

PERFORMANCE SPECIFICATION

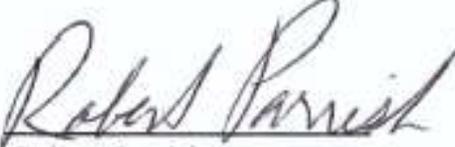
SYSTEM SPECIFICATION

FOR THE

LIVE TRAINING TRANSFORMATION (LT2)  
INTERIM RANGE SYSTEM (IRS)

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## 1.0 **Scope**

This Specification defines the performance characteristics for the Live Training Transformation (LT2) Interim Range System, hereon "IRS". The IRS will be a major component of LT2 Range Systems and will initially be used to support the communications networking requirements for both the Homestation Instrumentation Training System (HITS) and the Exportable Training Capability-Instrumentation System (ETC-IS).

### 1.1 **Background**

IRS is a production contract for an interim radio and network communication system. Two key programs, HITS and ETC-IS, both within the Project Manager for Training Devices (PM TRADE) office at U.S. Army Program Executive Office for Simulation, Training and Instrumentation (PEO STRI) have an immediate need for an IRS capability. PM TRADE has ongoing efforts to develop the long term common radio/network.

## 2.0 **Applicable Documents**

### 2.1 **Government Documents, Drawings, and Publications**

#### 2.1.1 Military Specifications and Standards

MIL-STD-1474D                      Noise Limits for Army Material

The above standard is available at <http://www.assistdocs.com/>

#### 2.1.2 Other Government Specifications and Standards

FED-STD-595C                      Notice 1 - Colors Used in Government  
Procurement

ICD Ver. 1.1                      LT2 Player Unit CTIA Common Message Set ICD

ICD200428 Rev A                      ICD for the Wireless Independent Target System (WITS)

ICD3262-001                      ICD for MILES Individual Weapon System (IWS)

MILXXI-TS-0014 Rev-B                      MILES XXI ICD

ICD200426 Rev C                      ICD for Independent Target System (ITS)

ICD 3357-01 Rev B                      ICD for Training Data Interface between MILES 2000 TESS  
and Instrumentation Unit

FAA Advisory                      Obstruction Marking and Lighting  
Circular AC  
70/7460-1K

FAA Advisory                      Specification for Obstruction  
Circular AC                          Lighting Equipment  
150/5345-43F

The above are available by request from PEO STRI, ATTN: SFAE-STRI-KOL, 12350 Research Parkway, Orlando, FL 32826.

ICD for the HITS Radio Frequency Identification (RFID) Tag

The above ICD is available on the LT2 Portal at <https://www.lt2portal.org>. Follow the product link to HITS.

### 2.1.3 Non-Government Specifications and Standards

ANSI/NFPA 70-2002                  National Electric Code

ANSI Z535.3-2002                  Criteria for Safety Symbols

ANSI Z535.4-2002                  Product Safety Signs and Labels

IEEE C95.1-2005                    IEEE Standard for Safety Levels with Respect to Human  
Exposure to Radio Frequency Electromagnetic Fields,  
3 kHz to 300 GHz

The above standards can be found at <http://webstore.ansi.org/>

### 3.0 **System Performance Requirements (T)**

This System Specification defines Threshold (T) and Objective (O) requirements and capabilities of the Interim Range System where performance levels may be tiered. All paragraphs without a T or O delineation are by default a Threshold requirement. The IRS shall be a commercial or non-developmental data network solution that has supported at least 1000 instrumented participants during one live training exercise IAW the Specification Paragraph 3.12. The IRS shall provide a complete end-to-end hardware and software materiel solution to be the bidirectional interface between the LT2 exercise control (EXCON) extensible markup language (XML) gateway and vehicles and personnel equipped with Multiple Integrated Laser Engagement System (MILES) Tactical Engagement Simulation Systems (TESS). The IRS shall enable the command and status messaging associated with MILES type direct and indirect fire mission data

sets, administrative MILES messaging, and real-time network management functions. The IRS shall provide the equipment (e.g. radios, antennas) and associated interface hardware for outfitting MILES equipped platforms, the associated network infrastructure used to capture and relay data across the exercise area, and backhaul capability to an off range EXCON location. This specification allocates IRS functions as follows:

- a) Network Operation and Management.
- b) Network Infrastructure.
- c) IRS Player Unit Radio (IPUR).
- d) IPUR Interface Kits.
- e) Peripheral Support Components (Including but not limited to Battery Charging module.)

### 3.1 Network Operation and Management

#### 3.1.1 Live Training Transformation Exercise Control (LT2 EXCON) Interface

The IRS shall interface to and interoperate with the LT2 EXCON via the LT2 Player Unit CTIA Common Message Set ICD and support all LT2 configuration, monitoring, test control, and data collection and analysis functions (T).

#### 3.1.2 System Administrator/Network Management Functions

The IRS shall provide an administrator the ability to set up, manage, configure, and troubleshoot the IRS to include the XML data interface (T). The IRS shall allow the system administrator to perform system setup and maintenance with a maximum of 8 hours of training and to the maximum extent reasonable be automated (T).

- a) System Setup and Maintenance: The system shall be capable of supporting automatically configuring the down range network components, allocating frequency assignment, and signal routing. The system shall provide continuous and on demand component/network end-to-end Built-In-Test (BIT) supporting maintenance and troubleshooting (T).
- b) Duplicate Message Filtering: The system shall filter out duplicate messages (as applicable) prior to publishing to the LT2 XML port (T).
- c) Selectable Reporting Rates: The system shall be capable of changing reporting rates by individual radios or groups of radios and have protection/warning features to prevent inadvertent configuration errors (T).

- d) Network Administrator Workstation: The IRS shall provide a ruggedized Network Administrator workstation, preferably a laptop sized configuration to reduce the overall logistics footprint (T). A supplemental monitor and keyboard may be provided if additional screen size is required to optimize use.

### 3.1.3 Growth Capability

The IRS Player unit shall be capable of:

- a) Supporting the addition/modification of interfaces to new/modified TESS or range instrumentation (T).
- b) Providing peer-to-peer communication of not less than 100Kbps per player to adjudicate real time OneTESS casualty assessment (RTCA) (O).
- c) Sending messages to a group of players within a specific geographic area (T).

## 3.2 Network Infrastructure

- a) The IRS shall provide a network infrastructure that transfers MILES TESS interface data between IPURs located on vehicles and personnel moving within an exercise area and the LT2 EXCON (T).

### 3.2.1 Electromagnetic Spectrum

The IRS shall maximize wireless coverage and connectivity while minimizing spectral use. The communications system shall comply with the policies and procedures for the Army Frequency Allocation to Equipment (Army J/F-12) Program as described in AR 5-12 (T).

- a) Total access network (not including backhaul) spectrum usage for 2,000 players shall be no more than 250 KHz (T) not including growth requirements of 3.1.3.
- b) Total access network (not including backhaul) spectrum usage for 10,000 players shall be: less than 4.0 MHz (T); less than 417 KHz (O) not including growth requirements of 3.1.3.

### 3.2.2 Backhaul

The IRS shall provide the capability of supporting backhauled to an EXCON located up to 20Km away from an exercise area and shall support the use case baselines as defined in paragraph 3.2.4.2 (T).

### 3.2.3 Infrastructure Equipment, Antennas and Masts

Equipment, antennas and associated masts/towers required to complete the network infrastructure shall be provided in the form of self-contained mobile tower trailers (T).

