AD-719087

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

TRACKING AND HITTING PERFORMANCE, MOVING GUN MOUNT - MOVING TARGET

1. OBJECTIVE

The objective of this Materiel Test Procedure (MTP) is to outline procedures for determining the tracking and hitting performance of direct fire artillery and automatic weapons against moving targets from a moving gun mount.

2. BACKGROUND

The final acceptability of a weapon system is largely governed by its ability to deliver effective fire rapidly and accurately on a target. The need for improving moving target hit capabilities from a moving gun mount has increased in direct proportion to the increase in battlefield mobility and the number of armored combat vehicles in modern armies. Stabilization is required for the rapid delivery of main armament (single shot) fire from a moving combat vehicle and greatly increases the hit potential of automatic weapons. In the absence of stabilization, experience indicates that it is better to stop the vehicles to fire the main armament and when traveling over extremely rough terrain this mode of firing may be preferable with a stabilized system. The primary criterion is, which mode of firing will produce a target hit in the shortest time.

Gun stabilization can be visualized as a means for keeping a vehicle mounted weapon pointed in a fixed direction while the vehicle itself is subjected to erratic motions from traveling over rough terrain. An integrated stabilization system must provide gun stabilization during vehicle movement and firing, in addition to meeting the requirements of a non-stabilized gun control system, and must be compatible with all fighting compartment operations.

The purpose of this test is to determine the extent to which the design potential and military requirements for the various weapon systems are realized under service test conditions.

3. REQUIRED EQUIPMENT

a. Appropriate moving vehicle-moving target range facilities
b. Appropriate combat vehicles
c. Appropriate tactical vehicles
d. Driving area where moving target range facilities can be simulated with tactical vehicles
e. Appropriate targets
f. Appropriate ammunition
g. Camera(s), Still, Motion or Video as available with necessary Film and Video Recorder when applicable

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h. Pullover gage for measurement of gun tube wear together with any other means that may be available for assessment of overall serviceability of the gun or gun launcher

i. Meteorological Equipment as required for measuring:
   1) Wind speed and direction
   2) Ambient temperature
   3) Relative humidity

j. Boresighting devices as required

k. Gridded Target

l. Ambulance with medical aid personnel and equipment

m. Forms for recording data

n. Qualified M1A1 Gunner's Quadrant

4. REFERENCES

A. USATECOM REG 385-6, Verification of Safety of Materiel During Testing.

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

C. Applicable Range Regulations and Standing Operating Procedures.

D. MTP 3-3-505, Speed and Precision of Lay.

E. MTP 3-3-507, Tracking and Hitting Performance, Stationary Gun Mount-Moving Target.

F. MTP 3-3-508, Tracking and Hitting Performance, Moving Gun Mount-Stationary Target.

G. MTP 2-3-500, Preoperational Inspection and Physical Characteristics.

H. MTP 3-3-500, Preoperational Inspection and Physical Characteristics (Armament and Individual Weapons).

I. MTP 4-3-500, Preoperational Inspection and Physical Characteristics.

J. MTP 3-3-503, Boresight and Zero.

K. Qualitative Materiel Requirement (QMR), Small Development Requirement (SDR) or other appropriate document.

L. Pertinent technical publications.

M. FM 17-12, Tank Gunnery.

5. SCOPE

5.1 SUMMARY

This MTP describes the following:

a. Preparation for Test - A review of the safety release. A determination of the availability of service personnel and that test materiel is in satisfactory condition for testing. Preparation of range site and boresighting and zeroing the weapon systems.

b. Nonfiring Exercises - Tracking tests conducted with the

following vehicle-armament combinations to evaluate basic performance characteristics of the gun and turret power control and stabilization system at varying vehicle (gun mount) and target speeds and for different angles of target presentation:

1) Combat vehicles with direct fire artillery class main armament.
2) Combat vehicles with automatic type main armament.
3) Flexible mounted automatic weapons on combat vehicles.

c. Firing Exercises - A test to determine the hitting capability and time required to hit moving targets with the vehicle traveling at different speeds over varying terrain conditions with those weapon systems described in paragraph b above.

5.2 LIMITATIONS

None.

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 and is understood prior to commencing testing.

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 (ref 4B) and are cognizant of:

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

b. All gunners should have completed the pertinent manipulation exercises outlined in MTP 3-3-505 (ref 4D) and done some firing at moving targets from a stationary vehicle and at stationary targets from a moving vehicle as described in MTP 3-3507 and MTP 3-3-508 (ref 4E and 4F respectively).

c. Record data shown in paragraph 6.3.1.1.

6.1.3 Inspection

a. Subject the weapon and fire control systems, the vehicle on which they are mounted and the test ammunition to applicable portions of MTP 2-3-500 (ref 4G) and MTP 3-3-500 (ref 4H).

b. Subject all ammunition to applicable portions of MTP 4-3-500 (ref 4I).

c. Record data shown in paragraph 6.3.1.2.

6.1.4 Pre-Testing Conditions

a. Arrange for the use of moving vehicle-moving target (firing) range facilities suitable for the weapon system being tested to include various angles of approach and departure from the target (see samples at appendix A, B, and C) with:

1) The driving surface of sample courses shown in appendix A and B should be graded and graveled to the extent necessary to permit all weather use.
2) The driving surface of the sample course shown in appendix C should be cross-country terrain that tracked vehicles can traverse at speeds up to 20 mph under dry conditions.

NOTE: Any cross-country driving surface will vary from day to day over the same terrain due to changes caused by weather/soil conditions and use of the course. Marker flags should be placed on each side of the course at intervals frequent enough to make it clearly visible to the vehicle operator. The course should be wide enough to allow maneuvering of the vehicle by the operator in order to avoid "bad spots" and provide the most stable platform possible for the gunner.

b. Arrange for the use of moving vehicle-moving target (non-firing) range facilities similar to the firing courses but where a vehicle with a target attached can be used for tracking purposes.

c. Prepare targets similar to the one shown in appendix D for use in nonfiring exercises and attach to a truck or an armored personnel carrier as target bearing vehicle.

d. Prepare targets to be used in the firing phase of this test.

