PRF-PT-00434B
26 March 2010

PERFORMANCE SPECIFICATION

FOR THE

MULTIPLE INTEGRATED LASER ENGAGEMENT SYSTEM (MILES)
INDIVIDUAL WEAPON SYSTEM (IWS)

Prepared by:
U.S. Army PROGRAM EXECUTIVE OFFICE for SIMULATION, TRAINING, & INSTRUMENTATION (PEO STRI)
12350 Research Parkway
Orlando, FL 32826-3276

SUBMITTED BY: Bobbi J. Parrish DATE: 26 MARCH 2010
Bobbi J. Parrish
Systems Engineer, SFAE-STRI-PS-EL

APPROVED FOR USE
AS ALLOCATED
BASELINE BY: James Grosse DATE: 26 MARCH 2010
James Grosse
Chief Engineer, Live Simulation Division, SFAE-STRI-PS-EL

TABLE OF CONTENTS

1 SCOPE

This performance specification defines the performance requirements of the Multiple Integrated Laser Engagement System (MILES) Individual Weapon System (IWS) and associated equipment.

1.1 SYSTEM DESCRIPTION

The MILES Individual Weapon System (IWS) requirement is for the replacement of the existing U.S. Army direct fire ground based MILES devices (Basic MILES) with the laser-based Tactical Engagement Simulation (TES) training devices. All MILES systems and devices will be downwardly operational compatible with the Basic MILES and MILES 2000 training devices. The MILES system will be fielded worldwide and used in all geographical areas. The MILES will not require new manpower assets, personnel requirements, or qualifications.

1.2 BACKGROUND

The family of the Basic MILES was developed in the early 1980's using technology and designs then available. The Army has identified the need for enhanced force-on-force simulation of armor and anti-armor devices. The enhancements will include player identification (PID), fratricide identification, multiple levels of kill, and vulnerability due to direction of attack. New weapons, ammunition, and weapon performance will be accommodated.

2 APPLICABLE DOCUMENTS

The following documents shown below form a part of this Specification to the extent specified herein.

2.1 SPECIFICATIONS, STANDARDS AND HANDBOOKS

The following specifications, standards, and handbooks form a part of this document to the extent specified herein.

MILITARY STANDARDS

MIL-STD-810E Notice 3	Environmental Test Methods and Engineering Guidelines
MIL-STD-1472F	Human Engineering Design Criteria for Military Systems, Equipment and Facilities
MIL-STD-461	Requirements For The Control Of Electromagnetic Interference Characteristics Of Subsystems And Equipment

(Unless otherwise indicated, copies of the above specifications, standards, and handbook are available through: https://assist.daps.dla.mil/quicksearch/.

2.2 OTHER GOVERNMENT DOCUMENTS

The following other Government documents, drawings, and publications form a part of this specification to the extent specified herein.

PMT 90-S002I	MILES Communication Code (MCC97) Standard
ICD 290065 REV D	Interface Control Document For The Data Interface Between The Range Communication System (RCS) Range Data Management System (RDMS) Data Communication Interface Unit (DCIU) and Tetrapol Central Node (TCN) for the National Training Center Instrumentation System (NTC IS)
ICD 706014 REV F	Interface Control Document for the Data Communication Interface (DCI) to Detection Device (DD) Interface Design for the Combat Training Centers (CTC) Instrumentation System (IS)
SAIB	Small Arms Integration Book (SAIB) March 2002
	Ground Safety Notification System Message, Control No. 95-01, Multiple Integrated Laser Engagement System (MILES)

(Unless otherwise specified copies of other Government documents, drawings and publications are available from: http://www.peostri.army.mil/PM-TRADE/ICD/.

2.3 CODE OF FEDERAL REGULATIONS

The following code of federal regulations form a part of this document to the extent specified herein.

10 CFR 40	Domestic Licensing of Source Material
21 CFR 1040	Performance Standards for Light-Emitting Products

(Unless otherwise specified copies of code federal regulations are available from: http://www.access.gpo.gov/nara/cfr/cfr-table-search.html)

2.4 NON-GOVERNMENT STANDARDS AND PUBLICATIONS

The following documents form a part of this document to the extent specified herein.

ANSI/NFPA 70-02 National Electrical Code

Air Transport Association of America (ATA)

ATA SPEC 300 Packaging of Airline Supplies (Revision 18)

American National Standards Institute (ANSI)

ANSI Z136.1-2000 Safe Use of Laser (Revision of ANSI Z136.1-1993)

ANSI/NEMA Z535.3 Criteria for Safety Symbols

ANSI/NEMA Z535.4 Product Safety Sign and Labels

(Unless otherwise specified copies of above documents are available from: http://www.nssn.org/

2.5 ORDER OF PRECEDENCE

In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3 REQUIREMENTS

3.1 MILES TRAINING SYSTEM DEFINITION

The MILES Individual Weapon System (IWS) shall:

a. Consist of a family of laser based training devices appended to foot soldiers and individual weapons.

b. Have a modular design with the flexibility to permit upgrading of the training system to accommodate product improvements.

c. Simulate each herein specified weapon and ammunition effect on a MILES equipped system.

d. Interface and be compatible with legacy MILES training devices in accordance with (IAW) PMT 90-S002.

e. Provide an external RS-232 serial interface to provide the capability to send and receive real-time data necessary to interface to the Combat Training Centers (CTCs). The signals as a minimum shall consist of transmit (Tx), receive (Rcv), and signal return (Ret). The RS 232 port will operate at baud rates between 2400 to 57600 with 1 start bit, 8 data bits, and 1 stop bit. This interface shall be located at either one of the lower front corners of the Harness. This interface shall be tested IAW ICD 706014, and ICD 290065.

f. As the result of a weapon trigger pull in an engagement, transmit messages that contain a unique PID code and the weapon and ammunition code in accordance with (IAW) PMT 90-S002.

g. Assess the lethality effects of the engagement.

h. Trigger the specified visual and audio cues.

i. Store engagement data in electronic media for retrieval and use in After Action Reviews (AARs).

j. Be programmable using an external programming source that does not require opening system devices or removing system components.

k. Provide ancillary devices to align lasers to weapon systems sights, for both zeroed and un-zeroed weapons.

l. Provide the necessary equipment to perform alignment of one hundred soldiers in less than one hour.

m. Provide administrative control functions

n. Be easy to maintain and service with minimum personnel, materiel, parts, special tools, and equipment.

3.1.1 MILES SYSTEM PRIME ITEMS

The MILES Training System shall consist of the following prime items:

a. MILES Individual Weapon System (IWS)

b. Training Data Transfer Device (TDTD) System

c. Ancillary Devices

3.1.1.1 FIRST ARTICLE

When specified, a sample shall be subjected to first article inspection.

3.1.2 MILES INTERFACE

Each MILES Laser Transmitter Unit shall interface with the MILES Manworn System by way of a laser light beam communication channel through the atmosphere IAW PMT 90-S002.

3.1.2.1 BASIC MILES INTERFACE

Each MILES device shall interface and be compatible with MILES Training Devices by way of the specified laser communication channel through the atmosphere IAW PMT-90-S002.

3.1.2.2 OPERATOR INTERFACE

Each MILES system and device shall interface with individual operators, crews, and controllers to input data and select system parameters to the MILES systems and to receive the system data from the MILES system.

3.1.2.3 DATA TRANSFER INTERFACE

Each MILES system shall provide an external data input/output (I/O) interface via an industry standard interface protocol for the upload and download of data meeting the specific timing requirements. The data transfer interface shall allow for the download of event data from the MILES systems**,** the upload of PID, weapon characteristics, and vulnerability data (Pk table) and the download of events data to a PC, laptop computer, Personal Digital Assistant (PDA), or similar device.

3.1.2.4 HOST INTERFACE

MILES systems shall interface optically, electronically, and mechanically with weapons systems, and operators.

3.1.2.4.1 MECHANICAL INTERFACE

The MILES systems shall be appended to weapon systems, and individual operators.

3.2 SYSTEM CHARACTERISTICS

3.2.1 INDIVIDUAL WEAPON SYSTEM (IWS) SYSTEM PERFORMANCE

The MILES IWS training system shall provide force-on-force engagement simulations to obtain feedback on the effects of direct fire weapon engagement simulations: on personnel, independent targets, crew served weapons, combat vehicles, and aircraft systems. MILES shall have the capability for use during periods of reduced visibility and darkness within the capabilities of the weapons with which it is being used. The casualty assessments shall pair attackers and their targets. The engagement results shall be indicated to the target and

attacker using visual and audible cues. The IWS shall perform IAW all MILES performance requirements and the following:

a. An IWS configuration for each of the weapons as defined in Appendix A is required. Each configuration shall provide a means of engagement pairing to a MILES attacker and lethality assessment at the Individual Weapon System.

b. The IWS shall be capable of being fired by any individual with a MILES Manworn System that is not in a kill casualty assessment mode. The Laser Transmitter shall transmit the PID and Ammo Type of the associated person operating the IWS.

c. Shall have a selectable mode of operation, not dependent on blanks, for use in aligning the laser output with the weapon sighting and for testing. This dryfire mode shall require controller personnel interaction for selection and shall not be independently available to the weapon operator.

d. Shall operate with blanks as a normal operating condition when mounted on an individual operator weapon. The IWS shall generate, upon firing of the blank, the electronic signals to encode the MILES Laser Transmitter Unit to implement the Enhanced MILES Communication Code IAW PMT 90-S002. When not in a dryfire mode, the laser simulation of a round or burst of rounds shall be fired only when activated by the firing of blank rounds.

e. Have no interconnecting cables between the Laser Transmitter and the other components of the IWS.

f. Shall provide an indication to the operator that pairing transmission has occurred in response to the firing of a blank round or a trigger pull when in dry-fire mode.

g. The M24 Laser Transmitter Unit shall transmit the M16 MILES weapon code parameters as specified in PMT-90-S002.

h. The M2, M107 Laser Transmitter Unit shall transmit the M2 MILES weapon code parameters as specified in PMT-90-S002.

i. The M249 Squad Automatic Weapon (SAW) Laser Transmitter Unit shall transmit the M16 MILES weapon code parameters as specified in PMT-90-S002.

j. The M240 Laser Transmitter Unit shall transmit the M16 MILES weapon code parameters as specified in PMT-90-S002.

k. The M16 and M4 shall have a common Laser Transmitter Unit with bracket.

l. Shall provide a Halo that communicates to the Harness via an inductive loop compatible with the Basic MILES and MILES 2000 Manworn.

m. The Laser Transmitter Unit shall report to the Manworn System every time it transmits a laser message.

n. Shall provide an IWS's Manworn System that shall:

(1) Assess a kill or near-miss when the Manworn System receives and decodes a MILES coded signal and determines the appropriate action IAW PMT-90-S002. The manworn Pk values for the Manworn System, with and without body armor, to be stored and utilized in the casualty assessment are as specified in PMT90-S002.