- a) Trailers: Trailers shall be a proven commercial or non-developmental design capable of extensive off road use in rough terrain and be capable of being towed by HMWWVs or commercial trucks (T).
- b) Towers (except existing ETC-IS towers): Towers shall be configured with a auto-erect (T) mast and capable of operation in 70mph winds at full height with equipment installed. An auto lowering safety feature for out of balance and excessive wind loading is desired but not required. Height measured from the ground to the top of the highest antenna or structure shall not exceed 110 feet (T); 45 feet (O). Towers 50 feet or greater in height shall have an FAA Advisory Circular AC 150/5345-43 compliant red L-810 obstruction lighting system for nighttime operations installed in accordance with Chapter 5 of FAA Advisory Circular AC 70/7460-1 (T).
- c) Networking Component Weight: The IRS design shall minimize the weight and wind loading of networking components placed on the tower/mast (T).
- d) Self Generated Power: The trailer shall be self-contained providing a diesel power generator, 1 hour automatic battery backup power, and carry sufficient fuel to continuously operate for at least 24 hours (T). Engagement of the backup battery shall send an alarm to the network administrator workstation with location and time (T).
- e) Shore power: The mobile tower and equipment shall have the capability to run off of 120/240VAC commercially available power when provided at the training site (T). AC power connection shall be via a commercial standard connector (T).
- f) Security: Remote equipment will have a local alarm to signal tampering and preclude theft. In addition, locations which have a RF link back to the EXCON will send an alarm message to the Exercise Control cell (T).

### 3.2.4 Network Scalability and Coverage (T)

- a) The IRS shall be scalable and capable of providing 90% coverage in 20Km x 20Km (HITS) exercise training areas for the use case herein while maintaining overall network connectivity and quality of service requirements at the LT2 EXCON XML

gateway. The IRS shall be expandable to support the ETC-IS training area which may be up to a 20Km x 40Km area.

#### 3.2.4.1 Locations

The IRS shall cover typical Army training areas such as:

Ft. Bliss, TX	Ft. Hood, TX	Ft. Bragg, NC
Ft. Drum, NY	Ft. Atterbury	Ft. Stewart, GA
Ft. Carson, CO	Camp Shelby, MS	Ft. Riley, KS
Ft. Lewis, WA	Ft. Campbell, KY	Ft. Benning, GA

#### 3.2.4.2 Use Case Baselines (T)

RF networking, connectivity, and coverage analysis for HITS and ETC-IS shall use the following Ft. Benning, GA use case under summer foliage conditions.

HITS Ft. Benning, GA exercise area (20 Km by 20Km) and EXCON location grid coordinates:

- FA 966 832
- GA 047 937
- GA 158 829
- GA 063 738
- EXCON Location FA 974 733

#### 3.2.4.3 Additional ETC-IS use case analysis and design parameters (T)

- Three ETC-IS towers will be available for use and placement in the exercise box at desired locations, subject to logistic supportability.
- One ETC-IS tower will be available for use at the EXCON location.
- Approximate IPUR antenna placement height on ETC-IS towers is 90 feet.
- Backhaul and between tower link utilizes the ETC-IS Redline 5.8Ghz directional antennas at a height of 106 feet.
- ETC-IS backhaul range has been demonstrated at >20Km.
- Maximum weight load on ETC-IS tower at IPUR height – (80lbs).
- Tower mounted equipment and cables shall minimize wind loading.

#### 3.2.5 Reporting Rates

The IRS will have an IPUR mix of approximately 30% vehicles and 70% dismounted Soldiers. The IRS shall support the following reporting rates:

- a) 2,000 IPUR: 1400 @ 10 second update rates, 600 @ 5 second update rates). (T)
- b) 10,000 IPUR: 7000 @ 10 second update rates, 3000 @ 5 second update rates. (O)

### 3.2.6 Network Quality of Service

- a) 90 % of the IPUR shall have less than 10 percent packet loss (T).
- b) 95 % of the IPUR shall have less than 5 percent packet loss (O).
- c) The IRS shall deliver 90% (T) / 95% (O) messages within the latencies defined in 3.2.7. Messages not delivered within the defined latencies are considered lost.
- d) The IRS shall have the capability to automatically detect and recover lost event messages during the live exercise and upon manual command of the EXCON at the end of the exercise (T).

### 3.2.7 Latency

The IRS shall have end to end latency from the TESS interface to the LT2 EXCON XML gateway of no greater than:

- a) 3 seconds (T).
- b) 2 seconds (O).

### 3.2.8 Network Sizing and Capacity

#### Threshold Capacity

The Interim Range System shall support 2000 instrumented entities for both the HITS and ETC-IS use case baselines without IPUR dynamic distribution density constraints (e.g., IPURs may be tightly clustered or uniformly distributed across the exercise area). The IRS shall have the capacity to support the update rates listed in paragraph 3.2.5(a) with an additional 14% bandwidth for event and area weapon effect messages (T).

#### Objective Capacity

The IRS shall support 10,000 instrumented entities for both the HITS and ETC-IS use case baselines without any latency performance degradations. The Interim Range System shall have the capacity to support the update rates listed in paragraph 3.2.5(b) with an additional 14% bandwidth for event and area weapon effect messages (O).

### 3.3 IRS Player Unit Radio (IPUR)

The IRS shall include IPURs that interface with MILES/I-MILES TESS and pass data between the TESS equipment worn by soldiers and mounted on vehicles to and from the LT2 EXCON via the network infrastructure (T).

#### 3.3.1 MILES TESS Interfaces

The IPUR shall interface to the following MILES/I-MILES TESS families of devices in accordance with the Interface Control Documents (ICDs) listed below and shall pass TESS and exercise data bi-directionally between the TESS equipment worn by the soldier and vehicle to and from the LT2 EXCON at the reporting rates listed in 3.2.5.

<b>MILES/I-MILES TESS</b>	<b>ICD</b>
MILES XXI (T)	MILXXI-TS-0014 Rev – B
MILES 2000 (T)	ICD 3357-001 Rev B
MILES IWS (T)	ICD3262-001
I-MILES ITS (T)	ICD200426 Rev C
I-MILES WITS (T)	ICD200428 Rev A

#### 3.3.2 Other Physical and Functional Characteristics

- a) The IPUR shall include an integrated capability to determine its GPS position and transmit its Time Space Position Information (TSPI) to the LT2 EXCON at the reporting rates listed in 3.2.5 (T).
- b) Each IPUR shall be configured with a Radio Frequency Identification (RFID) tag compliant with the HITS RFID Tag ICD to facilitate inventory management and timely equipment distribution/collection correlation to individual weapons and Soldiers (T).
- c) The IPUR when configured for dismount use (including carrying pouch, antenna, cables, and battery) shall weigh no more than 3 pounds (T) and 2.5 pounds (O).
- d) The IPUR, when worn by an individual, shall have a minimum of 96 hours battery life (T) and 120 hours (O) when supporting the defined capacity in paragraph 3.2.8.
- e) IPURs shall be capable of withstanding the shock and vibrations experienced during dismounted (soldier) and mounted (vehicle) use in force on force and live fire training without degradation (T).

3.4 IPUR Interface Kits

The IRS shall include interface kits to permit use of the IPUR in soldier and vehicle configurations (T). Selection of color for all painted surfaces shall be the low visibility, lusterless, non-reflective type Field Drab 33105 IAW FED-STD-595 with exception of surfaces required for the transmission of reception of electromagnetic signals (T).

3.4.1 Dismounted Installation Kit

- a) The Dismounted Kit shall include wearable cases/pouches compatible with MILES IWS and designed to be a least intrusive (size, weight, and overall packaging) solution to the Soldier (T).
- b) The Dismounted Kit shall include rechargeable batteries approved for use by the U.S. Army Communications and Electronics Command (CECOM) (T).

