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PERFORMANCE SPECIFICATION

SYSTEM SPECIFICATION
FOR THE
CLOSE COMBAT TACTICAL TRAINER

Prepared by:

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1. SCOPE.

1.1 Identification.

This specification covers the Close Combat Tactical Trainer (CCTT) used by active duty and reserve units for the conduct of training in command and control, tactical training, Army Training Evaluation Program (ARTEP) Mission Training, and combined arms exercises.

1.2 Entity Type Description.

The CCTT is a simulation system wherein various simulated elements replicating actual combat vehicles, weapon systems, and command and control elements are networked for real-time, fully interactive collective task training on computer generated terrain.

The CCTT system uses a Local Area Network (LAN) to provide this collective training and a Long Haul Network (LHN) to provide extended operations when required. (The extended operations requiring the linking of several CCTT systems is a Pre-Planned Product Improvement (P3I)). The CCTT System provides training to individual crew and unit personnel covering the skills and knowledge of crew through company task force level doctrine for the implementation of combat missions. The tactical areas and vehicles simulated by CCTT are listed below~~:~~.

a. Operations Center (OC)
    (1) Administrative Logistic Center (ALOC)
    (2) Tactical Operations Center (TOC)
    (3) Unit Maintenance Collection Point (UMCP)
    (4) Fire Direction Center (FDC)
    (5) Field Artillery Battalion Tactical Operation Center (FABTOC)
    (6) Tactical Air Control Party (TACP)
    (7) Higher Headquarters Support
b. M1A1 vehicle
c. M1A2 vehicle
d. M2A2 / M3A2 vehicle
e. Dismounted Infantry (DI)
f. M981 Fire Support Team Vehicle (FIST-V)
g. M113A3 Armored Personnel Carrier (APC)
h. High Mobility Multipurpose Wheeled Vehicle (HMMWV)

Each CCTT system configuration also contains consoles and~~/~~ workstations to facilitate training and a network system as identified below.

~~i~~a. Master Control Console

~~j~~b. After Action Review Console

~~k~~c. Maintenance Console

~~l~~d. Semi-Automated Forces (SAF) Workstations (OPFOR and BLUFOR)

~~(1)~~ Computer Generated Forces (CGF)

~~m~~e. Local Area Network

Mobile CCTT configurations are composed of ~~items a through e and items i through m~~M1A1, M2/M3, and DI modules, and mobile configurations of all workstations and consoles except the ~~with the exception of the~~ TACP portion of the OC.

~~, which is not provided in mobile CCTT systems.~~

~~Items a, and i through l are referred to as CCTT system Consoles/Workstations. Items b through h are referred to as CCTT system manned modules.~~

2. APPLICABLE DOCUMENTS.

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks.

The following specifications, standards, and handbooks of the exact issue identified by the Document Summary List form a part of this specification to the extent specified herein.

SPECIFICATIONS:

FEDERAL

W-C-596	-	Connector Plug, Receptacle, and Cable Outlet Electrical Power, General Specification for.

MILITARY

MIL-PRF-62218	-	Corrosion Preventive Compounds, Cold Application (For New and Fielded Motor Vehicles and Trailers)
MS75021	-	Connector, Receptacle, Electrical--12 Contact Intervehicular, 28 Volt (V), Waterproof.

STANDARDS:

FEDERAL

FED-STD-595	-	Colors Used in Government Procurement.

MILITARY

~~MIL-STD-209 - Interface Standard for Lifting and Tiedown Provisions.~~

MIL-STD-471	-	Maintainability Verification/Demonstration/Evaluation.
MIL-STD-810	-	Environmental Test Methods and Engineering Guidelines.

(Unless otherwise indicated, copies of above specifications, standards, and handbooks are available from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.1.2 Other Government documents, drawings, and publications.

The following other Government documents, drawings, and publications of the exact issue identified by the Document Summary List form a part of this specification to the extent specified herein.

OTHER PUBLICATIONS:

DEPARTMENT OF LABOR

29 Code of Federal Regulations, Title 29	-	R 98 Occupational Safety and Health Standards

DEPARTMENT OF TRANSPORTATION (DOT)

49 Code of Federal Regulations.	-	R 97 Federal Motor Carrier Safety Regulations Regulations, Title 49

U.S. ARMY MATERIEL SYSTEMS ANALYSIS ACTIVITY

Manned Module Verification and Validation Measurements

U.S. ARMY SIMULATION TRAINING AND INSTRUMENTATION COMMAND

116919	-	Close Combat Tactical Trainer (CCTT) Software Version Description Document (VDD)
121695	-	M1A1 Manned Module Acceptance Test Procedure
121696	-	Factory Acceptance Test Procedure for the M1A2 CPH Manned Module
121697	-	M2/M3 Manned Module Acceptance Test Procedure
121698	-	Factory Acceptance Test Procedure for the M113A3 Manned Module

121699 - Factory Acceptance Test Procedure for the M981 FISTV Manned Module

121700 - Factory Acceptance Test Procedure for the HMMWV Manned Module

121701 - Dismounted Infantry Acceptance Test Procedure

~~125040 - Mobile Operations Center Acceptance Test Procedure~~

~~126615 - Operations Center (OC) / Tactical Operations Center~~

~~126617 - Semi-Automated Forces (SAF) Acceptance Test~~

~~126618 - Master Control Console (MCC) / Maintenance Console~~

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions shall be obtained from the procuring activity or as directed by the Procuring Contracting Officer (PCO).)

2.2 Non-Government documents.

ACOUSTICAL SOCIETY OF AMERICA

ASA S1.4 - Specification for Sound Level Meters Amendment S1.4A-1985 ASA 47

ASA S1.40 - Specification for Acoustical Calibrators ASA 40-1984

(Applications for copies should be addressed to the Acoustical Society of America, 120 Wall Street; 32nd Floor, New York, NY 10005-299.)

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI/HFS 100-~~1998~~8 - American National Standard for Human Factors Engineering of Visual Display Terminal Workstations

~~ANSI/IEEE 446 - IEEE Recommended Practices for Emergency and Standbys Power Systems for Industrial and Commercial Applications.~~

ANSI Z535.3-1991 - Criteria for Safety Symbols

ANSI Z535.4-1991 - Product Safety Signs and Labels

(Applications for copies should be addressed to the American National Standards Institute, 11 W. 42nd Street; 13th Floor, New York, NY 10036.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D-1729-96	-	Standard Practice for Visual Appraisal of Colors and Color Differences of Diffusely-Illuminated Opaque Materials

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103-1137.)

CROUSE-HINDS MOLDED PRODUCTS

E0400-1686	-	Crouse-Hinds Posi•Lok Power Distribution System

(Application for copies should be addressed to Crouse-Hinds Molded Products, 4758 Washington Street, LaGrange, NC 28551.)

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 200	-	Reference Designations for Electrical and Electronic Parts and Equipment.
IEEE 802.2	-	Information Technology – Telecommunications and Information Exchange between Systems – Local and Metropolitan Area Networks – Specific Requirements – Part 2: Logical Link Control ISO/IEC 8802-2; IEEE Computer Society Document R(1998)
IEEE 1278.1~~a~~	-	IEEE Standard for Distributed Interactive Simulation Application, Protocols.

(Application for copies should be addressed to the Institute of Electrical and Electronics Engineers, 445 Hoes Lane, Piscataway, NJ 08854-4150.)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

~~NFPA Code 101~~	~~-~~	~~Code for Safety of Life from Fire in Buildings and Structures.~~
NFPA- 70-96	-	National Electric Code.
NFPA- 72-96	-	Standard for Installation, Maintenance and use of Protective Signaling Systems.
NFPA- 75-95	-	Electronic Computer/Data Processing Equipment.

NFPA 101-97	-	Code for Safety of Life from Fire in Buildings and Structures.
NFPA- 780-97	-	Standard for the Installation of Lightning Protection Systems

(Requests for copies should be addressed to National Fire Protection Association, 60 Batterymarch Street, Boston, MA 02110.)

SOCIETY OF AUTOMOTIVE ENGINEERS, INC. (SAE)

SAE J318	-	Air Brake Gladhand Service (Control) and Emergency (Supply) Line Couplers--Trucks, Truck-Tractors, and Trailers.
SAE J560	-	Seven-Conductor Electrical Connector for Truck-Trailer Jumper Cable, Standard.
SAE J700	-	Upper Coupler Kingpin--Commercial Trailers and Semitrailers; Standard.
SAE J702	-	Brake and Electrical Connection Locations--Truck-Tractor and Truck-Trailer, Recommended Practice.
SAE J1292	-	Automobile, Truck, Truck-Tractor, Trailer, and Motor Coach Wiring, Recommended Practice.

(Applications for copies should be addressed to the Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.)

TIRE AND RIM ASSOCIATION, INC. (TRA)

Tire and Rim Association Yearbook.

(Applications for copies should be addressed to the Tire and Rim Association, Inc., 3200 West Market Street, Akron, OH 44313.)

~~UNDERWRITER'S LABORATORIES, iNC.~~

~~UL 94 - Standard for Tests for Flamability of Plastic Materials for Parts in Devices and Appliances.~~

~~(Applications for copies should be addressed to the Underwriter's Laboratories, Inc., 333 Pfingston Road, Northbrook, IL 60062.)~~

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through

libraries or other informational services.)

2.3 Order of precedence.

In the event of a conflict between the text of this specification and the references cited herein, the specification takes first precedence.

3. REQUIREMENTS.

3.1 System configuration.

3.1.1 Software.

All CCTT manned modules ~~and~~, consoles and~~/~~ workstations shall use government furnished CCTT application software as defined by 116919 to provide CCTT manned module, console~~/~~, workstation, and network performance as required by this specification (see 6.1). Unless otherwise specified (see 6.2) the use of other application software, or modifications or additions to the government furnished application software shall not be allowed. Software such as operating systems and network managers, or other components needed to execute the application software, provide required LAN performance, or maintain CCTT equipment shall be provided with the system.

3.1.2 Hardware.

A CCTT system shall be composed of manned modules, consoles~~/~~, workstations, and network systems (see 6.2) as defined in this specification, and depicted in figures 1 and 2. Mobile CCTT systems shall be installed in semitrailers and equipped with portable power supplies (PPS).

3.1.3 Interface definition.

Figure 3 shows the external interfaces supported by the CCTT system and the internal interfaces between major components of the system. These interfaces are summarized in the following paragraphs. Requirements for some of the interfaces are defined in other paragraphs of this specification, in those cases the interface is briefly described and the applicable requirements paragraph is referenced.

3.1.3.1 External system interfaces.

3.1.3.1.1 Exercise initialization.

The CCTT system sha~~wi~~ll provide an interface to accept files stored on magnetic media. The requirements for this interface are defined in paragraph 3.7.2.1.2.1.

3.1.3.1.2 Exercise off-line storage.

The CCTT system ~~wi~~shall provide an interface to support long term off-line storage of exercises in magnetic media. The interface ~~will~~shall provide for the storage of all exercise data captured by the AAR as defined in paragraph 3.7.2.2.4.

3.1.3.1.3 Audio and ~~/~~Video interface.

The CCTT system ~~wi~~shall provide an audio~~/~~ and video recording capability to allow the AAR operator to create a ”take home video” of the exercise as described in paragraph 3.7.2.2.8.

3.1.3.1.4 System facility interface.

The CCTT system physical and electrical interfaces ~~wi~~shall conform to the requirements of paragraphs 3.2.4-3.2.4.5.4 for the fixed site configurations and to the requirements of paragraphs 3.8.4.26.2.2, 3.8.4.27, and 3.8.5 for the mobile configuration.

3.1.3.2 Internal system interfaces.

The principal internal interfaces within the CCTT system are 1) the interfaces between the major system components (manned modules, consoles and workstations) and 2) the interfaces within the major system components. Figure 3 shows the interfaces between major system components and Figure 4 show the interfaces within a major system component.

3.1.3.2.1 Interfaces between components.

The primary internal interface between major CCTT system components shall be provided via a Local Area Network (LAN). The LAN requirements are as defined in paragraph 3.7.4. The LAN shall transmit the exercise specific Protocol Data Units (PDUs) as defined in IEEE 1278.1.