(2) Inhibit the wearer from firing any IWS when the Manworn System has assessed that a kill has occurred.

(3) Have no external power switch. Removal of the power source shall cause a soldier to be assessed as a cheat kill. Provide a low power indication. After receiving a low battery indication the Manworn System shall have a time delay of at least two but not more than three minutes before assessing a cheat kill to allow for battery replacement.

(4) Perform the following actions in response to a corresponding electronic signal received by the Manworn System through the data transfer interface.

(a) Perform a kill
(b) Perform an administrative kill
(c) Indicate a near miss
(d) Reset the Manworn System
(e) Resurrect the Manworn System
(f) Synchronize the internal clock
(g) Modify the Pks of the Manworn System
(h) Run BIT
(i) Modify the System's PID

(5) Contain a device that shall generate a 74 +14/-6 dB audible signal 24 inches from the signal source, for not less than thirty seconds or until the user has acknowledged the Kill indication, each time the Manworn System determines a kill assessment. When the Manworn System determines a near miss assessment, the device shall emit a 0.3 up to 1.0 second 74 dB +14/-6 dB signal as specified for the MILES Manworn System.

(6) Automatically and within 500msec disable the Laser Transmitter Unit when a kill assessment has been assessed by the Manworn System.

(7) Be mounted such that a hit profile of an infantry soldier is created as specified for the MILES Manworn System.

(8) Return the MILES system units to a full operational state and stop any casualty assessment indication upon decoding of a reset or resurrection MILES code word.

(9) Contain a data display located on the Manworn System as specified for the MILES Manworn System. The display shall be readable by the wearer and by observer/controllers standing at a distance of two feet from the Manworn System.

(10) Have no direct mechanical connection, including electrical wire links, between the helmet/halo, weapon's Laser Transmitter Unit, or soldier's Manworn System, with the exception of interface with instrumentation systems or Land Warrior systems.

(11) Provide a Harness that shall not interfere with the soldier's Light Forces Vest, load bearing equipment (LBE), Modular Lightweight Load-bearing Equipment (MOLLE), or Interceptor Body Armor.

(12) Store on-board the Manworn System an OPFOR PID, BLUEFOR PID, and Pks. The PIDs shall be retained in memory such that they are available for selection by authorized personnel upon power up as part of the Manworn System's initialization. The Manworn System shall retain the information in semi-permanent memory that can be overwritten by downloading additional information from the TDTD System.

(13) Can be used with night vision goggles, and with the combat helmet and softcap headgear. (Combat helmets include PASGT (Helmet Ground and Parachutists) Helmet and ACH (Advanced Combat Helmet).

(14) In the event of a Cheat Event or a Tamper Event a catastrophic kill shall be assessed.

(15) The detector's amplifier circuit shall be a separate module from the Manworn System processing unit. The Manworn System shall provide a connector between the MILES Vest with Amplifier and the Processing Unit. Power to the Amplifier circuit shall be provide thru this connector. The connector shall be accessible only to maintenance personnel (not accessible to the user).

(16) The Manworn System shall have a total rounds fired field to be updated with every shot

(17) The Manworn System shall be capable of associating Surrogate Weapon Systems (i.e.: AT-4)

3.2.1.1 LASER TRANSMITTER UNIT (LTU)

The MILES IWS Laser Transmitter Unit shall:

a. Transmit weapon engagement data, including man kill code words, near miss code words, ammunition type, and PID, which allows Probability of Kill assessments.

b. Transmit the MILES PID that allows pairing between the shooter and the target.

c. Be downward MILES compatible by:

(1) Projecting a laser beam(s) to produce out to the effective range the hit "footprint" onto a target for each weapon and its ammunition being simulated as listed in Appendix A. The laser beam hit "footprint" shall convey ammunition type, PID, and the number of man and armor kill words as specified in PMT-90-S002,

(2) Projecting a laser beam(s) to produce out to the effective range the near miss "footprint" onto a target for each weapon and its ammunition being simulated as listed in Appendix A. The laser beam near miss "footprint" shall be larger than the laser beam hit "footprint" and shall convey ammunition type, PID, and the number of near miss words as specified in PMT-90-S002.

(3) Transmitting engagement data encoded on the laser beam for shooter to target pairing with the pairing probabilities. The aim point for the Laser Transmitter shall be the center of the target profile. For weapons that use blank ammunition for training purposes the MILES pairing probability shall be tested using blank ammunition, an independent certified government shooter shall be used for all pairing tests performed. MILES pairing probability shall be tested in its intended operational mode. A valid pairing shall include the correct decoding of the MILES Code, PID, and Ammo Type. The standard atmospheric conditions for the MILES training system are defined as a maximum visibility of 23.5 Km, wind speed of 2.5 $\pm$2.5 KMPH, a relative humidity of 55 $\pm$15 percent. The pairing requirement is below:

15%, 50%, 90% of Weapon Effective Range						
Weapon	Target System	Firing Mode	Assessment Required	-18 to 20 degrees C	25 +/- 5 degrees C	30 to 49 degrees C
M16A2, M4, M24, M107	Single MILES Manworn System	Single shot	Hit or Kill	90%	95%	90%
M240, M249, and M2	Three MILES Manworn Systems side by side, with 1±0.1 meter between the center of each target	Burst mode consisting of six to nine shots	Hit or Kill	80%	85%	80%

170% of Weapon Effective Range						
Weapon	Target System	Firing Mode	Assessment Required	-18 to 20 degrees C	25 +/- 5 degrees C	30 to 49 degrees C
M16A2, M4, M24, M107	Single MILES Manworn System	Single shot	Hit or Kill	<20%	<20%	<20%
M249	Three MILES Manworn Systems side by side, with 1±0.1 meter between the center of each target	Burst mode consisting of six to nine shots	Hit or Kill	<20%	<20%	<20%

15%, 50%, 90% of Weapon Suppression Range						
Weapon	Target System	Firing Mode	Assessment Required	-18 to 20 degrees C	25 +/- 5 degrees C	30 to 49 degrees C
M240 and M2	Three MILES Manworn Systems side by side, with 1±0.1 meter between the center of each target	Burst mode consisting of six to nine shots	Hit, Kill or Near Miss	80%	85%	80%

130% of Weapon Suppression Range						
Weapon	Target System	Firing Mode	Assessment Required	-18 to 20 degrees C	25 +/- 5 degrees C	30 to 49 degrees C
M240 and M2	Three MILES Manworn Systems side by side, with 1±0.1 meter between the center of each target	Burst mode consisting of six to nine shots	Hit or Kill	<20%	<20%	<20%

Note: The range to target shall be adjusted to take into account visibility conditions that are less than or greater than the standard clear visibility of 23.5 km.

(4) Transmit the Laser Transmitter Unit laser light beam at a wavelength of 904.5 ±25 nanometers.

d. Have no external power switches.

e. Provide a means of mounting and aligning the laser transmitter to the weapon system sights within 5 minutes or less with at least 264 hour alignment retention under training exercise conditions. The mounting of the laser transmitter shall not interfere with any tactical sighting device IAW Small Arms Integration Book (SAIB). Laser alignment shall be accomplished by adjustments made to the Laser Transmitter Unit and not the host weapon sights, the solution shall work with both zeroed and non-zeroed weapons. If this alignment requirement includes an Alignment Device(s), it shall be a stand-alone device.

f. Provide a single shot dryfire mode for pairing without firing blank ammunition. The dryfire mode shall require controller personnel interaction for selection and shall not be independently available to the weapon operator. If a dryfire trigger unit is provided it shall meet the rain, sand and dust environmental requirements.

g. Provide the shooter with a visual indication that the laser transmitter is firing properly.

3.2.1.2 TARGET SYSTEM

IAW PMT 90-S002, the MILES IWS Manworn Systems shall:

a. Decode the following Laser Transmitter Unit messages:

(1) Weapon Type
(2) Ammo Type
(3) PID

b. Be compatible with Laser Transmitter codes fired from MILES systems and:

(1) Detect the encoded laser beam transmitted by the MILES Laser Transmitter in ambient illumination ranging from darkness to full sunlight.

(2) Utilize detectors with maximum response centered in the 904.5±25 nanometers range.

(3) Pair throughout 360 degrees of detection coverage in azimuth and ±45 degrees of detection coverage in elevation off the centerline of the target.

(4) Create a statistical shot pattern that meets the requirements below:

(a) The statistical hit profile for the front and back of the Manworn System and the sides of the MILES 2000 TOW shall consist of a collection of aim points that pair the MILES man kill words and PID from the following Laser Transmitter Unit with the corresponding Target System. This profile, when measured in the dryfire mode at the midpoint of the Weapon's effective range, shall be larger than a circle with a diameter of 0.2 meters and shall fit inside a rectangle measuring 1.5 meters in the horizontal plane and 2.5 meters in the vertical plane.

Laser Transmitter(s)		Target System(s)
M16A2, M24, M240, M249, M2, M107	vs.	Manworn System
M16A2, M24, M240, M249, M2, M107	vs.	MILES 2000 TOW

(5) Process the electronic signals to decode the MILES code messages IAW PMT-90-S002. For missile engagements, initiate the casualty determination after 22 missile code messages are received within the tracking interval specified in PMT-90-S002, the initiation of the casualty determination shall not be dependent on the closing of the decoder's tracking interval window. In the event that the number of messages for a casualty evaluation is received before the tracking interval (decoding window) ends, the casualty assessment shall be made at that point.

c. Contain externally programmable Probability of kill (Pk) data for each MILES code number. All Pk values shall be externally programmable independently of the re-loading of the system software. The TDTD shall have the capability to upload a custom Pk table.

d. Process the decoded message in conjunction with a Pk factor in a MILES lethality algorithm and the target/weapon hierarchy specified in PMT-90-S002 to assess the effect of the attacking weapon on the attacked MILES system. In the event that only the MILES code portion of the message is decoded (no valid PID is decoded) the Manworn System shall still perform the casualty assessment.

e. Generate the following audio signals to trigger the following actions upon completion of casualty assessment effect on a target:

(1) Two tones for Manworn System's near miss indication.

(2) Continuous tones for the Manworn System's kill indication.

f. Process the PID portion of each engagement message group for linkage with lethality assessment.

g. Provide with an internal clock containing day, month, year, and time information synchronized by the Controller Device to a 30 second accuracy in a 96 hour period. The time display format shall be XXYYZZ or XX:YY:ZZ—where XX represents hours (00-24), YY represents minutes, and ZZ represents seconds.

h. Record and store MILES events that occur during a training exercise. The event recorder shall have sufficient memory capacity for storing the data of the last 500 events. Recorded data shall be retained under low power conditions and battery removal. Host PID shall be recorded with all events. The event data fields to be stored and displayed shall include the following:

(1) Initiation events, to include power up and Laser Transmitter association.

(a) Synchronized time of event
(b) Built In Test (BIT) results

(2) Lethality assessment events, to include hit, kill, and near miss.

