

The objective of this Materiel Test Procedure (MTP) is to provide guidelines for determining the compatibility of conventional ammunition-direct fire weapon combinations with related fire control equipment.

2. BACKGROUND

Final acceptability of a weapon system is largely governed by its ability to deliver effective fire rapidly and accurately on a target. To accomplish this, the weapon must have a high degree of inherent accuracy and be sufficiently compatible with the various types of ammunition provided for it to obtain as small a dispersion as practical with each type. When this is accomplished and firing table data for each type ammunition is prepared, accurate fire control equipment is needed to facilitate moving the impact of projectiles quickly and accurately from one point to another. The degree of inherent accuracy and kill capability of the weapon-ammunition combination is normally the major factor in determining the degree of sophistication that can be justified in the fire control equipment. For example, an expensive rangefinder could not be justified for use with a weapon system that could not hit the target consistently when the exact range was known. Each fire control component needs to be checked for accuracy under carefully controlled ideal test conditions as well as during firing exercises.

3. REQUIRED EQUIPMENT

a. Gridded Target.
b. Tape Measure.
c. Qualified Gunner's M1A1 Quadrant.
d. Level Hardstand Area.
e. Appropriate Firing Ranges.
f. Appropriate Field Targets.
g. Boresighting Devices as required.
h. Binoculars and Spotting Scopes.
i. Ambulance with medical aid personnel and equipment.
j. Appropriate Ammunition.
k. Meteorological Equipment as required for determining:

   1) Windspeed and direction
   2) Ambient temperature
   3) Relative humidity

m. Cameras, Still, Motion or Video as available with necessary Film and Video Recorder when available.
n. Forms for recording data.
o. Appropriate Gage for measuring the gun barrel.

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p. Appropriate Firing Tables.

4. REFERENCES

A. USATECOM Regulation 385-6, Verification of Safety of Materiel During Testing.
B. USAMC Regulation 385-12, Verification of Safety of Materiel From Development Through Testing, Production, and Supply to Disposition.
C. Applicable Range Regulations and Standing Operating Procedures.
D. Qualitative Materiel Requirements (QMR), Small Development Requirements (SDR) or other appropriate document.
E. Pertinent Technical Publications.
F. MTP 2-3-500, Preoperational Inspection and Physical Characteristics.
G. MTP 3-3-500, Preoperational Inspection and Physical Characteristics (Armament and Individual Weapons).
H. MTP 3-3-503, Boresight and Zero.
I. MTP 3-3-507, Tracking and Hitting Performance, Stationary Gun Mount-Moving Target.
J. MTP 3-3-508, Tracking and Hitting Performance, Moving Gun Mount-Stationary Target.
K. MTP 3-3-509, Tracking and Hitting Performance, Moving Gun Mount-Moving Target.
L. MTP 3-3-512, Round-to-Round Dispersion.
M. MTP 3-3-513, First and Subsequent Round Hitting.
N. MTP 4-3-500, Preoperational Inspection and Physical Characteristics.
O. MTP 10-3-501, Operator Training and Familiarization.

5. SCOPE

5.1 SUMMARY

This MTP describes the following:

a. Preparation for Test - Procedures for training and familiarization of personnel and inspection of materiel. The preparation for individual tests is covered in the applicable paragraph under paragraph 6.2, Test Conduct.

b. Calibration and Precision of Lay - A series of tests covering the following:

1) Azimuth Indicators - To determine the accuracy of the azimuth indicator and precision with which the weapon can be laid in deflection with this instrument.
2) Vehicular Mounted Elevation Quadrant - To determine the accuracy of this instrument and the precision with which quadrant elevations can be determined and the weapon can be laid in elevation.
3) Telescope Sight with Fixed Reticle - To determine the types of ammunitions accommodated and the accuracy of range graduation for each as compared to applicable firing table data.
4) Periscope Sight with Fixed Reticle - To determine the types of ammunitions accommodated and the accuracy of range gradu-

ation for each as compared to applicable firing table data.

