

MILES 2000
TRAINING DEVICE OPERATIONAL REQUIREMENTS DOCUMENT
FOR REPLACEMENT OF GROUND DIRECT FIRE
TACTICAL ENGAGEMENT SIMULATION (TES) DEVICES
CARDS NUMBER 0291
Revision Jul 96

1. General Description of Operational Capabilities.

a. MILES 2000 devices will be used primarily during force-on-force (FOF) exercises at home station from squad through brigade level to simulate the firing and effects of actual weapons systems. The devices will be used by all career management fields (CMF) that participate in FOF exercises. MILES 2000 devices will simulate actual weapons characteristics and provide a means to objectively assess weapons effects during FOF training. By providing these capabilities in a training environment soldiers will be able to make and correct mistakes which would result in casualties in actual combat. Devices covered by this ORD will support elements of every Mission Area as they participate in FOF training exercises at home station. The Close Combat Light and Heavy Mission Areas will be the most heavily utilized; however, each of the other Mission Areas will be affected as they participate in FOF exercises. It is anticipated that these devices will be supported as part of the current MILES contractor logistics support (CLS) effort.

b. This program was initiated by a Commercial Training Device Requirement (CTDR) approved in December 1989, CARDS reference number 0100R. The CTDR followed and provided improved capabilities for devices originally developed under Training Device Requirements (TDR) 074, 076, and 080.

c. In general, a MILES 2000 device shall consist of a shooter weapons simulation system (i.e. a laser based communications channel) and/or a target effects system.

d. The weapons/platforms to be simulated under this ORD are intended as replacements for the existing family of ground direct fire Multiple Integrated Laser Engagement System (MILES) devices currently in the Army inventory. As such, the devices are expected to be capable of adaptation to new and/or improved models of the host weapons/platforms. Not included in this ORD are requirements for "systems" devices [e.g. Line of Sight Anti-Tank (LOSAT), Javelin, Armored Gun System (AGS), Mk-19 GMG, etc.] and requirements for devices which are covered under other requirements documents, either completed or working (e.g. MILES grenade, MILES Claymore mine, etc.).

e. The weapons/platforms to be simulated under this ORD include, but are not limited to individual weapons [e.g. M16 Rifle and Sniper Weapons System (SWS)], machine guns [e.g. Squad Automatic Weapon (SAW) and M-60 MG], dismounted anti-armor weapons [e.g. Light Anti-Armor Weapon (LAW) and TOW], and combat/armored vehicles [e.g. M113 Armored Personnel Carrier (APC), M-1 Tank, and M2/3 Bradley Fighting Vehicle (BFV)]. These systems shall be capable of being adapted to portray a variety of Opposing Force (OPFOR) systems. A refined application of a vehicle detection system, to be known as the Mobile Independent Target System (MITS), which can be applied to various combat support/combat service support (CS/CSS) vehicles or other materiel targets is also required. Additionally, an individual soldier target system is required.

f. In addition to the weapons system simulators any support items required to ensure the systems are operational, e.g. controller device, weapons alignment fixture, vehicle test set, etc., are included in this requirement.

2. Threat. MILES 2000 devices will support the following warfighting capabilities packages: engage committed forces, Military Operations in Urban Terrain (MOUT), special operations, Forward Area Air Defense (FAAD), mobility, and counter mobility, as units participate in FOF exercises..

3. Shortcomings of the Existing Systems.

a. The current family of MILES devices was developed in the late '70s and early '80s using technology then available. That technology does not support the level of fidelity that is required by today's commanders and trainers. For example, the Armor/Anti-Armor Net Assessment (A³NA) conducted in 1988 identified the need for improved FOF simulation of armor and anti-armor weapons. Among the shortcomings detailed in the A³NA report were:

(1) The inability of the MILES systems to engage targets which could be acquired with the weapons systems sighting and target acquisition subsystems, i.e. Tanks and Bradley Fighting Vehicles use Forward Looking Infra-Red (FLIR) sighting systems which can acquire and fire on targets through dust, smoke, fog, and other battlefield obscurants which the MILES systems cannot penetrate.