(a) Synchronized time of event
(b) Lethality assessment
(c) PID of attacker
(d) Weapon and ammunition type
(e) Determination of fratricide by comparison of shooter and target PID

(3) Cheat Events, to include tampering attempts.

(a) Synchronized time of event
(b) Cheat category description

(4) Administrative events, to include time synchronization, administrative kills, resurrect, reset, and commanded BIT results.

(a) Synchronized time of event
(b) Administrative category description

i. When a casualty has been assessed, during both day and night conditions, display the weapon type causing casualty and the casualty assessment. The message shall remain displayed for 7.5 ±2.5 seconds.

j. Visually display, upon recall, no less than the 16 most recently recorded events. The scrolled messages shall remain displayed for 7.5 ±2.5 seconds. At a minimum, the following information shall be available for display:

(1) Results of last event (Kill/hit/near-miss)

(2) PID of attacking player/weapon system when killed

(3) Low battery indication

(4) BIT failure (by type)

(5) Host platform PID

(6) Synchronized time of an event in military format to the nearest second

k. Provide an interface that shall be used to manually select a PK table. This action shall require controller personnel interaction via MILES Code 35 with the associated PID and shall not be independently available to the user.

l. Allow transfer of the stored event data.

m. Allow download of vulnerability Pks and other data that programs the device to allow it to assume the role and performance characteristics of the system on which it will be installed. The data to be transferred shall include the following:

(1) OPFOR PID

(2) BLUEFOR PID

(3) Vulnerability and Pk data

n. Capability to prevent the host system from assessing a self kill from its own encoded laser transmission. The laser transmission is composed of the MILES code, Player ID, and Ammo Type. The self kill assessment shall be based on all three components of the laser transmission.

o. Provide a means to detect player efforts to inhibit MILES system equipment performance. Whenever the player tampers with a MILES system to interfere with normal power supply, cable connections, detectors, semi-permanent memory data storage unit, and controller's interface when it is locked to the player, the system shall detect a tamper attempt and perform a kill on the MILES system. The tamper attempt shall be stored in the event storage.

p. Retain all stored information regardless of system power status.

q. Contain an event memory clear function to allow only controller personnel to clear the event memory.

s. Perform a MILES catastrophic kill at the time of system power up.

3.2.2 BIT CHARACTERISTICS

A built-in fault detection and locating system shall be provided to detect performance degradation and failures and provide GO/ No Go status for all MILES systems. BIT features shall include the following:

a. Provide an assessment of overall system integrity in not more than 1 minute upon command.

b. Diagnose problems and faults to at least the major component level (excluding transit cases).

c. All MILES systems and devices which use battery power shall have a method to self test the battery power level for immediate operation without the use of special tools or modification. This test shall be performed automatically upon battery insertion and shall notify the operator of the battery power status.

d. Function on-line, shall be entirely self-contained, and shall require no external measurement equipment.

e. Display the results of BIT to the MILES system operator when the system has completed an integrity checkout.

f. Power On BIT - All MILES systems shall automatically initiate a complete BIT sequence in response to powering up the system with results indicated.

g. Manual BIT - All MILES systems shall initiate a complete BIT sequence in response to a request from the system operator.

3.2.3 COMPUTATIONAL SYSTEM REQUIREMENTS

The MILES computational system shall consist of computer systems and system software.

3.2.3.1 OPERATIONAL COMPUTER SYSTEMS

The operational computer systems shall consist of one or more commercial item processors and peripherals, interface hardware, controllers, and cables. Each processor shall have a word size, operating speed, installed memory, and bus bandwidth to fulfill the system requirements and spare capacity requirements of this Specification. The operational computer system(s) shall provide the following spare resources to allow for expansion and modification. Spare requirements shall be met during worst-case system operating conditions where maximum demands are placed on processors, memories, and I/O channels. The required spare resources are as follows:

a. Spare memory. The system shall provide spare memory for each processor equal to 50% of the installed memory for that processor. Spare memory for any shared memory equal to 50% of the installed memory shall also be provided. All installed spare memory shall be directly addressable by the delivered processor and operating system.

b. Spare I/O Capacity. The spare I/O channel throughput capacity shall equal or exceed 50% of the total installed I/O channel capacity.

3.2.3.2 OPERATIONAL SYSTEM SOFTWARE

The operational system software shall consist of one or more of the following: developed

software, reusable software, commercial item software, and modified previously-developed software. The system software shall consist of applications programs, support programs, and control programs required to meet the performance requirements.

3.2.3.2.1 SOFTWARE DEVELOPMENT REQUIREMENTS

Software procured under this Contract shall have been developed using recognized modern software engineering methods, and using a commercial item programming language and compiler. All machine dependent code and compiler dependent code shall be logically grouped into separate packages with meaningful names. Adaptation of previously-developed software to make it fully compliant with the MILES requirements shall also be accomplished using recognized modern software engineering methods.

3.2.3.2.2 RUN TIME ENVIRONMENT

If used, the run time environment shall consist of a commercial item real-time operating system.

3.2.3.2.3 FIRMWARE

Code or data which is stored in hardware devices (e.g., in a Programmable Read Only Memory) is software and shall be incorporated into the appropriate Computer Software Configuration Items (CSCI) with the same requirements as other software.

3.2.4 FALSE ALARM RATE

The MILES IWS shall have a cumulative false alarm rate of not more than one false alarm per 100 hours of field operations for 100 Individual Weapon Systems.

3.2.5 INSTALLATION AND REMOVAL REQUIREMENTS

All MILES systems shall be installed, operated, and removed without physical damage to or permanent modification of the host weapon system.

3.2.6 MOUNTING

MILES IWS system components that are mounted shall be as transparent as possible to the individual.

3.2.6.1 MOUNTING DEVICES

Mounting devices shall include all devices required to secure MILES system components to the host platform. Fasteners manipulated by the soldiers in the field shall be of the captive type.

3.2.7 NOT USED

3.2.8 TRANSIT CASES

The MILES device and system level transit cases shall be used to protect MILES components during transportation, storage, and handling. Where practical, the cases shall hold all the components of one or more kits of a particular configuration. The transit cases shall be built to comply with ATA SPEC 300, category I container. The transit case shall provide protected areas for attachment of all hardware. Top and bottom case surfaces shall be interlocking. Transit Cases shall be strong enough to stack 3 high in a storage environment. All transit cases requiring a two-person or higher lift shall have handles on all four sides. Transit cases shall have a data plate, inside the case, indicating type and amount of components stored within. A picture or line drawing shall be used to represent the layout of components.

3.2.9 PHYSICAL CHARACTERISTICS

3.2.9.1 WEIGHT AND SIZE

All MILES component assemblies shall be transportable and maneuverable by one person. When assembled in their respective operating configuration, the weight of each MILES component shall not exceed that prescribed by the lift and carry requirements. The weight and center of gravity of the MILES devices shall not impede the carrying, movement and functioning abilities of the individual or crew in conducting training. The MILES system components and devices shall be minimized such that they do not impede the carrying, movement, and functioning abilities of the individual, crew, and host platform in conducting training. Table 1 provides the maximum physical characteristics for the MILES IWS.

COMPONENT	SIZE/DIMENSIONS (INCHES) (H x W x L) or (V)	WEIGHT (LBS)
M240 Laser Transmitter (with bracket)	N/A	1.15
M16/M4 Laser Transmitter (with bracket)	N/A	1.0
M249 Laser Transmitter (with bracket)	N/A	1.0
M24 Laser Transmitter (with bracket)	N/A	1.0
M2 Laser Transmitter (with bracket)	N/A	4.0
M107 Laser Transmitter (with bracket)	N/A	2.0
Harness	N/A	2.0
Halo	N/A	0.3

MILES IWS MAXIMUM COMPONENT PHYSICAL CHARACTERISTICS
TABLE 1

3.2.9.2 POWER

All MILES system and devices shall have a self- contained power source. A commercially available power source shall be used.

3.2.9.2.1 POWER OPERATION

The MILES power supply shall satisfy the following power operation requirements:

a. The Individual Weapon Laser Transmitter Unit(s) shall be powered by a power source which shall implement a minimum of 10,000 shots over a period of 100 hours of field use before power source replacement is required.

b. The Manworn System shall provide a minimum of 100 hours of continuous operation without power source replacement, while sustaining at least 20 near miss assessments per day and 2 catastrophic kills per day.

c. The Alignment Device shall provide a minimum of 100 hours of continuous operation without power source replacement, while performing 60 alignments per day.

3.2.9.2.2 REPLACEABLE BATTERIES

All batteries shall take no more than two minutes to replace. All batteries shall be U.S. Army Communications-Electronics Command (CECOM) (www.monmouth.army.mil/cecom/lrc) approved. All batteries shall be easily accessible to the operator without need for tools.

3.2.9.2.3 LONG LIFE BATTERIES

Long-Life Batteries are batteries that will power the system for at least 2 years. All batteries shall take no more than ten minutes to replace. All batteries shall be U.S. Army

Communications-Electronics Command (CECOM) (www.monmouth.army.mil/cecom/lrc) approved. All batteries shall be easily accessible to the operator without need for special tools. The ninety-six (96) hour exercise is most frequently expected, and therefore will be used as the Design Reference Mission Profile (DRMP). Any given piece of MILES equipment is expected to be used the equivalent of forty-eight (48) ninety-six (96) hours exercises per year, for a total of 4608 hours per year.

SYSTEM/PLATFORM	ROUNDS EXPENDED PER 96 HR EXERCISE
Individual Weapons	
M16/M4 Rifle	600
M249 SAW	1500
M240 MG	2000
M2 MG	800
M24/M107	30

The Manworn System shall have 2 Kills and 20 Near Misses per day. The system will perform two alignments per day.

3.2.9.3 FINISH

All exterior surfaces of MILES components and devices shall be treated to resist corrosion or deterioration due to exposure to the elements.

3.2.9.4 COLOR

Selection of color for all surfaces shall be the low visibility, lusterless, nonreflective type. The color of the components shall be green or black, with the exception of surfaces required for the transmission or reception of electromagnetic signals.

3.2.9.5 TRANSPORTABILITY

Lift limits for devices shall be: One person (Male & Female - assuming 5 ft lift) - 37 pounds, Two-persons - 74 pounds, Three-persons 101.75 pounds, Four-persons - 129.5 pounds. Devices exceeding one person lift limits shall be prominently labeled with the total weight and required number of handlers. All MILES systems, when packed in their transit cases, shall withstand damage due to stresses incidental to movement, handling in transit, and tie-down aboard common carrying vehicles such as aircraft or trucks.

3.2.10 RELIABILITY

Each MILES IWS and Alignment Device shall have a minimum acceptable Mean Time Between Essential Functional Failure (MTBEFF) requirement of 690 hours and an objective MTBEFF of 1640 hours.

3.2.11 MAINTAINABILITY

The maximum acceptable Mean Time to Repair (MTTR) for each MILES system and device shall be 60 minutes or less. All equipment shall be easy to maintain and service with the minimum of personnel, material, parts, special tools and equipment.