5) Telescope Sight with Multiple Reticles - To determine the number of reticles provided, method of selection of reticles and the accuracy of range graduations for the various types of ammunition as compared to firing table data.
6) Periscope Sight (Movable Reticle) Used with a Ballistic Unit - To determine the types of ammunitions accommodated in the system and the accuracy of mil and range graduation as compared to firing table data and a gridded target.
7) Integrated Fire Control Systems - To determine the accuracy of individual components and the accuracy and compatibility of related components as compared to firing table data and a gridded target.

c. Range Determination - A test to determine the accuracy of the rangefinder when ranging on man-made and natural targets of various sizes and configurations distributed throughout the range specified for the instrument.

d. Field Firing - A monitoring of field firing tests described in references 4H, I, J, K, L and M, and a correlation of data to determine the compatibility of those components and systems shown in paragraph b and c above and the automatic lead computer and cant corrector with various types of ammunition under widely varying firing conditions.

5.2 LIMITATIONS

The contents of this MTP are primarily concerned with the functional compatibility of the ammunition-weapon-fire control combination for direct fire, large caliber vehicle-mounted weapons. However, by proper selection of procedures and minor alterations in methodology, it could be made usable for other weapons.

6. PROCEDURES

6.1 PREPARATION FOR TEST

6.1.1 Safety

The test officer shall ensure that a Safety Release has been received from HQ USATECOM in accordance with reference 4A, is understood, and complied with during testing.

Safety restrictions contained in the Safety Release should be reviewed and discussed with test personnel. The test officer is responsible for assuring that all test personnel are thoroughly briefed on all safety procedures and limitations connected with the test item prior to conducting the test.

6.1.2 Personnel

a. Ensure the availability of service personnel, representative of those that will operate the test item in the field, who have been trained in accordance with the procedures of MTP 10-3-501 and are cognizant of:

1) Pertinent technical publications for the test items
2) Applicable range regulations and standing operating procedures
3) Objectives of the test
4) Pertinent data required
5) Method of obtaining observations
6) Method of recording data
7) Safety hazards

b. Record the following for all test personnel:

1) Name, rank or grade and Military Occupational Specialty (MOS)
2) Training time and experience in MOS

6.1.3 Pretest Inspection

6.1.3.1 Ammunition

a. Subject ammunition to be tested to the applicable inspection procedures of MTP 4-3-500 and record all pertinent data and retain all photographs of defective ammunition.

b. For ammunition to be used in the checkout of test weapon and/or fire control systems the test officer shall ensure the availability of sufficient standard ammunition for each weapon to be tested and the following recorded for each type of ammunition:

1) Number of rounds received
2) Lot number of rounds received

6.1.3.2 Weapon, Fire Control Equipment and Vehicle

a. Subject the weapon, fire control equipment and vehicle on which they are mounted, when either or both are undergoing test, to the applicable inspection procedures of MTP 2-3-500 and MTP 3-3-500 recording all pertinent data on the test vehicle, fire control equipment and weapon and the number of rounds, by type if applicable, previously fired through the gun and gun barrel.

b. For weapons, fire control equipment and test vehicles which are to be used in the checkout of other equipment to complete ammunition - direct fire weapon combinations with related fire control equipment record the following:

1) For the weapon:

a) Nomenclature, model number and, when applicable, weapon and barrel serial number.
b) Number of rounds previously fired, by type, through the gun and gun barrel.
c) Pullover gage reading or other measurement of gun barrel wear.

2) Nomenclature, model number and serial number of each item of fire control equipment.

3) For vehicle on which weapon/fire control system is operated:

a) Nomenclature, model number and serial number
b) Miles operated

6.2 TEST CONDUCT

NOTE: This test is divided into two parts, i.e., Calibration Verification and Field Firing. The first is a verification check of graduations on various instruments and the range output from rangefinders and computers against a calibrated instrument and firing table data. The second is a comparison of firing results with firing table data, sight graduations and rangefinder/computer outputs.

6.2.1 Calibration and Precision of Lay

Record the following for each of the following procedures performed:

a. Date and time of testing and gunner(s) name.
b. Nomenclature and serial number on which the weapon system is mounted.

6.2.1.1 Vehicular Mounted Azimuth Indicators

a. With the vehicle positioned in an area where the weapon mount can be rotated through 360° and where the optical sights can be laid on a clearly defined aiming point. Lay one of the optical sights precisely on the selected aiming point and:

1) Depress resetter knob of azimuth indicator and rotate knob until micrometer and azimuth pointers are at zero.
2) Rotate weapon mount slowly through 360° and relay the sight precisely on the original aiming point.
3) Check to ensure that micrometer and azimuth indicators are at zero.