NOTE: The size of the target for main armament weapons should be as specified in the QMR or other appropriate criteria or

if not specified 2.3. x 2.3 meters (7 1/2 x 7 1/2 feet). The specified basic dimension of targets most prominent to the gunner must be maintained for assessment of target hits. However, in the interest of realism, target presentation should represent typical combat targets. These targets should be centered on a wire mesh background large enough to obtain projectile strike information on rounds that miss the target. See sample target at appendix E.

e. Survey all nonfiring and firing ranges and prepare a scaled plot of each.

NOTE: The distances to targets on sample ranges at appendix A, B, and C can be changed by moving the firing flags. If this is done a new scaled plot of the range should be prepared.

f. Erect a boresight and zeroing target as described in MTP 3-3-503 (ref 4J) at the required range for the weapon system.

g. Erect a gridded target as described in MTP 3-3-503 (ref 4J) at a convenient range for checking boresight retention.

h. Place available meteorological equipment near firing site.

i. Completely stow the vehicle with prescribed materiel or substitute items of as near the same weight and configuration as possible. Record shortages as described in paragraph 6.3.1.3.4.

j. Perform all prefiring checks.

k. Boresight each weapon at the prescribed ranges as described in MTP 3-3-503 (ref 4J). Record data as shown in paragraph 6.3.1.3.5.

l. Zero each weapon as described in MTP 3-3-503 (ref 4J) using the primary round developed for the weapon. Record data as shown in paragraph 6.3.1.3.6.

m. Upon completion of zeroing, lay the primary sight precisely on the gridded target and mark or record point of alinement for each optical sight and the main gun barrel.

n. Attach targets (appendix D) to selected vehicles.

o. Attach movie or video camera to weapon system on an adjustable mount so that camera can be alined on the same point as gunner's sight.

NOTE: If cameras are not available or cannot be attached to the weapon system time on target will be measured by another

crewman using an alternate sight and stopwatch. If an alternate sight is not available, the time on target will be estimated by the gunner.

p. If possible, a movie or video camera should be positioned on the ground (tripod mounted) at a point on the cross-country course (appendix C) so that the relationship between the gun barrel and vehicle hull can be photographed throughout the course.

NOTE: This camera should be synchronized with the camera mounted on firing vehicle so that later the film taken with the ground mounted camera can be related to the film taken with the vehicle mounted camera to establish the relative degree of compensation afforded by the stabilization system.

6.2 TEST CONDUCT

NOTE: Testing of each weapon system will be divided into two phases, nonfiring and firing. As a minimum both of these phases should be conducted near the beginning, midway point and completion of testing.

6.2.1 Nonfiring Exercises

6.2.1.1 Combat Vehicles with Artillery Class Main Armament

a. With the weapon system and camera boresighted at least three different crews will move their vehicles over each selected, graded and graveled driving course (paragraph 6.1.4a 1) with the gunner tracking the vehicular mounted moving target at least three times as described below:

1) With the main armament/coaxial machine gun and rigidly mounted cupola weapons in the following modes as applicable:
   a) Stabilized with and without automatic lead computers, when applicable.
   b) Power, unstabilized.
   c) Manual.

NOTE: 1. The term "rigidly mounted weapons" as used in this test denotes weapons installed in vehicles so as to provide precise gear or hydraulic type control by the gunner in traverse and elevation. The opposite would be a flexible or free mounted weapon either on a skate type ring mount or a pedestal mount where all movement is accomplished by manhandling. These latter types are covered in paragraph 6.2.1.3 below.

2. For those systems equipped with power controls, stabilization or automatic lead computers, operation in the manual mode, power unstabilized mode, and without the automatic lead computer may be limited to that considered necessary to determine the degree of improvement provided by power controls, stabilization and automatic lead computers.

2) Unless otherwise specified the gun mount vehicle speeds over graded and graveled courses (paragraph 6.1.4a 1) will be:
   a) Five to 10 mph
   b) Ten to 15 mph
   c) Fifteen to 20 mph

NOTE: 1. The objectives of the nonfiring exercises are to familiarize test personnel with and determine the maximum capability of the weapon control system. Therefore, nonfiring exercises should always be conducted under more severe conditions than those allowed for the firing phase.

2. For weapon systems that do not have an automatic lead computer or when the automatic lead computer is not being used, the proper lead (in mils) computed on the bases of the vehicle speed and direction of travel in relation to the target, range to target and target speed and direction of travel in relation to the weapon and velocity of ammunition should be given to the gunner and he should keep his sight alined on the target accordingly. Normally this is only done when the vehicle is moving on a perpendicular or near perpendicular course to the target.

3) Unless otherwise specified target vehicle speeds will be in 5 mile increments from 5 mph to 25 mph at ranges shown in appendix A and B.

4) Target vehicles should be accelerated and decelerated as required to test the maximum capability of the man-system combination.

b. On those vehicles with main armament and turret controls for the vehicle commander, repeat the exercise described in paragraph a with the commander manipulating controls for main armament and/or coaxial machine gun.

c. Repeat exercise described in paragraph a above with the commander using the cupola weapon system.

d. Measure the total time required for each run with a stopwatch. This is the total possible time for the gunner to be on target.

e. Photograph the:

1) Target throughout each run with the vehicle mounted camera and include the gunner's name or numerical designation and run number on the film.
2) Firing vehicle (see paragraph 6.1.4p) with the ground mounted camera when using the cross-country course (appendix C).

f. Compute the percentage of time on target by reviewing the film, from the on-vehicle camera, frame by frame or take the time on target recorded with the stopwatch and dividing by the total possible time on target. If a vehicle mounted camera cannot be used, have time on target measured by another crewman looking through an alternate sight and using a stopwatch. Compute percentage of time on target.

NOTE: If time on target cannot be filmed and an alternate sight is not available, the gunner will estimate his time on target, e.g., 20 percent, 30 percent, etc.

g. Repeat a through d above using night vision devices and each mode of lighting specified in the QMR and/or provided by the on vehicle searchlight.

h. For those vehicles providing the gunner with a secondary sight, repeat a and d above, using this sight.

i. Repeat exercises described in a through f above, using the ungraded driving surface (appendix C) and with:

1) Target vehicle speeds remaining the same.
2) Gun mount speeds reduced to the extent necessary to obtain at least 50 percent of time on target obtained while using the graded surface.

j. Each crew should conduct a dry run exercise over the selected firing course just prior to the firing test.

k. As a minimum conduct the nonfiring exercises near the beginning, midway point and near the completion of testing.

l. Record data as described in paragraph 6.3.2.1.

