
CHAPTER 8

Range Training Facilities

The light cavalry training program includes range firing and using training areas for dry-fire tables. This program builds on gunnery skills and tactical training gained in situational training exercises. This program is designed to provide a realistic environment and to use the vehicle's weapons to engage and destroy targets. The gunnery program must be planned with considerations for limited range densities and detailed planning of training ammunition. Tactical training must also be well planned to make maximum use of this expensive training, which may include threat vehicles and troops for a more realistic combat environment. This chapter outlines the procedures, duties, and responsibilities for establishing and operating gunnery and tactical training facilities.

Section I. LIVE-FIRE RANGES

A permanent light cavalry firing range is a designated post range or facility. There is a surface danger area diagram designating a firing line or maneuver area and safety limits, both on a map of the area and on the ground. Each range is designed for specific purposes-types of weapons and ammunition and particular firing tables. These ranges cannot be modified or used for other types of firing without approval (usually the range control officer is the approving authority).

Normally, temporary ranges are established to fill specific needs of units. These may be a home station subcaliber range where no permanent range exists or a special live-fire exercise range (combined arms live-fire exercises or ARTEP). Requests to establish a temporary firing range must be accompanied by a surface danger area diagram to inform the approving authority of the specific requirements and area desired.

Establishing a Live-Fire Range

Before selecting a site for a scaled range or a full-caliber range, make a detailed map and ground reconnaissance of areas available for firing.

SITE SELECTION

The range must be large enough to accommodate all weapon systems and types of ammunition to be fired, along with the scenario requirements of the table(s) to be fired. Realistic conditions not provided by the selected terrain should be constructed to enhance training. Examples are—

- Defilade stationary firing positions.
- Sufficient maneuver area and enough targets to provide multiple firing points and target locations.
- Targets in realistic arrays and, if possible, not marked by berms.

BALLISTIC FIRING TABLES

The ballistic data in firing tables for light cavalry ammunition are used to develop or modify surface danger area diagrams.

The use of ballistic characteristics combined with knowledge of the fire control system allows the crews to use the light cavalry weapons more effectively. (See FT .50-AD-1 and FT 7.62-A-2.)

The following terms explain the data in all gunnery firing tables. The data columns may differ slightly among various rounds of ammunition and types of weapons.

- Range. Vehicle-to-target distance.
- Superelevation. Additional elevation induced into the fire control system to raise the ballistic flight of a given projectile to ensure that the projectile hits a target at a given range.
- DX/DSE. Number of meters a 1-roil elevation change will make in linear range, on the ground, at a given range and superelevation.
- DH/DX. Change in height (in meters) of a projectile for a 100-meter change in linear range, on the ground, at a given range.
- Drift. Number of roils the projectile moves to the right of the gun-target line because of the spin caused by the gun rifling.
- Time of flight. The amount of time it takes a projectile to reach a target at a selected range.
- Ten-kilometer per hour (kph) crosswind deflection. Generally, a round is most unstable when it exits the muzzle. This effect of wind deflection assumes a 10-kilometer per hour crosswind. The correction is applied into the wind; when wind speed is not 10 kilometers per hour, the point of aim must be estimated.
- Maximum ordinate. The maximum height the projectile travels above the line of sight at a given range.
- Range to maximum ordinate. The range at which the maximum ordinate is reached. Out to this range, the projectile is ascending; beyond this range, the projectile is descending. The range to the maximum ordinate will always occur shortly past half the target range.
- Angle of fall. The number of roils between the projectile's trajectory at impact and the line of sight.
- Remaining velocity. Speed of the projectile, in meters per second, at a selected range.

SURFACE DANGER AREA DIAGRAMS

Light cavalry units establishing ranges or modifying existing ranges must submit surface danger area diagrams to the range control officer before firing. Surface danger area diagrams show range boundaries and safety features in overlay form, including range limit markers for firing positions. Ballistic firing tables (FT .50-AD-1) that provide values for range, maximum ordinates, and superelevation for each ammunition type are also required to construct surface danger area diagrams.