NOTE: If the micrometer and azimuth indicators are not at zero, the instrument must be repaired or replaced, with the action performed, if applicable, the reason recorded, and the procedures of steps a.1 through a.3 repeated.

4) Rotate weapon mount as rapidly as possible and stop suddenly. Repeat this operation two times, rotating the mount in the same direction.
5) Rotate the weapon mount slowly in the opposite direction until the sight is again precisely alined on the original aiming point.
6) Check to ensure that micrometer and azimuth indicators are at zero.

NOTE: If the micrometer and azimuth indicators are not at zero, the instrument must be repaired or replaced, with the action performed, and if applicable, the reason recorded, and the procedures of steps a.1 through a.6 repeated.

b. With the vehicle positioned as described in paragraph 6.2.1.2.1 below and the primary weapon sight alined on the center of the target, zero the azimuth indicator with the resetter knob and proceed as follows:

1) Using the azimuth indicator the gunner should make the following deflection lays and check their accuracy on the gridded target with his primary sight and record amount of elevation lying:

a) Right 5 mils
b) Right 12 mils
c) Right 20.5 mils
d) Right 25.7 mils

2) Repeat procedures outlined in paragraph 1) above except that lays will be made to the left.

NOTE: Final rotation must always be in the same direction to eliminate errors caused by slack in the gear train.

6.2.1.2 Sights and Vehicular Mounted Elevation Quadrants

6.2.1.2.1 Preparation - Place the vehicle on a level hardstand where there is sufficient space to position a gridded target approximately 80 meters to its direct front and perform the following:

a. Place mark on hardstand under front center of the vehicle to ensure that each subsequent vehicle is positioned in the same place.

NOTE: The ideal place for this test setup is in a motor park where it can be made permanent and the vehicle positioned under a shelter for inclement weather testing.

b. A second mark should be placed on either the hardstand or adjacent wall at a point that is parallel to the axis of the gunner's primary sight when the gun is pointing at the center of the gridded target.

NOTE: This is the point from which the distance to the gridded target is measured.

c. Prepare a gridded target as follows:

1) Wood panel type 4.88 x 4.88 meters (16 x 16 ft).
2) Paint target and divide it into grid squares 3.81 x 3.81 centimeters (1.5 x 1.5 inches).

3) Scale at least one vertical and horizontal row or grid squares into 5 equal parts as shown in Appendix A.

NOTE: The above scale will equal 0.10 mils at the range shown in paragraph d below.

d. Position gridded target 77.64 meters (254.65 ft) from and directly in front of the gunner's primary sight or vice versa if the target is already installed. The target installation must incorporate provisions for:

1) Raising and lowering the target to provide zero angle of elevation for the various weapons.
2) Raising either side of the target independently of the other side until a vertical line can be tracked precisely by the gunner's primary sight.

NOTE: This makes the target plumb with the gun trunnions.

e. Using procedures outlined in MTP 3-3-503 boresight the weapon and all optical sights on center cross of gridded target.

NOTE: If the boresight adjustment movement of any sight is insufficient to permit alining the sight on the selected point, record the mil differences. This error should be sufficiently uniform over the entire target to permit using it as a constant for this test.

6.2.1.2.2 Vehicular Mounted Elevation Quadrant - With the vehicle and gridded target positioned as described in paragraph 6.2.1.2.1, proceed as follows:

a. Make precise lay on center aiming cross of gridded target.
b. Set both the index arm and micrometer scale of the gunner's M1A1 quadrant at zero and place the quadrant on the quadrant seats of the breech ring with the "Line of Fire" arrow toward the muzzle.

1) If bubble of the M1A1 quadrant is not centered, elevate or depress the weapon until it is centered.
2) Check the zero setting of the M1A1 quadrant by turning it end for end, i.e., pointing the arrow toward the breech. If the bubble does not recenter itself, obtain different quadrant and repeat procedures beginning with step a.
3) Raise or lower the target as required until the gunner's sight is again precisely alined on the center aiming cross. The target is now at zero angle of site.

c. Center the bubble in the level vial of the vehicular mounted elevation quadrant by rotating the elevation knob.