3.4.2 Vehicle Installation Kit

Vehicle kits shall include everything required to physically secure and interface the IPUR to the following weapon/vehicle platforms and their specific MILES configurations (MILES XXI, MILES 2000, IWS, WITS (T) / CVS, TVS (O)). The time required for an individual to perform mounting and system check-out of the IPUR shall be 30 minutes or less (T). No permanent modifications to the vehicles or weapon systems shall be permitted and the IRS shall not interfere or degrade the performance of host war fighting platforms, crew, or weapon systems (T). Common or universal kit configurations across platform types are desirable but not required. Required vehicle types are as follows (T):

- a) Wheeled vehicles (HMMWV, HEMTT)
- b) M1 series tank
- c) M2 series fighting vehicle
- d) Stryker series of vehicles
- e) Family of Medium Tactical Vehicles (FMTV)
- f) Mine Resistant Armored Personnel (MRAP) vehicle
- g) M113 series of vehicles

Platform		MILES XXI	MILES 2000	MILES IWS	I-MILES ITS	I-MILES WITS	

Wheeled vehicles (HMMWV, HEMTT)		N	Y	N	Y	Y	
M1 series tank		Y	Y	N	N	N	
M2 series fighting vehicle		Y	Y	N	N	N	
Stryker series of vehicles		Y	N	N	Y*	Y*	
Family of Medium Tactical Vehicles (FMTV)		N	Y*	N	Y*	Y*	
Mine Resistant Armored Personnel (MRAP) vehicle		N	N	N	Y	Y	
M113 series of vehicles		N	Y	N	Y	Y	
Personnel		N	Y	Y	N	N	

Note: Y\* indicated a MILES target only; platform does not have a laser transmitter

#### 3.4.2.1 Battery and Charging System

Vehicle kits shall include a rechargeable battery system for IPUR operation using batteries approved for use by the U.S. Army CECOM. Vehicle kits shall interface to I-MILES/MILES TESS in accordance with the ICDs listed in 3.3.1 to maintain battery charge when power is available at the interface. Vehicle kits include interface cabling to connect to alternate power sources including NATO slave power receptacles and vehicle dome lights when installed on vehicles whose TESS does not have the capability of feeding through vehicle power (T). The charging system shall protect the vehicles and TESS from current sags, surges, and transients resulting from the interface. Without vehicle power, IPUR batteries shall have a minimum life of 96 hours (T) and minimum of 120 hours (O) when supporting the defined capacity in paragraph 3.2.8.

#### 3.4.2.2 Shock and Vibration

The kits as integrated on each platform type shall be capable of withstanding the shock and vibrations experienced by the vehicles in force on force and live fire training operations without degradation (T).

### 3.5 Peripheral support components

- a) IRS shall require use of only basic issue items (BII) for vehicle and man-worn kit installation (T). Each IRS system shall include any special tools and test equipment required to maintain the system and its components (T).
- b) IRS shall have a battery charging capability to charge up to maximum of 1400 IPUR dismount kit batteries in 48 hours. The system will include ability to scale the battery charging capability from 100 to a maximum of 1400 Individual Instrumentation Kit batteries without modification to the IRS system. (T)

### 3.6 Deployability and Recovery

- a) The IRS (excluding the IPUR and installation kits) shall be capable of being deployed, operated and maintained by a staff of 4 trained personnel and be set-up and operational at a new 20Km x 20Km location 32 man-hours (T). Assume the HITS Ft. Benning training area as described in paragraph 3.2.4.2.
- b) The IRS (excluding the IPUR and installation kits) shall be recoverable by two individuals in no more than 8 hours (T). Assume the HITS Ft. Benning training area as described in paragraph 3.2.4.2.

### 3.7 IRS Configurations

The IRS shall be capable of supporting both the HITS and ETC-IS individually and in a combined application (T). When ETC-IS visits a HITS location, the HITS IRS components will supplement the ETC-IS IRS components to create a larger exercise area and increase the number of instrumented participants.

#### 3.7.1 HITS Configuration

The IRS HITS configuration and performance shall be, without exception, an end-to-end solution as specified herein (T).

#### 3.7.2 ETC-IS Configuration

The ETC-IS configuration and performance shall be an end-to-end solution as specified herein with the configuration exceptions as follows:

- a) Three (3) existing ETC-IS 106 foot towers and Remote Base Station (RBS) will be located in each ranges' exercise area and shall host IRS components as required based on the offeror's design (T). The ETC-IS tower is the Integrated Tower

Systems model SRS-106 (see <http://www.intelcotowers.com/pdf/srs-106-srs-89.pdf>)

- b) IRS shall utilize the ETC-IS backhaul network located at each tower. ETC-IS will provide access to the Cisco Ethernet network switches and the 5.8GHz Redline directional antennas (T).
- c) One (1) existing ETC-IS 106 feet tower and EXCON RBS located at each ranges' EXCON area shall host IRS components to as required based on the offeror's design (T).
- d) IRS may utilize power and environmentally controlled space provided inside the ETC-IS exercise area and EXCON RBSs for processing and networking equipment. Exercise area towers are co-located with their RBS. The IRS shall provide for the EXCON tower to be located up to 1000 feet away from the EXCON RBS (T).
- e) IRS mobile nodes shall be capable of supplementing the ETC-IS IRS configured towers to enable additional area coverage at each range location without onsite modification (T).

### 3.8 Environmental

- a) The IRS shall operate in the weather conditions of sun, rain, snow, fog, fine particle dust as experienced at locations described in 3.2.4.1 Locations (T).
- b) Equipment shall be capable of operation from -20 degrees to 120 degrees Fahrenheit (T).

### 3.9 Packaging

#### 3.9.1 Containerization

The IRS equipment shall be packaged allowing transport in or towed by a HMMWV or commercial truck (i.e. F250 type). Transit cases shall be used to protect the IPUR, installation kit and Network Operation and Administration components during transportation, storage, and handling. Transit cases shall be built to comply with ATA SPEC 300, Category I container and shall provide protected areas for attachment of all hardware. Top and bottom case surfaces shall be interlocking. If transit cases with all components require a two-person or more lift, they shall have handles on all four sides. Transit Cases shall be designed to facilitate accountability without removing components, such as packing components with the serial numbers up/visible (T).

### 3.9.2 Ruggedization

All IRS components and equipment shall be sufficiently ruggedized to be transported off-road and operated at training locations described in 3.2.4.1 Locations. Cables and equipment shall be resistant to damage during installation, removal, and usage in the harsh military training environment (T).

## 3.10 Electromagnetic Environment

### 3.10.1 Electromagnetic Environmental Effects (E3) (T)

All equipment shall operate in the electromagnetic environment described below without being a source of electromagnetic interference or a victim of site/location generated electromagnetic emissions, whether radiated or conducted. The electromagnetic environment expected at the utilization sites is a high electromagnetic noise environment for radiated energy. The equipment site is an active military training range with an active airfield operation. The equipment site contains electromagnetic effects from licensed/authorized radio frequency emitters, lightning storms, power line transients, and electrostatic fields generated by human operators and maintainers. Thus, considerable electromagnetic emissions from numerous electromagnetic emitter sources, both intentional (i.e. radar, radio both fixed and mobile) and unintentional (i.e. ignition noise), will be adjacent to the equipment.

### 3.10.2 Electromagnetic Compatibility (EMC) (T)

The IRS shall be electromagnetically compatible with itself and adjacent electrical, electromechanical, and electronic equipment at the installation site. The Interim Range System shall be electromagnetically compatible with itself such that system operational performance requirements can be met.