(2) The inability of the MILES system to discriminate as to area of impact of a hit. The current system uses a single probability of kill (P_k) for an entire vehicle whereas the P_k varies on the vehicle depending on the thickness of the armor at the point of impact.

(3) The inability of the MILES system to "fire" more than one type of ammunition from capitol system platforms, for instance tank cannon can fire at least high explosive anti-tank (HEAT) and armor piercing fin-stabilized discarding sabot (APFSDS) rounds which exhibit different ballistic characteristics and result in different P_k on the target vehicle.

b. Additionally, the existing family of devices does not support training of fratricide issues. Technology has progressed to the point that many of the deficiencies and shortcomings which have been identified can be incorporated into an improved family of devices.

c. In addition to the dated technology used, the current family of devices is beginning to reach the end of its life cycle. As replacement of these devices becomes necessary it appears a prudent business decision to buy devices which not only reflect improved weapons fidelity but also take advantage of improvements which will result in a reduced logistics burden. Examples of logistics support advances include longer life batteries, reduced power consumption by components, advances in electronics design and manufacturing techniques which produce more rugged and robust equipment which will result in reduced maintenance and repair requirements.

4. Capabilities Required.

a. System Performance.

(1) General Characteristics. As a family, MILES 2000 devices shall:

(a) Be downwardly compatible with the current family of MILES devices, IAW PMT-90-S002A, Standard for MILES Communication Code Structure.

(b) Be readily adaptable to a Simulation of Area Weapons Effects - Radio Frequency (SAWE-RF)/MILES II configuration using modular SAWE-RF components to retrofit the MILES 2000 devices.

(c) Be adaptable to Combat Training Center (CTC) instrumentation systems without design changes to the MILES 2000.

(d) Be EMI compatible with the training battlefield environment.

(e) Operate effectively under environmental conditions in which a soldier can acquire a target with a non-FLIR assisted eye.

(f) Transmit player identification (PID) IAW PMT 90-S002A.

(g) Have a hit probability (P_H) approximately equal to that achieved with live ammunition at the same ranges and approximate the Probability of Kill (P_K) of the weapon and ammunition type selected for the engagement.

(h) Be as small and light as practical so as to not significantly impede the normal carrying, movement, and functioning abilities of the soldier in conducting his training.

(i) Be capable of operating for 100 hours without power source replacement.

(j) Conform to CFR Title 21, subchapter J, part 1040 for laser equipment, system design, written operator manuals, and maintenance instructions. If 21 CFR 1040 cannot be met due to operational requirements, MIL-STD-1425 shall be used as a design requirement. The laser shall be safe for intrabeam viewing to include magnifying optics up to 7x50 for ranges greater than 75 meters and greater than 12 meters for the unaided eye.

(k) Conform to a hierarchy of weapons effects with respect to lethality and vulnerability.

(l) Employ a surrogate weapon which exhibits the actual weapons characteristics of size, weight and feel in cases where appending a training device to the weapon system is impractical.

(m) Be flexible in design to permit upgrading of the training system to accommodate product improvements to the host weapons platform.

(n) Be capable of storing 500 time-tagged exercise events for future downloading and use during an After Action Review (AAR) via a standard communications data bus. Time-tagged events shall be synchronized for the exercise location.

(o) Provide a means for distinguishing between the receipt of friendly and opposing force fires (fratricide)

(p) Be capable of distinguishing between opposing forces when the equipment is issued.

(q) Have a built in test (BIT) capability which shall include GO/NO GO testing and indication of purposeful deceit (cheating).

(r) Have the capability for use during periods of reduced visibility and darkness generally within the capabilities of the weapons with which it is being used.