3.1.3.2.1.1 MCC LAN interfaces.

In addition to transmission of the exercise specific Protocol Data Units (PDUs) as defined in IEEE 1278.1 the MCC shall use file transfer protocols to execute the download of updated CCTT system software and terrain databases to the workstations and manned modules.

3.1.3.2.1.2 MC LAN interfaces.

In addition to transmission of the exercise specific Protocol Data Units (PDUs) as defined in IEEE 1278.1 the MC shall use the simulation management PDUs to monitor and control the CCTT system BIT. The MC shall receive the results of the BIT from the workstations and modules and shall control the operation of the BIT within the system components. The MC shall use file transfer protocols to execute the download of updated CCTT system software and terrain databases to the workstations and manned modules.

3.1.3.2.2 Interfaces within components.

Figure 4 shows the internal interfaces between host processor and the components that comprise a workstation, ~~/~~console or manned module. Not all components may be supported in any single

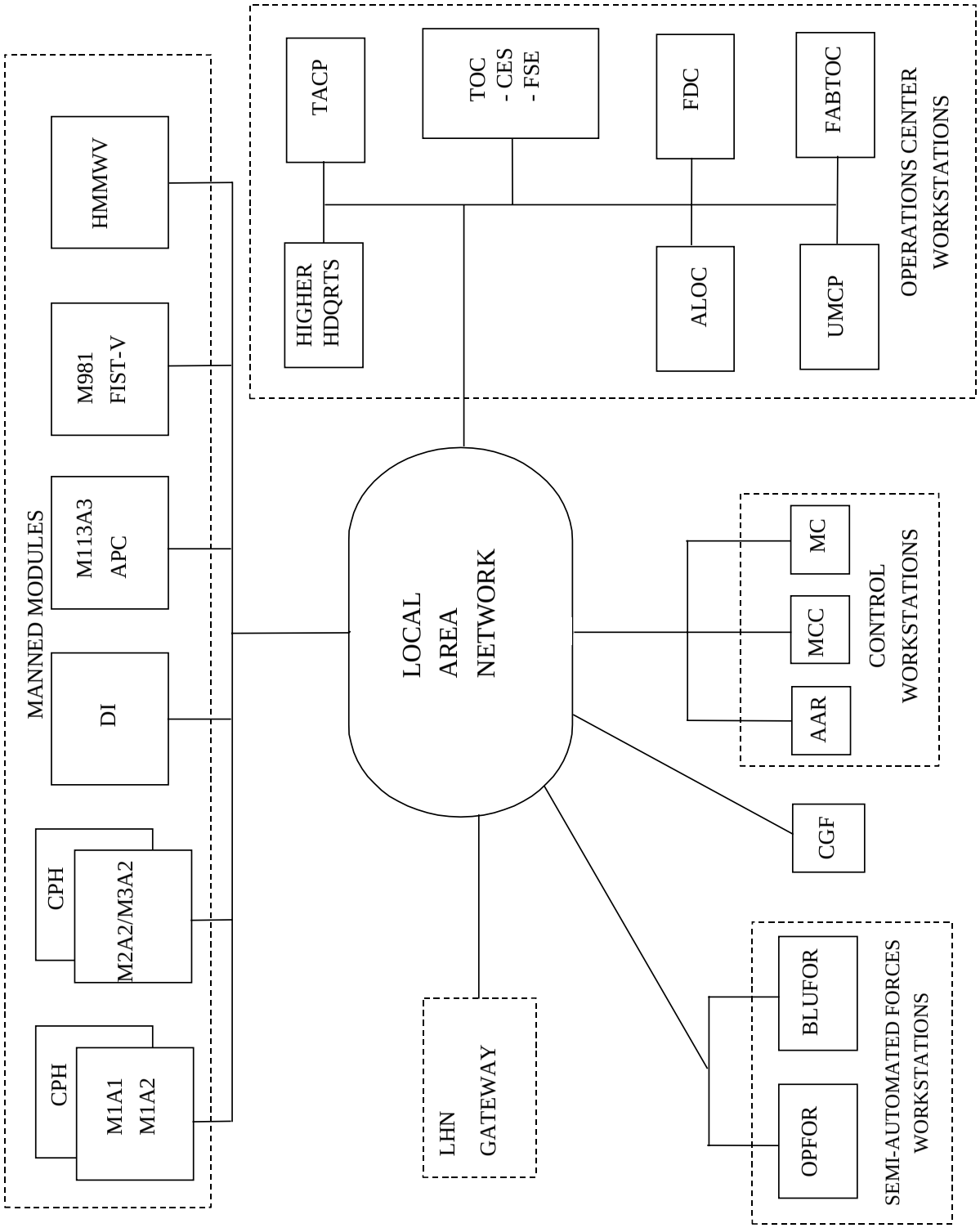

FIGURE 1 Close Combat Tactical Trainer System Diagram - Fixed Sites

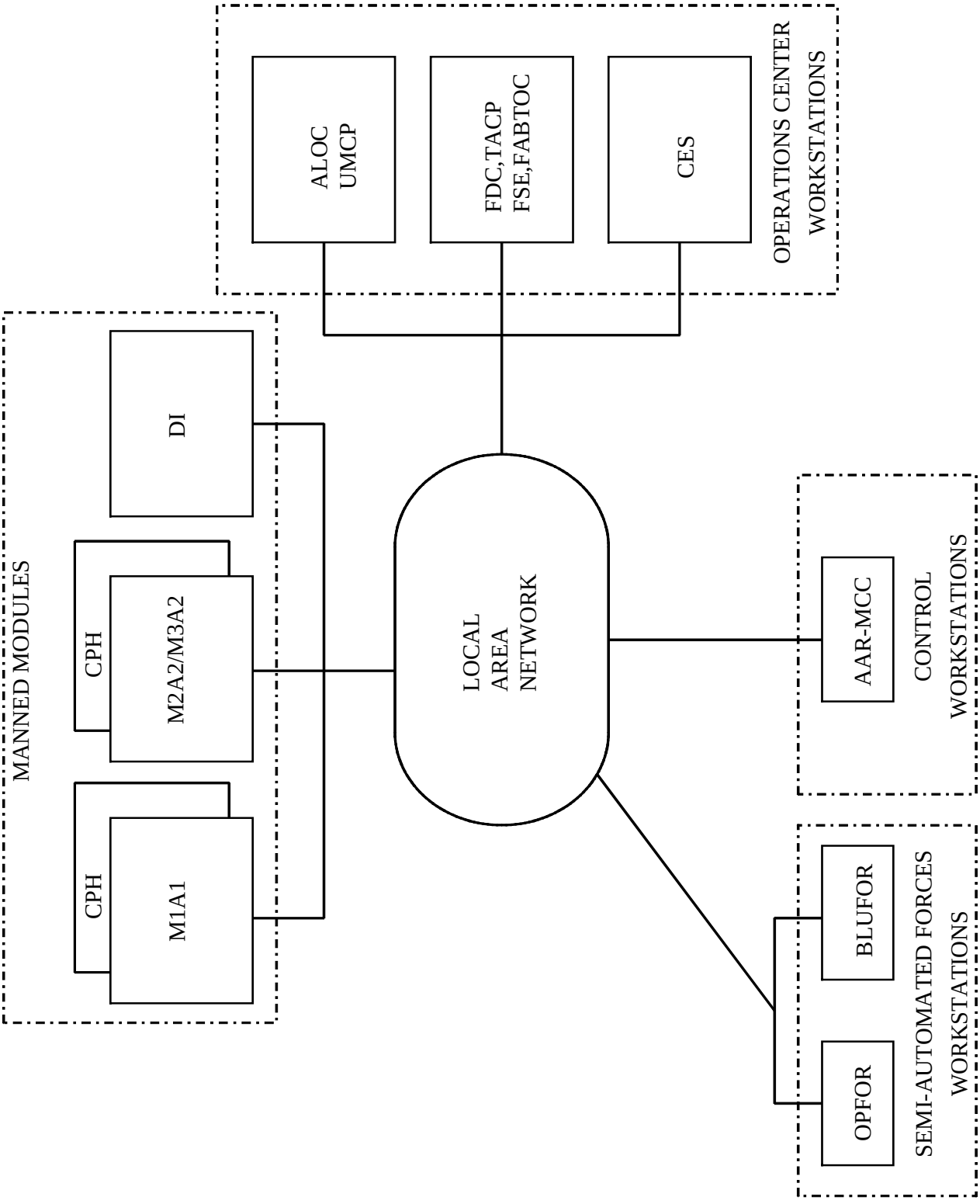

FIGURE 2 Close Combat Tactical Trainer System Diagram - Mobile Sites

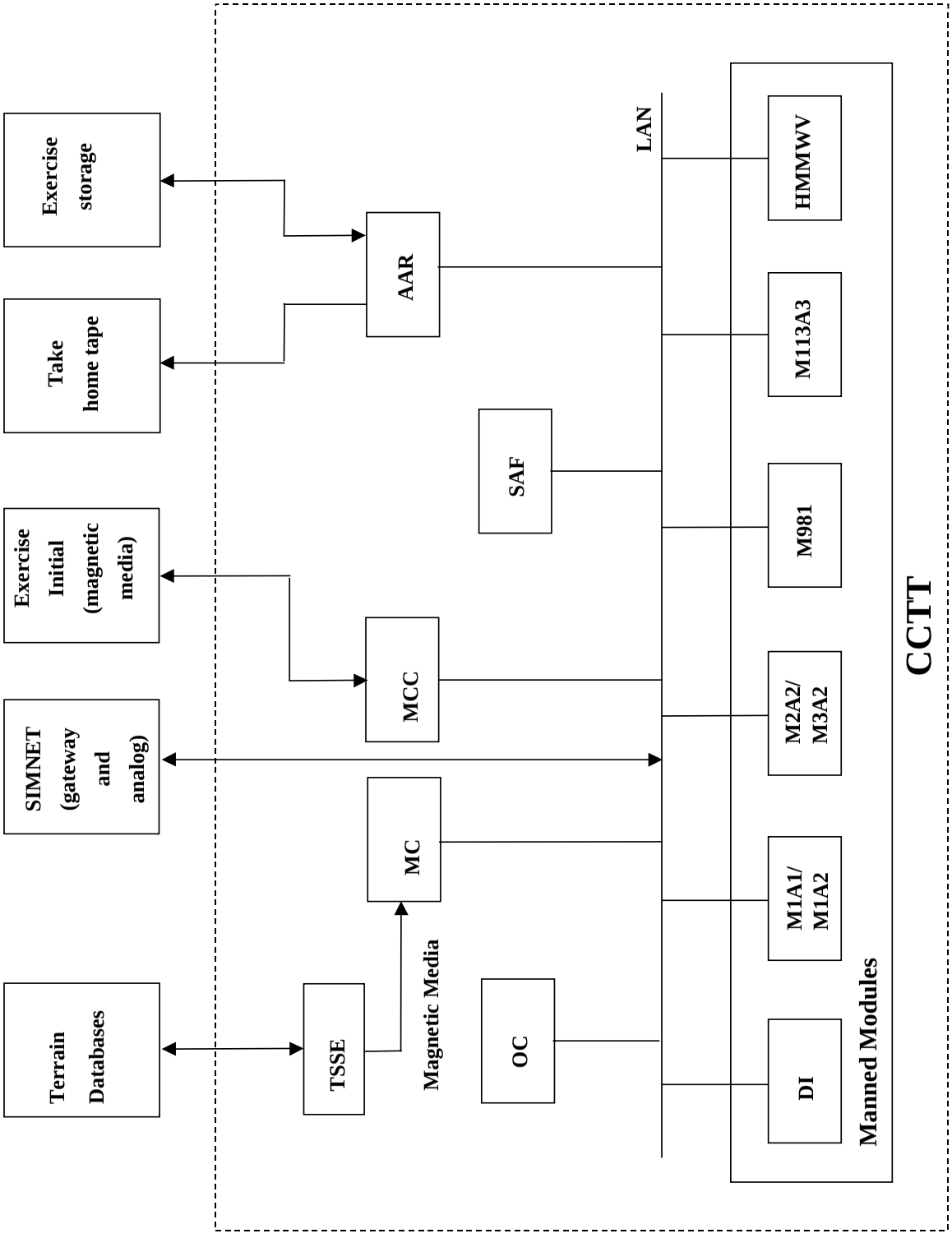

FIGURE 3 CCTT System Interface Block Diagram

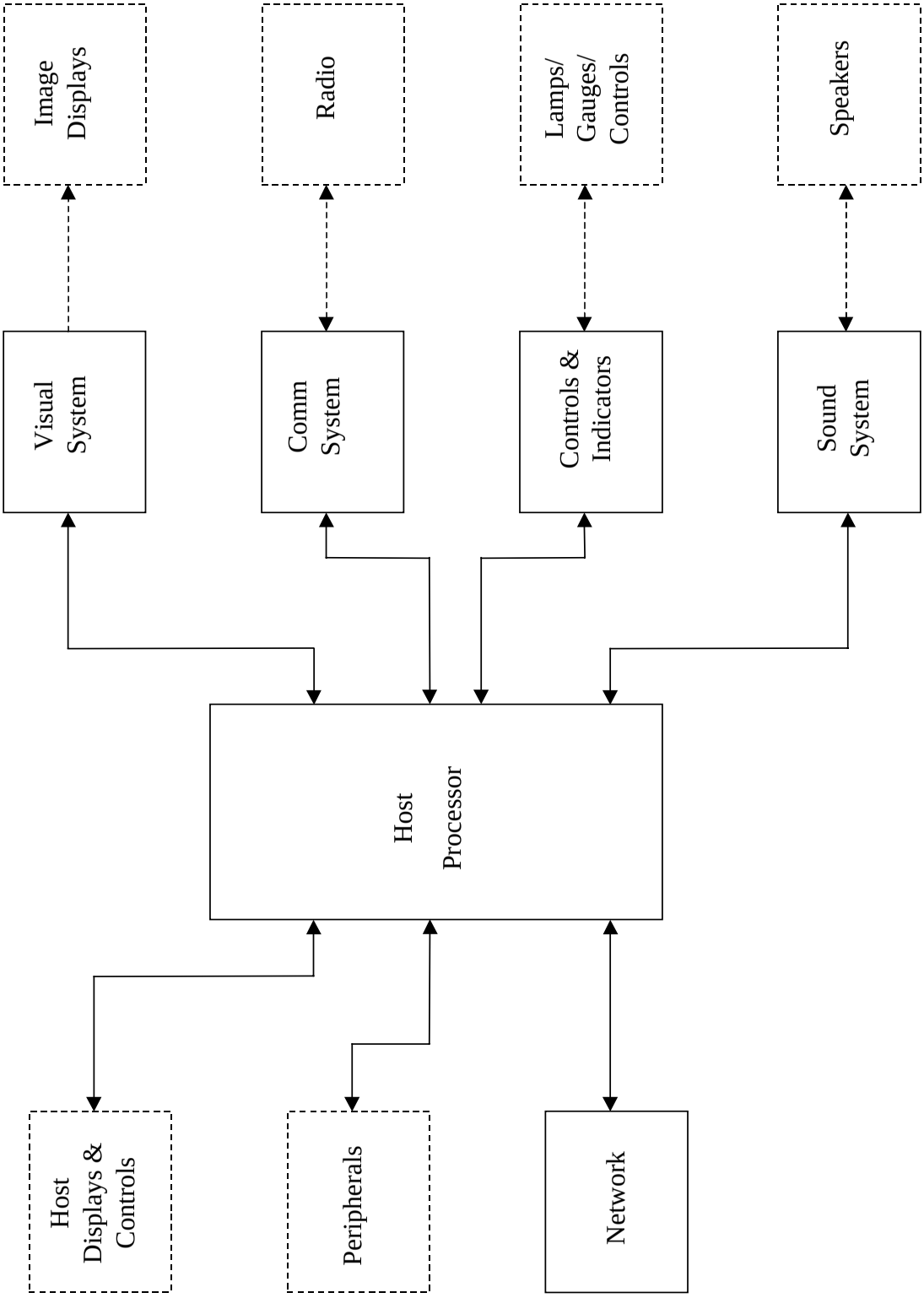

FIGURE 4 CCTT Major Component Generic Internal Interfaces

Workstation, /console or manned module. The following paragraphs describe the functions provided by the interfaces between these components.

3.1.3.2.2.1 Network interface.

The host processor shall interface with the network to receive and send PDUs. The host processor shall be responsible for processing the received PDUs and the creation of PDUs to be sent as a function of received PDUs and inputs from the other components within the manned module or workstation or console.

3.1.3.2.2.2 Visual system interface.

The host processor ~~will~~shall provide the visual system with entity data which the visual system ~~will~~shall process to create the console/, workstation or manned modules view of the virtual battlefield on the image displays. The data provided to the visual system from the host processor ~~will~~shall include information about the components view point, moving model selection parameters, selection and activation of animated sequences, visibility controls, and appearance and location information of entities within that field of view. The visual system ~~will~~shall also interface to the host processor to provide status information to support BIT. The visual system ~~will~~shall interface to the image displays for output of the rendered images.

3.1.3.2.2.3 Communication system interface.

The communication system ~~will~~shall receive analog voice signals from the radio, and intercom equipment and convert that data to digital voice message packets. The digital voice message packets ~~will~~shall be sent from the communication system to the host processor. The host processor ~~will~~shall route the message packets to the appropriate receiving radios by sending radio PDUs to the network. The communications system ~~will~~shall provide status information to the host processor to support BIT. The communication system ~~will~~shall be able to receive digital voice message packets from the host processor and convert them to analog voice signals. The analog voice signals ~~will~~shall be sent to the appropriate radios~~,~~ and~~/or~~ intercoms being supported by that communication system.

3.1.3.2.2.4 Controls and indicators interface.

An interface ~~will~~shall be provided between the host processor and the controls and indicators system of a manned module. The controls and indicators system ~~will~~shall sample the state of the operator controls of a manned module and then provide that state information to the host processor when requested. The host processor ~~will~~shall analyze the controls and generate any required PDUs on the network or updates to the other component systems. The controls and indicators system ~~will~~shall provide status information to the host processor to support BIT. The controls and indicators system ~~will~~shall be able to send indicator and control state updates to the controls and indicators in the manned module. The host processor ~~will~~shall send updates to the state of the controls and indicators and the controls and indicators system ~~will~~shall process those updates to turn indicator lamps on or off, change the reading of gauges, modify the reaction of operator controls, etc.

3.1.3.2.2.5 Sound system interface.

The sound system ~~will~~shall receive commands and data from the host processor in order to

generate sound cues and effects. The sound system ~~will~~shall interface with speakers contained within the manned module ~~or~~, workstation, or~~/~~ console. The sound system ~~will~~shall send status information back to the host processor in order to support BIT.

3.1.3.2.2.6 Host processor interfaces.

In addition to the interfaces with the other component systems, the host processor ~~will~~shall interface with computer peripherals, controls, and displays. The controls and displays interfaces ~~will~~shall support operator control of the host processor for BIT, performance of workstation and~~/~~ console functions, and performance of virtual manned module tasks.

3.2 System performance.

The CCTT system shall use a parameter-driven open architecture in the implementation of the CCTT manned modules, consoles,~~/~~ workstations, and network system components of the CCTT system. Each manned module shall be designed to operate autonomously and shall be able to transmit and receive changes in the state of entity variables or when events occur.