### 3.10.3 Inter-system EMC (T)

The IRS shall be electromagnetically compatible with its defined Electromagnetic Environment (EME) such that the system operational performance requirements can be met. The expected EME at the operational site is 50 V/m (RMS) in the frequency range of 10 KHz to 10 GHz. Inter-system EMC covers compatibility with, but is not limited to: the operational site EME, adjacent equipment, and friendly emitters (CB, UHF, VHF, cellular, etc.).

### 3.11 System Safety (T)

#### 3.11.1 Environmental Safety (T)

The IRS shall be safe to operate and maintain and present no uncontrolled safety, health, or environmental hazards to operators and maintainers throughout the life cycle of the system. Any design or modifications shall comply 29 CFR 1910, the National Fire Protection Association Codes, including hazards to users, operators, maintainers, and personnel adjacent to the system. The system shall provide failsafe features for safety of personnel during installation, operation, maintenance, testing, support activities, and disposal. COTS equipment shall be certified as meeting the requirements of a nationally accredited safety-testing laboratory for its intended use (i.e., UL, etc.), or host nation equivalent. Training equipment that can be mistaken for tactical equipment shall be marked "FOR TRAINING USE ONLY".

#### 3.11.2 Electrical Safety (T)

Electrical circuitry and installation shall comply with the requirements of the National Electric Code (ANSI/NFPA 70). Applicable danger, caution, and warning signs shall be designed and installed in accordance with ANSI Z535.3 and ANSI Z535.4 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.

#### 3.11.3 Hazardous Materials (T)

The IRS shall use non-toxic/environmentally acceptable alternatives whenever possible from a cost effectiveness and operational point of view. The system shall not incorporate hazardous material, such as asbestos; glass fiber materials (as the outer surface or covering on cables, wire, or other items where they may cause skin irritation to operating personnel); Halon or other Ozone-depleting substances; or Polyvinyl chloride (PVC) materials within crew or personnel occupied compartments. When maintenance procedures require access to glass fibers, such as insulation, the contractor shall install a caution note alerting maintenance personnel. The 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).

#### 3.11.4 Personnel Safety (T)

The IRS shall provide maximum safety to personnel and system equipment when installing, operating, adjusting and maintaining the equipment. Cables shall be minimized and located to preclude tripping hazards or damage to cables. All

equipment shall conform to MIL-STD-1474 noise limits. The design of the equipment shall provide user personnel maximum access and safety while operating and maintaining the equipment. Equipment and transit cases housing equipment shall be designed, installed, and labeled so that it can be removed, handled, and lifted safely. Single person lift limits for equipment are as follows: (Table 1)

<b>Handling Function</b>	<b>1-person (male/female) Lbs</b>	<b>2-Person Lbs</b>	<b>4-Persons Lbs</b>
Equipment lifted less than five feet above the floor	37	74	128
Equipment lifted less than three feet above the floor	44	88	154
Equipment designed to be carried 33 feet or less	42	84	147

Table 1: Lift Limits

### 3.11.5 Mechanical Safety (T)

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 system/equipment is stable and easy to handle.

### 3.11.6 Antenna Safety (T)

Antenna tips or other sharp rods shall have tip caps or other suitable design fixture to prevent puncture hazards to eyes, etc., where personnel are likely to be exposed to such hazards. Where design considerations permit, antennas shall be coated with a dielectric material to insulate against at least 10,000 volts Root Mean Squared (RMS). To assure adequate lightning protection, the following design features are required for all fixed, semi-permanent, and mobile facilities that incorporate antenna tower/masts:

- a) Antenna masts must incorporate a ground stud with the necessary hardware to permit secure attachment of a ground strap/rod.
- b) Lead-in wires require discharge units (lightning arrestors) on each conductor or enclosure in a continuous metallic shield that is effectively grounded; coaxial cable lead-in may be used as is if the outer shields are grounded at both ends.

### 3.11.7 RF Safety (T)

The system design shall protect personnel, fuels, and ordnance from hazardous effects of electromagnetic radiation. Antennas and other devices that carry sufficient RF voltage to burn or injure personnel shall be protected from accidental contact in the same manner as for AC voltages. Microwave or RF radiation signs shall be permanently affixed to warn personnel of danger zones. Transmitters shall comply with the maximum permissible exposure (MPE) limits for general public/uncontrolled environments as contained IEEE C95.1-2005.

### 3.12 System Maturity

- a) The system shall have supported a 1,000 or more participants Live Collective Training Exercise where the end-to-end network connected Tactical Engagement Simulation Systems on each participant to a central exercise control suite (T).
- b) The Exercise shall have occurred between 2007 and 2010 (T).
- c) The Exercise shall have covered a minimum of 150 square Km (T).
- d) The proposed network type and function shall be the same that supported the Exercise. Hardware, such as the IPUR, may be an updated version but shall interface to the network in the same manner as the hardware did in the Exercise (T).

## 4.0 Verification

This section includes all verifications to be performed during acceptance testing to determine that the system offered for acceptance conforms to all requirements in section 3.0 of this specification.

Unless otherwise specified, all inspections shall be performed in prevailing environmental conditions that define normal range operations.

Methods of Verification include:

- a) Analysis. An element of verification that uses established technical or mathematical models or simulations, algorithms, charts, graphs, circuit diagrams, or other specific scientific principles and procedures to provide evidence that state requirements were met.
- b) Demonstration. An element of verification that generally denoted the actual operation, adjustment, or re-configuration of items to provide evidence that the designed functions were accomplished under specific scenarios. The items may be instrumented and quantitative limits of performance monitored.

- c) Test. An element of verification and inspection that generally denoted the determination, by technical means, of the properties or elements of items, including functional operation, and involves the application of established scientific principles and procedures. Testing to be performed at contractor's facility will be referred as T<sub>F</sub> and at On-Site exercise location as T<sub>OS</sub>.
- d) Examination. An element of verification and inspection consisting of investigation, without the use of special laboratory appliances or procedures, of items to determine conformance to those specified requirements which can be determined by such investigations. Examination is generally nondestructive and typically includes the use of sight, hearing, smell, touch, and taste; simple physical manipulation; mechanical and electrical gauging and measurement; and other forms of investigation. Examination may include Certificates of Compliance. Certification is an element of verification that generally denotes or documents the prior conduct of formal test verification, and relies on documented test results, performance data, analytical data, or vendor documentation. The items require that the contractor certify that the requirements have been met.

The IRS shall:

Seq.	Requirement:	E	A	D	T <sub>F</sub>	T <sub>OS</sub>
1	Be a commercial or non-developmental data network solution that has supported at least 1000 instrumented participants during one live training exercise. (T)	X				
2	Provide a complete end-to-end hardware and software materiel solution to be the bidirectional interface between the LT2 exercise control (EXCON) extensible markup language (XML) gateway and vehicles and personnel equipped with Multiple Integrated Laser Engagement System (MILES) Tactical Engagement Simulation Systems (TESS). (T)			X		
3	Enable the command and status messaging associated with MILES type direct and indirect fire mission data sets, administrative MILES messaging, and real-time network management functions. (T)			X		
4	Provide the equipment (e.g. radios, antennas) and associated interface hardware for outfitting MILES equipped platforms, the associated network infrastructure used to capture and relay data across			X		

	the exercise area, and backhaul capability to an off range EXCON location. This specification allocates IRS functions as follows:					
4a	Network Operation and Management. (T)					
4b	Network Infrastructure. (T)	X				
4c	IRS Player Unit Radio (IPUR). (T)	X				
4d	IPUR Interface Kits. (T)	X				
4e	Peripheral Support Components. (T)	X				