3.2.12 ENVIRONMENTAL CONDITIONS

Devices and component parts, units, and subassemblies of MILES shall operate and be stored under the environmental conditions as follows:

3.2.12.1 HIGH TEMPERATURE

MILES system components and devices, to include the Alignment Device, shall comply with the following temperature requirements:

a. All components shall operate in an environment with a maximum temperature of 49 degrees Celsius and Solar Loading of 1120 W/m².

b. All components shall operate after being stored in an environment with a maximum temperature of 70 degrees Celsius.

3.2.12.2 LOW TEMPERATURE

MILES system components and devices to include the Alignment Device shall comply with the following temperature requirements: Minimum operating temperature shall be -18 degrees C and the minimum storage temperature shall be -33 degrees C.

3.2.12.3 SHOCK

MILES components and devices shall not be damaged when subjected to the specified shock spectrum of MIL-STD-810E NOTICE 3, Method 516.4, Procedure I - Functional Shock. Components and devices in their transit cases shall not be damaged when subjected to the recommended drop test of Table 516.4-II and Procedure IV - Transit Drop.

3.2.12.4 VIBRATION

MILES components and devices shall not be damaged when subjected to the specified vibration limits of MIL-STD-810E Notice 3. The requirements of MIL-STD-810E Notice 3 shall be:

a. The Alignment Device(s) shall continue to function after being subjected, without transit cases, to Method 514.4, Category 3 (Loose Cargo).

b. Individual Weapon System components shall continue to function after being subjected, without transit cases, to Method 514.4, Category 3 (Loose Cargo).

3.2.12.5 HUMIDITY

MILES component and devices , to include the Alignment Device, shall not be damaged during operations under relative humidity conditions up to 100%.

3.2.12.6 RAIN

Alignment Device(s), TDTD, and all transit cases shall not be damaged when subjected to the following limits. Those components and devices subjected to the immersion test shall not be subjected to the rain test.

Rainfall rate:	10 centimeter/hour
Droplet size:	0.5 millimeter to 4.5 millimeters
Wind velocity:	64 kilometers/hour

3.2.12.7 SAND AND DUST

MILES components, devices, Alignment Devices, and Transit Cases shall not be damaged when subjected to the following limits:

Blowing sand air velocity:	29 meters/second
Sand concentration:	1.1 $\pm$0.25 g/cubic meters

Blowing dust air velocity:	8.9 meters/second
Dust concentration:	10.6 ±7 g/cubic meters
Dust composition:	Silicon Flour

3.2.12.8 IMMERSION

The Individual Weapon Systems shall show no evidence of water leakage when immersed in water to a depth of one meter IAW MIL-STD-810E NOTICE 3.

3.2.12.9 CORROSION

Internal circuitry and components shall be treated to resist corrosion and deterioration due to condensation.

3.2.12.10 SALT AND FOG

All exterior surfaces, including transit cases, shall be treated to resist corrosion or deterioration. As a minimum performance requirement, these surfaces shall exhibit no blistering, lifting of the coating system, and substrate corrosion after being subjected to a 5% sodium chloride atomized spray as described in MIL-STD-810E Notice 3, Method 509.3.

3.3 CONSTRUCTION

3.3.1 MATERIAL AND PARTS

The MILES components and devices should maximize the use of commercial and non-developmental products.

3.3.2 ELECTROMAGNETIC RADIATION.

The equipment shall be electromagnetically compatible with itself such that system operational performance requirements can be met. All hardware intended for field use shall be Electromagnetic Compatible (EMC) with all other adjacent operating systems intended for field use. The equipment shall be electromagnetically compatible with the defined external EME such that system operational performance requirements can be met. Inter-system EMC covers compatibility with, but is not limited to, the installation site EME, adjacent facilities and friendly emitters (other MILES equipment (MILES I, MILES 2000, MILES XXI), CB, UHF, VHF, cellular, etc.).

3.3.2.1 RADIATED EMISSIONS

The radiated emission limits of MIL-STD-461E, RE102, for electric fields, ground installed equipment, shall be met for the frequency range of ten kHz to 18 GHz. The IWS components and devices when operating shall be not be a source of radiated emissions so as to create electromagnetic interference, malfunctions, degradation of performance, or deviations from operational parameters to adjacent operating electronic or electrical equipment.

3.3.2.2 RADIATED SUSCEPTIBILITY

The IWS components shall be able to operate in the following radiated electrical field levels without a degradation in performance.

FREQUENCY RANGE	ELECTRIC FIELD INTENSITY
10 kHz to 2 MHz	20 Volts/meter
2 MHz to 30 MHz	50 Volts/meter
30 MHz to 1 GHz	50 Volts/meter
1 GHz to 18 GHz	50 volts/meter

3.3.2.3 ELECTROSTATIC DISCHARGE (ESD) EFFECTS

The MILES IWS electronic equipment and controls that are operator accessible shall be designed to minimize degradation of performance when subjected to ESD.

Interior & Exterior Levels
(kilovolts)
4

Electrostatic Discharge EME

3.3.2.4 NON-DEVELOPMENTAL ITEMS (NDI) AND COMMERCIAL ITEMS

The NDI and commercial items shall meet the Electromagnetic Environmental Effects (E^3) requirements suitable for ensuring that the system operational performance requirements are met.

3.3.2.5 LIFE CYCLE E^3 HARDNESS

The MILES equipment operational performance and E^3 requirements shall be met throughout the rated life cycle of the equipment and shall include the following: maintenance, repair, surveillance, and corrosion control.

3.3.2.6 ELECTROMAGNETIC RADIATION HAZARDS (EMRADHAZ)

The equipment design shall protect personnel, fuels, and ordnance from any hazardous effects of electromagnetic radiation generated from the MILES systems or components.

3.3.2.7 OPTICAL INTERFERENCE

The MILES systems shall meet the requirements for the operation (false kills) of the MILES detectors to include reflection of its corresponding laser beam.

3.3.3 NAMEPLATES AND PRODUCT MARKING

The MILES Nameplates shall be provided for each serialized MILES system. Product markings shall be displayed prominently on the transit cases. Nameplates shall include nomenclature, part number, and a unique serial number. All remaining replaceable parts including mounting parts shall be marked with the part number. All cables shall be clearly marked with designated function, cable part number, and connector reference numbers. All assemblies with connectors shall identify the connector reference number on the body of the assembly.

3.3.4 INTERCHANGEABILITY

Interchangeability among common parts of the MILES hardware and software shall be required. All parts, assemblies, and units having the same part number shall be directly and completely interchangeable.

3.3.5 SYSTEM SAFETY

Any design or modifications shall meet 29 CFR 1910, and National Fire Protection Association Codes. The MILES system shall provide fail-safe features for safety of personnel during installation, operation, maintenance, testing, support activities, and disposal. Commercial item equipment shall be certified as meeting the requirements of a nationally recognized safety testing laboratory (such as Underwriters Laboratory). Training equipment that can be mistaken for tactical equipment shall be marked “FOR TRAINING USE ONLY”. As a minimum, the following areas shall be considered for the MILES systems:

3.3.5.1 ELECTRICAL SAFETY

Electrical circuitry and installation shall comply with the requirements of the National Electric Code (ANSI/NFPA 70-02). Danger, caution, and warning signs shall be designed and used IAW ANSI/NEMA Z535.3-98 and ANSI/NEMA Z535.4-98 to warn user personnel of specific hazards such as voltage, current, and thermal. Batteries shall be sufficiently separated from electronic components to prevent damage from corrosion.

3.3.5.2 HAZARDOUS MATERIALS

The MILES training system shall not incorporate any asbestos. Glass fiber materials shall not be used as the outer surface or covering on cables, wire, or other items where they may cause skin irritation to operating personnel. When maintenance procedures require access to glass fibers, such as insulation, a proper caution note shall be provided. Ozone-depleting substances, such as Halon, shall not be used. The MILES training system shall preclude exposure of personnel or the environment to excessive levels of toxic, carcinogenic, or otherwise hazardous materials as defined by the Occupational Health and Safety Administration (OSHA), Environmental Protection Agency (EPA), and the Department of Transportation (DOT).

3.3.5.3 MECHANICAL SAFETY

Moving parts shall be guarded or provided with safety devices to prevent mechanical injury to operator and maintenance personnel. Edges and corners shall be rounded and free from burrs. Center of gravity shall be such that MILES system components and devices are stable and easy to handle.

3.3.5.4 PERSONNEL SAFETY

The design shall be such as to provide maximum safety to personnel and MILES training system equipment when installing, operating, adjusting, and maintaining the equipment. The MILES systems shall not exceed steady state or impulse noise levels of 85 dBA for steady-state and 140 dBA for impulse noise. MILES training system equipment shall be designed and installed so that it can be removed, handled, and lifted safely, as well as be designed without a permanent chest strap that may be dangerous (see Ground Safety Notification System Message, Control No. 95-01, Multiple Integrated Laser Engagement System (MILES)).

3.3.5.5 IONIZING RADIATION

If Cathode Ray Tube (CRT) monitors are used, measurements shall be taken to ensure that monitors do not have a higher x-radiation exposure rate than 0.5 milliroentgen (mR) per hour at a distance of 5 centimeters from an external point as required in section 1020.10 of Public Law 90-602, The Radiation Control for Health and Safety Act.

3.3.5.6 LASER SAFETY

Laser equipment, system design, written operator manuals, and maintenance instructions shall conform to CFR Title 21, subchapter J, part 1040. For those requirements of 21 CFR 1040 that cannot be met due to operational requirements, an exemption shall be requested from the Government and ANSI Z136.6-2000 shall be used as the design requirement for the items listed above. If exempted, the laser shall have a label of exemption from FDA standards IAW ANSI Z136.6-2000. Hazard classification shall be IAW ANSI Z136.1-2000.

a. The laser eye safety classification shall be Class 1, or Class 3a and the Nominal Ocular Hazard Distance (NOHD) shall not exceed the following:

Unaided viewing	-10 meters
Aided Viewing (using 7 power optics)	- 50 meters

b. Labeling shall be IAW ANSI Z136.6-2000, according to the hazard classification, and placed such that it is clearly visible. The wording contained in the upper block of the warning design shall be consistent with the perceived hazard.

3.3.5.7 RADIOACTIVE MATERIAL RESTRICTION IN OPTICAL PRODUCTS

The optical products shall contain no thorium or other source materials, as defined by 10 CRF 40, in excess of 0.05 percent by weight (500 ppm), or other radioactive materials. Optical products are defined as optical glass constituents or raw materials, optical glass components such as windows, filters, reflectors, prisms, beamsplitters, lens elements and fiber optics, optical assemblies, and optical coatings, except for IR objective lenses. Radioactive materials are defined as radioactive material per item in excess of concentrations or in quantities greater than 0.001 microcuries.