Surface danger area diagrams on established ranges should be modified when these ranges do not provide realistic conditions or do not make maximum use of available terrain. Restrictions and precautions for surface danger area diagrams are in AR 385-63. When engaging ground targets, maximum range may be reduced to 1,500 meters if the firing elevation of the gun can be maintained at 15 degrees or less. If the weapon cannot be controlled at 15 degrees or less (when firing while moving over rough terrain), the maximum range should be used. (Range at 1,500 meters is the maximum distance the projectile can travel when fired at elevations of 15 degrees or less. This value was derived using data from the ballistic firing tables along with ricochet data.)

When laser range finders are used, an additional buffer area (area C) may be added (see AR 385-63). Every object the laser beam strikes reflects energy. In most cases, this energy is diffused and not hazardous. Remove mirrors (plastic or glass) and other flat mirror-like objects having a vertical or near vertical surface from the target area; these objects may reflect the laser beam and cause injury. If this is impractical, cover the surfaces with lusterless paint or some nonreflecting material, such as cloth or cardboard.

Reconnaissance

The OIC and NCOIC should conduct a reconnaissance and coordinate with range control before their unit occupies a range or training area. It is not possible to list all areas checked during a reconnaissance, but the following should be considered, as a minimum:

- Where are the routes to the range or training area?
- How many vehicles can simultaneously fire a stationary or moving course?
- Are there hull-down and defilade positions?
- What control facility (tower) is available; what is its condition?
- What communication hookups are available to operate the range?
- Are range limit markers visible during day, reduced visibility, and night firing?
- Which barriers and guard posts need to be closed or manned?
- Who furnishes the targets, target supplies, and training devices used on the range?
- What requirements will be necessary for target operators or target details?
- What ammunition can be used on the range?
- Has the range or training area been cleared of duds?
- Where are the following areas:
 - Ammunition pad?
 - Firing line and maneuver areas?

- Barriers and guard posts?
- Range bits?
- Helipad?
- Aid station?
- Parking areas?
- Maintenance area?
- Latrine?
- Briefing and debriefing areas?
- Tower?

Personnel, Equipment, and Layout

Good planning and execution of range or tactical training will allow progressive training and proper evaluation of the unit. Administrative requirements are in AR 385-63, local range regulations, and unit SOPS. A range book containing all applicable regulations and reference materials (for example, range schedules, firing tables, gunnery tables, maps, range logs) will assist the OIC in operating the range efficiently.

REQUIRED PERSONNEL

The following personnel are required for conducting range training:

- Officer in charge. The OIC is responsible for everything that occurs at the range or training site. This includes planning, preparing, coordinating, and executing the training exercise. AR 385-63 lists an overview of the duties to be completed or supervised by the OIC. The OIC will also designate assistants to be responsible for specific areas of operation. All personnel involved in the training exercise report to the OIC regarding their respective duties.
- Range safety officer (RSO). The RSO is a commissioned officer, warrant officer, or NCO (E6 or higher) who is weapon-systems qualified. The RSO is a direct representative of the OIC. The RSO will have no responsibilities during range firing other than the following:
 - Conduct a safety briefing before all live-fire exercises.
 - Enforce all safety regulations.
 - Ensure all ammunition is handled correctly.

- Enforce smoking restrictions near the vehicles; ammunition; and petroleum, oils, and lubricants (POL).
 - Ensure misfires are handled as stated in AR 385-63 and the appropriate operator's manual.
 - Investigate and report accidents, in accordance with all regulations.
 - Ensure weapons on live-fire ranges are pointed toward the impact area at all times.
 - Ensure personnel are clear of the danger area (except as authorized in AR 385-63).
 - Check all DA Forms 2408-4 for proper combination of barrel, receiver, feeder, and round count.
 - Check all ammunition (TB 9-1300-385) for suspended or restricted lots.
 - Ensure barriers and guards are in place before the start of the exercise.
 - Check for proper identification and qualifications and ensure transportation of medical personnel, if used or required.
 - Inspect and clear all weapons following the completion of fire.
- Noncommissioned officer in charge. The NCOIC coordinates and supervises details and assists the OIC and RSO in operating the range or training area. Duties of the NCOIC include—
 - Prepare a surface danger area diagram and range overlay.
 - Prepare scaled ranges, if required.
 - Organize range firing exercises.
 - Set up range firing exercises.
 - Ensure range firing exercises are properly conducted.
 - Supervise the crews to ensure that proper boresighting and zeroing are accomplished.
 - Coordinate target array and layout for range firing and qualification.
 - Conduct remedial training on site, as needed.
 - Ensure an effective light cavalry crew evaluator program is implemented for standardization.