4.1 Network Operation and Management

4.1.1 Live Training Transformation Exercise Control (LT2 EXCON) Interface

The IRS shall:

Seq.	Requirement:	E	A	D	T <sub>F</sub>	T <sub>OS</sub>
1	Interface to and interoperate with the LT2 EXCON via the LT2 Player Unit CTIA Common Message Set ICD. (T)			X		X
2	Support all LT2 configuration, monitoring, test control, and data collection and analysis functions. (T)			X		X

4.1.2 System Administrator/Network Management Functions

The IRS shall:

1	Provide an administrator the ability to set up, manage, configure, and troubleshoot the IRS to include the XML data interface. (T)			X		
2	Allow the system administrator to perform system setup and maintenance with minimal training, using user intuitive Graphical User Interfaces (GUI) and to the maximum extent reasonable be automated. (T)			X		
3	System Setup and Maintenance: The system shall be capable of supporting automatically configuring the down range network components, allocating frequency			X		

	assignment, and signal routing. The system shall provide continuous and on demand component/network end-to-end Built-In-Test (BIT) supporting maintenance and troubleshooting (T).					
4	Filter out duplicate messages (as applicable) prior to publishing to the L2T XML port. (T)			X		X
5	Be capable of changing reporting rates by individual radios or groups of radios with automated protection and warning features to prevent inadvertent configuration errors. (T)			X		X
6	Provide a ruggedized Network Administrator workstation, preferably a laptop sized configuration to reduce the overall logistics footprint. A supplemental monitor and keyboard may be provided if additional screen size is required to optimize use. (T)	X				

#### 4.1.3 Growth Capability

The IRS Player Unit shall be capable of:

Seq.	Requirement:	E	A	D	T <sub>F</sub>	T <sub>OS</sub>
1	Supporting the addition/modification of interfaces to new/modified TESS or range instrumentation (T).			X		
2	Providing peer-to-peer communication of not less than 100Kbps per player to adjudicate real time OneTESS casualty assessment (RTCA) (O).		X			X
3	Sending messages to a group of players within a specific geographic area (T).			X		

#### 4.2 Network Infrastructure

The IRS shall:

Seq.	Requirement:	E	A	D	T <sub>F</sub>	T <sub>OS</sub>
1	Provide a network infrastructure that transfers MILES TESS interface data between IPURs located on vehicles and personnel moving within an exercise area			X		

	and the LT2 EXCON. (T)					
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4.2.1 Electromagnetic Spectrum

The IRS shall:

Seq.	Requirement:	E	A	D	T <sub>F</sub>	T <sub>OS</sub>
1	Maximize wireless coverage and connectivity while minimizing spectral use.			X		
2	The communications system shall comply with the policies and procedures for the Army Frequency Allocation to Equipment (Army J/F-12) Program as described in AR 5-12. (T)	X				
	a) Total access network (not including backhaul) spectrum usage for 2,000 players shall be no more than 250 KHz (T) not including growth requirements of 3.1.3.		X			X
	a) Total access network (not including backhaul) spectrum usage for 10,000 players shall be: less than 417 KHz (O); less than 4.0 MHz (T) not including growth requirements of 3.1.3.		X			

4.2.2 Backhaul

Seq.	Requirement:	E	A	D	T <sub>F</sub>	T <sub>OS</sub>
1	The IRS shall provide the capability of supporting backhauled to an EXCON located up to 20Km away from an exercise area. (T)			X		

4.2.3 Infrastructure Equipment, Antennas and Masts

Equipment, antennas and associated masts/towers required to complete the network infrastructure shall be provided in the form of self-contained mobile tower trailers (T).

Seq.	Requirement:	E	A	D	T <sub>F</sub>	T <sub>OS</sub>
a	Trailers: Trailers shall be a proven commercial or non-developmental design capable of extensive off road use in rough terrain and be capable of being towed by	X		X		

	HMWWVs or commercial trucks (T).					
b	a) Towers (except existing ETC-IS towers): Towers shall be configured with a auto-erect (T) mast and capable of operation in 70mph winds at full height with equipment installed. An auto lowering safety feature for out of balance and excessive wind loading is desired but not required. Height measured from the ground to the top of the highest antenna or structure shall not exceed 110 feet (T); 45 feet (O). Towers 50 feet or greater in height shall have an FAA Advisory Circular AC 150/5345-43 compliant red L-810 obstruction lighting system for nighttime operations installed in accordance with Chapter 5 of FAA Advisory Circular AC 70/7460-1 (T).			X		
	2. An auto lowering safety feature for out of balance and excessive wind loading is desired but not required. Height measured from the ground to the top of the highest antenna or structure shall not exceed 110 feet (T); 45 feet (O).	X				
	3. Towers 50 feet or greater in height shall have an FAA Advisory Circular AC 150/5345-43 compliant red L-810 obstruction lighting system for nighttime operations installed in accordance with Chapter 5 of FAA Advisory Circular AC 70/7460-1 (T).			X		
c	Networking Component Weight: The IRS design shall minimize the weight and wind loading of networking components placed on the tower/mast (T).		X			
d	1. Self Generated Power: The trailer shall be self-contained providing a diesel power generator, 1 hour automatic battery backup power, and sufficient fuel to continuously operate for at least 24 hours (T).				X	
	2. Engagement of the backup battery shall send an alarm to the network administrator workstation with location and time (T).			X		
e	1. Shore power: The mobile tower and equipment shall have the capability to run off of 120/240VAC commercially available power when provided at the training site (T).			X		

	2. AC power connection shall be via a commercial standard connector (T).	X				
f	a) Security: Remote equipment will have a local alarm to signal tampering and preclude theft. In addition, locations which have a RF link back to the EXCON will send an alarm message to the Exercise Control cell (T).			X		

#### 4.2.4 Network Scalability and Coverage

The IRS shall:

Seq.	Requirement:	E	A	D	T <sub>F</sub>	T <sub>OS</sub>
1	Be scalable and capable of providing 90% coverage in 20Km x 20Km (HITS) and 20Km x 40Km (ETC-IS) exercise training areas for the use cases herein while maintaining overall network connectivity and quality of service requirements at the LT2 EXCON XML gateway. (T)					X

##### 4.2.4.1 Locations

The IRS shall cover typical Army training areas such as:

Seq.	Requirement:	E	A	D	T <sub>F</sub>	T <sub>OS</sub>
1	Stated in 3.2.4.1.					X

##### 4.2.4.2 Use Case Baselines (T)

RF networking, connectivity, and coverage analysis for HITS shall use the following Ft. Benning, GA use cases under summer foliage conditions:

Seq.	Requirement:	E	A	D	T <sub>F</sub>	T <sub>OS</sub>
1	As stated in 3.2.4.2 a).	X				

The Ft. Benning design establishes a baseline system that is representative of many locations that HITS will be employed.