6.2.1.2 Combat Vehicles with Automatic Type Main Armament

Conduct nonfiring exercises as described in paragraph 6.2.1.1. Record data as described in paragraph 6.3.2.2.

6.2.1.3 Flexible Mounted Automatic Weapons on Combat Vehicles

a. During daylight, with the gun mount vehicle and the target vehicle moving at speeds shown in paragraph 6.2.1.1a 2) and 3) over each of the target courses shown in appendix A, B and C the gunner will attempt to keep the flexible mounted weapon alined on the target.

NOTE: If required, the speed of both the firing vehicle and the target should be reduced to the extent necessary to enable the gunner to be on or near the target at least 25 percent of the time.

1) Measure the total time for each exercise.
2) Photograph time on target with a motion picture camera, if one can be mounted in conjunction with this weapon.
3) If time on target cannot be recorded on film, have the gunner estimate the time on target, e.g., 20 percent, 30 percent, etc.

NOTE: It is doubtful if resources such as a flexible mounted camera or an alternate sight will be available for measuring the time on target for these weapons. However, it is a necessary prefiring training exercise and must be conducted.

b. Repeat the exercise described in a above with at least two gunners.

c. Record data as described in paragraph 6.3.2.3.

6.2.2 Firing Exercises

NOTE: 1. The size of targets, target speeds and range to targets should be as specified in the QMR or other appropriate criteria insofar as is practicable. However, where facilities permit realism in target presentation such as shown by the example at Appendix E should be accomplished.
2. Check boresight alinement by relaying on the gridded target periodically throughout testing.
3. All gun barrels will be within the prescribed wear limits.

6.2.2.1 Combat Vehicles with Artillery Class Main Armament

a. Upon completion of nonfiring exercises and during daylight:

1) Boresight and zero or verify the zero of the weapon system as described in MTP 3-3-503 (ref 4J) or other appropriate criteria.

2) Using firing ranges similar to those shown in appendix A, B and C, at least three gunners will fire the coaxial machine gun at appropriate ranges for the weapon (250 to 800 meters) under the following conditions, as applicable:

NOTE: Each "run" should be conducted as a tactical exercise with the vehicle commander designating the target and giving fire commands as described in FM 17-12 (ref 4M).

a) Driving Surfaces
   1. Graded and graveled to the extent necessary to permit all weather use.
   2. Cross-country terrain.

b) Modes of Operation
   1. Power, unstabilized.
   2. Stabilized and using automatic lead computer.
   3. Stabilized without automatic lead computer.
   4. Manual.

   NOTE: Note 2 under paragraph 6.2.1.1a 1)c) is applicable here also.

c) Vehicle Speeds. Unless otherwise specified vehicle speeds should be:
   1. Five to 10 mph.
   2. Ten to 15 mph.
   3. Fifteen to 20 mph.

d) Target Speeds. Unless otherwise specified and when practicable, target speeds should be the same as those satisfactorily used in nonfiring (tracking) exercises.

e) Range Determination
   1. Sights will be set on the prescribed battlesight prior to beginning of each exercise.
   2. Initial range determination for each target will be made as prescribed by the test officer.
   3. Adjustments, following the firing of the initial burst on each target, will be by observation of tracer and using the burst-on-target method of adjustment unless otherwise directed.

f) The size of the bursts will be 20 to 25 rounds.

g) Fire Commands
   1. In general these should be as described in FM 17-12 (ref 4M).
   2. The command, FIRE should not be given until the reaches the red flag (see appendix A).
   3. The command, CEASE FIRING should be given by the time the vehicle reaches the white flag.

NOTE: To prevent the crews from determining the range to the target from the position of the Fire and Cease Fire

flags, these flags can be eliminated, the driver's excape hatch removed and the driver given flags or other type markers to be dropped on the ground each time the weapon is fired. When the flags are recovered the approximate range to the target can be noted and recorded.

h) Measure the following with stopwatches:
   1. Time to fire the first burst or round.
   2. Time to fire each subsequent burst or round.
   3. Total time to complete the entire exercise.

i) Photograph the target being fired upon with a movie or video camera that is mounted on and alined with with the weapon system.

b. Record data as described in paragraph 6.3.3.1a.

c. Repeat the firing exercises described in a above to the extent possible with the cupola mounted weapon at appropriate ranges (250 to 1,600 meters) except that size of burst will be 10 to 20 rounds. Record data as described in paragraph 6.3.3.1a.

d. Repeat the firing exercises described in a above using the main armament and conventional ammunition at appropriate ranges for the weapon system. Record data as described in paragraph 6.3.3.1a.

e. If the main armament has a missile firing moving gun mount-moving target capability, repeat the firing exercises described in a above to the extent possible using inert missiles at ranges up to the maximum specified for the weapon system. Record data as described in paragraph 6.3.3.1a.

f. On those vehicles providing a secondary sight for the gunner, conduct a limited sample of firing exercises described in paragraph a and d above using that sight. Record data as described in paragraph 6.3.3.1a.

g. On those vehicles with main armament and turret controls for the vehicle commander, conduct selected portions of firings described in paragraph a and d above with him firing the weapon. Record data as described in paragraph 6.3.3.1a.

h. Repeat selected parts of testing described in paragraph a and c through g above using night vision devices and each mode of lighting provided by the on-vehicle searchlight or other artificial light sources prescribed by the QMR or other appropriate criteria. Record data as described in paragraph 6.3.3.1a and b.

i. As a minimum, moving vehicle-moving target firing tests should be conducted near the beginning, midway point and end of testing.

6.2.2.2 Combat Vehicles with Automatic Type Main Armament

a. Upon completion of non-firing exercises and during daylight:

1) Boresight and zero or verify the zero of the weapon system as described in MTP 3-3-503 (ref 4J) or other appropriate criteria.
2) Using firing ranges similar to those shown in Appendix A, B and C at least two gunners will fire the main armament and coaxial weapon, if any, under the conditions described in paragraph 6.2.2.1a, f, g and h that are applicable to the weapon system.