- Ammunition NCO. Duties of the ammunition NCO include—
 - Ensure ammunition is accounted for, by type and lot; correct for the scheduled firing; and properly stored and secured on the ammunition pad in the training area.
 - Check any ammunition resupply to be sure it is not restricted or suspended (check with RSO and TB 9-1300-385).
 - Issue the correct type and number of rounds as instructed by the OIC and keep a running inventory to cross-check daily expenditures turned in to the OIC by vehicle commanders.
 - Ensure the ammunition pad is continually policed of links, brass, and packaging materials.

- Target NCO. Target NCOs are not needed on many of the automated ranges. Where target NCOs are required, their duties include—
 - Ensure targets are the type, color, and scale (if applicable) required.
 - Ensure targets are in the proper location on the range.
 - Ensure the target detail is proficient in the operation and troubleshooting procedures for all target mechanisms used.
 - Ensure the target detail has the required equipment and supplies, and prepositioned targets are available when needed.
 - Ensure spare targets, target mechanisms, batteries, patches, and other related equipment are on the range or training site to support training.
 - Report to the OIC any mechanical malfunctions that require prompt repair to continue firing.

- Evaluator. Duties of the evaluator include—
 - Enforce required safety precautions.
 - Act as an instructor during practice.
 - Act as an evaluator during qualification.
 - Debrief crews at completion of firing.
 - Confer with OIC on any scoring discrepancy.

- Fire-fighting detail. This detail is required at some range facilities during dry seasons. When such a detail is used, consider the following:
 - Availability of fire-fighting equipment.
 - Designated vehicles for troops and equipment.
 - Access routes to the impact or target areas.
- Bunker personnel. Bunker personnel move targets, if applicable.
- Radiotelephone operators. These operators maintain communications during an exercise.
- Medic. The medic must—
 - Know how to get to the nearest aid station or hospital (must have strip map to nearest aid station or hospital).
 - Know radiotelephone operating procedures for use during air evacuation.
 - Have identification card (medical) or a memorandum for record from his commander stating that he is a qualified medic.
 - Be properly equipped for the mission.

RANGE EQUIPMENT

The OIC and NCOIC should make sure that the following equipment is on hand:

- For gunnery and tactical exercises—
 - Current gunnery standards for the table being conducted.
 - Targets and target operating and control mechanisms.
 - Target repair equipment.
 - Range regulations.
 - Flashlights for scorers.
 - Batteries for lights and radios.
 - Recovery means.
 - Evaluator communications.
 - Briefing tent.

- Scorecards.
- Stopwatches.
- Binoculars.
- Night vision devices with enough batteries.
- Field telephones, as required.
- Fire-fighting equipment.
- Vehicles:
 - + Target and scoring detail.
 - + Fire-fighting detail.
 - + Backup aid vehicle.
 - + Safety officer's vehicle (moving range).
- Generators to power light sets.
- Equipment for concurrent training.
- Boresight equipment.
- Other table(s) of organization and equipment (TOE) and expendable supplies.
- All other required regulations, SOPS, maps, and overlays.
- FM radio sets and antenna GRC-292 or OE-254.
- For gunnery exercises—
 - Range flag.
 - Range lights or lanterns.
 - Flag sets for vehicles and tower.
 - Compass for marking rounds out of impact area.
 - Ballistic firing tables.

- For tactical exercises—
 - MILES equipment.
 - Opposing forces (OPFOR) equipment.
 - OPFOR personnel.