4.2.4.3 Additional ETC-IS use case analysis and design parameters (T)

Seq.	Requirement:	E	A	D	T <sub>F</sub>	T <sub>OS</sub>
1	Three ETC-IS towers will be available for use and placement in the exercise box at desired locations, subject to logistic supportability. (T)					X
2	One ETC-IS tower will be available for use at the EXCON location. (T)					X
3	Approximate IPUR antenna placement height on ETC-IS towers is 90 feet. (T)	X				
4	Back haul and between tower link utilizes the ETC-IS Redline 5.8Ghz directional antennas at a height of 106 feet. (T)	X		X		X
5	ETC-IS backhaul range has been demonstrated at >20Km. (T)					X
6	Maximum weight load on ETC-IS tower at IPUR height – (80lbs). (T)		X	X		
7	Tower mounted equipment and cables shall minimize wind loading. (T)		X	X		

4.2.5 Reporting Rates

The IRS will have an IPUR mix of approximately 30% vehicles and 70% dismantled Soldiers. The IRS shall support the following reporting rates:

Seq.	Requirement:	E	A	D	T <sub>F</sub>	T <sub>OS</sub>
a	2,000 IPUR: 1400 @ 10 second update rates, 600 @ 5 second update rates). (T)		X			X
b	10,000 IPUR: 7000 @ 10 second update rates, 3000 @ 5 second update rates. (O)		X			

4.2.6 Network Quality of Service

Seq.	Requirement:	E	A	D	T <sub>F</sub>	T <sub>OS</sub>
a	90 % of the IPURs shall have less than 10 percent packet loss (T).					X
b	95 % of the IPURs shall have less than 5 percent packet loss (O).					X
c	The IRS shall deliver 90% (T) / 95% (O) messages within the latencies defined in 3.2.7. Messages not					X

	delivered within the defined latencies are considered lost.					
d	The IRS shall have the capability to automatically detect and recover lost event messages during the live exercise and upon manual command of the EXCON at the end of the exercise (T).					X

#### 4.2.7 Latency

The IRS shall have end to end latency from the TESS interface to the LT2 EXCON XML gateway of no greater than:

Seq.	Requirement:	E	A	D	T <sub>F</sub>	T <sub>OS</sub>
1	3 seconds (T).					X
2	2 seconds (O).					X

#### 4.2.8 Network Sizing and Capacity

##### Threshold Capacity

The IRS shall:

Seq.	Requirement:	E	A	D	T <sub>F</sub>	T <sub>OS</sub>
1	Support 2000 instrumented entities for both the HITS and ETC-IS use case baselines without IPUR dynamic distribution density constraints (e.g., IPURs may be tightly clustered or uniformly distributed across the exercise area). (T)		X			X
2	Support the update rates of 2,000 IPUR: 1400 @ 10 second update rates, 600 @ 5 second update rates and an additional 14% bandwidth (T).		X			X

##### Objective Capacity

The IRS shall:

Seq.	Requirement:	E	A	D	T <sub>F</sub>	T <sub>OS</sub>
1	Support 10000 instrumented entities for both the		X			X

	HITS and ETC-IS use case baselines without IPUR dynamic distribution density constraints (e.g., IPURs may be tightly clustered or uniformly distributed across the exercise area). (O)					
2	Support the update rates of 10,000 IPUR: 7000 @ 10 second update rates, 3000 @ 5 second update rates and an additional 14% bandwidth (O).		X			

4.3 IRS Player Unit Radio (IPUR)

The IRS shall:

Seq.	Requirement:	E	A	D	T <sub>F</sub>	T <sub>OS</sub>
1	Include IPURs that interface with MILES TESS and pass data between the MILES TESS equipment worn by soldiers and mounted on vehicles to and from the LT2 EXCON via the network infrastructure. (T)			X		

4.3.1 MILES TESS Interfaces

- a. The Interim Range System shall Interoperate with the following TESS IAW the listed ICDs:

Seq.	Requirement:	E	A	D	T <sub>F</sub>	T <sub>OS</sub>
1a	MILES XXI (T) MILXXI-TS-0014 Rev – B			X		
1b	MILES 2000 (T) ICD 3357-001 Rev B			X		
1c	MILES IWS (T) ICD 3262-001			X		
1d	MILES ITS (T) ICD200426C			X		
1e	MILES WITS (T) ICD 200428A			X		
1f	<del>I-MILES CVS (O) ICD 194165 Rev B</del>			X		
1g	<del>I-MILES TVS (O) TBD</del>			X		

- b. The Interim Range System:

Seq.	Requirement:	E	A	D	T <sub>F</sub>	T <sub>OS</sub>
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2	Shall pass TESS data between the TESS equipment worn by the soldier and vehicle to and from the LT2 EXCON at the reporting rates listed in 3.2.5. (T)			X		
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#### 4.3.2 Other Physical and Functional Characteristics

The IPUR:

Seq.	Requirement:	E	A	D	T <sub>F</sub>	T <sub>OS</sub>
2a	Shall include an integrated capability to determine its GPS position and transmit its Time Space Position Information (TSPI) to the LT2 EXCON at the reporting rates listed in 3.2.5. (T)			X		X
2b	Shall be configured with a Radio Frequency Identification (RFID) tag compliant with the HITS RFID Tag ICD to facilitate inventory management and timely equipment distribution/collection correlation to individual weapons and Soldiers. (T)			X		X
2c	The IPUR when configured for dismount use (including carrying pouch, antenna, cables, and battery) shall weigh no more than 3 pounds (T) and 2.5 pounds (O).	X				
2d	The IPUR, when worn by an individual, shall have a minimum battery life of 96 hours (T) and 120 hours (O) when supporting the defined capacity in paragraph 3.2.8.			X		
2e	Shall be capable of withstanding the shock and vibrations experienced during dismounted (soldier) and mounted (vehicle) use in force on force and live fire training without degradation. (T)			X		

#### 4.4 IPUR Interface Kits

The IRS shall:

Seq.	Requirement:	E	A	D	T <sub>F</sub>	T <sub>OS</sub>
1	Include interface kits to permit use of the IPUR in soldier and vehicle configurations. (T)	X				

2	Selection of color for all painted surfaces shall be the low visibility, lusterless, non-reflective type Field Drab 33105 IAW FED-STD-595 with exception of surfaces required for the transmission of reception of electromagnetic signals. (T)	X				
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4.4.1 Dismounted Kit

The IPURs shall:

Seq.	Requirement:	E	A	D	T <sub>F</sub>	T <sub>OS</sub>
1	Include wearable cases/pouches compatible with MILES IWS and designed to be a least intrusive (size, weight, and overall packaging) solution to the Soldier. (T)	X				
2	Include rechargeable battery/batteries approved for use by the U.S. Army Communications and Electronics Command (CECOM). (T)	X				

4.4.2 Vehicle Kit

Vehicle kits shall:

Seq.	Requirement:	E	A	D	T <sub>F</sub>	T <sub>OS</sub>
1	Include everything required to physically secure and interface the IPUR to the following weapon/vehicle platforms and their specific MILES configurations (MILES XXI, MILES 2000, IWS, WITS (T)).	X				
2	Require 30 minutes or less for an individual to perform mounting and system check-out of the IPUR. (T)			X		
3	No permanent modifications to the vehicles or weapon systems shall be permitted and the IRS shall not interfere or degrade the performance of host war fighting platforms, crew, or weapon systems. (T)			X		
4	Common or universal kit configurations across platform types are desirable but not required. Required vehicle types are as follows:	X				
4a	Wheeled vehicles (HMMWV, HEMTT) . (T)	X				

4b	M1 series tank. (T)	X				
4c	M2 series fighting vehicle. (T)	X				
4d	Stryker series of vehicles. (T)	X				
4e	Family of Medium Tactical Vehicles (FMTV). (T)	X				
4f	Mine Resistant Armored Personnel (MRAP) vehicle. (T)	X				
4g	M113 series of vehicles (T)	X				

Battery and Charging System

Vehicle kits shall:

Seq.	Requirement:	E	A	D	T <sub>F</sub>	T <sub>OS</sub>
1	Include a rechargeable battery system for IPUR operation using batteries approved for use by the U.S. Army CECOM. (T)	X				
2	Interface to I-MILES/MILES TESS in accordance with the ICDs listed in 3.3.1 to maintain battery charge when power is available at the interface and include interface cabling to connect to alternate power sources including NATO slave power receptacles and vehicle dome lights when installed on vehicles whose TESS does not have the capability of feeding through vehicle power. (T)					X
3	The charging system shall protect the vehicles and TESS from current sags, surges, and transients resulting from the interface. Without vehicle power, IPUR batteries shall have a minimum life of 96 hours (T) and minimum of 120 hours (O) when supporting the defined capacity in paragraph 3.2.8.				X	