1) If elevation scale is not on zero make and record the following adjustments as required:

a) Loosen screws and slip scale until zero is opposite the elevation scale index.
b) Tighten screws.

2) If micrometer scale is not on zero:

a) Loosen screws on the elevation knob
b) Slip micrometer scale to zero
c) Tighten screws

d. Set the elevations listed below on the vehicular mounted elevation quadrant. Center the bubble after each setting by depressing or elevating the weapon and record the name of the personnel performing the test, then using the index arm and micrometer knob level the bubble of the MIA1 quadrant and compare and record the difference in the reading on the two quadrants.

1) Minus 10 mils
2) Plus 20, 35 and 50 mils

e. Conduct the following using at least three different gunners, recording the names of the individual test gunners:

1) Set the elevations listed below on the on-vehicle elevation quadrant, center the bubble after each setting by elevating the weapon and check the accuracy of lay on the gridded target using one of the optical sights and record the degree of elevation error and the nomenclature of the sight used.

a) Plus 5 mils
b) Plus 12.5 mils
c) Plus 22.3 mils
d) Plus 27.9 mils

2) Repeat the procedures described in paragraph 1)a) and b) above except that the mil settings will be minus instead of plus

f. Record data as described in paragraph 6.3.2.1.2.

6.2.1.2.3 Telescope sight with Fixed Reticle. With the vehicle and gridded target positioned and the weapon system boresighted as described in paragraphs 6.2.1.2.1d and e, proceed as follows:

a. List each type of ammunition for which separate range graduations are provided in the telescrope

NOTE: For this procedure, it is assumed that the telescope will have range graduations (reticles) for more than one type of ammunition.

b. Using the first range graduation line (from the zeroing cross) lay precisely on the center cross of the gridded target.

1) Record the ammunitions to which this graduation line applies and the applicable range for each.
2) Center the bubble in the vehicular mounted elevation quadrant by using the micrometer knob
3) Record the elevation reading from the quadrant
4) Compare the quadrant reading with the superelevation shown in the firing table for each type of ammunition and record the differences, where applicable

c. Repeat procedures described in paragraph b.1), 2), 3) and 4) for each range graduation line in the telescope.

d. Record data as described in paragraph 6.3.3.1.3.

6.2.1.2.4 Telescope Sight with Multiple Reticles.

With the vehicle and gridded target positioned and the weapon system boresighted as described in paragraphs 6.2.1.2.1d and e, proceed as follows:

a. List each type of ammunition for which a separate reticle is provided

b. Using the reticle selector lever, select the desired reticle and:

1) Record the reticle selected
2) Using the first numbered range graduation as the sighting point, lay precisely on the center cross of the gridded target
3) Level the bubble in the elevation quadrant by use of the micrometer knob
4) Record the reading from the elevation quadrant
5) Compare the quadrant elevation reading with the superelevation shown on the firing table for the selected ammunition at the range used. Record differences, if any.
6) Repeat the above procedure for each numbered range graduation on the reticle.

c. Repeat procedures described in paragraph b above for each other reticle provided in the sight.

d. Record data as described in paragraph 6.3.2.1.4

6.2.1.2.5 Periscope Sight with Fixed Reticle. Use the same test procedures as described in paragraph 6.2.1.2.3. Record data as described in paragraph 6.3.2.1.5.

6.2.1.2.6 Periscope Sight (Movable Reticle) used with a Ballistic Unit. With the vehicle and gridded target positioned and the weapon system boresighted as described in paragraphs 6.2.1.2.1d and e, proceed as follows:

a. List each type ammunition for which a scale is provided in theballistic unit in addition to the mil scale.

b. Set 10 mils on the mil scale of the ballistic unit, relay precisely on the center cross of the gridded target using the periscope sight and:

1) Using the micrometer knob, center the bubble of the elevation quadrant
2) Record mil reading on the vehicular mounted elevation quadrant
3) Record the difference, if any, between the readings on the ballistic unit and that on the elevation quadrant

NOTE: If appreciable differences are encountered, use an M1A1 gunner's quadrant as a check against the vehicular mounted quadrant.