- (s) Be fired by activation of the weapon's primary trigger or firing switch.
- (t) Include appropriate firing signatures to forces being engaged. Use of items already in the Army inventory are encouraged.
- (u) Provide appropriate cues (indicating results of engagement) at the target for both the target being engaged and as feedback to the firer. **(P³I)** Cues shall be compatible with tactical target acquisition and optical systems.
- (v) The system shall have no uncontrolled safety or health hazards and shall conform to OSHA requirements, best commercial practices, (and applicable Military Standards when possible).
- (w) Provide a visual display which, as a minimum, will report results of BIT and play back of the last 16 exercise events.
- (x) **(P³I)** - Successfully engage targets under conditions and ranges equivalent to the capabilities of the FLIR sights, optical sights, and EM communications equipment on the systems being simulated.

(2) Characteristics of Individual Weapons and Machine Gun Simulators (e.g. M16 and M-60 MG):

- (a) Devices shall be capable of being mounted on the host weapon without permanent modification to the host and being zeroed by the firer within 15 minutes. Zeroing shall be accomplished by adjustments made to the device and not the host weapon sights.
- (b) Devices shall not interfere with and shall be capable of being zeroed with night vision devices.
- (c) Devices shall provide the firer with an indication that the device is firing properly.
- (d) Device activation shall correspond directly to the firing of a blank round.
- (e) Provisions shall be made for a means to permit device activation without the use of blanks (dry fire).

(3) Characteristics of the Man-Worn Detector System (MWDS):

- (a) The MWDS shall establish hit and near miss zones on the individual soldier to permit reasonable target coverage regardless of the outer garment and/or headgear being worn.
- (b) The MWDS shall provide an indication of hits at the target and shall differentiate between a hit and near miss.
- (c) The MWDS shall provide the target with an identifiable indication of casualty assessment.
- (d) The MWDS shall provide a visual display which can be viewed under reasonably normal light conditions to permit immediate feedback to the user.

(4) Characteristics of Dismounted Anti-Armor Weapons (e.g. LAW and TOW):

- (a) Devices shall be capable of simulating a basic load of ammunition. The basic load shall be capable of being adjusted by authorized personnel.
- (b) The rate of fire of devices shall be adjustable by authorized personnel.
- (c) Guided missile firing shall require gunners to accurately track the target being fired upon to an extent similar to the tactical system.
- (d) Simulated missile flight times shall be adjustable.
- (e) Guided missile simulators shall provide an indication to the firer when the missile track time is complete.
- (f) Crew served Anti-Armor systems (e.g. TOW) shall have a vulnerability component which will permit the weapon itself to be "killed".
- (g) (P³I) - Anti-Armor systems shall include appropriate firing obscurants and down range tracking indications to the gunner.

(5) Characteristics of Combat/Armored Vehicle Engagement Systems (VES), (e.g. M113, M1 Tank and, M2/3 BFV):

(a) VES systems shall consist of a lethality (offensive) component and a vulnerability (detector) component. The vulnerability component shall establish a vehicular hit profile which shall generally conform to the vehicle profile, and a near miss zone which extends beyond the vehicle hit profile. The VES target shall be scored as being in one of the following states:

- (1) KILL, with kill discrimination to include:
 - (a) Catastrophic Kill
 - (b) Fire Power Kill
 - (c) Mobility Kill
 - (d) Communications Kill
 - (e) Cheat Kill
- (2) HIT/Not killed.
- (3) Near Miss

(b) The system shall be directionally sensitive to engaging weapons and reflect tactical vulnerabilities.

(c) The P_k shall be specific to each weapon and ammunition type and shall characterize the segment of the target it hits. P_ks shall be programmed and inserted into VES via a controlled means, i.e. only available to authorized personnel. As a minimum the following factors shall be programmable and considered in P_k determinations:

- (1) Aspect angle discrimination.
- (2) Target characteristics.
- (3) Type of attacking weapon and ammunition simulated.