Shock and Vibration

The kits as integrated on each platform type shall:

Seq.	Requirement:	E	A	D	T <sub>F</sub>	T <sub>OS</sub>
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1	Be capable of withstanding the shock and vibrations experienced by the vehicles in force on force and live fire training operations without degradation. (T)			X		
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4.5 Peripheral support components

IRS shall:

Seq.	Requirement:	E	A	D	T <sub>F</sub>	T <sub>OS</sub>
1a	Require use of only basic issue items (BII) for vehicle and man-worn kit installation. (T)			X		
1b	Each IRS system shall include any special tools and test equipment required to maintain the system and its components. (T)	X				
2	IRS shall have a battery charging capability to charge up to maximum of 1400 IPUR dismount kit batteries in 48 hours. The system will include ability to scale the battery charging capability from 100 to a maximum of 1400 Individual Instrumentation Kit batteries without modification to the IRS system. (T)		X		X	

4.6 Deployability and Recovery

The IRS shall:

Seq.	Requirement:	E	A	D	T <sub>F</sub>	T <sub>OS</sub>
1	The IRS (excluding the IPUR and installation kits) shall be capable of being deployed, operated and maintained by a staff of 4 trained personnel and be set-up and operational at a new 20Km x 20Km location 32 man-hours (T). Assume the HITS Ft. Benning training area as described in paragraph 3.2.4.2.			X		
2	The IRS (excluding the IPUR and installation kits) shall be recoverable by two individuals in no more than 8 hours (T). Assume the HITS Ft. Benning training area as described in paragraph 3.2.4.2.			X		

4.7 IRS Configurations

The IRS shall:

Seq.	Requirement:	E	A	D	T <sub>F</sub>	T <sub>OS</sub>
1	Be capable of supporting both the HITS and ETC-IS individually and in a combined application. When ETC-IS visits a HITS location, the HITS IRS components will supplement the ETC-IS IRS components to create a larger exercise area and increase the number of instrumented participants. (T)					X

4.7.1 HITS Configuration

The IRS HITS configuration and performance shall:

Seq.	Requirement:	E	A	D	T <sub>F</sub>	T <sub>OS</sub>
1	Be, without exception, an end-to-end solution as specified herein. (T)					X

4.7.2 ETC-IS Configuration

The ETC-IS configuration and performance shall be an end-to-end solution as specified herein with the configuration exceptions as follows:

Seq.	Requirement:	E	A	D	T <sub>F</sub>	T <sub>OS</sub>
a	Three (3) existing ETC-IS 106 feet towers and Remote Base Station (RBS) will be located in each ranges' exercise area and shall host IRS components as required based on the offeror's design. (T)	X				
b	IRS shall utilize the ETC-IS backhaul network located at each tower. ETC-IS will provide access to the Cisco Ethernet network switches and the 5.8Ghz Redline directional antennas. (T)			X		
c	One (1) existing ETC-IS 106 feet tower and EXCON RBS located at each ranges' EXCON area shall host IRS components to as required based on the offeror's design. (T)	X				
d	IRS may utilize power and environmentally controlled space provided inside the ETC-IS exercise area and	X		X		

	EXCON RBSs for processing and networking equipment. Exercise area towers are co-located with their RBS. The IRS shall provide for the EXCON tower to be located up to 1000 feet away from the EXCON RBS. (T)					
e	IRS mobile nodes shall be capable of supplementing the ETC-IS IRS configured towers to enable additional area coverage at each range location without onsite modification. (T)					X

4.8 Environmental

The IRS:

Seq.	Requirement:	E	A	D	T <sub>F</sub>	T <sub>OS</sub>
1	Shall operate in the weather conditions of sun, rain, snow, fog, fine particle dust as experienced at locations described in 3.2.4.1 Locations. (T)	X				X
2	Equipment shall be capable of operation from -20 degrees to 120 degrees Fahrenheit. (T)	X				X

4.9 Packaging

4.9.1 Containerization

The Interim Range System equipment shall:

Seq.	Requirement:	E	A	D	T <sub>F</sub>	T <sub>OS</sub>
1	The Interim Range System equipment shall be packaged allowing transport in or towed by a HMMWV or commercial truck (i.e. F250 type). Transit cases shall be used to protect the IPUR, installation kit and Network Operation and Administration components during transportation, storage, and handling. Transit cases shall be built to comply with ATA SPEC 300, Category I container and shall provide protected areas for attachment of all hardware. Top and bottom case surfaces shall be interlocking. If transit cases with all components require a two-person or more lift, they shall have handles on all four sides. Transit Cases shall be designed to facilitate accountability without removing	X		X		

	components, such as packing components with the serial numbers up/visible (T).					
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4.9.2 Ruggedization

All Interim Range System components and equipment shall:

Seq.	Requirement:	E	A	D	T <sub>F</sub>	T <sub>OS</sub>
1	Be sufficiently ruggedized to be transported off-road and operated at training locations described in 3.2.4.1 Locations. (T)					X
2	Cables and equipment shall be resistant to damage during installation, removal, and usage in the harsh military training environment. (T)					X

4.10 Electromagnetic Environment

4.10.1 Electromagnetic Environmental Effects (E3) (T)

The IRS shall:

Seq.	Requirement:	E	A	D	T <sub>F</sub>	T <sub>OS</sub>
1	Operate in the electromagnetic environment described below without being a source of electromagnetic interference or a victim of site/location generated electromagnetic emissions, whether radiated or conducted. (T)					X

4.10.2 Electromagnetic Compatibility (EMC) (T)

The IRS shall:

Seq.	Requirement:	E	A	D	T <sub>F</sub>	T <sub>OS</sub>
1	Be electromagnetically compatible with itself and adjacent electrical, electromechanical, and electronic equipment at the installation site. (T)					X
2	Be electromagnetically compatible with itself such that system operational performance requirements					X

	can be met. (T)					
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4.10.3 Inter-system EMC (T)

The IRS shall:

Seq.	Requirement:	E	A	D	T <sub>F</sub>	T <sub>OS</sub>
1	Be electromagnetically compatible with its defined Electromagnetic Environment (EME) such that the system operational performance requirements can be met. (T)					X

4.11 System Safety (T)

4.11.1 Environmental Safety (T)

The IRS shall:

Seq.	Requirement:	E	A	D	T <sub>F</sub>	T <sub>OS</sub>
1	Be safe to operate and maintain and will present no uncontrolled safety, health, or environmental hazards to operators and maintainers throughout the life cycle of the system. (T)	X		X		
2	Any design or modifications shall comply 29 CFR 1910, the National Fire Protection Association Codes, including hazards to users, operators, maintainers, and personnel adjacent to the system. (T)	X				
3	The system shall provide failsafe features for safety of personnel during installation, operation, maintenance, testing, support activities, and disposal. (T)			X		
4	COTS equipment shall be certified as meeting the requirements of a nationally accredited safety-testing laboratory for its intended use (i.e., UL, etc.), or host nation equivalent. (T)	X				
5	Training equipment that can be mistaken for tactical equipment shall be marked "FOR TRAINING USE ONLY". (T)	X				

4.11.2 Electrical Safety (T)

Electrical circuitry and installation shall:

Seq.	Requirement:	E	A	D	T <sub>F</sub>	T <sub>OS</sub>
1	Comply with the requirements of the National Electric Code (ANSI/NFPA 70). (T)	X				
2	Applicable danger, caution, and warning signs shall be designed and installed in accordance with ANSI Z535.3 and ANSI Z535.4 to warn user personnel of specific hazards such as voltage, current, and thermal. (T)	X				
3	Batteries shall be sufficiently separated from electronic components to prevent damage from corrosion. (T)	X				

4.11.3 Hazardous Materials (T)

The contractor shall:

Seq.	Requirement:	E	A	D	T <sub>F</sub>	T <sub>OS</sub>
1	Use non-toxic/environmentally acceptable alternatives whenever possible from a cost effectiveness and operational point of view. (T)	X				
2	The system shall not incorporate hazardous material, such as asbestos; glass fiber materials (as the outer surface or covering on cables, wire, or other items where they may cause skin irritation to operating personnel); Halon or other Ozone-depleting substances; or Polyvinyl chloride (PVC) materials within crew or personnel occupied compartments. (T)	X				
3	When maintenance procedures require access to glass fibers, such as insulation, the contractor shall install a caution note alerting maintenance personnel. (T)	X				
4	The 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). (T)		X			

4.11.4 Personnel Safety (T)

The LT2 IRS shall:

Seq.	Requirement:	E	A	D	T <sub>F</sub>	T <sub>OS</sub>
1	Provide maximum safety to personnel and system equipment when installing, operating, adjusting and maintaining the equipment. (T)			X		
2	Cables shall be minimized and located to preclude tripping hazards or damage to cables. (T)	X				
3	All equipment shall conform to MIL-STD-1474 noise limits. (T)					X
4	The design of the equipment shall provide user personnel maximum access and safety while operating and maintaining the equipment. (T)			X		
5	Equipment and transit cases housing equipment shall be designed, installed, and labeled so that it can be removed, handled, and lifted safely. (T)	X				

Single person lift limits for equipment are as follows: (Table 1)

Handling Function	1-person (male/female) Lbs	2-Person Lbs	4-Persons Lbs
Equipment lifted less than five feet above the floor	37	74	128
Equipment lifted less than three feet above the floor	44	88	154
Equipment designed to be carried 33 feet or less	42	84	147

Table 1: Lift Limits

4.11.5 Mechanical Safety (T)

Moving parts shall:

Seq.	Requirement:	E	A	D	T <sub>F</sub>	T <sub>OS</sub>
1	Be guarded or provided with safety devices to prevent mechanical injury to operator and maintenance personnel. (T)	X				
2	Edges and corners shall be rounded and free from burrs. (T)	X				
3	Center of gravity shall be such that system/equipment is stable and easy to handle. (T)	X				

4.11.6 Antenna Safety (T)

Antenna tips or other sharp rods shall:

Seq.	Requirement:	E	A	D	T <sub>F</sub>	T <sub>OS</sub>
1	Have tip caps or other suitable design fixture to prevent puncture hazards to eyes, etc., where personnel are likely to be exposed to such hazards. (T)	X				
2	Where design considerations permit, antennas shall be coated with a dielectric material to insulate against at least 10,000 volts Root Mean Squared (RMS). (T)	X			X	
3	To assure adequate lightning protection, the following design features are required for all fixed, semi-permanent, and mobile facilities that incorporate antenna tower/masts: (T)	X				
3a	Antenna masts must incorporate a ground stud with the necessary hardware to permit secure attachment of a ground strap/rod. (T)	X				
3b	Lead-in wires require discharge units (lightning arrestors) on each conductor or enclosure in a continuous metallic shield that is effectively grounded; coaxial cable lead-in may be used as is if the outer shields are grounded at both ends (T)	X				

4.11.7 RF Safety (T)

Seq.	Requirement:	E	A	D	T <sub>F</sub>	T <sub>OS</sub>
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1	The system design shall protect personnel, fuels, and ordnance from hazardous effects of electromagnetic radiation.		X			
2	Antennas and other devices that carry sufficient RF voltage to burn or injure personnel shall be protected from accidental contact in the same manner as for AC voltages. (T)	X				
3	Microwave or RF radiation signs shall be permanently affixed to warn personnel of danger zones. (T)	X				
4	Transmitters shall comply with the maximum permissible exposure (MPE) limits for general public/uncontrolled environments as contained IEEE C95.1-2005. (T)		X			

4.12 System Maturity

The system shall:

Seq.	Requirement:	E	A	D	T <sub>F</sub>	T <sub>OS</sub>
1	Have supported a 1,000 or more participants Live Collective Training Exercise where the end-to-end network connected Tactical Engagement Simulation Systems on each participant to a central exercise control suite (T).	X				
2	The Exercise shall have occurred between 2007 and 2010 (T).	X				
3	The Exercise shall have covered a minimum of 150 square Km (T).	X				
4	The proposed network type and function shall be the same that supported the Exercise. (T)	X				
5	Hardware, such as the IPUR, may be an updated version but shall interface to the network in the same manner as the hardware did in the Exercise (T).			X		

## 5.0 Acronyms

Ao	Operational Availability
AR	Army Regulation
BAM	Basic Accreditation Manual
BIT	Built In Test
COTS	Commercial Off the Shelf
CPM	Consolidated Product-Line Management
CTIA	Common Training Instrumentation Architecture
CVS	Combat Vehicle System
CWBS	Contract Work Breakdown Structure*
DIACAP	DoD Information Assurance Certification and Accreditation Process
DoD	Department Of Defense
DOT	Department of Transportation
DSL	Document Summary List
E <sup>3</sup>	Electromagnetic Environmental Effects
EMC	Electromagnetic Compatibility
EME	Electromagnetic Environment
EPA	Environmental Protection Agency
EXCON	Exercise Control
FOC	Full Operational Capability
GFI	Government Furnished Information
GOTS	Government Off the Shelf
HEMTT	Heavy Expanded Mobility Tactical Truck
HITS	Homestation Instrumentation Training System
HMMWV	High Mobility Multipurpose Wheeled Vehicle
IA	Information Assurance
IAVA	Information Assurance & Vulnerability Alert
IAW	In Accordance With
ICD	Interface Control Document
IMS	Integrated Master Schedule
IOC	Initial Operational Capability
IP	Internet Protocol
IPR	Interim Program Review
IPUR	Interim Range System Player Unit Radio
IRS	Interim Range System
ITS	Independent Target Systems
IUID	Item Unique Identification
IWS	Individual Weapon Systems
LT2	Live Training Transformation
MILES	Multiple Integrated Laser Engagement Simulation
MPE	Maximum Permissible Exposure

MRAP	Mine Resistant Armored Personnel
NCSS	Networked Communications Subsystem
NDI	Non-developmental Items
NET	New Equipment Training
O	Objective
OSHA	Occupational Health and Safety Administration
PDD	Product Definition Data
PEO STRI	Program Executive Office for Simulation, Training, and Instrumentation
PM TRADE	Project Manager Training Devices
PU	Player Unit
PVC	Polyvinyl Chloride
QA	Quality Assurance
RF	Radio Frequency
RF ID	Radio Frequency Identification Tag
RMS	Root Mean Squared
RTCA	Real-Time Casualty Assessment
SAR	Safety Assessment Report
SOW	Statement Of Work
STIG	Security Technical Implementation Guide
SYSCON	System Control
T	Threshold
TESS	Tactical Engagement Simulation Systems
TRR	Test Readiness Review
TSEP	Telecommunication System Engineering Plan
TSPI	Time Space Position Information
TVS	Tactical Vehicle System
XML	Extensible Markup Language