3.2.1 Training exercise support .

The manned simulators and the ~~consoles /~~ workstations which comprise the CCTT system shall be reconfigurable from the Master Control Console to provide individual vehicle, platoon, and company sized training exercises. A fixed site CCTT system shall have the capability to provide from one to five completely separate and independent exercises concurrently, subject to the maximum entity count identified in Section 3.7.4.1. The worst case mix for the five exercises shall be three company and two platoon level exercises simultaneously. The Mobile version of CCTT shall be required to support one exercise at a time when operating in a stand alone mobile configuration. The vehicle simulation modules within a CCTT mobile configuration shall support from one to five exercises when connected to a CCTT fixed site system. An exercise shall operate on one terrain database at a time. The control of all of the selected exercises shall be supported by one Operation Center. The CCTT system shall provide the capability to perform data collection and after action review on one to five exercises concurrently subject to the assignment of one exercise per After Action Review console. The CCTT system shall provide the capability to perform CCTT communications on one to five exercises concurrently, subject to a maximum total of 60 communications channels. The CCTT system shall provide the capability to record 48 sets of total system checkpoint (reset) data. The 48 sets of checkpoint data shall represent the most recent sets of checkpoint data at any point in an exercise. The data logged shall include data sufficient to recreate the simulated operational, supply, damaged and failed state of simulated and emulated vehicles, the sequence of CIS executions and environmental situational data.

3.2.2 Latency.

3.2.2.1 System Latency.

System latency for all observable visual and aural cues and interactions shall be no greater than 350 milliseconds from the time of input. The latency shall be measured as the average time from student input in one CCTT module (e.g., turning the steering control or firing the weapon) to presentation of the cue in another CCTT module. The system response for all observable events generated for emulated vehicles (SAF, OC, and emulated DI), measured as the average time from

CGF event generation to presentation of the cue in a CCTT module, shall meet system latency requirements. LAN performance and system transmission rates shall be kept within parameters necessary to meet the system latency requirements. Processor simulation time clocks between two processors shall be synchronized to within +/- 20 milliseconds from the slowest clock time to the fastest clock time to support the correlation of PDUs which are a part of the protocol defined by IEEE-1278.1a.

3.2.2.2 Manned Module Latency.

The average latency within a module shall not exceed 273 milliseconds.

3.2.3 Dead Reckoning Algorithms (DRAs).

Every CCTT manned module, console and workstation shall utilize a methodology which shall avoid anomalous entity movement. A look-ahead mechanism shall be employed to maintain entity position and orientation in the database between receipt of actual entity position and orientation data. When a position correction is performed on a visual model the resulting visual update shall not exceed the time latencies for individual modules.

3.2.4 Physical characteristics.

The CCTT basic designs shall have the following physical characteristics as outlined in this specification. The system design shall be modular to allow for future product upgrades, modifications, and technology insertion.

3.2.4.1 Weight.

The weight of the CCTT equipment shall not exceed a uniformly distributed maximum load of 100 pounds (lbs.) per square foot or a concentrated load of 1000 pounds applied on one square inch.

3.2.4.2 Height.

CCTT fixed site equipment shall not exceed a height of 10 feet 8 inches, and shall be capable of operation within a ceiling height of twelve feet.

3.2.4.3 Equipment dimensions.

In an uninstalled configuration, CCTT manned modules shall be capable of passage through a 120 inches wide by 120 inches high opening and all other equipment shall be capable of passage through a 72 inch wide by 84 inch high opening. The maximum size footprint of each manned module, in its installed configuration, including electronic cabinets, shall be 225 square feet except Dismounted Infantry module which shall not exceed 500 square feet.

3.2.4.4 Trainer maintenance access.

The CCTT devices shall require no greater than one meter of clearance from adjacent equipment or walls for passageways, maintenance, and air circulation.

3.2.4.5 Electrical requirements.

Each CCTT system shall operate on 208VAC +/-10 percent~~%~~, three phase, 50 or 60 Hertz +/- 1~~%~~ percent power.

3.2.4.5.1 Electrical design.

The equipment shall be designed to meet the requirements of the NFPA- 70-96.

3.2.4.5.2 Emergency disconnect.

The equipment design shall include the emergency power disconnect(s) required by Section 645 of NFPA- 70-96.

3.2.4.5.3 Phase balance.

The equipment power distribution shall be designed so that the normal load on any one phase does not vary from the average load of the three phases by more than 7.5 percent.

3.2.4.5.4 Utility power.

Utility electrical power receptacles shall be provided as part of the equipment installation. The receptacles shall be placed so that a W-C-596 approved duplex receptacle ~~will~~shall be within 6 feet of any area where maintenance is to be performed.

3.2.4.6 Equipment cooling.

The temperature inside a manned module shall not exceed 80 degrees Fahrenheit when operated at full capacity with full personnel loading given a maximum ambient environment of 75 degrees Fahrenheit.