NOTE: 1. The size of targets, vehicle and target speeds and range to targets should be as specified in the QMR or other appropriate criteria.
2. Depending upon the system being tested and the ammunition being used, firing may be by either the slow or full automatic rate of fire or a combination of the two.
3. Normally the range to the target will be estimated and confirmed or adjusted as required by firing a single shot and followed by a prescribed burst.

b. As a minimum, moving vehicle-moving target firing should be conducted near the beginning, midway point and end of the service test.

c. Record data as described in paragraph 6.3.3.2.

6.2.2.3 Flexible Mounted Automatic Weapons

a. Upon completion of nonfiring exercises, conduct moving vehicle-moving target firing exercises using at least three gunners at appropriate ranges for the weapon system on courses similar to those described in Appendix A, B and C.

1) Vehicle and target speeds should be as determined during the nonfiring exercises outlined in paragraph 6.2.1.3.
2) The size of targets and bursts should be as specified in the QMR, other appropriate criteria or as used for similar weapons mounted coaxially or in a cupola.
3) Adjustment of fire will be by observation of tracer and/or projectile impacts.
4) Measure the following with stopwatches:
   a) Time to fire first burst.
   b) Time to fire each subsequent burst.
   c) Total time used for firing at each target.
   d) Total time to complete the entire exercise.

b. Repeat a limited amount of the firing described in a above during hours of darkness in conjunction with the night firing described in paragraph 6.2.2.1h.

c. Record data as described in paragraph 6.3.3.3.

6.3 TEST DATA

6.3.1 Preparation for Test

6.3.1.1 Personnel

a. Record the following for all test personnel:

1) Name.
2) Rank or grade.
3) Military Occupational Specialty (MOS).
4) Training in MOS.
5) Experience in MOS.

b. Record the following for each gunner:

1) Whether pertinent manipulation exercises in MTP 3-3-505 (ref 4D) have been completed.
2) The amount of firing done with the test weapon at moving targets as described in MTP 3-3-507 (ref 4E).
3) The amount of firing done with the test weapon during testing described in MTP 3-3-507 and MTP 3-3-508, reference 4E and 4F respectively.

6.3.1.2 Inspection

Record all services, adjustments, and repairs to the vehicle and the weapon and fire control systems and the following for:

a. The weapon:

1) Nomenclature and model number.
2) Serial number.
3) Number of previous rounds fired by type through:
   a) The gun.
   b) The gun barrel.
4) Pullover gage readings or other barrel and gun wear measurements.

b. Each item of fire control equipment:

1) Nomenclature and model number.
2) Serial number.

c. Vehicle on which weapon/fire control system is mounted:

1) Nomenclature and model number.
2) Serial number.
3) Miles operated.

d. Ammunition:

1) Number of rounds received by type and lot numbers.
2) Discrepancies revealed by inspection, if any.

6.3.1.3 Pre-Testing Conditions

6.3.1.3.1 Range Facilities. Retain scaled plots of:

a. Each nonfiring range.

b. Each firing range.

6.3.1.3.2 Targets. Retain drawing or photograph of each type target used for:

a. Nonfiring exercises.

b. Firing exercises

c. Boresighting and zeroing.

d. Boresight alinement retention checks.

6.3.1.3.3 Meteorological Equipment. Record the type used.

6.3.1.3.4 Stowage. Record prescribed on-equipment materiel and basic issue items not available for stowing in the driving and fighting compartments of the vehicle.

6.3.1.3.5 Boresighting. Record the following:

a. Equipment used.

b. Range to target.

c. Setting on each boresight knob or sight upon completion of boresighting.

6.3.1.3.6 Zeroing. Record the following:

a. Date and time.

b. Nomenclature and serial number of weapon.

c. Nomenclature and serial number of vehicle weapon was mounted on.

d. Type and size of target used.

e. Range to target.

f. Angle of site to target.

g. Quadrant elevation reading.

h. Fire control equipment used.

i. Ammunition used by type and lot number.

j. Number of rounds fired.

k. Final boresight knob or sight settings.

l. Horizontal and vertical distance of the strike of each projectile from the aiming point (artillery class weapons).

m. Distance of center of impact (CI) from aiming point.

n. Ambient temperature.

o. Relative humidity.

p. Wind speed and direction.

q. Point of alignment of each optical sight and the gun barrel on the gridded target.

6.3.2. Test Conduct - Nonfiring Exercises

6.3.2.1 Combat Vehicles with Artillery Class Main Armament

a. Record the following for each tracking exercise conducted during daylight:

1) Date and time.
2) Nomenclature and serial number of vehicle on which weapon system is mounted.
3) Total test miles accumulated on vehicle.
4) Nomenclature of target vehicle and type and size of target used.
5) Description and length of course (attach plot to include location of ground mounted camera, when applicable) and

6) Weapon control system mode used.
7) Nomenclature and serial number of sight used.
8) Designation of person doing tracking, i.e., gunner or vehicle commander, and their name.
9) Method used to determine "time on target".
10) Speed of:
    a) Gun mount vehicle
    b) Target vehicle.
11) How target lead was determined, when applicable (automatic lead computer or estimation).
12) Total time to complete exercise.
13) Time on target to tenth of minute.
14) Percent of time sight was properly alined on target to tenth of minute.
15) Description of weather conditions.
16) Type, amount and positive identification of movie film or still photographs taken of:
    a) Target.
    b) Firing vehicle, when applicable.
17) Whether vehicle mounted and ground mounted cameras were synchronized, when applicable.
18) Results of comparison of vehicle mounted and ground mounted movie or video film, e.g., relative degree of compensation afforded by the stabilization system, when applicable.

b. Record data as described in a above and the following for each tracking exercise conducted during darkness.

1) Description of atmospheric light conditions (cloudy, overcast, foggy, starlight, moonlight, etc.).
2) Type of light source used.

6.3.2.2 Combat Vehicles with Automatic Type Main Armament

Record applicable data as described in paragraph 6.3.2.1 above.