(d) Kills (i.e. catastrophic, firepower, mobility, communications) shall render the appropriate vehicle subsystem inoperable, within safety constraints.

(e) A means to ensure that the "ammunition" loaded by the loader is the same as that selected by the gunner shall be provided.

(f) Minimum data requirements for player feedback and AAR purposes are:

(1) Firing Platform:

- (a) Host platform ID.
- (b) Weapon initiation.
- (c) Ammunition type.
- (d) Ammunition remaining.
- (e) Tamper occurrence.

(2) Target Platform:

- (a) Host platform ID.
- (b) Firing platform ID.
- (c) Ammunition type.
- (d) Result of engagement.
- (e) Hit zone.

(g) The VES BIT shall include:

- (1) VES major components (field replaceable units).
- (2) Detectors.
- (3) Cables.
- (4) Back-up power source voltage.

(h) The results of the MILES 2000 BIT shall be displayable to a crew member.

(i) The following VES parameters shall be programmable:

(1) Weapon characteristics, to include variable programming of OPFOR weapons systems.

(2) Target Vulnerability (including aspect angle and turret position versus hull position and angle of attack).

(3) Ammunition Characteristics:

- (a) Type.
- (b) Missile time of flight.
- (c) Reload delay time.

(d) Ammunition load/mix.

(j) The VES shall include an information transfer mode which shall provide immediate access to the 16 most recent events.

(k) The VES shall include a remote display capability where appropriate to meet crew member training requirements.

(l) Installation (mounting, system check-out, and boresighting as required) of VES will be accomplished by the vehicle crew onto their operational weapons platform in less than one hour. The equipment shall be capable of being removed from a weapons platform and returned to transit cases in less than one hour by the crew.

(m) Host vehicle type with its associated vulnerabilities and weapons types shall be selectable by authorized personnel.

(n) Vehicle power may be used as the primary power source; however, the system must retain its vulnerability with the vehicle master switch in the "off" position.

(6) Characteristics of the Mobile Independent Target System (MITS):

(a) The MILES 2000 MITS shall be mountable on a variety of vehicular and non-vehicular combat/combat support/combat service support "target only" assets.

(b) Relative vulnerability of the MITS to various types of fire shall be adjustable by authorized personnel. The P_k shall be programmable across the range 0-100%.

(7) Characteristics of the MILES 2000 Controller Device:

(a) This device shall, as a minimum, have the capability to:

(1) Transmit the set of MILES codes as specified in PMT -90-S002A to a minimum of 100 meters.

(2) Decode, store, and display MILES messages to include Player ID.

(3) Remotely interrogate MILES 2000 devices for operational readiness.

(b) The Controller Device shall:

(1) Resurrect casualties to their pre-casualty state.

(2) Reset players' ammunition load.

(c) (P³I) - The Controller Device shall be capable of remotely adjusting players' ammunition load.

(d) (P³I) - The Controller Device shall have the capability to remotely time synchronize MILES 2000 devices.

(8) Characteristics of the Stored Information Downloading Device (SIDD):

(a) This device shall allow authorized personnel to retrieve and store event data from the MILES 2000 devices.

(b) The downloaded data shall be outputted to an industry standard database format.

(c) (P³I) - The SIDD shall have a wireless remote download capability.

b. Logistics and Readiness.

(1) Reliability Requirements.

(a) Threshold reliability requirements for MILES 2000 devices are as follows:

| | MTBEFF (hours) |
|-------------------------------|-------------------|
| Individual Weapons | 690 |
| Dismounted Anti-Armor Weapons | 950 |
| Combat Armored VES | 480 |
| MITS | 910 |
| Controller Device | 1900 |

(b) Objective reliability requirements are as follows:

| | MTBEFF (hours) |
|-------------------------------|-------------------|
| Individual Weapons | 1640 |
| Dismounted Anti-Armor Weapons | 970 |
| Combat Armored VES | 740 |
| MITS | 1660 |
| Controller Device | 4450 |

(2) MILES 2000 devices shall be designed for ease of maintenance and servicing with minimum personnel, materiel, parts, special tools, and equipment.