3.2.4.7 Console lighting.

Illumination shall be provided at the consoles to illuminate all panels, recorders, instruments, controls, and work surfaces. The illumination level shall be 540 LUX (50 foot-candles) when measured at the task object or 760 mm (30 inches) above the floor.

3.2.4.8 Colors.

The exterior color for CCTT manned module enclosures shall conform to FED-STD-595 color chip number 23578. The interior color for CCTT M2/M3A2 manned module crew and driver compartments shall conform to FED-STD-595 color chip number 24533. The interior color for CCTT M1A1 and M1A2 manned module crew and driver compartments shall conform to FED-STD-595 color chip number 17875, with exception of the main gun breech, which shall conform to FED-STD-595 color chip number 26008. The interior color for CCTT M113 and M981 FIST-V manned modules shall conform to FED-STD-595 color chip number 17875. The interior color for CCTT M577A2 enclosures shall conform to FED-STD-595 color chip number 24533. The interior color for CCTT HMMWV manned module driver and passenger compartments shall conform to FED-STD-595 color chip number 34094. The exterior case color for CCTT simulated SINCGARS radios shall conform to FED-STD-595 color chip number 34094.

3.2.4.9 Cabling.

Facility power, CCTT major component interconnecting cables, and grounding cables shall be installed in facility provided overhead cabletrays. Cabling within any CCTT major component shall be placed such that the cabling does not present a trip hazard to operating personnel.

3.2.5 Availability.

The CCTT ~~S~~system must complete 90~~%~~ percent of ~~P~~platoon and 90~~%~~ percent of ~~C~~company/~~C~~company ~~T~~team tactical training exercises without a system abort.

3.2.6 Maintainability.

Maintainability shall be in accordance with the following requirements.

3.2.6.1 Quantitative maintainability .

Specified MTTR values for each CCTT manned module, console, workstation, and network system shall be as shown below. CCTT configuration items as listed below shall have a maximum-repair-time (MMAX) of 120 minutes to the 90th percentile for unscheduled on-site maintenance. Routine alignment of the displays in a CCTT module to the performance levels specified herein shall be accomplished within a system wide average of thirty minutes.

	MTTR (Hours)
M1A1 CPH Simulator	.95
M1A2 CPH Simulator	1.00
M2A2/M3A2 CPH Simulator	1.00
M981 FIST-V Simulator	.95
M113 APC Simulator	1.00
HMMWV Simulator	1.00
DI Simulator	.95
Operations Center	.95
Operations Trailer	.90
SAF	.95
AAR Work Station	1.00
Master Control Console	.95
Maintenance Console	.90
Network Equipment Fixed Site	.90
Network Equipment Mobile Site	.90

3.2.6.2 Qualitative maintainability.

General maintainability characteristics of the trainer shall be as follows.

3.2.6.2.1 Built-In-Test (BIT).

The CCTT BIT shall be composed of three components: (1) daily readiness check, (2) performance monitoring (PM), and (3) fault detection and locating (FL) and shall apply to all the equipment in the CCTT system. The design of controls and readout devices shall be such that they can be easily used and interpreted by maintenance personnel. The BIT shall have the capability of being fully exercised by a single operator. The circuits and devices providing the BIT shall be designed in such a manner that failure of these circuits or devices shall not cause failure of the training device The system shall provide an assessment of the overall device integrity in not more than five minutes upon command. The Maintenance Console (MC) shall be the primary system console for BIT operation control. The Master Control Console (MCC) shall

also have the capability to perform any of the BIT functions. Manned module and workstation status shall be available at both the MC and the MCC

3.2.6.2.1.1 Daily readiness check.

Daily readiness check program(s) shall be designed and implemented to enable operating personnel to determine that the CCTT system is ready for operation. The program shall utilize automatic sequencing through a series of static inputs utilizing the normal iteration rate of the various program units. The ~~D~~daily ~~R~~readiness ~~C~~check shall consist of the following steps:

a. Power On Self Tests and non-man in the loop electrical or electronic tests shall be executed automatically by the simulators and processors upon activation of the power.

b. Each simulator shall be instantiated as an entity by the MCC (or MC) operator for the purposes of collecting power on BIT status and starting the daily readiness checks.

c. The visual system monitors shall be verified that they are active with the correct image present.

d. A predefined operations checklist shall be performed to verify manned module operation.

e. The checklist status shall be reported to the MCC (or MC).

f. Each simulator shall be assigned to the exercise and set to simulator initial conditions upon completion of vehicle checklist.

The daily readiness check for steps a., b. and f. ~~-~~shall require less than 15 minutes to complete where item f. is performed from an existing exercise file.

3.2.6.2.1.2 Performance monitoring (PM).

The PM component shall function on-line, be entirely self-contained, and shall require no external stimuli nor measurement equipment. Normal operation of the PM capability of the host processor shall be in an energized mode continuously monitoring all circuitry with no warm-up period required. PM in the host processor shall have the capability to continuously monitor operating system anomalies and record them to an error log. Host processors, whose built in test includes parity checking and memory error detection, shall have the capability to monitor those errors continuously and record them in an error log. The operator shall have the capability to readily query the error log.

The status of communication within each network node shall be provided to the network manager. When PM BIT tests detect a fault and if no network fault exists, then the tests shall provide enough information to isolate to the faulty workstation~~/~~, console or manned module. If a fault is detected in the network, the network manager shall be used to isolate the fault to the failing workstation~~/~~, console or manned module.

3.2.6.2.1.3 Fault Localization (FL).

The FL component shall function off-line, and shall require manual initiation. Upon indication of failures of ~~COTS~~commercial equipment, diagnostic routines, procedures, test units, and other procedures from the vendor shall be used to isolate the faulty hardware to the Lowest Replaceable Unit (LRU). For prime and subcontractor newly designed equipment and the image generator, fault locating BIT shall be provided.

The status and results shall be displayed in an easily readable format on a console and printed hard copy (selectable by the operator) and shall include identification of the error and necessary corrective action. The results shall be stored in computer files which shall be accessible via display or hardcopy printout at a later time. The diagnostic operator interface formats shall be the same for every station in the CCTT configuration. The operator shall have the capability to run FL on all hardware in the station or choose to check out individual components of the station. Provisions shall be made for automatic sequencing through the tests, or portions thereof, incrementally to verify the desired output at each step. The operator shall have the option of either proceeding after he has noted the errors or stopping the computers to determine the type and nature of the failure through the use of the Cathode Ray Tube (CRT) terminal. The operator shall be able to perform the module control tests by moving the control and displays down to the specific module where the operator can control the BIT while sitting inside the module with hands-on access to each required manual control. The software and user interfaces for running local diagnostics shall be the same as for running from the MC itself. The locally executed diagnostics shall have no impact to the network as they shall be capable of running in parallel to CCTT simulations. The Fault Localization shall provide the capability for the operator to run checkout diagnostics on any unused workstation or manned module at any time. The FL shall provide the capability for any particular console, at the discretion of the MC operator, to be removed from the active simulation configuration, and perform FL on its own hardware.

3.2.6.2.2 Lamps.

All lamps used in the trainer shall be replaceable from the front, unless the lamp(s) is used in the simulation of tactical equipment that does not have front accessibility.

3.2.6.2.3 Blown fuse indicator light.

When fuses are incorporated into a new design, blown fuse indicator light(s) shall be provided and shall be visible on the outside of the equipment rack when all doors are closed and when standing in front of the rack.

3.2.6.2.4 Accessibility.

Accessibility shall be in accordance with the following requirements.

3.2.6.2.4.1 Cable slack.

Adequate cable slack and cable bending features shall be provided to assure full extension access to multiple equipment extensions during maintenance. Adequate cable slack shall also be provided in the cables behind equipment panels to permit removal of each instrument, display, or control panel and disconnection from associated cables in one maintenance operation from the equipment.

3.2.6.2.4.2 Assemblies.

Units, assemblies, subassemblies, and parts shall be provided with adequate accessibility and removability for ease of maintenance. If tracks, slides or roller are provided, automatically operated locking devices shall also be provided to lock the assembly in the servicing position as well as in the fully opened (except for the equipment rack shelf) and fully closed positions. The design of each major assembly, subassembly, and unit of the CCTT system, shall permit access to its interior components and parts for maintenance. It shall not be necessary to displace or

remove wires, cables, subassemblies, or assemblies in order to gain access to mounting screws, test points, adjustment points, lubricating points, and the like. Where visual inspection is necessary, and open access is not feasible, transparent access panels shall be used. The placement of parts shall be such as to provide space for the use of test probes. Assemblies subject to replacement or service shall not be permanently secured.

3.2.6.2.4.3 Covers, panels, and doors.

Hinged covers and doors shall be provided with a means to retain them in an open position; and when opened, shall not cause the equipment to become unbalanced. A retention device fastened to the equipment shall be used on removable covers for which no convenient location for depositing the cover is available during maintenance. Front panels containing parts which require maintenance such as instruments, switches, potentiometers, and the like, shall provide adequate accessibility and/ removability for ease of maintenance. Where parts or assemblies are mounted on hinged doors, panels, or covers, electrical ground return shall not depend on the hinge contact for electrical continuity. A separate grounding means shall be provided for the electrical ground return. Locking devices shall be installed on the hinged covers and doors to retain them in the open position to permit accessibility and to prevent injury to personnel performing maintenance.

3.2.6.2.4.4 Handles.

Handles and hand grips shall be provided for removing units or chassis from enclosures. Handles on enclosures shall be recessed.

3.2.6.2.4.5 Replacement of modular assemblies.

Plug-in techniques shall be used to permit replacement of modular assemblies. All modular assemblies shall be designed so that they can be inserted into the equipment in one position only. Sockets shall be oriented in the same direction and positioned so that the sockets are visible. Modular circuits shall be grouped in functional units.

3.2.6.2.4.6 Cabinet door locks.

All equipment cabinet doors equipped with key operated locks shall utilize a common key for all locks.

3.2.6.3 Circuit card connectors, power, and ground.

Inadvertent insertion of a card in the wrong slot ~~will~~shall not result in damage to the circuit card or to other parts of the system.

3.2.7 Environmental conditions.

Component parts, units, assemblies, and subassemblies of the CCTT fixed site system shall meet the environmental performance requirements that follow. Requirements for mobile CCTT systems are specified in paragraph 3.8.

3.2.7.1 Standard temperature and humidity.

The equipment shall be designed to operate in an environment with a temperature range of 60 to 85^{o}F and a relative humidity of 40 to 75 percent non-condensing, unless otherwise specified.

3.2.7.2 Storage.

The CCTT system shall be designed such that it ~~will~~shall not be damaged, nor shall the performance be degraded, when stored in a humidity range of 25 to 75 percent non-condensing, and a temperature range of 0 to 125 degrees F closed to the environment.

3.2.7.3 Vibration.

The CCTT system shall be designed such that it ~~will~~shall not be damaged, nor shall the performance be degraded by common commercial carrier vibrational stresses.

3.2.7.4 Shock.

The CCTT system shall be designed such that it ~~will~~shall not be damaged, nor shall the performance be degraded by infrequent nonrepetitive shocks or transient vibrations encountered during handling, transportation, and service environments.

3.2.7.5 Transportability.

The CCTT system shall be constructed such that relocation of the training system can be accomplished without physical modification (e.g. soldering, welding, unsoldering, cutting, crimping, or destruction) of material. CCTT system components, when disassembled for relocation, shall be capable of being packaged in containers with door openings of 7 feet~~'~~ 5~~"~~ inches in height and 7 feet ~~'~~8½~~"~~ inches in width, and internal dimensions of 19~~'~~ feet 4¼~~"~~ inches in length, 7~~'~~ feet 9~~"~~ inches in height, and 7~~'~~ feet 8½~~"~~ inches in width.

3.3 Design and construction.

3.3.1 Recycled, recovered, or environmentally preferable materials.

Recycled, recovered, or environmentally preferable materials should be used to the maximum extent possible provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

3.3.2 Electromagnetic radiation.

No wireless radio frequency communications shall be used within the CCTT system.