LAYOUT FOR GUNNERY EXERCISES

A well-organized gunnery range provides maximum firing time. If ranges are planned and organized and all items are collected before moving to the range, firing can start on time and finish in time to clear the range orderly.

A battalion or squadron level range operation SOP will save both time and energy for the firing unit. The SOP should include guidelines for occupying the range and describe actions to be taken for specific tasks:

- Coordinating with maintenance contact teams.
- Operating moving targets.
- Replacing targets.
- Repairing target mechanisms.
- Fighting range fires.
- Writing range scenario.
- Establishing firing orders.
- Policing the range.
- Departing the range.
- Breaking down ammunition.
- Moving vehicles to the ammunition point and ready line.

Moving ranges have a maneuver box not found on stationary ranges. If course roads exist, they should be used for movement. (The vehicle commander should also use available terrain for masking assistance to OICs in planning these exercises.) Maneuver boxes are used to allow the vehicle crew to acquire, range, and destroy targets arranged in a realistic array as outlined on appropriate gunnery tables. Maneuver boxes must be clearly defined and adhered to (start and stop points) and at no time will this area extend or surpass the exposure and engagement times.

To determine the size of a maneuver box, average vehicle speed for the course and target exposure time must be known. The procedure for determining the length of a maneuver box is as follows:

Vehicle Speed: 12 miles per hour.

Target Exposure: 42 seconds.

Convert vehicle speed into meters per second (multiply by the constant 0.447416).

$$12 \text{ (miles per hour)} \times 0.447416 = 5.368992$$

Convert meters per second into maneuver box length.

$$5.368992 \times 42 \text{ (target exposure)} = 225.49766 \text{ meters}$$

Round to the nearest whole number.

Maneuver box length is 225 meters.

Note. The maximum distance the vehicle could travel and still have the target exposed is the length of the maneuver box. Roundup to the next whole number if the number after the decimal point is 5 or more.

LAYOUT FOR TACTICAL TRAINING

Tactical training can be conducted either on ranges or in training areas, whichever is available. Most of the preparation that goes into a gunnery exercise also applies in tactical training.

The configuration of the course depends on local terrain. Each task must fit specific terrain, so tasks on gunnery tables probably will not be encountered in the order in which they appear in a particular table.

As in the gunnery tables, tactical tasks need a range operation SOP that will save time and energy for the firing unit. The SOP should include guidelines for setting up the tactical range or training area and should describe actions to be taken for specific tasks:

- Coordinating with maintenance contact team (for multiple integrated laser engagement system [MILES] devices).
- Testing MILES equipment.
- Setting up tactical tasks (layout) based on METT-T and task standards.
- Briefing OPFOR and control personnel on duties for each engagement.
- Test firing weapons (Hoffman signature device, machine guns with blank adapters).
- Moving vehicles to the start point and issuing fragmentary orders (FRAGO) to initiate movement down the course.
- Conducting after-action reviews (AAR) after each engagement and assembling crews (re-setting MILES equipment).
- Controlling movement on the course to prevent congestion of HMMWVs or platoons.

- Policing the range or training area.
- Departing the range or training area.

TARGETS

Full-scale targets should be the same shape, size, and color as the threat targets they represent.

Note. For a detailed description of targets, target mechanisms, and target control, see TC 25-8.

Hard Targets (Live Fire)

When available and where ricochets do not present safety hazards, hard targets are preferred when firing high explosive (HE) service ammunition. Old tank hulls and turrets, APCs, and wheeled vehicles make good hard targets. When filled with sand or dirt, these hard targets will withstand many hits.

Soft Targets (Live Fire)

Soft targets are made from target cloth or wood by the unit or range control. These targets should be olive drab.