6.3.2.3 Flexible Mounted Automatic Weapons

Record the following:

a. Date and time.

b. Nomenclature of weapon.

c. Nomenclature of weapon mount.

d. Nomenclature of sight used.

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

f. Total test miles accumulated on vehicle.

g. Nomenclature of target vehicle and type and size of target used.

h. Description of course (attach plot) and whether driving surface was graded and graveled or cross-country terrain.

i. Name of gunner.

j. Speed of:

a) Gun mount vehicle.
b) Target vehicle.

k. Total tracking time.

l. Method of recording time on target.

m. Percent of time sight was alined on target.

6.3.3 Test Conduct - Firing Exercises

6.3.3.1 Combat Vehicles With Artillery Class Main Armament

a. Record the following for each moving vehicle-moving target firing exercise conducted with each type weapon during daylight:

1) Date and time.
2) Location.
3) Nomenclature and serial number of vehicle on which weapon system is mounted.
4) Total test miles accumulated on vehicle.
5) Type and size of target used.
6) Description and length of course (attach plot to include position of ground mounted cameras, when applicable) and whether driving surface was graded and graveled or cross-country terrain.
7) Nomenclature and serial number of weapon being used.
8) Number of previous rounds fired (by type) through barrel and weapon.
9) Name and position of person tracking and firing, i.e., gunner or vehicle commander, and sight used.
10) Speed of target and direction of travel in relation to the course of the firing vehicle.
11) Speed of vehicle.

12) Type of driving surface (graded and graveled or cross-county).
13) Time to fire first burst, round or missile, as applicable.
14) Initial range setting used and how determined.
15) Size of burst, when applicable, and whether ammunition was all of same type or specified combat mix.
16) How lead was determined, i.e., estimated or by use of automatic lead computer.
17) Time to fire second and subsequent burst, round or missile, as applicable.
18) Total time to complete the exercise.
19) Method used for adjusting subsequent bursts or rounds, as applicable.
20) Number of target hits obtained, and for artillery class rounds and missiles, the location of projectile impacts on the target and/or the surrounding wire mesh screen, when applicable.
21) Nomenclature and lot number of rounds fired and nomenclature and serial number of missiles fired, as applicable.
22) Total rounds or missiles fired, as appropriate.
23) Type, amount and positive identification of movie or video film or still photographs taken.
24) Ambient temperature.
25) Relative humidity.
26) Wind speed and direction.
27) Whether ammunition had been transported in the vehicle and, if so, the total distance.
28) Mode of fire (slow or full automatic), when applicable.

b. Record data as described in a above and the following for each moving vehicle-moving target firing exercise conducted with each type weapon during darkness:

1) Description of atmospheric light conditions (cloudy, overcast, foggy, starlight, moonlight, etc.).
2) Type of night sight and/or light source used.

6.3.3.2 Combat Vehicles with Automatic Type Main Armament

a. Record applicable data as described in paragraph 6.3.3.1a above for each firing exercise conducted during daylight.

b. Record applicable data as described in paragraph 6.3.3.1a and b for each firing exercise conducted during darkness.

6.3.3.3 Flexible Mounted Automatic Weapons

Record applicable data as described in paragraph 6.3.3.1a and b.

6.4 DATA REDUCTION AND PRESENTATION

Data in paragraph 6.3 will be consolidated as described below and presented in tabular or graph form so as to indicate whether the test item meets the applicable criteria.

6.4.1 Nonfiring Exercises

Compute the average of the percentage of time-on-target for each gunner in each mode of operation for each sight and each vehicle and target speed and course under daylight and night conditions at the beginning, midpoint and end of testing. Total the averages for all gunners for each condition and compute the grand average for each condition.

6.4.2 Firing Exercises

6.4.2.1 Artillery Class Armament

Compute the number of hits obtained with first or subsequent rounds, and the time required for each gunner to complete each target engagement in each mode of operation for each sight and each vehicle and target speed and course under daylight and night conditions at the beginning, midpoint and end of testing. Total the averages for all gunners under each condition and compute the grand average in percentage of hits obtained and time required to obtain a target hit under each condition. Also compute the percentage of misses that actually impacted on the wire mesh surrounding the target.

6.4.2.2 Automatic Weapons

Compute the number of hits obtained with first or subsequent bursts, size of bursts, total rounds fired and the time required for each gunner in each mode of operation for each vehicle and target speed and course under daylight and night conditions at the beginning, midpoint and end of testing. Total the averages for all gunners under each condition and compute the grand average of percentage of targets hit under each condition and the percentage of rounds fired which hit the target.

6.4.2.3 Effects of Wear

a. Compare results of exercises conducted at the beginning, midpoint and end of testing to determine the effect, if any, which vehicle operation had on tracking capabilities.