3.3.6 HUMAN ENGINEERING

The detail design and functionality of the MILES training system shall be IAW the following sections of MIL-STD-1472: Control 5.1 (Control/display integration); 5.2 (Visual displays); 5.3 (Audio displays); 5.4 (Controls); 5.5 (Labeling); 5.6 (Anthropometry); 5.9 (Design for maintainer); 5.11.1 Portability of Load Carrying; 5.13 (Hazards and safety); 5.15 (User-computer interface).

3.3.6.1 SPEECH INTELLIGIBILITY

Speech Intelligibility requirements shall be IAW MIL-STD-1472. Intelligibility of synthetic speech will be measured using representative panel of listeners.

3.4 ADDITIONAL COMPONENT CHARACTERISTICS

3.4.1 TRAINING DATA TRANSFER DEVICE (TDTD) SYSTEM

The TDTD System shall provide the following functions:

a. Upload information to the Laser Transmitter Unit and Manworn System to initialize it with specific information to uniquely identify its performance capabilities. Data to be uploaded includes weapon type(s), MILES codes, PID, and vulnerability data commensurate with the system on which the device will be installed.

b. Downloaded data from the Laser Transmitter Unit and Manworn System including all event data.

3.4.1.1 UPLOAD/DOWNLOAD/INITIALIZE TIME

The TDTD System shall take no more than three minutes per system to perform any of the following functions for the MILES systems:

a. Uploading of all needed data, to include sets of vulnerability tables.

b. Initialize.

c. Downloading and appending to a database all stored event data.

3.4.1.2 TDTD SYSTEM STORAGE REQUIREMENTS

The TDTD System shall be capable of storing the information required to initialize a minimum of 25 MILES configurations. Additionally, the TDTD System shall also be capable of storing the downloaded event records of a minimum of 25 MILES devices. Not more than 50% of the TDTD System storage medium shall be utilized to meet this requirement.

3.4.1.3 PERSONAL COMPUTER (PC) COMPATIBILITY

The TDTD System shall include either a light-weight portable computer, a Personal Digital Assistant (PDA), or an interfacing device to a PC such that data to be uploaded to the MILES device can be generated on a PC and the data retrieved from the MILES device can be read into and manipulated by a PC with the TDTD System software. The TDTD System interface unit shall meet the environmental requirements of Rain and Sand & Dust.

3.4.1.4 AFTER ACTION REVIEW (AAR) SYSTEM SOFTWARE

The AAR software program shall provide the following capabilities:

a. Accept all recorded event data.

b. Provide the following AAR reports:

(1) A list of each MILES system's downloaded event records by time and date.

(2) A list of all fratricide incidents and the associated PIDs.

(3) A list of each of the downloaded MILES system's lethality assessment events and the associated event information.

(4) A list of each of the downloaded MILES system's cheat events and the associated event information.

(5) A list of each of the downloaded MILES system's administrative events and the associated event.

c. The ability for the AAR operator to generate ad hoc reports using the downloaded data.

d. Display time in the format XXYYZZ or XX:YY:ZZ, where XX represents hours (00-24), YY represents minutes, and ZZ represents seconds.

3.4.2 "ANCILLARY DEVICES",

3.4.2.1 ALIGNMENT DEVICE(S)

The IWS Laser Transmitter Units shall be capable of being aligned to the host weapon sights to allow the systems to perform as specified without interfering with tactical capabilities. If these alignment requirements include an Alignment Device(s), they shall be stand-alone device(s) and be effective regardless of whether the weapon is zeroed or not.

3.4.2.2 NOT USED

4 VERIFICATION

4.1 DESIGN VERIFICATION

The matrix in Table I specifies the methods of verification for each of the requirements of Section 3. The Qualification Methods of Table I are defined as follows:

a. Examination (E). Examination is an element of inspection consisting of investigation, without the use of special laboratory appliances or procedures, of supplies and services to determine conformance to those specified requirements that can be determined by such investigations. Examination is generally nondestructive and includes, but is not limited to, the use of sight, hearing, smell, touch, and taste; simple physical manipulation; mechanical and electrical gauging and measurement; and other forms of investigation.

b. Testing (T). Testing is an element of inspection and generally denotes the determination, by technical means, of the properties or elements of supplies, or components thereof, including functional operation, and involves the application of established scientific principles and procedures. Test shall consist of measurement, calculation, and other accepted scientific means to establish that the performance requirements of this Specification are met.

c. Analysis (A). Analysis shall be performed through the review of applicable and adequate documentation to verify that the specified requirements have been met. Verification shall be by mathematical analysis, statistical analysis, sampling the correlation of measured data, and observing test results with calculated expected values, conformance of end items with Contractor-generated specifications and documentation from lower tier supplies, as well as Government-approved configuration item specifications and documentation.

d. Demonstration (D). Demonstrations will be performed through actual exercise of the item to verify that the specified requirements have been met.

e. Certification (C). Certification is an element of inspection to verify that the requirement has been met. Certifications must include documented test results, performance data, analytical data, or vender documentation. The certifications must be made available to Government representatives immediately upon request for review during inspections.

TABLE I. Method of Verification

Requirement Paragraph	Paragraph Title	Test Paragraph	Qualification Methods
3.1.2	MILES Interface	N/A	T

3.1.2.1	Basic MILES Interface	N/A	A,D,E,T
3.1.2.2	Operator Interface	N/A	A,D,E,T
3.1.2.3	Data Transfer Interface	N/A	A,D,E
3.1.2.4	Host Interface	N/A	A,D,E
3.2.1	IWS System Performance	N/A	A,D,E,T
3.2.1.1	Laser Transmitter Unit (LTU)	N/A	A,D,E,T
3.2.1.2	Target System	N/A	A,D,E,T
3.2.2	BIT Characteristics	N/A	A,D,E,T
3.2.3	Computational System Requirements	N/A	A,D,E
3.2.3.1	Operational Computer System(s)	N/A	A,D,E,T
3.2.3.2	Operational System Software	4.2.1	A,D,E
3.2.3.2.1	Software Development Requirements	4.2.1.1	A,D,E,C
3.2.3.2.2	Run Time Environment	N/A	A,D
3.2.3.2.3	Firmware	4.2.1.2	A,D,E,T,C
3.2.4	False Alarm Rate	N/A	A,D,T
3.2.5	Installation and Removal Requirements	N/A	A,D,E
3.2.6	Mounting	N/A	A,D,E
3.2.6.1	Mounting Devices	N/A	A,D,E
3.2.7	Not Used	N/A	A,D,E
3.2.8	Transit Case(s)	4.2.2	A,E,T
3.2.9.1	Weight and Size	N/A	A,T
3.2.9.2	Power	N/A	A,D
3.2.9.2.1	Power Operation	N/A	A,D,T
3.2.9.2.2	Replaceable Batteries	N/A	A,D,E,T
3.2.9.2.3	Long Life Batteries	N/A	A,D,E,T
3.2.9.3	Finish	N/A	A,E,T
3.2.9.4	Color	N/A	E
3.2.9.5	Transportability	4.2.3	A,D,E,T
3.2.10	Reliability	4.2.4	T
3.2.11	Maintainability	4.2.5	A,D
3.2.12	Environmental conditions	4.2.6	N/A
3.2.12.1	High Temperature	4.2.6.1	A,T
3.2.12.2	Low Temperature	4.2.6.2	A,T
3.2.12.3	Shock	4.2.6.3	A,T
3.2.12.4	Vibration	4.2.6.4	A,T
3.2.12.5	Humidity	4.2.6.5	A,T
3.2.12.6	Rain	4.2.6.6	A,T,C
3.2.12.7	Sand and Dust	4.2.6.7	A,T
3.2.12.8	Immersion	4.2.6.8	A,T
3.2.12.9	Corrosion	4.2.6.9	A,E

3.2.12.10	Salt/Fog	4.2.6.10	A,T,C
3.3.1	Material and parts	N/A	C
3.3.2	Electromagnetic Radiation	4.2.7	A,T
3.3.2.1	Radiated Emissions	4.2.7.1	A,T
3.3.2.2	Radiated Susceptibility	4.2.7.2	A,T
3.3.2.3	ESD Effects	4.2.7.3	A,T,D
3.3.2.4	Non-developmental items (NDI) and commercial items	4.2.7.4	A,T,D
3.3.2.5	Life cycle, E3 hardness	4.2.7.5	D
3.3.2.6	Electromagnetic radiation hazards (EMRADHAZ)	4.2.7.6	A,D,E,T
3.3.2.7	Optical Interference	N/A	D
3.3.3	Nameplates and product marking	N/A	E
3.3.4	Interchangeability	4.2.8	D,E,T
3.3.5	System Safety	4.2.9	A,D,E,T
3.3.5.1	Electrical Safety	4.2.9.1	A,D,E,T
3.3.5.2	Hazardous Materials	4.2.9.2	A,C,E
3.3.5.3	Mechanical Safety	4.2.9.3	A,D,E,T
3.3.5.4	Personnel Safety	4.2.9.4	A,D,E,T
3.3.5.5	Ionizing Radiation	4.2.9.5	A,D,E,T
3.3.5.6	Laser Safety	4.2.9.6	A,D,E,T
3.3.5.7	Radioactive Material Restriction in Optical Products	4.2.9.7	A,C,E
3.3.6	Human engineering	N/A	A,D,E
3.3.6.1	Speech Intelligibility	N/A	A,D,T
3.4.1	TDTD System	N/A	A,D,E,T
3.4.1.1	Upload/Download Time	N/A	A,D
3.4.1.2	TDTD System Storage Requirements	N/A	A,D
3.4.1.3	PC Compatibility	N/A	A,D,E
3.4.1.4	AAR System Software		N/A
3.4.2	Ancillary Devices	N/A	A,D,T
3.4.2.1	Alignment Devices	N/A	A,D,T
3.4.2.2	Not Used	N/A	A,D,T

4.2 VERIFICATION METHODS

The verification methods shall be on hardware systems and subsystems to ensure compliance with the following characteristics. If a Specification characteristic is identical for several subsystems, Approval may be obtained to perform qualification on a representative subsystem.

4.2.1 INTEGRATION TESTS

Integration Tests are Contractor conducted/Government witnessed tests conducted at Contractor facility. Integration Tests shall demonstrate the IWS performs in accordance to the specification. During these tests, the IWS software shall be tested in accordance to the test procedures approved by the Government to determine if that the software passes through the various software paths to determine that the software is robust and can handle abnormal inputs as well inputs that cover maximum, minimum and average data inputs.

4.2.2 SYSTEM VERIFICATION TESTS (SVT)

System Verification Tests (SVT) are Contractor conducted/ Government witnessed tests at Contractor facility. SVTs shall demonstrate that the IWS kits are compliant to the requirements in this specification. During these tests, various IWS kits shall be used in multiple configurations with other training devices to determine if there are any deviations that requiring fixing. Verification of one laser transmission per blank fired shall be tested (+/- 0.01%). No laser transmission with the bolt action of the weapon (+/-0.01%).

4.2.3 FIRST ARTICLE TEST

First Article Test for Production Lots will consist of Environment Tests and EMI Tests.