(3) Users shall perform maintenance to include dusting, cleaning, and changing batteries. All other maintenance shall be performed by contractor logistics support (CLS).

c. Critical System Characteristics. MILES 2000 devices will be fielded worldwide and used in all geographical areas.

5. Integrated Logistics Support (ILS).

a. Maintenance Planning.

(1) Maintenance of MILES 2000 devices shall be IAW procedures in the applicable technical manuals.

(2) MILES 2000 devices will be supported by an existing or new CLS contract issued by the Simulations, Training, and Instrumentation Command (STRICOM).

(3) Maintenance training shall be provided to CLS personnel.

b. Support Equipment. Maintenance above user level shall be performed by CLS using system specific and standard test and diagnostic equipment.

c. Human Systems Integration. MILES 2000 devices will replace systems currently in the field and as such will require no new manpower assets nor personnel qualifications. The system shall be fielded with a training support package consisting of operator and maintenance training to include manuals, documentation, and vehicle specific video installation instructions which shall include system capabilities and detailed installation instructions.

d. Computer Resources. Computer resources for maintenance and life cycle support shall be provided.

e. Other Logistics Considerations.

(1) Devices will be issued to installation Training Support Centers (TSC) for support of units in area of responsibility (AR 5-9).

(2) Storage, handling, and property accountability will be IAW AR 350-38 and other related documents.

(3) Devices shall be provided with containers for individual or multiple systems. The container must be capable of storing and protecting the devices under reasonable conditions of environment and handling. Pamphlets with graphics covering the installations and operation instructions of the equipment shall be included in the container.

6. Infrastructure Support and Interoperability.

a. Command, Control, Communications, and Intelligence. NA.

b. Transportation and Basing. No special transportation will be required. Using units will be responsible for transportation.

c. Standardization, Interoperability, and Commonality.

(1) MILES 2000 devices shall be downwardly compatible with the existing family of MILES devices, adaptable to a SAWE-RF/MILES II configuration, and adaptable to CTC instrumentation systems.

(2) This ORD will be provided to other services and allied governments IAW existing regulations to determine interest in cooperative acquisition of MILES 2000 devices.

d. Mapping, Charting, and Geodesy Support. NA.

e. Environmental Support. NA.

7. Force Structure.

a. MILES 2000 devices will be issued to installation TSCs based on the number and type of units supported, so equipment density will vary from installation to installation. For the most part the devices will be issued in "unit sets" (i.e. sufficient number and mix of devices to outfit a specific type of unit, e.g. an armor battalion).

b. It is anticipated that the devices will be fielded to support Active Component (AC) and Reserve Component (RC) training requirements.

c. The distribution plan currently calls for the following total numbers of devices, which are subject to adjustment as the force structure changes:

| DEVICE | TOTALS |
|----------------|---------------|
| M16 Rifle | 130,434 |
| SWS | 500 |
| SAW | 8,830 |
| M60 MG | 5,934 |
| M2 MG | 3,628 |
| LAW | 11,484 |
| Dragon | 3,926 |
| TOW | 635 |
| M113 APC | 4,293 |
| M-1 Tank | 3,743 |
| M2/3 BFV | 4,319 |
| MITS | 10,670 |
| OPFOR Vehicles | 1,400 |

8. Schedule Considerations. Initial operational capability (IOC) will be achieved when the first installation on the distribution list has received enough equipment and manuals to support a battalion task force FOF (BLUFOR/OPFOR) exercise. Full operational capability will be achieved when the current inventory of MILES equipment has been replaced with MILES 2000 devices. An IOC of 1QFY95 is desired.

Annexes

A - Rationale

B - Coordination