4) Repeat procedures and record data as described above using several randomly selected mil settings on the ballistic unit.

c. Set 300 meters or yards on the ballistic unit scale for a selected type of ammunition, relay as described in paragraph b above and:

1) Using the micrometer knob, center the bubble of the elevation quadrant
2) Record mil reading on elevation quadrant
3) Compare the above reading with the superelevation shown in the firing table for the 300 meter or 300 yard range for the selected ammunition. Record difference, if any.
4) Repeat above procedures at 200 meter or yard increments for the remaining range scale for the selected type of ammunition.
5) Repeat the procedures described above for each other type of ammunition shown on the ballistic unit.

d. Record data as described in paragraph 6.3.2.1.6.

6.2.1.2.7 Integrated Fire Control System. With the vehicle and gridded target positioned and the weapon system boresighted as described in paragraphs 6.2.1.2.1d and e, proceed as follows:

NOTE: The term, "integrated fire control system," as used in this text is defined as a system incorporating a rangefinder with a capability of transmitting range data into the computer; the computer transforms numerical range data into superelevation in mils, for the indexed ammunition type, which is fed to the weapon and the gunner's sight.

a. Begin with the computer and range finder indexed at zero rnage and the computer switch on the rangefinder in the "ON" position.

NOTE: If the computer has a range correction mechanism, this should be set at zero also.

1) Index a type of ammunition on the computer
2) Set a range of 600 meters or yards on the rangefinder
3) Check range input reading on computer and record difference, if any, between it and that shown on rangefinder
4) Turn computer to "ON" position
5) Check range output reading on computer and record difference, if any, between it and the input and rangefinder readings

NOTE: If there are any differences in range readings of paragraph 3), 4) and 5, system must be adjusted, repaired, or replaced before continuing.

6) Record mil superelevation reading in mils on the computer
7) Using the micrometer knob, level the bubble of the vehicular mounted elevation quadrant and record the reading
8) Record the mil reading as seen on the gridded target through the gunner's sight
9) Compare the readings from paragraph 6), 7) and 8) with the superelevation shown in the firing table for the selected ammunition at a range used. Record differences, if any.
10) Repeat procedures described above for at least one range except that the range is set manually into a computer instead of the rangefinder.
11) Repeat the procedures described above for one of same ranges except that a plus 5 percent range correction will be inserted into the system by use of the range correction knob.
12) Repeat procedures described in paragraphs 2) through 9) above for the selected ammunition at least three other ranges.

b. Repeat procedures described in paragraph a above for each other type of ammunition covered in the computer.

c. Record data as described in paragraph 6.3.2.1.7.

6.2.2 Range Determination

6.2.2.1 Preparation

a. Erect targets of various sizes and configurations or use natural obstacles at random points between 1,000 meters from the weapon system and the maximum range of the rangefinder.

b. Number each target or obstacle and survery the distance to them.

c. Make a plot of the target area shown the range to and the number of each target for use as a reference in recording test results.

d. Record data as described in paragraph 6.3.2.

6.2.2.2 Ranging

a. With the vehicle positioned on fairly level ground, at least six different crewmen should range on each target in the order directed by the test officer.

NOTE: The range scale window of the rangefinder shall be masked to prevent range intelligence.

b. Record the target number and the range to each target as shown on the computer.

c. Compare the range obtained by ranging to each target with the known (surveyed) range.

d. Record data as described in paragraph 6.3.2.

6.2.3 Field Firing

NOTE: Normally only limited quantities of ammunition will be available for service testing. Therefore, the firing portion of the compatibility with fire control equipment test shall be conducted concurrently with other firing tests. The data to be obtained from each test will depend upon the type of the testing being performed and the time limitations for its performance.

6.2.3.1 Zeroing

Conduct this test as described in MTP 3-3-503 (ref 4F) with the following additions:

a. Determine the angle of site to the target prior to firing.

b. Center the bubble on the vehicular mounted elevation quadrant before each round is fired and record reading.

c. Compare the superelevation used with that shown in the firing table for the type ammunition being used and the range to the target.

d. Record data as described in paragraph 6.3.3.1.

6.2.3.2 Round-to-Round Dispersion

Monitor this test as described in MTP 3-3-512 (ref 4J) and compare the superelevation used with that in the firing table for the round used and range fired. Record data as described in paragraph 6.3.3.2.