3.3.3 Safety and health hazards.

The CCTT system shall be designed and constructed for safe operation and maintenance. The risks due to human error under routine, non-routine, and emergency conditions shall be minimized. A fail-safe design shall be provided in those areas where failure can cause death, severe injury, severe occupational illness, or major system damage.~~to be safe and free of hazards to all personnel. Any safety or health hazards associated with any phase of operation to include installation, operation, maintenance, testing, storage, transportation, and disposal shall be eliminated or its associated risk controlled to a level acceptable to the Government.~~ The design shall satisfy the requirements herein and the conditions of the System Safety Design Verification Checklist at appendix C.

3.3.3.1 Electrical safety.

Electrical circuitry shall comply with the requirements of the National Electric Code. Equipment shall be listed or certified by a Nationally Recognized Test laboratory (NRTL) (e.g. Underwriters

Laboratories) or be shown to comply with appropriate consensus standards. The design and development of electronic equipment shall: provide fail safe features; incorporate methods to protect personnel from inadvertent contact with voltages capable of producing shock hazards: and insure that all external electrically conductive parts, surfaces, and shields are at ground potential at all times during normal operation. The main power switch shall be located in front of the system, clearly labeled, and shall cut off power to the complete CCTT system. Danger, caution, and warning signs shall be designed and used in accordance with ANSI Z535.3-1991 and ANSI Z535.4-1991 to warn user personnel of specific hazards such as voltage, current, and thermal. For GFE or/ existing vehicles used within CCTT, warning signs already designed/ and approved for such vehicles ~~will~~shall be used. For potentials between 70 and 500 volts warning shields and sign labels shall read ”CAUTION (insert maximum voltage) VOLTS”. Circuit breakers shall be on the equipment side of the power switch and shall be capable of manual reset only. Computer equipment shall meet the requirements of Chapter 4 of NFPA 75-95, except that flexible alternating current (AC) power cords shall not exceed 25 feet in length. Batteries shall be sufficiently separated from electronic components to prevent damage from corrosion. In addition, grounding wands shall be provided and installed in each equipment rack where an interlock circuit is installed because of residual electrical charges. The wands shall be permanently wired to the equipment ground system.

3.3.3.2 Personnel safety.

The design of the CCTT system shall be such as to provide maximum safety to personnel and system equipment when installing, operating, transporting, adjusting and maintaining the equipment. Materials used shall, in the end-item configuration, be non-combustible or fire retardant. Parts and assembled equipment shall be cleaned of smudges, loose, spattered, or excess solder; weld metal; metal chips and mold release agents; or any other foreign material which might detract from the intended operation, function, or appearance of the equipment. Screws, nuts and bolts shall show no evidence of cross threading, mutilation, or detrimental or hazardous burrs, and shall be firmly secured. Bearing assemblies shall be free of rust, discoloration, and significant surface imperfections. Wires and cables shall be positioned or protected to avoid contact with rough or irregular surfaces and sharp edges and to avoid damage to conductors or adjacent parts. Shielding on wires and cables shall be secured in a manner that ~~will~~shall prevent it from contacting or shorting exposed current-carrying parts. The ends of the shielding or braid shall be secured to prevent fraying. The design of CCTT shall comply with NFPA 101-97 for ingress, /egress and other life safety issues. Adequate ventilation shall be ensured by introducing fresh air into any personnel enclosure. If the enclosure volume is 4.25 m^3 (150 ft3) or less per person, a minimum of 0.85 m^3 (30 ft^3) of ventilation air per minute shall be introduced into the enclosure; approximately two-thirds should be outdoor air. Air shall not move past personnel at a velocity of 60 m (200 ft) per minute. Where manuals or loose papers are used, airspeed past these items shall not be more than 30 m (100 ft) per minute. Unless wiring ducts or conduits are used, mechanically mounted cable clamps shall be provided to ensure correct routing of electrical cables within and between equipment items. Cables shall be routed or protected in such a way that they may not be pinched by doors, walked on, used for hand holds, or bent or twisted sharply or repeatedly. Cables shall be labeled to indicate the equipment to which they belong and the connectors with which they mate. Where

commercial~~COTS~~ equipment is used, if commercial (e.g., UL) safety standards are met, then the ~~COTS~~commercial equipment need not be modified, except by labeling to meet the additional safety requirements stated in this section. Fire extinguishers shall be provided for all confined space areas as well as be easily accessible within the facility as described within C~~ode of~~ F~~ederal~~ R~~egulations,~~ Title 29 ~~(Occupational Safety and Health Standards)~~. Emergency power off switches shall be provided that can easily be reached by all operator personnel in the event of an emergency.

3.3.3.3 Hazardous materials.

The CCTT 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. PVC materials shall not be used in the crew compartment. The CCTT system shall preclude exposure of personnel or the environment to excessive levels of toxic, carcinogenic, or otherwise hazardous materials as defined by ~~the (~~OSHA~~)~~, ~~(~~EPA~~)~~, and ~~the (~~DOT~~)~~.

3.3.3.4 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 the system is easy to handle; the system shall be stable. A means shall be provided to lock or ~~/~~disengage the wheels of applicable equipment, so the system can not be inadvertently moved.

3.3.3.5 Acoustical noise.

The control of acoustical noise generation and penetration shall be in accordance with ~~29~~29 CFR 98 ~~CFR 1910.95 (OSHA)~~. In addition, the acoustical noise level in operational areas of the trainer shall not exceed the requirements of sound generation system paragraphs provided throughout this specification for the various components of CCTT. The acoustical noise level in simulator bay aisles shall be less than 81dB.

3.3.4 Human performance and~~/~~ human engineering.

The design of the CCTT system, exclusive of simulated feature fidelity, shall be in conformance to applicable provisions of the human factor engineering criteria and requirements of ~~ANSI/HFS 100-1988~~ANSI/HFS 100-88. All aspects of the CCTT system, except those portions which replicate actual military hardware, shall be governed by the dimensional range from the 5th percentile female to the 95th percentile male soldiers working with the system. Design, selection, and arrangement of equipment shall ensure ease, efficiency, and safety of operation in the performance of all necessary functions by the crew and other personnel in fulfilling the intended use of CCTT. Factors causing simulation sickness and fatigue shall be reduced to a minimum. Crew station fidelity design developed under the concept of providing only what is necessary and essential for the task shall assure limitations and fidelity are not contributing factors in crew fatigue.

3.4 Identification and marking.

Markings for components and assemblies shall be as permanent as the normal life expectancy of

the item. Markings shall be capable of withstanding the environment in which they are utilized and any necessary cleaning procedures. Legibility shall be as required to ensure ready readability. Markings shall not ~~adversely~~adversely affect the life and utility of the item. Location of identification and reference designator markings shall ensure visibility and allow differentiation from other items during normal operational use.

3.4.1 Identification markings.

Identification markings shall minimally consist of the design agency Contractor and Government Entity (CAGE) code, a dash (or slant), and the identifying part number. Commercial ~~off-the-shelf~~ items which are already marked, as well as parts within an assembly or subassembly which are not normally subject to removal, replacement, or repair do not require identification markings.

3.4.2 Reference designator markings.

All disconnectable cables and wires shall be marked with reference designator markings consisting of the reference designation of the item (minimally the "W" and "P" designation) as well as assembly designations as required to readily differentiate the part. The marking shall also contain the reference designation of the item it connects to. Circuit cards and terminal boards receiving cables or wires shall be marked in order to facilitate connections. Ground wires and cables and ~~/~~wires within a commercial ~~off-the-shelf~~ assembly do not require reference designator markings.

3.4.3 ESD Markings.

Electrostatic discharge sensitive assemblies shall be identified as such utilizing standard, commercial markings.

3.4.4 Major assembly markings.

Major assemblies such as equipment racks, manned module compartments, workstations, and semitrailers shall have identifying labels consisting of black marking on a white or silver background. Identification shall include name of the procuring agency, name of the assembly, part number, contract number, manufacturer and CAGE, serial number, and year of manufacture.

3.4.5 Simulated and Modified Tactical Equipment.

Modified operational/tactical equipment for CCTT use only, as well as simulated equipment which could be mistaken for operational/tactical equipment shall be marked "WARNING: FOR TRAINER USE ONLY" if the equipment can be removed without the use of tools.

3.5 Logistics.

The CCTT shall support a maintenance concept of ~~total~~ Life Cycle ~~c~~Contractor ~~logistic s~~Support (LCC~~L~~S).

3.6 Module common performance requirements.

The following requirements shall be applied in the design and fabrication of all manned modules and specific positions within the manned modules.

a. Nuclear, B~~B~~iological, and ~~C~~ Chemical (NBC) Gear - The CCTT manned module designs shall allow the crews to wear NBC gear (M25, M40 and M17 series individuals protective mask, microclimatic vest, and the chemical protective overgarment worn over individual clothing) and hook up to the gas particulate system during a training exercise. Personnel shall be encumbered no more than occurs in the operational equipment. This is applicable not only to the compartment but the use of the simulated controls and communications. A conditioned fresh air flow of not less than 0.85m^3 (30 ft^3) of ventilation air per minute shall be provided. Air shall move past personnel at a velocity of no more than 60m (200 ft) per minute.

b. Combat Vehicle Crew (CVC) Helmets - The design of the CCTT manned modules shall ensure that CVC helmets can be worn at all crew positions without restriction of movement or degradation in ability to operate controls normally.

c. Simulated Compass - Each manned module shall provide a compass simulation, presented in degrees, (mils for the M981 FIST-V) depicting the orientation of the long axis of the vehicle (or the direction facing for dismounted infantry) on the simulated terrain to grid north. For manned modules except DI, the simulated compass shall be located inside the compartment.

d. Module Compartment Tolerances - The CCTT manned module compartments shall be designed based upon actual vehicle dimensions as documented in Army Material Systems Analysis Activity (AMSAA) Manned Module Verification and Validation Measurements. Space constraints within the compartments and the interior dimensions shall be within 2.5 inches of the actual vehicle.

e. Physical/dimensional characteristics - The replicated components within the modules shall be dimensionally accurate to within +/- 0.25 inches of the actual vehicle as documented in AMSAA Manned Module Verification and Validation Measurements. Items which are non-functional and non-tactile (i.e. viewable by the student but not touched during training) shall be dimensionally accurate to within 5 percent.

f. Component placement - Placement of module components within the compartment shall replicate the location within the baseline vehicle to an accuracy of +/- 1.5 inches, and. distances between adjacent components including panels shall be within +/- 0.25 inches as documented in AMSAA Manned Module Verification and Validation Measurements.

g. Emergency Compartment Lighting - Each CCTT manned module compartment shall provide battery powered emergency lighting which automatically activates in the event of a power failure to the compartment. The emergency lighting system shall be self charging with a charge indicator. The system shall provide sufficient lighting in the compartment interior for a minimum of 15 minutes.

h. Module f~~Fire Detection~~ire detection ~~S~~system - Each CCTT manned module compartment shall provide a fire detection system which detects the onset of possible emergency. The system shall meet the NFPA ~~Code~~ 101-97 for the design of the fire detection system and shall meet NFPA 70-96 and NFPA 72-96 ~~(Aug 1993)~~ for the installation, test, and maintenance of the system. Components used in the fire detection system shall be UL approved. The system shall also meet the following:

(1) Power and signal cable groups shall be isolated from fire alarm cables.

(2) Activation of the module fire detection system shall sound an alarm inside the module compartment(s) and shall trigger internal alarms in compartments of all modules.

(3) A strobe light shall illuminate on top of the module exterior and shall be visible. Activation of one module's fire detection system shall not trigger strobes on any other modules.

(4) The fire detection system shall provide an output interface for the facility fire alarm system and shall trigger the facility alarm upon activation.

(5) Activation of a module's fire detection system shall deactivate power within the module.

(6) Each module's fire detection system shall incorporate a battery backup ability that ~~will~~shall allow the fire detection system to remain operational for a minimum of twenty four (24) hours after the removal of power.

(7) Activation of the f~~F~~acility ~~F~~fire ~~D~~detection ~~S~~system shall not trigger strobes on any modules.