4.2.4 SYSTEM INTEGRATION TESTS (SIT)

System Integration Tests (SIT) is a government conducted/Contractor supported test at Government facility. SIT shall be used to determine if the IWS works in a Force-on – Force environment. This test is a large scale test that will fully exercise the devices. This test shall be used as the acceptance test for the IWS. The test shall capture training data from all players (BLUFOR and OPFOR) and validate that the correct data is transmitted between the players.

4.2.5 OPERATIONAL SYSTEM SOFTWARE

The software shall be examined to ensure that it meets the MILES requirements.

4.2.5.1 SOFTWARE DEVELOPMENT REQUIREMENTS

The Contractor shall certify that the software developed for the MILES uses established software engineering methodologies.

4.2.5.2 FIRMWARE

The Contractor shall certify that any firmware developed meets the same developmental requirements as the software. The code and documentation shall be visually examined to ensure compliance.

4.2.6 TRANSIT CASES

The MILES system level transit cases shall be tested to ensure protection of MILES unit components during transportation, storage, and handling. The transit cases shall be verified by testing to ensure they meet the requirements of: High Temperature, Low Temperature, Shock, Vibration, Rain, Sand and Dust, and Corrosion.

4.2.7 TRANSPORTABILITY

The transportability requirements shall be verified by analysis, demonstration, certification, and examination. Verification that the MILES hardware does not exceed the weight and balance envelope shall be by demonstration and analysis. Verification that the MILES components and support equipment are housed in designated containers shall be by analysis and examination. Label requirements shall be verified by examination.

4.2.8 RELIABILITY

The reliability requirements shall be verified by a Reliability Qualification Test (RQT). The RQT shall be conducted in accordance with a government approved RQT Plan.

4.2.9 MAINTAINABILITY

A MTTR of 60 minutes or less for each MILES system and device shall be verified by demonstration.

4.2.10 ENVIRONMENTAL CONDITIONS

The environmental requirements shall be considered verified after successful completion of the following tests: high temperature, low temperature, shock, vibration, humidity, rain, sand and dust, immersion, corrosion, and salt fog. The component parts, units, and subassemblies of MILES shall operate and be stored under the conditions described below:

a. Arrange if desired to allow the post-test inspection and operational checkout for preceding test to serve as the pre-test inspection and operational checkout for the next test.

b. Perform tests on a selected sample of each type MILES equipment. In the event of a failure of a sample to satisfactorily complete a test, the Contractor shall inspect every component of that type for the presence of a fault responsible for failure and shall correct such fault prior to randomly selecting the next sample for retest. No percentage defective is allowable.

c. Unmodified, stand-alone commercial equipment which is covered for repair or replacement by an original equipment manufacturer's warranty and/or which is tested to MIL-STD-810E Notice 3 requirements equal or higher than specified herein shall be certified as conforming without necessity for additional environmental testing.

4.2.10.1 HIGH TEMPERATURE

The High Temperature requirements shall be verified by test IAW MIL-STD-810E Notice 3, Method 505.3, Procedure I, MIL-STD-810E Notice 3, Method 501.3, Procedure I - Storage, and the following conditions shall apply:

Procedure I - Solar Radiation Operating

a. The high temperature requirement shall be +49 degrees C for operation and 1120 W/m^2.

b. The test unit shall be fully assembled into its operation state, with power applied.

c. Temperature sensors shall be located on the exterior surface of the test unit.

d. The test shall consist of three 24 hour cycles.

e. An operational check-out shall be conducted during the period of maximum response in each temperature cycle and at the conclusion of the test.

Procedure I - Storage

a. The high temperature storage requirement shall be +70 degrees C.

b. The test unit shall be properly packaged and in its storage configuration.

c. The temperature sensors shall be located on the exterior surface of the test unit.

d. The test shall be conducted for seven cycles (each cycle shall be 24 hours in duration).

e. An operational check-out shall be conducted at the conclusion of the test.

4.2.10.2 LOW TEMPERATURE

The Low Temperature requirements shall be verified by test IAW MIL-STD-810E Notice 3, Method 502.3, Procedures I (Mild Cold, Induced for 24 hours), MIL-STD-810E Notice 3, Method 502.3 Procedure II (Basic Cold, Operational, for three cycles), and the following conditions:

Procedure I - Storage

a. The low temperature storage requirement shall be -33 degrees Celsius.

b. The test unit shall be properly packaged and in its storage configuration.

c. The temperature sensors shall be located on the exterior surface of the test unit.

d. The test shall be conducted for three cycles (24 hours).

e. An operational check-out shall be conducted at the conclusion of the test.

Procedure II - Operation

a. The low temperature requirement shall be -18 degrees Celsius for operation.

b. The test unit shall be fully assembled into its operation state.

c. Temperature sensors shall be located on the exterior surface of the test unit.

d. The test shall consist of three 24 hour cycles.

e. An operational check-out shall be conducted at the last hour of each 24 hour cycle and at the conclusion of the test.

4.2.10.3 SHOCK

The Shock requirements shall be verified by test IAW MIL-STD-810E Notice 3, Method 516.4 Procedure I - Functional Shock, Figure 516.4-4. Components and devices in their transit cases shall also be subjected to the recommended drop test of Table 516.4-II and Procedure IV - Transit Drop.

a. The test unit system shall be fully assembled into its operation state for Procedure I.

b. For Procedure I, use the Operational Test For Ground Equipment test shock response spectrum of Figure 516.5-10.

c. An operational check-out shall be conducted at the conclusion of the test.

4.2.10.4 VIBRATION

The Vibration requirements shall be verified IAW MIL-STD 810E, Method 514.4, Category 3 (Loose Cargo)

a. The Individual Weapon System components, Alignment Device(s), and TDTD system shall be assembled in their operational mode, without transit cases.

b. Procedure III - Category 3 - Loose cargo transport shall be performed for a duration

of 30 minutes.

c. An operational checkout shall be performed at the conclusion of the test.

4.2.10.5 HUMIDITY

The Humidity requirements shall be verified IAW MIL-STD 810E Notice 3, Method 507.3 Procedure I (Natural), Cycle 3, with the following requirements:

a. The test unit shall be fully assembled into its operation state.

b. The test cycle used shall be as defined by Figure 507.3-I.

c. Each cycle shall be 24 hours in duration.

d. The test duration shall be for ten cycles with a quick look and operational check-out after the fifth cycle.

e. An operational check-out shall be conducted at the conclusion of the test.

4.2.10.6 RAIN

The Rain requirements shall be verified by test IAW MIL-STD-810E Notice 3, Method 506.3 Procedure I - Blowing Rain. The test unit shall be subjected to the following limits:

a. The test unit shall be fully assembled into its operation state.

b. The rainfall rate shall be a minimum of four inches per hour.

c. The wind velocity shall be a minimum of 40 miles per hour.

d. The temperature of the test unit shall be at least ten degrees Celsius greater than the rain temperature at the beginning of each 30 minute exposure period.

e. The test shall be conducted for a period of 30 minutes per face until all faces have been exposed.

f. The failure criteria shall be degradation of performance of the test unit following the rain test and unconditional failure as defined in MIL-STD-810E Notice 3, Method 506.3, paragraph I-4.1.2.

g. After completion the test unit shall be examined for water content inside the unit. An operational check-out shall be conducted at the end of the test.

h. The transit case requirement shall be verified by the above test procedure or

through certification, by manufacturer, of analogous test procedures and data.

4.2.10.7 SAND AND DUST

The Sand and Dust requirements shall be verified by test IAW MIL-STD-810E Notice 3, Method 510.3, when subjected to the following limits (Test items shall be powered on during test):

a. Sand. The test unit shall be tested IAW MIL-STD-810, Method 510.3, Procedure II, for blowing sand, and with the following requirements:

1. The test unit shall be fully assembled into its operation state and all optics, windows and front panels shall be protected.

2. The sand particle size shall be from 0.15 to 0.85 millimeters and the concentration of 1.1 grams per cubic meter.

3. The air velocity in the test chamber shall be from 18 to 29 meters per second.

4. The test shall be conducted for a period of 90 minutes per face until all faces have been exposed.

5. An operational check-out shall be conducted at the conclusion of the test.

b. Dust. The test unit shall be tested IAW MIL-STD-810, Method 510.3, Procedure I for blowing dust, and with the following requirements:

1. The test unit shall be fully assembled into its operation state.

2. The dust particle size shall be from 0.0001 to 0.01 millimeters and the concentration of 10.6 grams per cubic meter.

3. The air velocity in the test chamber shall be 8.9 meters per second.

4. The test shall be conducted for six hours at +23 degrees Celsius and six hours at +49 degrees Celsius, with an operational check conducted during the second test period.

5. An operational check-out shall be conducted at the conclusion of the test.

4.2.10.8 IMMERSION (LEAKAGE)

The Immersion requirements shall be verified IAW MIL-STD 810E Notice 3, Method 512.3, Procedure I - Basic Leakage.

a. The test unit shall be fully assembled into its operation state and the following:

b. The test unit temperature shall be stabilized to 27 degrees C above the water temperature, with the water temperature at 18 ±10 degrees C.

c. The immersion depth shall be one meter and immersion period of two hours.

d. Observations for air bubbles originating from the unit shall be done.

e. After completion the test unit shall be examined for water content inside the unit. Evidence of water penetration into the test unit following the immersion test or not completing the operational check-out at the conclusion of the test shall be basis for failure.

4.2.10.9 CORROSION

The Corrosion requirements shall be verified by examination and analysis.

4.2.10.10 SALT AND FOG

The Salt and Fog requirements shall be verified IAW MIL-STD-810E Notice 3, Method 509.3 for Salt Fog climatic tests, and with the following requirements:

a. The test unit shall be fully assembled into its operation state.

b. The solution concentration shall be five percent ± one percent.

c. The test unit shall be exposed alternating 48-hour periods of salt fog exposure and drying conditions for a minimum of four 48-hour periods (two wet and two dry).

d. An operational check-out shall be conducted at the conclusion of the test.

e. Failure criteria shall be any noticeable corrosion or blistering on the interior or exterior of the test unit, or failure to properly perform during the operational check-out at the conclusion of the test.

f. The transit case requirement of 4.2.2 shall be verified by the above test procedure or through manufacturer certification of analogous test procedures and data.

4.2.11 ELECTROMAGNETIC ENVIRONMENTAL EFFECTS (E^3).

The safety critical functions shall be verified to be electromagnetically compatible with the E^3 generated by the IWS systems/ subsystems/components and with installation site electromagnetic environments prior to operator use at the IWS installation sites.

4.2.11.1 RADIATED EMISSIONS

The Contractor shall test the IWS components and verify IAW MIL-STD-461E, Method RE102 to ensure that it does not emit any signals above the established threshold from 10 kHz to 18 GHz. The IWS components when operating shall be not be a source of radiated emissions so as to create electromagnetic interference, malfunctions, degradation of performance, or deviations from operational parameters to adjacent operating electronic or electrical equipment as described in Section 3.