6.2.3.3 First and Subsequent Round Hitting

Monitor this test as described in MTP 3-3-513 (ref 4K) with special attention to firing from canted positions and compare the actual range with the range determined with the rangefinder for each round fired and the point of impact of each projectile in relation to the target. Record data as described in paragraph 6.3.3.3.

6.2.3.4 Tracking and Hitting Performance

a. Monitor testing and review films of dry-run and firing tests described in MTP 3-3-507 (ref 4L) MTP 3-3-508 (ref 4M) and MTP 3-3-509 (ref 4N) as pertains to the use of:

1) Lead lines in the sight reticles
2) Automatic lead computer
3) Automatic cant corrector

b. Record data as described in paragraph 6.3.3.4.

6.3 TEST DATA

6.3.1 Preparation for Test

6.3.1.1 Personnel

Record the following for all test personnel:

a. Name
b. Rank or grade
c. Military Occupational Specialty (MOS)
d. Training time in MOS
e. Experience in MOS

6.3.1.2 Pre-Test Inspection

Retain all photographs of defective material and record all services, adjustments and repairs to the weapon system, fire control system and related vehicular components and the following for:

a. The weapon:

1) Nomenclature and model no
2) Serial number of weapon and barrel, when applicable
3) Number of previous rounds dired by type through:
   a) The gun
   b) The gun barrel
4) Pullover gage reading or other measurement of gun barrel wear, as applicable

b. Each item of fire control equipment:

1) Nomenclature and model no
2) Serial no

c. Vehicle on which weapon system is mounted:
1) Nomenclature and model no
2) Serial no
3) Miles operated

d. Ammunition

1) Number of rounds received by type and lot numbers
2) Descrepancies revealed by inspection

6.3.2 Test Conduct

6.3.2.1 Calibration and Precision of Lay

Record the following for each exercise:

a. Date and time

b. Nomenclature and serial number of vehicle on which weapon system is mounted.

c. Name of gunner(s)

6.3.2.1.1 Vehicular Mounted Azimuth Indicators. Record data in paragraph 6.3.2.1 above and the following:

a. Model and serial number of azimuth indicator

b. Repairs to or replacement of the azimuth indicator, if applicable, with reasons theefor.

c. The amount of error in laying the weapon system on the gridded target with the azimuth indicator at each of the following settings:

1) Right 5 mils, 12 mils, 20.5 mils and 25.7 mils
2) Left 5 mils, 12 mils, 20.5 mils and 25.7 mils

6.3.2.1.2 Vehicular Mounted Elevation Quadrant. Record the following:

a. Adjustment, if any, made to the vehicular mounted elevation quadrant to make its zero reading coincide with that of the M1A1 quadrant.

b. Names of personnel conducting the vehicular mounted/ M1A1 quadrant compatibility test and the following:

1) Each elevation at which test was conducted
2) The difference in readings between the two quadrants obtained at each elevation

c. Names of personnel conducting the vehicular mounted elevation quadrant/gridded target compatibility test and the following:

1) The degree of error in each plus elevation lay as measured on the gridded target with an optical sight
2) The degree of error in each minus elevation lay as measured on the gridded target with an optical sight.
3) Nomenclature of sight used in making above measurements

6.3.2.1.3 Telescope Sight with Fixed Reticle. Record the following:

a. Nomenclature and serial number of the telescope

b. Nomenclature and serial number of the vehicle

c. Each type of ammunition for which separate range graduations are provided

d. Names of gunners

e. Each range graduation line checked

f. The superelavation in mils for each range graduation line checked

g. The difference between the superelevation recorded in paragraph f above and that shown in the firing table for each different type of ammunition on each range graduation line

6.3.2.1.4 Telescope Sight with Multiple Reticles. Record the following:

a. Nomenclature and serial number of:

1) Telescope sight
2) Vehicular mounted elevation quadrant
3) Weapon
4) Vehicle on which items are mounted

b. Number of different reticles in the sight and the ammunition(s) for which each is intended to be used

c. Names of gunners

d. Each range graduation checked

e. Superelevation in mils for each range graduation checked

f. The difference between the superelevation recorded in paragraph e above and that shown in the firing table for each idfferent type of ammunition for each range