(8) Activation of the f~~F~~acility's ~~F~~fire ~~D~~detection ~~S~~system shall activate the internal alarms in all compartments and all modules.

i. Emergency Power Disconnect - Each CCTT manned module compartment shall provide an emergency power disconnect button. The button shall be lighted and covered with a safety panel to preclude accidental activation. The module shall be capable of subsequently being powered-up and reconstituted into the data base in the appropriate position and condition within the exercise only after the disconnect has been reset at the module.

j. Turret/Hull Reference Indicator - For vehicles with turrets, the module shall display the ~~direction/~~orientation of the turret relative to the hull. The indicator shall be visible to the gunner and commander.

k. Crosstalk between simulator sound systems shall be minimized through the use of materials which have acoustic attenuation and isolation properties. The acoustical attenuation between closed simulators shall be a minimum of 30 dB.

3.6.1 Simulated damage and failure.

The M1A1, M1A2, M2A2/M3A2, M981 FIST-V, M113A3 APC, and HMMWV modules shall be subject to three categories of simulated failures, which are:

a. Combat damage.

b. Stochastic failure.

c. Deterministic failure.

The equipment shall reflect the inflicted damage by partially or fully disabling (or degrading) the vehicle subsystems and controls. Crews shall be made aware of vehicle failures only to the extent

that associated changes to control responses, lights, gauges, sounds, and visual observations provide this information to them. The simulated DI soldier shall only be subject to combat damages and deterministic failures as indicated in 3.6.1.5.

3.6.1.1 Combat damage.

Combat damage shall be simulated for all entities in the battlefield. Combat damage shall be defined as damage inflicted when a vehicle, aircraft, ~~and/~~or personnel receive either the effects of mines, exploding ordnance, or direct, or indirect fire from opposing and friendly forces during the battle simulation. A means shall be provided within each module to display crewman casualty for all crew members within the module. The display shall be visible to all crewmembers and shall include both wounded and killed states.

3.6.1.2 Stochastic failures.

A stochastic failure occurs when the vehicle or equipment fails on its own, not through crew error or combat damage. The frequency of failure shall be determined by the Mean Time Before Failure (MTBF) or Mean Miles Before Failure (MMBF) for the particular vehicle, based on available data. Stochastic failures shall degrade the performance of the vehicle.

3.6.1.3 Deterministic failures.

Deterministic failures are failures that occur due to resource depletion or improper action. Deterministic failures include, but are not limited to, mismanagement of fuel and ammunition, collisions, thrown tracks (resulting from improper high speeds and turns on soft surfaces, and attempting steep inclines beyond the capability of the system), resource depletion, and ignored stochastic warnings by the crews.

3.6.1.4 Areas of potential failures.

The CCTT shall provide malfunctions and failures for the areas below. Each occurrence shall be based upon statistical data for combat, deterministic, and stochastic failures.

a. Transmission.
b. Engine.
c. Weapon systems.
d. Turret.
e. Fire control systems.
f. Electrical systems.
g. Communications.
h. Tracks or drive trains or wheels.
i. Control panels or displays.

3.6.1.5 Dismounted infantry failures.

The simulated dismounted infantry shall be subject to two categories of failures. These are:

a. Combat fatalities or casualties. Combat fatalities for the dismounted infantry occur when the squad or platoon receives either a direct or indirect fire hit, or mine effects.

The location of the hit, the type of ammunition used, and the kill zone, shall determine the extent of the injury. The wounded shall impact the functioning of the squad by reducing movement speed and shall reduce the DI's ability to employ the weapons listed in 3.7.10.2.1.

b. Deterministic failure. Deterministic failures for DI shall be limited to depletion of the ammunition and weapons resources specified in 3.7.10.2.1.

3.6.2 Simulated repairs.

Simulated repairs for CCTT shall be classified into two categories: Self-repairs which represent those repairs that the crew can perform on their own without assistance, and repairs via the UMCP simulation in which the crew must coordinate with the dispatcher via radio to arrange a rendezvous with a repair maintenance vehicle to repair the vehicle. Both classes of repairs are timed using MTTR data. The total repair time for each occurrence shall be the summation of repair times for all subsystems of the vehicle requiring attention. The crew shall be notified by the system that repairs are completed.

a. Self-repairs shall commence upon crew request of those damages or failures to the vehicle and shall represent repairs that a crew could accomplish themselves. The following are examples of self-repairs:

(1) Repairing thrown tracks.

(2) Repairing laser range finder

(3) Repairing main gun misfire

b. Repairs via the UMCP shall occur when a vehicle subsystem fails and cannot be fixed through self-repairs. The vehicle crew shall determine the damage, relay the information to the UMCP, and arrange a rendezvous with a repair maintenance vehicle. If the repair maintenance vehicle cannot repair the vehicle then the damaged vehicle shall be towed to the UMCP by one of the recovery vehicles listed in paragraph 3.7.1.3. If during the repair, either the damaged vehicle, or the maintenance vehicle drives away or is destroyed, the current item under repair and the items not yet repaired when the vehicle is displaced or destroyed shall remain in a failed state.

3.6.3 Dynamic and kinematic fidelity for manned simulators.

The simulation shall result in the steady-state and dynamic motion of the vehicle in the terrain database within the tolerances specified below unless otherwise specified in an appendix for a particular vehicle.

a. Velocity and acceleration. The vehicle simulation shall replicate the velocity and acceleration due to accelerator position, brake pedal position, transmission selection, malfunctions, and terrain. Maximum velocity shall be within 10 percent~~%~~ of actual vehicle performance. Acceleration shall be within 15 percent of the actual vehicle subject to a lower bound of 0.3 meters per second squared.

b. Engine. The simulated vehicle shall include all functions of the engine required for simulation of the speedometer (+/- 2 MPH), tachometer (+/- 100 RPM), aural cues related to engine speed, output torque, and engine malfunctions and warning systems.

c. Transmission. The vehicle simulation shall model the output torque and torque/speed ratio as a function of shift lever position, accelerator position, engine output, load, RPM, malfunctions, and terrain. All transmission control positions shall be simulated and functional.

d. Starting system. Each manned module shall provide the controls and indicators required to start the engine. The simulation shall replicate the steps required by the operator, time sequences (+/- 1 second), and RPM (+/- 500 RPM).

e. Braking system. The braking system for each of the vehicles shall be modeled. Braking distances and deceleration rates shall be simulated based upon terrain, transmission selection, and pedal displacement (+/- 15 percent).

f. Steering. The feel and response of the vehicle's steering system shall be provided. Deadband shall be within 3 degrees of the actual vehicle. The turning radius shall be replicated within fifteen percent for given speeds and steering control positions. The rate of turn based upon steering position, velocity, transmission selection and terrain shall be within 15 percent. The differential steering system for tracked vehicles shall be modeled to include the power distribution and control to the tracks.

g. Fire control systems. The vehicular fire control systems shall be replicated to allow precision gunnery techniques and degraded mode gunnery techniques (e.g. gunner's auxiliary sight, and manual traverse and elevation handles). Limits of travel shall be within 8 degrees for rotational travel and one inch for linear travel. Control forces shall be simulated (+/- 1.0 pound~~pounds~~s breakaway force, +/- 2.0 pounds ending force). Laser range finders shall be simulated to include accuracy (+/- 3 meters), the range indications in the sight and multiple return indications. Laser designators shall be replicated in terms of effective range accuracy (+/- 3 meters) and function. The simulation of the reticle for the M1 family of vehicles shall include the reticle jump.

h. Turret and cupola dynamics and kinematics. The CCTT shall simulate the turret and cupola dynamics of the M1 family of vehicles, M2A2/M3A2, and FIST-V. The simulation shall interface with the hull simulation. Turret orientation shall be displayed in the visual scene. Turret movement shall be in response to crew member control inputs, motion transmitted from the hull simulation, and the stabilization and elevation systems. The simulation shall include stabilization systems, rotation rates, gun elevation rates, kinematics, and dynamic modeling within 10 percent.

i. Missile dynamics. The dynamic simulation of the missile fly-out (velocity, lateral and vertical acceleration, trajectory, range) shall be provided for those missiles visible in the database (e.g. TOW, Dragon, Copperhead). For missiles controlled by gunner inputs, the simulation shall accurately model the missile response to gunner controls within +/- 10 percent~~%~~. If the gunner control inputs a change in azimuth or elevation which is greater than the capability of the missile to change direction the gunner shall lose control of the missile. For wire guided missiles, the simulation shall replicate broken wires and loss of line-of-sight. The interaction between laser designators and laser guided missiles shall be simulated. The visual simulation shall include missile launch

signature, gunner's sight obscuration after launch, flare in the rear of the missile both in the gunner's sight and on the battlefield, and impact visual effects.

3.6.4 Emulated vehicles fidelity.

The emulated vehicle models shall simulate the movement of the ground vehicles, aircraft, dismounted infantry (DI), and guided weapons to allow the visual model of the entity to be correctly displayed in the visual scene. The simulation shall provide terrain following for the emulated visual models of ground vehicles and DI's on the terrain database. The simulated ground vehicles and DI's shall follow the terrain contours to within an accuracy of 0.3 meters.

3.6.5 Simulated ballistics.

The ballistic simulation of each weapon and ammunition type shall replicate the visual characteristics of the firing signature, trajectory flyout, and the impact signature. The rate of fire of the modeled weapon shall replicate that of the actual weapon. The CCTT dismounted infantry unit shall be subject to the same resource limitations as actual field units. The resources shall be selected and controlled in accordance with the established initial conditions of the exercise and the capabilities of resupply sources. The firing of the Smoke Grenade SALVOs on the different weapon systems shall be simulated.

3.6.6 Simulated ammunition transfer.

The modules shall provide the crew with the means to simulate the transfer of ammunition from ammunition prestock which has been placed in the database, from supply vehicles, or from other manned vehicles. This capability shall provide the ability to choose the type of ammunition and shall indicate the type and number of rounds transferred. A means to transfer from vehicle ammunition storage areas to the "ready rack" shall also be provided. The number of available rounds for each weapon type shall be indicated to the crew. The time to transfer rounds shall replicate the real world times (e.g. time for soldiers to transfer from vehicle to vehicle, or within areas inside the vehicle). The crew shall be made aware when the transfer is complete and shall have the capability to terminate the transfer at any time. Partial ammunition loads shall be possible as a result of terminated transfers.

3.6.7 Simulated towing fidelity.

A manned vehicle simulator shall have the capability to tow another tracked or wheeled vehicle on the simulated battlefield, within the towing operational limits of the manned vehicle simulator. The manned towing vehicle simulator shall use a trainer unique interface to initiate the tow connection to a manned or emulated vehicle. A tow connection initiation shall be prevented unless the vehicles are within 11 meters center point to center point of each other and the towing vehicle is within +/- 45 degrees of the forward longitudinal center-line of the vehicle to be towed. After the tow connection has been made, the manned simulator acceleration and velocity shall reflect the additional load of the vehicle being towed. Simulation of towing shall be unaffected by the state of the manned, towed vehicle simulator controls. Failures of the simulated tow bar or cable shall not be simulated.

3.7 Major component characteristics.

3.7.1 Operations Center (OC).

The OC shall be comprised of replicated work areas for the battalion staff functions consisting of a Tactical Operations Center (TOC), a Combat Trains Command Post (CTCP also known as ALOC), a Field Artillery Battalion Tactical Operations Center (FABTOC), a Unit Maintenance Collection Point (UMCP), two mortar Fire Direction Centers (FDC) and a Tactical Air Control Party (TACP). The work areas shall be configured to replicate a generic version of a fielded heavy battalion task force command post. The work area shall provide the battalion staff a realistic setting within the framework of CCTT for performing their respective functions. The M577A2 enclosures shall include replicated work surface areas, shelves and non-folding table leaves, racks and shelves for communications equipment, lighting, rear door, and ramp. OC Workstations shall be able to share printers over the network. The tent-extensions shall have removable walls to allow reconfiguration of OC areas into alternate configurations. The OC/M577A2 enclosures shall be protected by a fire detection system meeting the requirements of paragraph 3.6. for the manned modules. The OC items shall provide communications including 36 CCTT SINCGARS radios (which can be used as radios or remotes), 36 handsets, and 36 external speakers to allow intercommunications to appropriate modules and consoles and is portable and relocatable among OC facility components.