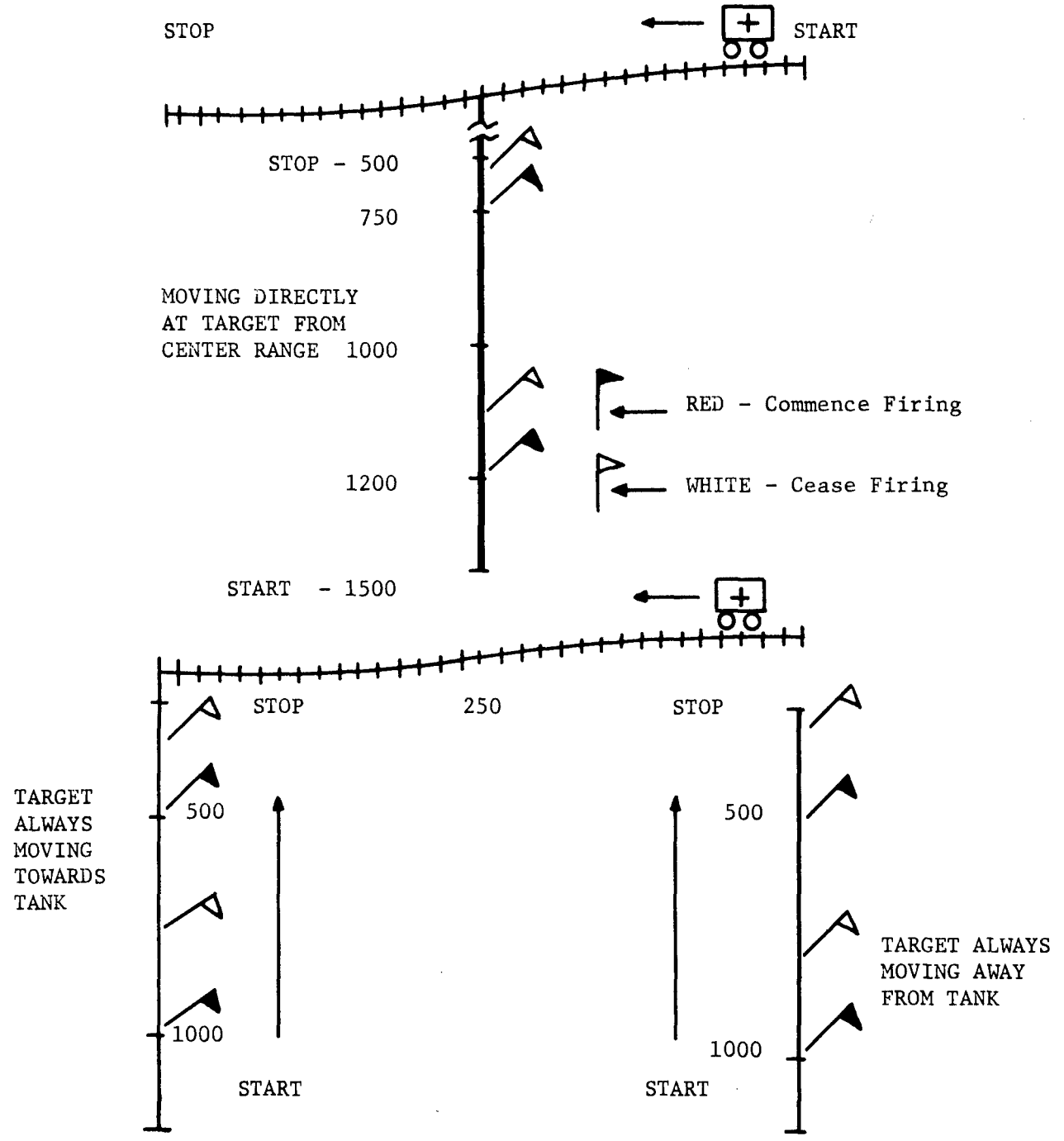
b. Compare the results of firings conducted at various stages of barrel wear to determine the effects such wear may have on dispersion and hit capabilities.

6.4.2.4 Effects of Transporting

Compare the results obtained with ammunition that had been transported in the firing vehicle for varying distances with ammunition that had not been transported.

APPENDIX A

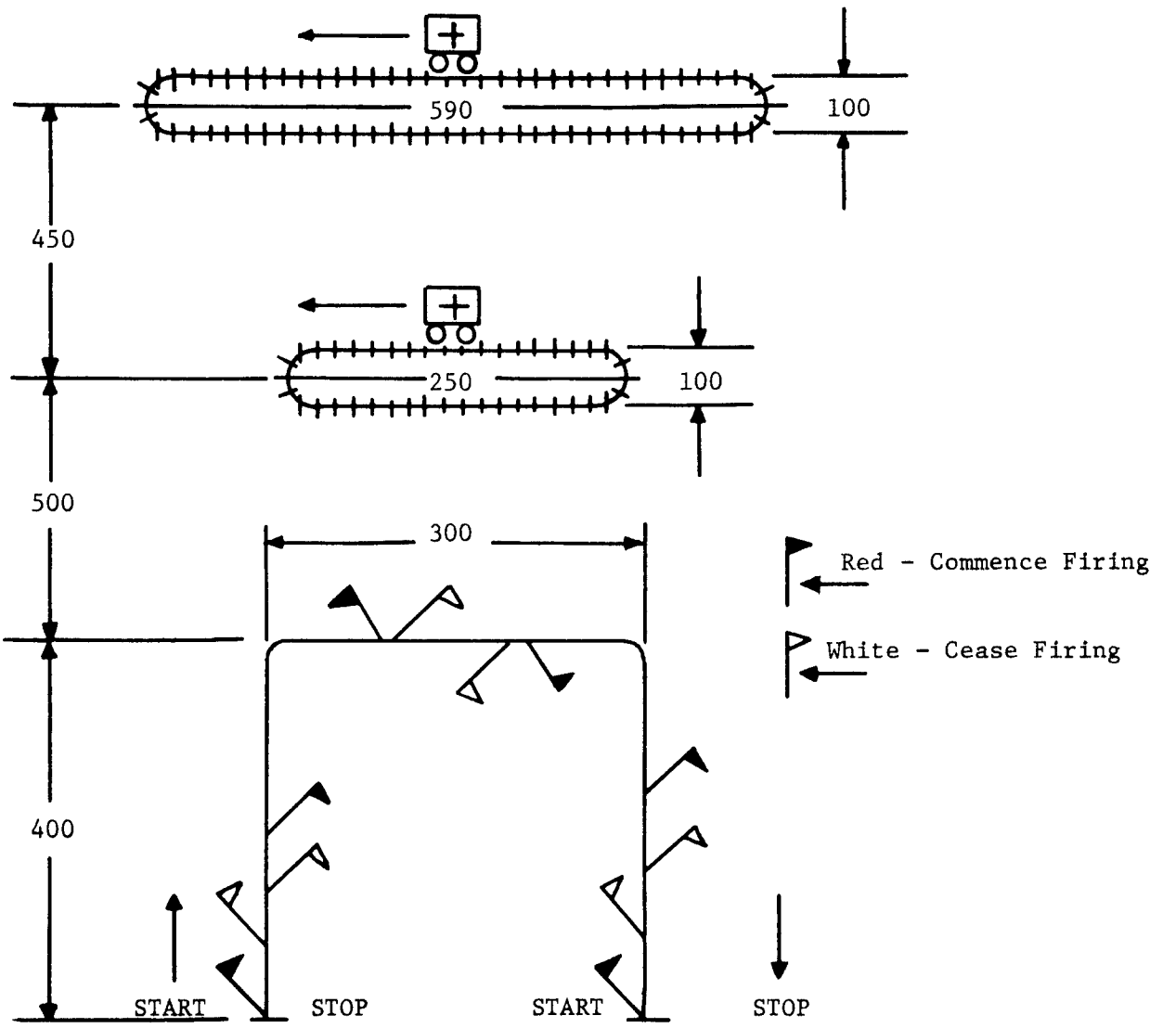
SAMPLE MOVING VEHICLE - MOVING TARGET RANGE
(STRAIGHT-ON, MULTI_RUNWAY COURSES: GRAVITY TARGET)