6.3.2.1.5 Periscope Sight with Fixed Reticle. Record data as described in paragraph 6.3.2.1.3 above.

6.3.2.1.6 Periscope Sight (Movable Reticle) Used with a Ballistic Unit. Record the following:

a. Nomenclature and serial number of:
1) Periscope sight
2) Vehicular mounted elevation quadrant
3) Ballistic unit
4) Weapon
5) Vehicle on which items are mounted

b. Each type of ammunition for which a scale is provided on the ballistic unit

c. Each mil setting at which a comparison was made with the vehicular mounted or M1A1 quadrant

d. Difference, if any, between the ballistic unit and quadrant readings for each mil setting

e. The difference, if any, between the mil reading at each range for each type of ammunition and the superelevation reading shown in the firing table

f. Name of gunners

6.3.2.1.7 Integrated Fire Control System. Record the following:

a. Nomenclature and serial number of:
   1) Each fire control component in the system
   2) Weapon
   3) Vehicle on which items are mounted

b. Each type of ammunition accommodated in the computer

c. For each type of ammunition at each range fed through the rangefinder:
   1) Range in meters or yards indexed on the rangefinder or computer
   2) Range input reading in meters or yards on computer when originally indexed on the rangefinder
   3) Range reading on rangefinder when originally indexed on the computer
   4) Range output reading in meters or yards on computer
   5) Superelevation reading in mils on computer
   6) Superelevation reading on vehicular mounted quadrant
   7) Mil reading as seen on the gridded target through the gunner's sight
   8) Superelevation shown in the firing table
   9) The actual change in superelevation caused by a plus 5 percent range correction in the computer
   10) Percent range correction used, when applicable

6.3.2 Range Determination

Record the following:

a. Nomenclature and serial number of:

   1) The rangefinder
   2) Vehicle on which rangefinder is mounted

b. Surveyed distance to each target (attach plot of target area)

c. Names of crewmen performing range determinations

d. Range to each target as determined by each crewman

6.3.3 Field Firing

6.3.3.1 Zeroing

Record the following for each round fired:

a. Nomenclature and serial number of:

1) Sight(s) used
2) Other fire control components used
3) Vehicular mounted elevation quadrant
4) Weapon
5) Vehicle on which items are mounted

b. Type controls used (manual or power)

c. Type and lot number of ammunition used

d. Fire control system used (primary or secondary, stabilized or unstabilized)

e. Distance to target

f. Range to target

g. Range setting used

h. Horizontal and vertical distance of each round from point of aim

i. Horizontal and vertical distance of center of impact from point of aim

j. Percent range correction used, when applicable

k. Angle of site to target

m. Quadrant elevation reading

n. Superelevation shown in the firing table for the round used at the range fired.

o. Pitch and/or cant of vehicle

6.3.3.2 Round-to-Round Dispersion

Record data described in paragraph 6.3.3.1 for each round fired.

6.3.3.3 First and Subsequent Round Hitting

Record applicable data described in paragraph 6.3.3.1 and:

a. The method used for determing the range for each round fired.

b. Method used for determing the necessary cant correction (estimation or automatic)

c. Percentage of total hits obtained on first, second or third round

d. Percentage of first, second or third round hits obtained from canted positions

6.3.3.4 Tracking and Hitting Performance

Record applicable data described in paragraph 6.3.3.1 and:

a. Designation of person doing tracking and firing, i.e., gunner or vehicle commander

b. Type sight and sight reticle used

c. Method of determining the necessary leads (estimation of automatic lead computers)

d. Method of determining the necessary cant correction (estimation or automatic cant corrector)

e. Total rounds fired under each test condition and vehicles speed

f. Percent of hits obtained under each test condition and vehicle speed

6.4 DATA REDUCTION AND PRESENTATION

6.4.1 Calibration and Precision of Lay

Summarize data for all separate components, each component within a system and each system showing incompatibilities, if any, between these and the firing table data, MIAI computer output and gridded target graduations.