The OC shall be capable of supporting both single and multiple exercises without any physical modifications to the OC consoles. Each OC console shall provide a plan view display capability. Each OC console shall support multiple OC functions (for example, FSE, FABTOC) concurrently. Each OC console (excluding the TACP console) shall be capable of providing any OC function, including the TACP CAS capabilities, but excluding the TACP DI and visual capabilities. The TACP console shall be capable of providing any OC function, except that the TACP DI and visual display capabilities are provided only when the TACP function is the only function assigned to the TACP console. The fixed site OC shall provide the capacity for 48 voice channels that can be used concurrently with each OC console having the capacity to support at least 6 voice channels. The mobile OC consoles shall provide the capacity for 12 voice channels that can be used concurrently. The mobile OC shall provide 8 CCTT SINCGARS radios, 8 external speakers, and 8 handsets.

In all cases, each item of the OC shall be visible in the database at all times and shall be vulnerable to the effects of the enemy, collision, weather, and stochastic and deterministic failures. The OC items shall be relocatable by: (1) the MCC operator, as requested by the training unit commander or his staff, (2) the console operator, and (3) by tethering to another vehicle. While being relocated by the console operator or by tethering to another vehicle, the vehicles shall be visible and shall match realistic speeds based upon terrain and weather. The TOC shall be relocatable by the OC CES workstation operator and by the OC FSE workstation operator. The vehicles dispatched by OC consoles shall be visible in the database at all times, including while moving, and shall exhibit the same characteristics and limitations of the actual vehicles they represent. Each emulated vehicle shall be susceptible to combat damage in accordance with 3.6.1.1, collision damage, weather, time, and terrain effects and shall simulate stochastic failures in accordance with 3.6.1.2.

The resources for fixed site OC capabilities shall have a capacity to simultaneously support up to 301 entities total for all exercises. The resources for mobile OC capabilities shall have a capacity to simultaneously support up to 100 entities. The system shall support the following types of OC emulated entities and, for an exercise, support up to the following quantity of each type of OC emulated entity:

OC:

3 - M577A2 for the TOC (1 for S2, S3, and FSE)

1 - M577A2 for the CTCP

2 - M577A2 for the FABTOC

1 - M577A2 for the FDC A

1 - M577A2 for the FDC B

1 - M998, HMMWV for the UMCP

CTCP:

16 - M978 HEMTT (Heavy Expanded Mobility Tactical Trucks) (Fuel Truck)

15 - M977/M985 HEMTT (Ammunition Truck)

1 - M1091 MTV (POL) Tanker

UMCP:

Maintenance Vehicles:

5 - M113A3 (Personnel Carrier)

7 - M1078 LMTV (2.5 Ton Truck)

7 - M1079 LMTV Van

7 - M1083 MTV (5 Ton Truck)

Recovery Vehicles:

7 - M88A2 Recovery Vehicle

1 - M984A1 HEMTT Wrecker

1 - M1089 MTV Wrecker

CES:

2 - M728 CEV (Combat Engineer Vehicle)

4 - LNCHR AVLB M60A1 Series (Armored Vehicle Bridge Launcher)

5 - M9 ACE (Armored Combat Earthmover)

4 - M58 A3 MCLIC

2 - VOLCANO (mounted on an M1083 MTV)

9 - M113A3 (Personnel Carrier)

9 - US DSMT ENGR Pers, 8 Pers (1 team per M113A3)

FDC:

6 - M1064 CARR Mort w/BMS 120

FABTOC:

24 - M109A5/M109A6 SP HOW (155mm Self-Propelled Howitzers)

24 - M992 FAASV

9 - M270 MLRS (Multiple Launch Rocket System)

TACP:

100 - A10, F16

3.7.1.1 Administrative Logistics Center (ALOC).

The Combat Trains Command Post (CTCP also known as ALOC) shall provide simulated Combat Service Support (CSS) operational capabilities and functions via a console and communication system that allows for the control of resources associated with personnel and logistic support. The logistics support shall include providing ammunition and fuel to requesting units. Control over the battalion's ammunition and fuel supply trucks shall be through the CSS console responding to requests for support. The CSS shall simulate (types and numbers to be predetermined during exercise initial conditions generation) fleets of fuel trucks and ammunition trucks. The fuel trucks simulated shall be as specified in section 3.7.1. The ammunition trucks simulated shall be as specified in section 3.7.1. The performance/limitations of the resupply vehicles shall replicate the capabilities of the actual vehicles specified in section 3.7.1 to include vehicle speed limitations, weight capacity, and tank capacity~~/~~ or range. While a vehicle is undergoing operator maintenance (self-repair), supply transfers shall be allowed provided that all other criteria for the supply transfers are met. The dispatched vehicles shall automatically travel to the dispatched location utilizing the most tactically appropriate routes based on terrain that is trafficable unless a specific route is designated by the CSS operator. The CSS console shall display the initial status for all support vehicles showing what supplies and amounts are available, and breakdowns if any have occurred. The CSS console shall display updated status for all support vehicles showing supplies and amounts that are available, and breakdowns that have occurred only if the console operator requests the data updates. The CSS vehicles shall, when directed by the CSS operator, displace by the following methods:

a. Follow a HMMWV .

b. Travel independently based on explicit directions from the CSS work station.

c. Travel independently based on predefined routes (i.e. Major Supply Routes).

d. Relocate automatically to the designated location via the most tactically appropriate route considering vehicle capabilities and performance.

The dispatched trucks shall then be capable of being redirected to other locations. At any time, the operator at the CSS console shall either direct the supply truck to service another vehicle, stay where it is, or return back to the point of origin for resupply. The capability to transfer supplies from one resupply truck to another shall be provided. The CSS shall be able to access ammunition and fuel prestock. The CSS shall also be able to transfer ammunition and fuel stock between the truck and prestock(s) in the database.

3.7.1.2 Tactical Operations Center (TOC).

The TOC shall consist of the XO, S-2 and S-3 battalion staff work areas, the combat engineering support function, and the fire support element function. The communication capabilities shall include communications with the higher headquarters. The TOC shall be provided with the appropriate tactical equipment, furniture and capabilities to create a realistic environment for the performance of battalion staff functions.

3.7.1.2.1 Combat engineering support.

The CES function shall provide command, control and maneuverability to emulated engineer vehicles. The engineer vehicles shall, when directed by the CES operator, displace by the following methods:

a. Follow a vehicle as described in 3.7.13.

b. Travel independently based on explicit directions from the CES workstation.

c. Travel independently based on predefined routes (i.e. m~~M~~ajor supply routes).

The emulated vehicles shall be capable of providing the following (as enumerated in Table A-1):

a. Emplacement of minefields.

b. Emplacement of obstacles to include log cribs, abatis, concertina fences, tank ditches, and craters.

c. Breaching and clearing of minefields (including marking the cleared minefield lanes).

d. Breaching and~~/~~ clearing of obstacles to include log cribs, abatis, concertina fences, tank ditches, and craters.

e. Construction of combined and ~~/~~hull defilade positions,

f. Construction of infantry fighting positions.

g. Construction of terrain objects with the exception of ribbon bridges (ribbon bridges shall be constructed with no time delays upon command from the CES console operator).

h. Destruction of terrain objects to include ribbon bridges.

i. Deployment of the AVLB.

j. Recovery of the AVLB.

The CES initiated functions shall be accomplished in real-time and visually depicted in incremental stages on the exercise database. The CES console shall provide the operator an interactive graphical representation of the battlefield via a plan view display IAW 3.7.2.2.1.1.

The console shall be located in the TOC tent extensions. The workstation shall include a field table-like work area/surface for the console, appropriate status boards, CCTT SINCGARS, and an appropriate chair for a field environment. The CES functions shall simulate the vehicles specified in section 3.7.1. Dismounted engineers shall be capable of performing engineering functions including mine clearing, mine laying and obstacle emplacement. Along with these functions, the visual marking of minefields of a rectangular size with a selectable area of up to 5000 square meters shall occur in real-time. The CES shall be capable of making twenty minefields for each exercise.

3.7.1.2.2 Fire support element.

The FSE shall provide simulated secure and non-secure SINCGARS radio communications with the FIST-V, the FABTOC, the FDC and the FO. The FSE shall have the capability to coordinate fire support, including the implementation of the commander's guidance, establishing the priority given to targets, and development of the fire support plan. The FSE shall have the capability to monitor fires, including monitoring the delivery of fires and the capability of direct support fire units to provide fire support.

The FSE function shall provide the capability to create, modify, and display a fire support plan consisting of a fire support execution matrix, target list and data (including CAS targets and data), schedule of fires, fire support overlay elements, and control measures. The FSE function shall provide the capability to send and receive digital Free Text Messages and "Message to Observer (MTO)" messages. The FSE function shall provide the capability to enter fire mission data, targets, and fire support asset status and location data. The FSE function shall provide the capability to initiate fire missions, send fire requests, intervene missions, and deny fire requests. The FSE function shall provide the capability to adjust fires. The FSE function shall provide the capability to plan and fire cratering missions.

The FSE function shall provide the capability to display fire fans for mortars and artillery.

The FSE function shall use the Advanced Field Artillery Tactical Data System (AFATDS) windows and menu . The FSE simulation of AFATDS shall include a non-standard AFATDS mission type of cratering fire mission. The FSE function shall use menu bars and option selection pull-down menus equivalent to the AFATDS FSE Fire Support Control Terminal menus to traverse windows with menu option selections limited to the functionality specified in the preceding FSE requirements.

3.7.1.3 Unit Maintenance Collection Point.

The UMCP shall provide the capability to coordinate repair and recovery of all battalion vehicle assets. The UMCP shall dispatch simulated repair and recovery vehicles, which shall automatically travel to the dispatched location utilizing the most tactically appropriate routes available unless otherwise directed by the UMCP operator. The UMCP vehicles shall, when directed by the UMCP operator, displace by the following methods:

a. Follow a HMMWV.

b. Travel independently based on explicit directions from the UMCP workstation.

c. Travel independently based on predefined routes (i.e. major supply routes).

The UMCP capability shall simulate the vehicles specified in section 3.7.1. The UMCP function shall allow the OC UMCP workstation operator to assign specific types of repair capabilities to each maintenance vehicle, limited only by the personnel capacity of each maintained vehicle. The repair capabilities assignable to maintenance vehicles by the OC UMCP workstation operator shall include engine, transmission, ~~/~~suspension, turret, ~~/~~weapon, fuel system, and communications and electronic repair.

The performance and ~~/~~limitations shall replicate the capabilities of the actual vehicles. The armored recovery vehicles and wreckers shall be visible in the CCTT database to retrieve vehicles back to the UMCP that are immobilized (stuck, damaged, etc.) in the terrain or non-repairable in the field. Once the desired repairs occur, the operator at the UMCP console shall either direct the repair vehicle to another vehicle or return back to the UMCP.

3.7.1.4 Fire Direction Center.

Two FDC stations shall be represented utilizing mock-ups of the M577A2 vehicle. The FDC station shall control the fires and compute the firing data for the mortar platoon or sections. The FDC station shall simulate the FDC to Gun Crew interface. The FDC station shall provide simulated SINCGARS radio communications with the FABTOC, the FIST-V, the FSE, and the FO. The FDC station shall provide simulated digital communications with the FIST-V, the FSE and the FO. The FDC station shall include the capability of entering computed firing data into the computer system and of entering actual firing data into the system that would normally be passed to the gun crews during fire missions. The mortar platoon's fire power shall be derated when damages or failures occur. The FDC station shall provide an ammunition on hand report, by ammunition type and quantity, upon request, subject to the restriction of reporting only the data available in a tactical situation. During initialization the mortar locations along with ammunition on hand shall be determined. The following missions shall be provided through the FDC:

a. Adjustments - a single round fired.

b. Firing for effect - all guns firing a specified number of rounds.

c. Final protective fires - a continuous curtain of fire stretching between two specified points.

d. Deliver field fires.

e. Move field fires.

f. Resupply field units.