(All dimensions in meters)

APPENDIX B

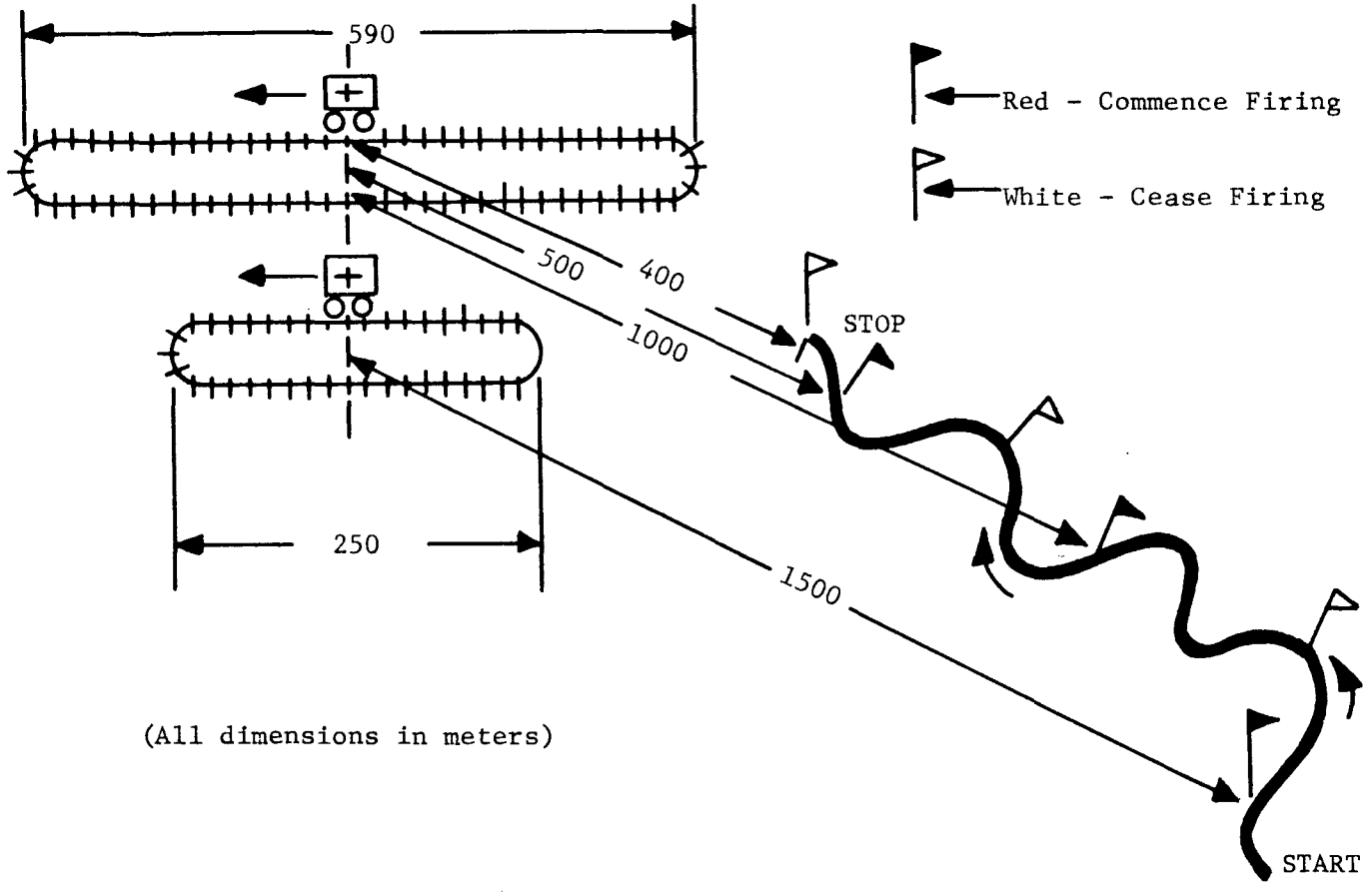
SAMPLE MOVING VEHICLE - MOVING TARGET RANGE
(INVERT U-SHAPED: TWO OVAL, MOVING TARGETS)



(All dimensions in meters)