FLAGS

On all ranges, the vehicle will display flags to show the vehicle's weapon status. The following flags will be used:

- *Red.* Vehicle is engaged in firing. Weapons are loaded and pointed at the target area; safety is off.
- *Green.* All weapons are cleared and elevated; safety is on and all ammunition on board the vehicle is stowed.
- *Yellow.* There is a malfunction on the vehicle. This flag is used in conjunction with the red or green flag.
 - *Yellow and red.* The vehicle has a malfunction or misfire; weapons are pointing at the target area and are not clear. (Safety is on; if not, notify range safety personnel.)
 - *Yellow and green.* The vehicle has a malfunction; all weapons are clear and safety is on.
- *Red and green.* The vehicle is preparing to fire or the crew is conducting a nonfiring exercise. Weapons may be loaded, but safety is on. Ammunition is loaded in the ready boxes.

RANGE CONTROL

The range control officer is responsible for coordination and safe conduct of range activity for all units using range facilities. Normally, unit leaders are required to receive a range briefing from the range control officer before occupying a range. Schedule this briefing promptly to prevent any delay in training. Range control should also provide a set of local range regulations and policies.

RANGE COMMUNICATIONS

The installation range officer controls all ranges by wire and radio communication. The control system is used for obtaining clearance to fire, making reports, coordinating, and calling cease fire.

The OIC controls all training activities, including firing, by the best means available and always has a backup system.

Wire is the preferred means of communication between target operators and personnel in the impact area or, in tactical training, the OPFOR. In all cases, the OIC plans for a backup communication system to prevent delay.

Range Operations

A plan must be developed for conducting light cavalry training. This plan will vary with the tables to be trained. The plan should reflect consideration of the following areas.

ASSETS

Training can be conducted by battalion/squadron or troop/company.

Battalion/Squadron

The battalion/squadron signs for, administers, and clears the range or training site. (The training troop assists in range police and administrative duties.) This allows the troop/company to concentrate on gunnery, tactics, and maintenance. Advanced gunnery tables require support from outside the squadron because of the magnitude of the target array and number of personnel needed to control the range. The tactical tasks should not require assets from sources other than the squadron.

Troop/Company

The troop/company signs for, administers, and clears the range or training area. The squadron provides the necessary support in details, safety officers, range guards, and administrative personnel.

OPENING THE RANGE OR OCCUPYING THE TRAINING SITE

The required personnel perform the following tasks:

- The OIC—
 - Moves to the range or training site before the unit arrives.
 - Checks communications and, for live-fire exercises, ensures that backup communications are available.
 - Briefs the safety officer, the evaluators, and the units that will be trained.
 - Ensures range equipment is present and operational.

- The safety officer or safety NCO—
 - Ensures that barriers are closed and range guards are posted and briefed on their duties.
 - Ensures that no live ammunition is present on a nonfiring range.
 - Supervises placing vehicles in the correct order for firing or training.
 - Inspects stowage, handling, and lot number for restricted or suspended ammunition.
 - Inspects medics and vehicles.
 - Inspects DA Form 2408-4 for each weapon fired.
 - Gives safety briefing before all live-fire exercises.
- The NCOIC—
 - Gives final briefing to light cavalry crew evaluators.
 - Ensures concurrent training is setup properly.
 - Moves to the range or training site before the firing unit.
 - Sets up additional training areas.
 - Supervises ammunition, targets, and administrative details.

DURING THE EXERCISE

The following actions must be performed:

- The OIC—
 - Controls firing of live-fire exercises.
 - Maintains efficient throughput within units and between units going through the course.
 - Maintains all required communications.
- The NCOIC—
 - Supervises all details.
 - Controls the movement of personnel from firing positions to additional training and other administrative areas.

- Ensures range firing is conducted in accordance with the appropriate gunnery table.
- Ensures zeroing is accomplished correctly.
- Supervises remedial training on site as needed.
- Supervises light cavalry crew evaluators.
- Assists safety personnel, when required, in clearing weapons.
- Assists maintenance personnel, when required, in troubleshooting and correcting malfunctions.
- Assists the commander in determining or verifying alibi conditions.
- The safety officer or safety NCO—
 - Ensures that misfires are handled in accordance with safety regulations.
 - Observes for any safety violation.
 - Clears each vehicle upon completion of exercise.