4.2.11.2 RADIATED SUSCEPTIBILITY

The Contractor shall test the IWS components and verify IAW MIL-STD-461E to ensure that it is not susceptible to signals from 10kHz to 18 GHz. The components shall not exhibit any malfunction, degradation of performance, or deviation from operational parameters when subjected to radiated levels as described in Section 3.

4.2.11.3 ELECTROSTATIC DISCHARGE (ESD) EFFECTS

The Contractor shall test the IWS components to ensure that it is not susceptible to ESD. The components shall not exhibit any malfunction, degradation of performance, or deviation from operational parameters when subjected to ESD levels as described in Section 3.

4.2.11.4 NON-DEVELOPMENTAL ITEMS (NDI) AND COMMERCIAL ITEMS.

All MILES systems, subsystems and components compliance shall be verified by test(s) (laboratory and/or field), demonstrations, analysis, or a combination of these methods.

4.2.11.5 LIFE CYCLE, E3 HARDNESS.

Compliance of MILES equipment shall be verified by test(s), analysis, inspection(s), or a combination of these methods. The ability to detect maintainability, accessibility, and testability degradations shall be demonstrated.

4.2.11.6 ELECTROMAGNETIC RADIATION HAZARDS (EMRADHAZ).

Compliance of the MILES equipment that none of the systems, subsystems, or components present hazards to fuel, personnel, and ordnance shall be verified by test, demonstrations, analysis, inspections, or a combination of these methods.

4.2.12 INTERCHANGEABILITY

The Interchangeability requirement shall be verified by a test that shall demonstrate interchangeability of circuit card assemblies, spare part assemblies, and devices. A functional test or demonstration of fit shall be conducted after each interchangeability trial. No degradation of performance shall be allowed. Verification shall include certification that all circuit card assemblies, spare parts, and devices are fit, function and interface interchangeable with MILES devices.

4.2.13 SYSTEM SAFETY

The Contractor shall verify the following requirements of each configuration described in Appendix A and the System Safety requirements of this Specification. By analysis, examination, demonstration and test, the Contractor shall complete and verify compliance to the applicable items on the safety checklist provided in Appendix B. The System Safety requirements shall be considered verified after successful completion of requirements outlined in Table I along with those stated in this Section.

4.2.13.1 ELECTRICAL SAFETY

The Contractor shall verify by analysis, examination, demonstration, and test that the electrical circuitry and installation meet applicable requirements of the National Electrical Code (ANSI/NFPA 70-93). The Contractor shall provide a list of all danger, caution, and warning signs installed in the MILES equipment and incorporated into applicable Technical Manuals (TM) and Publications. This list, which shall include design and wording of each sign IAW ANSI/NEMA Z535.3-91/Z535.4-91, shall be attached to Appendix B. The completed safety checklist-Appendix B shall be submitted and demonstrated to the Government as part of physical safety inspections of each MILES major component. The Contractor shall verify by analysis and test that the installation, operation, handling, and maintenance of batteries used with the MILES equipment does not present safety or health hazards for user personnel or damage associated equipment.

4.2.13.2 HAZARDOUS MATERIALS

The Contractor shall confirm by analysis, examination, and certification that the MILES equipment does not incorporate any asbestos or ozone-depleting substances, that glass fiber materials are not used as the outer surface or covering on cables, wire, or other items where they may cause skin irritation to operating personnel, and that PVC materials are not used in the crew compartments. The Contractor shall demonstrate by analysis and certification that the MILES training system does not expose personnel or the environment to unacceptable levels of toxic, carcinogenic, or otherwise hazardous materials as defined by OSHA, EPA, or DOT. The Contractor shall attach to the completed Appendix B any applicable Material Safety Data Sheets along with any required warning signs on equipment and procedures/warnings in TMs and Publications.

4.2.13.3 MECHANICAL SAFETY

The Contractor shall verify by analysis, examination, demonstration, and test that any moving parts of the MILES equipment are properly guarded or provided with safety devices to prevent injury to operator and maintenance personnel, that any edges or corners are rounded and free from burrs, and that the MILES equipment's center of gravity is such that components and devices are stable and easy to handle. The Contractor shall attach to Appendix B any applicable warning signs to equipment or warnings to related TMs and publications.

4.2.13.4 PERSONNEL SAFETY

The Contractor shall verify by analysis, demonstration, examination, and test that the MILES noise generating devices do not exceed impulse and steady state noise level requirements defined in this Specification. The Contractor shall also verify by analysis, examination, demonstration, and test that the MILES equipment meets safety and health requirements of MIL-STD-1472, paragraphs 5.9.11.3, 5.9.11.5, and 5.13. The Contractor shall attach to the completed Appendix B the design and wording of warning signs installed in equipment along with warnings incorporated into TMs and publications as related to personnel safety.

4.2.13.5 IONIZING RADIATION

The Contractor shall verify by analysis, demonstration, examination, and test that, IAW Section 1020.10 of Public Law 90-602, no x-radiation equipment has an exposure rate higher than 0.5 mR per hour at a distance of five centimeters from an external point. The Contractor shall attach to the completed Appendix B the design and wording of warning signs installed in equipment along with warnings incorporated into TMs and publications as related to ionizing radiation.

4.2.13.6 LASER SAFETY

The Contractor shall verify by analysis, demonstration, examination, and test that laser equipment, system design, written TMs, and maintenance instructions meet the requirements of CFR Title 21, subchapter J, Part 1040. The Contractor shall submit an exemption to, and obtain an approval from, the Government to those requirements of 21 CFR 1040 that can not be met due to operational requirements in accordance to laser safety requirements defined in Laser Safety of this Specification. IAW ANSI Z136.1-2000, the Contractor shall install on the equipment applicable laser safety labels along with incorporating applicable warnings in TMs and publications. The Contractor shall attach to the completed Appendix B the design and wording of warning labels and warnings as related to laser safety.

4.2.13.7 RADIOACTIVE MATERIAL RESTRICTIONS IN OPTICAL PRODUCTS

The Contractor shall verify by analysis, examination, and certification that the MILES equipment does not incorporate any thorium or other source materials, or other radioactive materials as defined in Radioactive Material Restriction in Optical Products of this Specification. The Contractor shall attach to the completed Appendix B any applicable Material Safety Data Sheets along with any required warning signs on equipment and procedures/warnings in the TMs and Publications.

4.3 FIRST ARTICLE INSPECTION

First article inspection shall be performed on initial production samples. Approval of the first article by the Government shall not relieve the contractor of the obligation to supply MILES systems that are fully representative of those inspected as a first article sample. Any changes or deviation of the production units from the first article sample shall be subject to

the approval of the contracting officer.

5 PACKAGING

5.1 PACKAGING

For acquisition purposes, the packaging requirements shall be as specified in the contract. When actual packaging of materiel is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6 NOTES

(This section contains information of a general or explanatory nature which may be helpful, but is not mandatory.)

6.1 ADAPTABILITY

The MILES system shall be adaptable to weapon systems currently under development and future weapon systems for which detailed data on configuration, lethality, and other weapon/platform data is not yet available.

6.2 ABBREVIATIONS AND ACRONYMS

The following list of abbreviations and acronyms are stated in this Specification.

ABBREVIATION	TERM
AAR	After Action Review
ANSI	American National Standards Institute
ATA	Air Transport Association
BIT	Built In Test
CRF	Code of Federal Regulations
CSCI	Computer Software Configuration Item
DOD	Department of Defense
DOT	Department of Transportation
E3	Electromagnetic Environmental Effects
EMC	Electromagnetic Compatible
EME	Electromagnetic Environment
EPA	Environmental Protection Agency
IAW	In Accordance With
IEEE	Institute of Electrical and Electronic Engineers
I/O	Input/Output
IR	Infrared Red

ABBREVIATION	TERM
IWS	Individual Weapon System
LTU	Laser Transmitter Unit
MCC97	MILES Communication Code
MILES	Multiple Integrated Laser Engagement System
MTBEFF	Mean Time Between Essential Functional Failure
MTTR	MEAN Time to Repair
NDI	Non-Developmental Item
OSHA	Occupational Health and Safety Administration
PC	Personal Computer
PDA	Personal Digital Assistant
PEO STRI	Program Executive Office for Simulation, Training and Instrumentation
PID	Player Identification
Pk	Probability of kill
PVC	Polyvinyl chloride
SAW	Squad Automatic Weapon
SAIB	Small Arms Integration Book
TES	Tactical Engagement Simulation
TM	Technical Manuals

APPENDIX A -- MILES SYSTEM CONFIGURATIONS

MILES Individual Weapon System

A MILES Individual Operator Weapon System configuration and associated Manworn Systems shall be required for the following weapons:

	Weapon	Maximum Firing Rate	Effective Range	Suppression Range
a.	M16A2/M4 (w&w/o M203)	650 RPM	550M	N/A
b.	M24 Sniper Rifle	15 RPM	1000M	N/A
c.	M249 SAW short/long barrel	725 RPM	800M	N/A
d.	M2	650 RPM	1000M	1800M
e.	M240B	650 RPM	800M	1100M
f.	M107	15 RPM	1500M	N/A

APPENDIX B -- SYSTEM SAFETY DESIGN VERIFICATION CHECKLIST

Applicability

This checklist is provided as guidance for design safety requirements of MILES 2000, DIFCUE, MGSS and the associated Pyrotechnic configurations of this procurement action. It is intended for use in contractor's concurrent engineering process and during Government safety inspections.

Instructions

(1) Select the sections of this checklist that apply to the item to be inspected.

(2) Review each question. Eliminate those that do not apply by marking **NA** (not applicable) or add any applicable questions that were not included.

(3) Evaluate each applicable question and record conformance or non-conformance by a **Y** (Yes) or **N** (No), respectively.

(4) Remarks should include a discussion on how it is in conformance or non-conformance.

SECTION 1: ELECTRICAL SAFETY

1.1 Are operating personnel protected from accidental contact with voltages in excess of 30 volts?

1.2 Does each contact, terminal or like device, having voltages between 70 and 500 volts, rms or DC, with respect to ground, have barriers or guards to minimize accidental contact by operating or maintenance personnel?

1.3 Are barriers or guards that protect terminals or like devices exhibiting 70-500 volts, clearly marked to indicate highest voltage encountered upon its removal?

1.4 Are portions of assemblies operating at potentials above 500 volts, RAMS or DC, completely enclosed from the remainder of the assembly, and is the enclosure provided with non-bypassable interlocks?

1.5 Are enclosures for potentials, which exceed 500 volts, marked "DANGER, HIGH VOLTAGE, XXX VOLTS", in black on a yellow background?

1.6 Do all circuits and capacitors discharge to 30 volts or less within no more than two seconds after power is removed?

1.7 If the answer to question 1.6 is **NO**, are the high-voltage capacitors or circuits automatically discharged when the case or rack is opened?