APPENDIX C

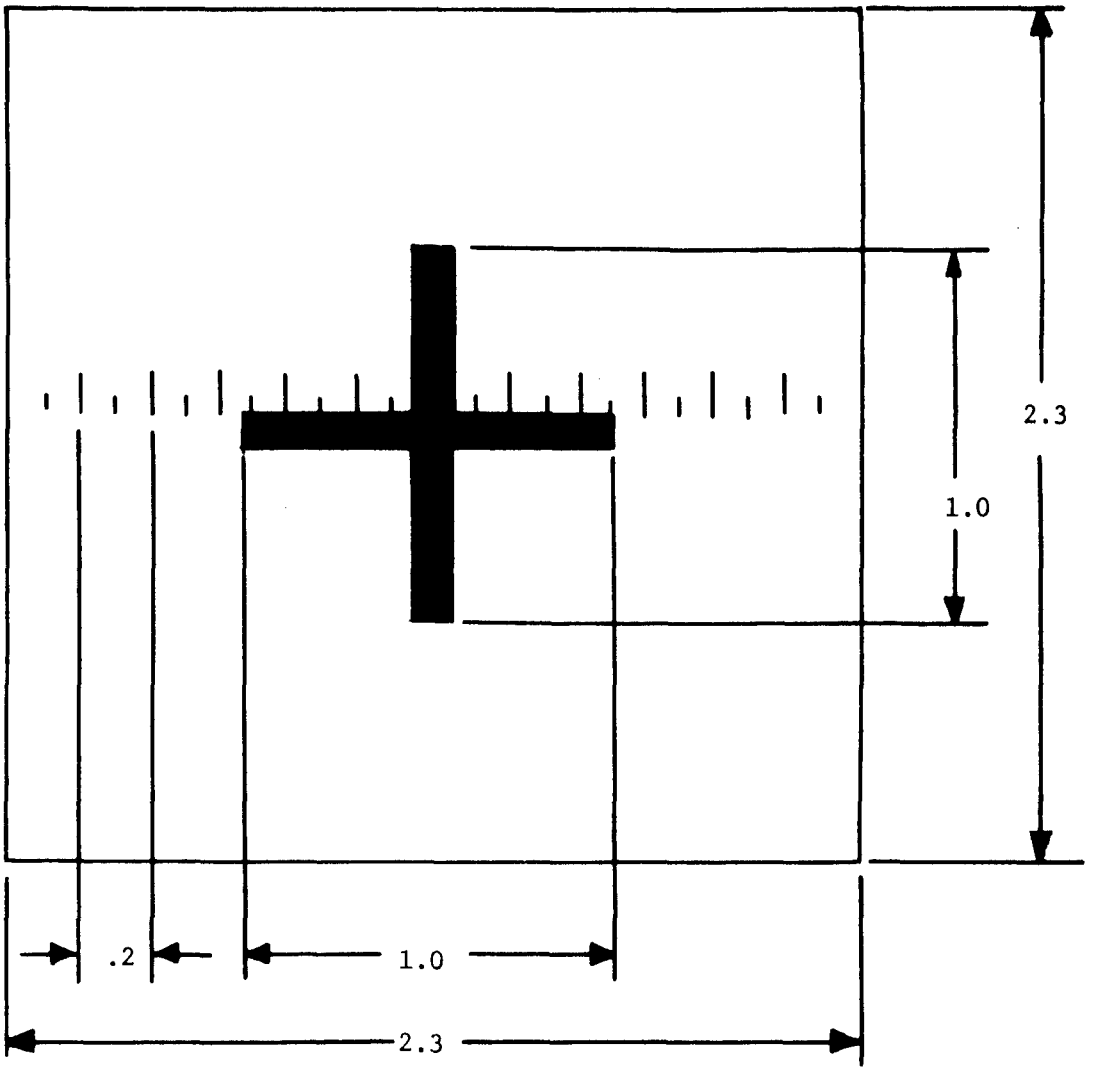
SAMPLE MOVING VEHICLE - MOVING TARGET RANGE
(CROSS-COUNTRY TRAVEL, DIAGONAL ZIG-ZAG APPROACH)



(All dimensions in meters)

APPENDIX D

SAMPLE TRACKING AND LEAD OBSERVATION TARGET



(All dimensions in meters)

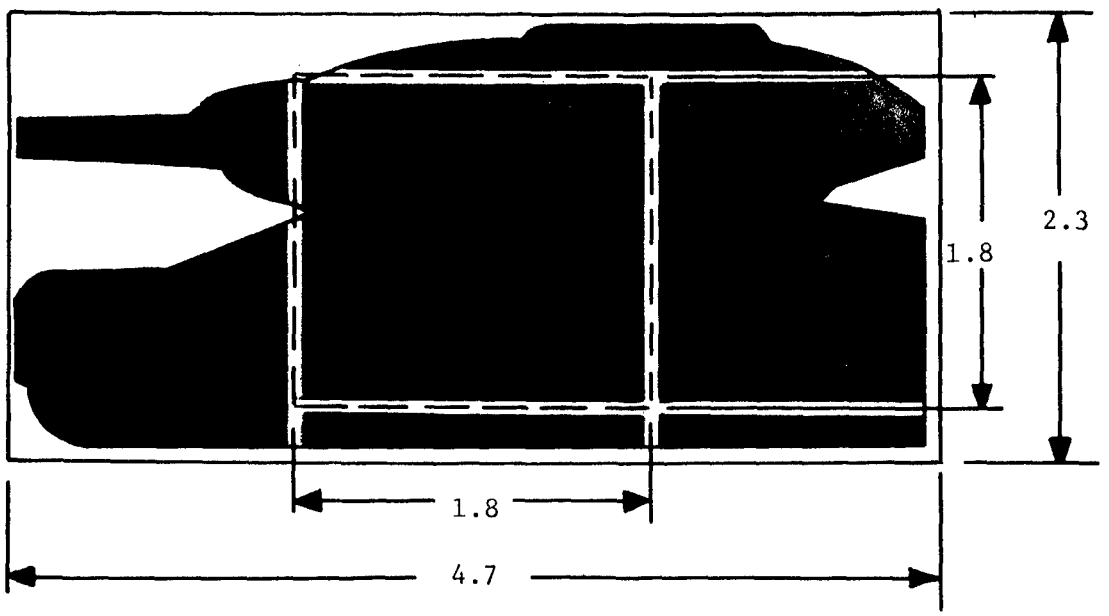
Explanatory Notes:

Target of plyboard construction with pattern painted using a combination of USAF yellow and black.

Attach to truck or armored personnel carrier as target bearing vehicle.

APPENDIX E

SAMPLE MOVING TANK TARGET



(All dimensions in meters)

Explanatory Notes:

Target concept assuming the basic 6-ft x 6-ft (1.8m x 1.8m) superstructure of existing facility can be extended to provide target of larger overall dimensions shown.

Brace and frame structure for the extension to be lightest possible suitable for support of screen wire mesh cover and attached tactical silhouette cut from OD target cloth.

Gunner may note outline of the target frame but aims at the tank silhouette centered on the target face.

If the larger target cannot be used then the entire 6-ft x 6-ft (1.8m x 1.8m) target area will be covered with OD target cloth and the gunner's aim modified accordingly.

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13. ABSTRACT

Procedures are specified for evaluating the performance characteristics of gun and turret power control and stabilization systems at varying gun mount and target speeds.

14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Automatic weapons Combat vehicles Weapon firing tests						