CLOSING THE RANGE

The following tasks must be performed:

- The OIC—
 - Notifies range control that firing has terminated.
 - Debriefs unit personnel.
 - Ensures the range or training area is cleared in accordance with local regulations and SOPs.
- The NCOIC—
 - Supervises ammunition and target details.
 - Ensures range facilities have been policed and cleaned.
- The ammunition NCOIC—
 - Ensures no munitions are removed from the range by anyone other than authorized personnel.
 - Prepares residue certificates required by the ammunition supply point.
 - Ensures all DA forms are filled out properly and kept up to date.

TIPS FOR TRAINING ON THE RANGE

When conducting training on the range—

- Brief key personnel. Before moving to the training site, brief key personnel in setting up the site and in reacting to unusual circumstances. This will keep downtime to a minimum and prevent boredom.
- Start on time. Have the training site ready and communications setup early so crews can begin firing on time. Plan operations so there will be no interruptions of training for maintenance of the course except the prearranged or normal shutdown time, which will be posted in the range daily bulletin. This means there must be sufficient targets to complete all training before the scheduled break.
- Use range marker lights (live fire). Do not fire at night without a light and a thermal range marker on the range safety markers. If the range marker lights fail, all ranges that use the same impact area must be closed. To prevent this, consider placing two lights on each range safety marker, making sure that a backup light is available. Make sure lights are in good operating condition and batteries are fresh.
- Plan illumination. Register weapons providing indirect illumination before dark. For ease of control and reduction of support requirements (ammunition pads, OIC, safety officers, transportation, communications), locate indirect-fire weapons on the same range with firing vehicles.
- Keep a log. The OIC will maintain an accurate log. A log will help keep the OIC better informed of dry-firing and live-firing times and other important events. As a minimum, the log should contain the following entries:
 - When the unit occupied the range or training site.
 - For live fire, when permission to fire was received from range control.
 - Who gave the permission to fire.
 - When the range was in a cease-fire status.
 - When the range reopened.
 - Compass azimuth to any stray impacts and time of impact.
 - When the unit cleared and departed the range.
- Brief guards. Have a plan to check and change guards frequently. Also, make sure guards are briefed on their duties and their importance, and understand the instructions.
- Be prepared for fires. During dry seasons, there is always a danger that tracer illumination will cause grass and forest fires. Be prepared to control the situation quickly. It may be necessary to reduce the number of tracer rounds in linked ammunition, if fires persist.

- Police the area. Keep the area policed at all times. A clean training site reduces the chance of injury, especially at night. Police continually to avoid spending valuable time cleaning up after firing.
- Brief visitors. Have a plan for briefing visitors and designate a briefing NCO or officer. Brief visitors before escorting them to the primary training site.
- Check safety markers. Make sure range safety markers are present before live firing begins; if light markers are used, check operations before darkness.
- Coordinate for munitions. Coordinate with the support elements responsible for supplying live ammunition or pyrotechnics. This coordination ensures having the correct type of ammunition in the correct amounts at the right time and place. Ensure the ammunition to be fired has been checked against TB 9-1300-385 for restricted or suspended ammunition lot numbers.
- Conduct other training. Stress those areas in which the unit needs additional training. The following are suggested areas for additional training:
 - Target acquisition.
 - Range determination.
 - Movement techniques.
 - Crew tasks.
 - Section tasks.
 - Fire commands.
 - Methods of adjustment.
 - Prepare-to-fire checks.
 - Misfire procedures.
 - Target identification.
 - Maintenance of vehicles and weapons.
- Remove disabled vehicles. Quickly remove disabled vehicles from the course to prevent loss of training time. A manned recovery vehicle must be in position to support the unit.
- Brief bunker personnel (live fire). Brief bunker personnel on safety regulations and requirements. Bunker personnel must be given definite control measures, such as entering and exiting the bunker and bunker area. Bunker personnel must have two means of communication with the tower.
- Brief OPFOR personnel. Brief OPFOR personnel on the role they will play in tactical training. Make sure they know what to do and when to do it. Stress that their actions must be the same for each unit going through the course.