1.8 Are test points provided in equipment where measurement of potentials in excess of 300 volts is required?

1.9 Are test points designed to require plug-in, not clamp-on, test instruments?

1.10 Are green indicator lamps provided to indicate "power on"?

1.11 Is sufficient space provided between shield endings and exposed conductors to prevent shorting or arcing?

1.12 Are electrical conductors designed to prevent insertion of the wrong plug into a receptacle or other mating unit?

1.13 Are plugs and receptacles coded and marked to clearly indicate mating connectors, where those of similar configuration are in close proximity?

1.14 Are plugs and receptacles designed to preclude electrical shock and burns while being disconnected?

1.15 Are male plugs de-energized when disconnected?

1.16 Are dissimilar plug/receptacle pairs used in units containing explosives?

1.17 When equipment is designed to operate on more than one type of input power, does the connector design prevent connection or use of improper power?

1.18 Are single-phase power cables properly color coded:
Black: hot; White: neutral; Green: ground?

1.19 Are three-phase power cables coded as in Question 1.18, above, with the second and third phases in red and blue, respectively?

1.20 Are meter terminals protected from voltages of 70 volts or more?

1.21 Do probes that are part of or accessories to the equipment contain safety guards that prevent contact with the tip and is the length of the exposed portion of the tip not more than 0.75 inches? (This question does not apply if the voltages to be measured are less than (a) 30 volts rams, (b) 60 volts DC, or (c) 24.8 volts DC interrupted at a rate of 10 Hz to 200 Hz.)

1.22 Are current and voltage overload protection devices provided?

1.23 Except for antennas and transmission line terminals, are all external parts, surfaces, and shields at ground potential at all times?

1.24 Is the path from the equipment to ground continuous and permanent?

1.25 Is the ground wire color coded green or green with yellow stripes?

1.26 Does the ground have capacity to safely conduct any currents that might be imposed thereon?

1.27 Is the ground wire separate from electrical circuits, i.e., not tied to neutral?

1.28 Has a test been conducted to determine the amount of leakage current on the grounding conductor? If **YES**, indicate the amount of current, in milliamperes, that was measured.

1.29 Is the impedance of the path from the equipment tie point to ground sufficiently low to limit the potential drop and to allow the operation of over- current devices in the circuits?

1.30 Does the path from the equipment tie point to ground have sufficient mechanical strength to minimize accidental ground disconnection?

1.31 Is the ground connection to the chassis or frame secured by one of the following: Spot welded terminal lug, Soldering lug, Screw, nut, and lockwasher?

1.32 through 1.34 - DELETED

1.35 Are both the phase and neutral supply voltage lines not connected to the chassis?

1.36 Are wires and cables supported and terminated to prevent shock and fire?

1.37 Are DC power connections color coded and marked for polarity?

1.38 Does the main power switch cut off all power to the complete equipment?

1.39 Is the main power switch clearly identified?

1.40 Is the main power switch located on the front panel?

1.41 Is physical protection provided from accidental contact with the power input side of the main power switch and the incoming power line connections?

1.42 Are power switches located such that they cannot be operated by accidental contact?

1.43 Are switches provided to deactivate mechanical drive units without disconnecting other parts of the equipment?

1.44 Are means provided to cut off power while installing or replacing an item of equipment or an assembly or part thereof?

1.45 Are emergency controls readily accessible and clearly identified?

1.46 Does the equipment use batteries? If **YES**, indicate whether batteries are the primary or backup power source.

1.47 Is the battery in the Government inventory? If **YES**, indicate the battery's nomenclature, e.g., BA-xxx, BB-xxx, etc.

1.48 Has U.S. Army Communications and Electronics Command (CECOM) approved the battery assignment?

1.49 Can the battery enclosure or box prevent injury or damage in the event of a violent gas venting or rupture of the battery cells?

1.50 Are battery compartments vented?

SECTION 2: MECHANICAL SAFETY

2.1 Are safety covers provided for exposed gears, cams, levers, fans, and belts?

2.2 - DELETED

2.3 Are positive means provided to prevent mismating of fittings?

2.4 Are doors and drawers and associated catches, hinges, supports, fasteners, and stops designed to prevent accidental injury?

2.5 Is the installed equipment free of overhanging edges and corners that may cause injuries?

2.6 Is the equipment likely to remain upright under normal use and in strong wind, considering its means of support and center of gravity?

2.7 Does the weight of equipment that is designed to be carried by a single soldier not exceed the following limits?

Handling Function	Weight (lbs) Male & Female	Male Only
Equipment designed to be lifted from the floor to five feet or less above the floor.	37	56
Equipment designed to be lifted from the floor to three feet or less above the floor	44	87
Equipment designed to be carried 33 feet or less.	42	82

2.8 Does the weight distribution allow easy handling, moving, and positioning?

2.9 Are suitable carrying handles provided?

2.10 Are lifting requirements labeled on equipment weighing over 37 lbs?

2.11 Are safety relief valves provided for pressurized systems or components?

2.12 Is all glass of the non-shatterable type?

SECTION 3: ENVIRONMENTAL SAFETY

3.1 Is the temperature of all exposed parts less than 60^{o}C, when the ambient temperature is 25^{o}C, regardless of the condition of operation?

3.2 Is the temperature of front panels and operating controls less than 49^{o}C, when the ambient temperature is 25^{o}C, regardless of the condition of operation?

3.3 Is the release of toxic, corrosive, or explosive fumes or vapors prevented?

3.4 Are the outer coverings of cables, wires, and other components free of glass fiber materials?

SECTION 4: RADIATION SAFETY

4.1 Are warning labels provided that indicate the hazardous range of microwave emissions for components that produce a power density in excess of the following limits?

Frequency (f) (MHz)	Power Density mW/cm^2
0.01 - 3	100
3 - 30	900/f^2
30 - 100	1
100 - 1,000	100
1,000 - 300,000	10

4.2 Have tests verified no radium or other radioactive materials are present? (MIL-STD-454M, Rq 1 [4.8.3])

4.3 Are radiation markings and labels affixed to all parts or components producing microwave, radio frequency or laser radiation?

4.4 Are filters, goggles, or other protective devices provided, and are warning signs posted, for all sources of radio frequency, ultraviolet, infrared, high-energy visible, laser, and any other type of hazardous radiant energy?

4.5 - DELETED

4.6 Is either an FDA classification label or a DA Label 168 affixed to each laser device?

SECTION 5: OTHER SAFETY

5.1 Is equipment designed to prevent accidental ignition of hazardous atmospheres? (Applicable to equipment that is intended for use in atmospheres of explosive gas or vapors, combustible dusts, or ignitable fibers and flyings.)

5.2 Is a shut-down device or an alarm provided to prevent injury or equipment damage?

5.3 Is there adequate separation between critical warning lights and other lights?

5.4 Are audible warning signals distinguishable from other sounds under normal operating conditions?

5.5 Are warning circuits separate from control circuits?

QUESTIONS 5.6 THROUGH 5.14 PERTAIN TO SYSTEM SOFTWARE. SOFTWARE INCLUDES FIRMWARE. THE TERM HARDWARE INCLUDES THE SYSTEM OR EQUIPMENT AND ALL SUBSYSTEMS AND COMPONENTS.

5.6 Is the system or equipment free of software that (a) could create a hazard, (b) controls hazardous processes or outputs, or (c) controls information upon which the operator must rely in order to make safe decisions? If **YES**, then skip questions 5.7 through 5.14.

5.7 Does the software adequately control all hazardous routines and outputs?

5.8 Does the software allow the operator to take control over the hardware at any time? If the answer is **YES**, then skip question 5.9.

5.9 Does the software allow the operator to take control over the hardware when hazardous routines or outputs are involved?

5.10 Will operator have information needed in order to make safe decisions without reliance upon information generated by the software? If **YES**, skip 5.11.

5.11 Is the probability that the software will fail to provide information needed by the operator in order to make safe decisions at an acceptably low level?

5.12 Is the probability that the software will induce a critical hazard at an acceptably low level?

5.13 Can the failure of any input or output device cause a critical hazard?

5.14 Does the system assume or revert to a safe state upon a power failure or upon the

failure of any hardware component, such as the primary computer?

SECTION 6: HEALTH HAZARDS

6.1.a. Are noise levels less than 85 dBA for steady state or 140dBP for impulse? If your response is no, answer question b.

b. Are appropriate warnings and/or safeguards provided on the equipment and in the technical manuals?

6.2.a. Are hazardous or potentially hazardous materials(e.g., toxics, flammables, ignitables, corrosives, reactives, explosives, oxidizers, carcinogens) used or required (operation, maintenance and/or storage)? If your response is yes, answer questions b, 6.3, and 6.4.

b. Can non-hazardous materials be substituted?

6.3 Are potential exposures to hazardous materials during use, maintenance, and disposal controlled to levels below the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit (PEL), American Conference Of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLV), and/or National Institute of Occupational Safety and Health (NIOSH) Recommended Exposure Limits (REL) (use the most stringent standard)?

6.4 Is personal protective equipment (PPE) required for use of any identified hazardous materials?

6.5 Is the shelter required to be occupied during normal operations?

6.6 Is the vehicle required to be occupied during normal operations of the shelter?

6.7.a. Is the shelter air conditioned and/or heated to prevent heat and cold stress to occupants? If your response is yes, answer question b.

b. Is the system's ECG sufficient to maintain temperatures within the shelter between 60-86 degrees F?

6.8.a. Is lighting required within the shelter? If yes, answer question b.

b. Are light levels within the shelter sufficient to conduct normal operations?

6.9.a. Is the shelter powered by a generator, vehicle, etc? If your response is yes, answer question c.

b. Are personnel required to be in or near vehicles with generators operating and/or

the vehicle engine idling during normal operating conditions? If your response is yes, answer question c.

c. Do the diesel exhaust levels within the shelter or vehicle exceed permissible limits of the following substances:?

Permissible Limits (PPM)

Substance	8 Hr TWA	STEL
Carbon Monoxide	35	200
Formaldehyde	0.75	2
Sulfur Dioxide	2	5
Acrolein	0.1	0.3
Nitric Oxide	25	N/A
Nitrogen Dioxide	N/A	1

6.10.a Is insulating material (e.g., asbestos, fibrous glass, mineral wool, polystyrene foam, polyurethane foam) added or incorporated into the shelter, vehicle, or equipment? If your response is yes, answer question b.

b. Are appropriate warnings and/or safeguards provided on the equipment and in the technical manuals?

6.11.a. Are ozone-depleting substances (ODS) (e.g., CFC-11, CFC-12, CFC-113, CFC-114, CFC-115, HCFC-22, HCFC-123, Halon 1211, Halon 1301, Halon 2402, Methyl Chloroform, Carbon Tetrachloride) required? (Clean Air Act). If your response is yes, answer questions b and c.

b. Class 1 ODS can not be used. Are appropriate warnings and/or safeguards provided on the equipment and in the technical manuals?

c. Can substitution with an ozone depletion potential (OPD) of 0.05 or less be used?