6.4.2 Range Determination

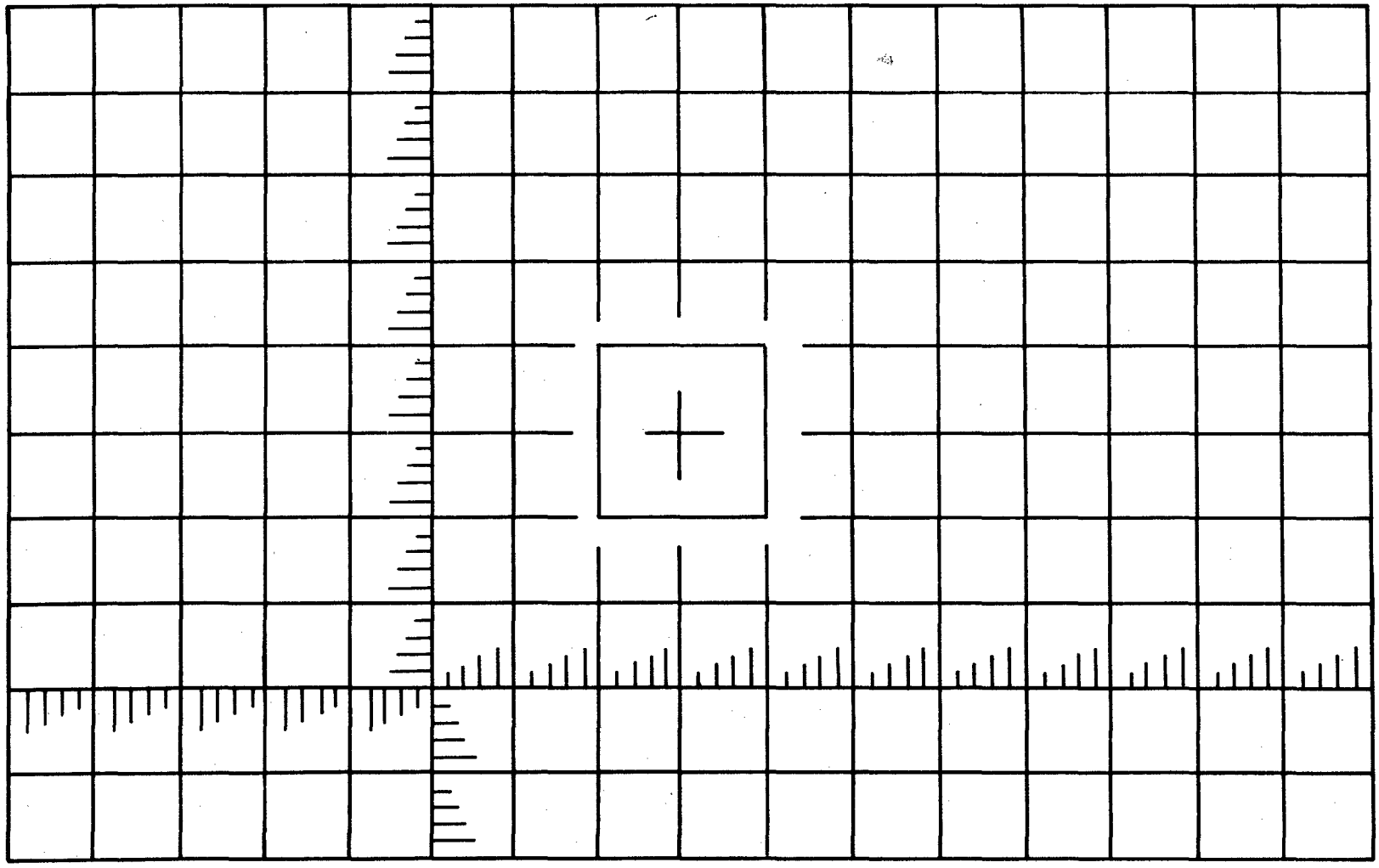
Present test data in tabular or graphic form showing degree of error for each individual at each range under each test condition and a consolidation showing the same data for all personnel participating in the test.

6.4.3 Field Firing

Consolidate and summarize all firing results with particular emphasis on correlation of these data and those presented in paragraph 6.4.1 and 6.4.2 and the degree of improvement provided by the automatic lead computer and cant corrector.

APPENDIX A

SAMPLE GRIDDED TARGET



For use as shown in paragraph 6.2.1.2.1 of basic MTP

Grid Pattern: 0.50-mil squares
Scale: 0.10-mil graduations