Section II. SCALED RANGES

The preparation and use of scaled ranges require only minor changes from procedures used to conduct live fire. Scaled range firing helps prepare crews and sections for live fire and qualification, and allows units to train themselves in range operation during home-station training. Unit leaders, gunners, and local range control officers may assist OICs in planning, executing, and evaluating scaled ranges.

The rising cost of ammunition, fuel, and spare parts makes it difficult to produce and maintain skilled light cavalry crews and sections. To overcome these training limitations, more gunnery training must be done at the home station using simulators, training devices, and innovative training techniques.

Range Use

The commander chooses the range scale that best suits his training needs and facilities.

Using scaled ranges, units can realistically simulate day and night firing by single vehicles and sections against single and multiple, stationary and moving targets. Targets representing friendly equipment can be placed in the target area to give the crew practice in distinguishing friend from foe. For overseas units, terrain and target arrays can be setup to resemble anticipated threat targets and actual terrain in front of prepared battle positions.

The crew, moving down the course, engages a series of machine gun targets. Although all targets are within battlesight range, precision and battlesight gunnery techniques should be practiced on the half-scale range. The crew also runs the course at night using available illumination (flare, infrared, or white light) or thermal sights.

Types of Ranges

The three types of scaled ranges are small-scale, stationary vehicle; small-scale, moving vehicle; and half-scale, stationary or moving vehicle.

SMALL-SCALE (1/60 OR 1/30), STATIONARY VEHICLE

This range is used for stationary single squad, and section firing exercises. The scale chosen (1/60 or 1/30) depends on the area available. Ideally, these ranges are large sand tables and, as such, offer the best possibility for deployed units to setup target arrays that resemble those expected in actual battle positions. Until sand-table ranges can be constructed, any surface can be used if berms are available for safety.

The size of the range depends on the area available and the caliber of the device used. The required size of the impact area can be reduced by adding berms.

Impact or laser targets, with appropriate mechanisms of the desired scale (targets), are emplaced on the scaled range to present challenging engagement exercises. Targets representing friendly equipment may be placed in the target area to give the crew practice in target identification. See the combat range versus scaled ranges for proper target emplacement distances. Appropriate scaled objects (roads, buildings, vegetation, and terrain features) add realism to the target area.

SMALL-SCALE (1/10), MOVING VEHICLE

A moving vehicle range requires a larger area than the stationary vehicle range. The 1/30- scale range can be used; however, the scale is so small that terrain changes too fast for a moving vehicle to use proper adjustment techniques. For example, in a course run simulating 1,200 meters on a 1/30- scale range, a moving vehicle traverses only 113 feet. A vehicle moving at three miles per hour travels this distance in 27 seconds. The suggested scale is 1/10. The exact configuration of the 1/10 scale range varies depending on local area assets and type of terrain.

This range can be easily constructed on an existing small-arms or machine gun range. Direction of vehicle movement can be parallel to the firing line or through the impact area, depending on the size and shape of the area available.

Simulated machine gun impact targets or laser targets with appropriate target mechanisms are employed within distance constraints of the scaled ranges. These are necessary so the desired scaled target range is retained when firing.

From marked firing locations, the vehicle moving along a designated route engages a series of activated machine gun targets. The vehicle keeps moving during engagements; however, their speed is considerably slower than normal because of the short distances between targets. Crew duties for battlesight and precision engagements should be practiced. Night firing and battlefield obscuration can be accomplished as in the stationary scaled course.

HALF-SCALE

Half-scale ranges are used for stationary or moving vehicle exercises. More realistic training can be conducted on half-scale ranges than on smaller scale ranges. Additionally, ranging on the target can be practiced.

The length of the range depends on the area available (for example, for the 7.62-mm coax, the impact area must be at least 4,800 meters).

Note. Impact areas may be waived to a lesser distance with the addition of berms. Approval for this can be granted by local range control.

Targets

The scaled impact target is available in scales of 1/60, 1/30, and 1/10. The target is mounted on a stationary scaled pop-up target mechanism. The target, a two-dimensional silhouette made from plastic, is easily replaced when destroyed. Targets are available in an assortment of threat vehicle silhouettes as well as some friendly equipment silhouettes for target identification practice.

Target Mechanisms

The following types of mechanisms are used with small-scale targets:

SMALL-SCALE MOVING TARGETS AND SCALED MOLDED RUBBER TARGETS

This target mechanism is used on the 1/60-scale, 1/30-scale, and 1/10-scale ranges. It is to be made locally. Targets for use with this mechanism can be obtained locally.

SMALL-SCALE STATIONARY TARGETS

This device is a wire-operated target mechanism for popping up 1/60-scale, 1/30-scale, and 1/10-scale impact or laser targets. The device is powered by any 24-volt electrical source. When the target is struck by an impact weapon, the target falls. The mechanism comes with wire attached to the control box (or for 1/60-scale and 1/30-scale targets through a junction box). The wire and the target mechanism are buried in sand or in the ground to protect them from projectile impacts. When not in use, the mechanism should be removed or covered to protect it from the weather. Quick-connect plugs are used for easy removal.

M31A1 TARGET-HOLDING MECHANISM FOR SMALL-SCALE STATIONARY TARGETS

The M31A1 target-holding mechanism is used for popping up impact targets of 1/20-scale. This device is normally operated on 110 volt alternating current (AC).

Section III. TRAINING DEVICES

Because of the high cost of ammunition and the overcrowding of training areas, the use of training devices at home station is becoming increasingly more important. The use of training devices can enhance full-caliber gunnery by training personnel in their weak areas before they advance to the intermediate gunnery tables.

The MILES TOW equipment is the most realistic device available for simulating tactical engagements; it is valuable in maneuver training exercises and ARTEPs. However, MILES TOW is not a precision gunnery trainer and should not be used to train gunner tracking skills.

The MILES permits the vehicle and crew to take part in realistic combat training exercises. Although MILES is basically a tactical maneuver simulation device, it contributes significantly to crew interaction. Actual firing conditions of all vehicle weapons are simulated using laser beams. Blank ammunition and an antitank weapons effect simulator system (ATWESS) firing device add to the system realism (see TC 25-6-1).

The laser target interface device (LTID) is a MILES laser receptor that attaches to a target. It limits the target hit area and requires a more precise gunner sight lay. The interface is connected to the hit sensing connector of the target holding mechanism and will cause the target to fall upon receipt of a MILES target kill code. (See FM 17-12-7 for further information.)

The precision gunnery training system (PGTS) is a group of training devices used to train precision gunnery. The TOW gunnery trainer (TOW GT) is one of this PGTS group. This crew-portable trainer simulates the sights, controls, switches, and indicators of the TOW 2 guided missile system. The battlefield scenes presented include both threat and friendly vehicle targets. The gunner selects, tracks, and engages targets just as he would on the battlefield; he hears the commands from the instructor station and the battlefield sounds of small arms and guns firing.

The TOW field tactical trainer (TOW FTT) is another member of the PGTS group. This device is used to teach precision gunnery skills to TOW 2 gunners in the field; it may be used on designated ranges, general outdoor areas, or initial gunner familiarization in an outdoor environment and for gunner skill enhancement and progression. The TOW FTT trains gunners to adopt a correct firing position, to assess target engageability, and to engage and track the target. Missile launch, flight, and impact effects are realistically simulated by the TOW FTT.

The M70-series training set may be used to train TOW gunnery; this device measures the precision of a gunner's tracking overtimes approximating missile flight times. Although it does not measure tracking ability or teach target engagement skills, it can determine if a gunner possesses the necessary foundation for successful gunnery. The M70-series training set can duplicate targets out to 3,000 meters. TOW launch characteristics are simulated by having the gunner fire and track with the M80 blast simulator and missile simulation round (MSR). This prepares the gunner for an actual missile launch by simulating the time delay after trigger depression (1.5 seconds), the noise (160 decibels), and the backblast (75 meters).

Note. For further information on the TOW GT, TOW FTT, and M70-series training set, see Chapter 9.