3.7.1.5 Field Artillery Battalion Tactical Operation Center.

The FABTOC shall provide direct support and general support level simulation of fire support and fire support coordination. The FABTOC shall contain a representation of the digital communications capability of the ~~Advanced Field Artillery Tactical Data System (~~AFATDS~~)~~ to provide simulated digital communications with the FIST-V, the FSE and the FO. The FABTOC station shall provide simulated SINCGARS radio communications with the FIST-V, the FSE and the FO. This communication capability shall allow the FIST-V to call for fire, adjust fire, register target reference points, develop pre-planned fires, provide intelligence, and conduct other

free text communications. The FABTOC shall be depicted as two M577A2's in the exercise database. The FABTOC shall allow fire support personnel to accomplish the following:

a. Command and control of field artillery battalion direct support and general support operations,

b. Acquire targets through simulated digital message or radio communications with the

c. FIST-V, the FSE and the FO,

d. Deliver field artillery fires,

e. Move field artillery fires and units,

f. Resupply field artillery units,

g. Mass field artillery fires,

h. Variable Sheath Fires, and

i. Deliver cratering artillery fires.

3.7.1.6 Tactical air control party.

The TACP station shall provide the capability to control close air support (CAS) missions. ~~The TACP station shall provide a plan view display.~~ The simulated aircraft shall be visible in the exercise database for the same conditions the aircraft would be visible in real world situations. The TACP simulation shall provide the capability for simulated aircraft evasive action for self protection. The system shall provide the capability to establish all CAS missions during initialization of an exercise. Initialization parameters shall include location, destination, weapons load, command instructions set attack profile (consisting of initial point, offset direction, and target type) and schedule. The TACP station shall provide the capability to divert any of the initialized CAS missions (provides on-call missions). The TACP simulation shall model air travel times from designated airfields to selected strike areas. The TACP station shall be located in the facility near the TOC. The TACP station shall be isolated from the TOC ~~by a walled open ceiling enclosure~~.

The TACP station ~~will~~shall provide the following capabilities and displays to the TACP operator.

a. The TACP simulation shall include the aircraft specified in section 3.7.1.

b. The TACP simulation shall have the capacity for one (1) to five (5) pairs of aircraft per mission. The TACP simulation shall have the capacity to fly missions until either 50 missions have been flown or 100 aircraft have been used.

c. The TACP station shall provide the capability to prioritize targets. The TACP station shall provide the capability to control mission locations. The TACP station shall provide the capability to enter target descriptions. The TACP simulation shall provide messages (on the TACP console display) representing simulated radio communications from the aircraft.

d. The TACP station shall contain a single color display IAW Appendix A for the visual display.

e. The TACP station shall contain a CCTT SINCGARS radio (which is part of the overall count of 36 OC radios) to support CAS requests.

f. The TACP station shall provide a plan view display.

g. The MCC shall provide the capability to select ordnance loads for the TACP controlled aircraft. The CCTT system shall simulate ordnance weapons effects and damage caused by the ordnance used. The MCC shall allow selection of the aircraft munitions for the A10 and F16 as enumerated in Table A-1. The CCTT system shall allow the operator to designate the close air mission as a cratering mission.

3.7.1.7 Higher headquarters workstation.

The higher headquarters workstation shall provide communications to the TOC. Command, control and support functions shall be provided by simulating the Brigade Command/Operations Net function, the Brigade Intelligence Net function and the Brigade Administrative/Logistics Net function. The workstation shall be enclosed by a four walled, open ceiling enclosure and occupy between 64 and 80 square feet. The workstation shall have at least 12 square feet of work area/surface, a combination of bulletin board and erasable type status boards comprising at least 15 square feet, three CCTT SINCGARS radio sets (which are part of the 36 overall OC radios), and an adjustable height, swivel chair with padded armrests and seat.

3.7.2 Control consoles.

The CCTT system shall be controlled by the Master Control Console and CCTT exercises shall be recorded and played back by the After Action Review Console.

3.7.2.1 Master Control Console (MCC).

The MCC shall be capable of performing the MC functions in the case of MC failure. The MCC shall have both a menu display and a plan view display capability. The MCC console functions shall be accomplished through the use of a menu-driven user control system. The MCC shall have radio communication link with the rest of the CCTT system, selectable to a single module, a group of modules or entire site. The MCC PVD shall provide a static presentation of the exercise situation upon operator selection. The MCC PVD shall not provide continuous updates of simulated entity positions. The MCC PVD shall provide snapshots of BLUFOR simulated entities as a default, and snapshots of OPFOR simulated entities as an operator selection. The MCC shall incorporate password protection.

3.7.2.1.1 Start-up procedures.

The MCC console shall provide the capability to initialize the CCTT system over the network through the use of menus. The following capabilities and information shall be provided to the MCC operator on the overall system relative to powering-up, initialization, or monitoring a training session:

a. Running the Daily Readiness Check.

b. Status of the CCTT Fiber Distributed Data Interface (FDDI) network (number of users, traffic, saturation etc).

c. Status of all consoles and ~~/~~workstations in the OC.

d. Status of all manned modules on the network required for the selected training exercise(s) (i.e. exercise number, crew ID, operational status).

e. Selection of a training exercise identifying all required support (modules, extra inputs~~, etc.~~)

f. The manned modules ~~and,~~ consoles and ~~/~~workstations shall be configurable to one of the five simultaneous exercises. The modules shall be reassignable and accommodate a failed initialization.

~~*g. CCTT shall permit training units to prepare initial conditions on a personal computer utilizing a Win 32 environment at their home station and then provide this information to the MCC operator for exercise initialization.*~~

~~*h*~~g. When a manned module or ~~console/~~workstation finishes successfully the required power-up procedures, including ~~D~~daily ~~R~~readiness ~~C~~check on the individual manned module or ~~console/~~workstation, a message shall be sent automatically to the MCC and maintenance console indicating the particular manned module or ~~console/~~workstation is up and ready for the planned exercise. If a module or workstation fails initialization, this information shall also be displayed and a menu list ~~will~~shall identify equivalent unassigned modules, ~~consoles or~~ workstations.

~~*i*~~h. Physical location on the network shall not be a limiting factor, all modules required in a particular session shall be allowed to be anywhere (physically) on the LAN. The MCC shall have the capability to identify individual modules on the LAN via the network. The modules shall display the Army standard vehicle marking system identifier in the visual database. The crew ID shall be a 7-character alphanumeric code used to identify unit and vehicle.

~~*j*~~i. The fixed site MCC shall be able to initialize fixed site equipment and mobile CCTT equipment connected to the CCTT fixed site network. For new equipment installed permanently or temporarily at a fixed site, the fixed site MCC shall be able to initialize equipment connected to the CCTT fixed site network.

3.7.2.1.2 Exercise control.

The MCC shall provide to the operator the capability to develop, change, and select all aspects of the desired training exercise (e.g., weather conditions, time of day, friendly and ~~/~~enemy mix, fuel and ammunition loads, location of ammunition pre-stock in the database, logistical allocations, support allocations, vehicle locations and orientations, vehicle status in terms of age or condition). The MCC shall be able to control from one to five exercises independently.

3.7.2.1.2.1 Exercise initialization.

The capability for the MCC operator to initialize a tactical exercise, on the terrain database as required by the training unit commander, shall be provided. Defaults for all parameters shall

exist with the option to change any and all values. The capability to initialize modules as friendly or enemy in the visual database shall be provided. The capability to emplace individual vehicles, squads, platoons, company teams, and supporting units at specific coordinates with given orientation shall be provided. The MCC operator shall have the capability to emplace vehicles in standard deployment formations at a halt, i.e., company laager, combat trains laager, tail gate resupply, platoon herringbone, etc. The MCC shall place from zero (0) to five (5) each fuel and ammunition prestock entities simultaneously on the battlefield per battalion TOC. Exercise initialization parameters shall be saved in data files and on transportable storage media. During initialization of the exercises, the MCC shall assign up to, and including, fifty frequencies total for all exercises for radio communications. During the training exercise, the MCC shall have the capability to assign ten frequencies, plus the remaining frequencies unused from exercise initialization. The MCC operator shall be able to enter exercise date, initialization parameters and other salient characteristics at the start of an exercise. The MCC shall have the ability to recall initialization parameters from transportable storage media.~~.~~

3.7.2.1.2.2 Exercise modification.

Existing exercise initial conditions on file shall be capable of being permanently modified, or copied and modified to create new conditions through the MCC. The options for changing exercise parameters shall be the same as allowed for initial condition generation.

3.7.2.1.2.3 Exercise real-time intervention.

The MCC shall provide the ability to monitor and change any and all parameters of an exercise during its execution in a real-time mode. The effects of all changes shall be immediate and permanent only in the real-time operation. The stored data file for the particular initial conditions of an exercise shall not be affected by changes during an exercise.

a. Restart - The MCC operator shall have the capability to restart (without being powered-down) a single module up to a platoon of modules within an exercise using the initial conditions, within less than 30 seconds. For a group of modules greater than a platoon (to include the entire site) initialization shall take less than 5 minutes (without being powered-down).

b. Reconstitution - The MCC operator shall have the capability to reconstitute a module or group of modules. Reconstitution shall be defined as the reappearance of the vehicle or dismounted infantry once it has been killed. The module shall be placed in the same position with the same conditions (damage, fuel, ammunition, etc) just prior to being killed.

c. Pause and ~~/~~resume - The MCC operator shall have the capability to pause an exercise during real time and then resume without loss of information or insertion of anomalies.

d. Reset - The MCC operator shall be able to stop an exercise, select the desired time, reset parameters and values to the levels that existed at the nearest data storage time preceding the selected time, and to continue the exercise. The MCC shall provide the capability during initial condition to select the interval for recording checkpoint data. All simulated and non-fixed wing aircraft emulated moving entities when reset shall have zero velocity.

3.7.2.1.3 Current status.

At all times, the MCC shall provide data relative to the individual status (operational, non-operational, faults identified if any) of all fixed site and mobiles manned modules and workstations connected to the CCTT fixed site LAN.

3.7.2.1.4 MCC console printer.

The MCC and MC stations shall be able to share printers over the network.

3.7.2.2 After Action Review (AAR) console.

For each CCTT system the capability to display from one to five simultaneous exercises at five separate AAR consoles shall be provided.

The capability, without loss of fidelity, to display any AAR visual display channel or the AAR PVD upon a debrief display as defined in A.3.2.1.8 shall be provided.

3.7.2.2.1 AAR visual capabilities.

The AAR console shall have a plan view display, a visual display, and a menu display.

3.7.2.2.1.1 Plan view display.

The AAR plan view display (PVD) shall display an orthogonal, topographical view of the gaming area. The AAR plan view display shall have sufficient size, color capacity, and image resolution to display information as required herein and shall meet the human factors engineering provisions of ~~ANSI/HFS 100-1988~~ANSI/HFS 100-88.

The AAR PVD shall operate from information available on the simulation network. The AAR PVD shall update at a minimum of 1 Hz. when displaying no more than 50 icons. Fire, detonation, and fast moving aircraft shall update to the AAR PVD display within 133 milliseconds of receipt of new data from the CCTT LAN.

The AAR plan view display shall have a zoom capability in two modes. Each AAR PVD zoomed area shall fill the entire display. AAR PVD zoom mode one shall consist of a fixed window size that can be moved about the entire display to designate an area to be enlarged. The time period for AAR PVD zoom mode one to redraw with contour lines displayed shall not exceed five seconds. AAR PVD zoom mode two shall consist of a user selectable window size that ~~will~~shall designate an area for enlargement. The time period for AAR PVD zoom mode two to redraw with contour lines displayed shall not exceed 15 seconds. The AAR PVD shall have the capability to create, edit, store, recall and display tactical overlays. The AAR operator shall have the capability to display tactical overlays on the AAR PVD. The AAR console shall display a portion of a tactical overlay if the current zoom mode does not allow display of the full tactical overlay. The AAR operator shall have the capability to display tactical overlays in any one or all of the colors, red, blue, and black. The AAR PVD tactical overlays shall be part of the displayed image. The AAR PVD tactical overlays shall move and zoom in conjunction with the underlying background, but are maintained as graphics whose components do not thicken or shrink with zoom, (e.g., in response to a zoom, an unfilled box symbol would increase/decrease in width and height while the thickness of its side would remain unchanged). The AAR console shall make use of methods that provide fast data entry for PVD tactical overlays such as drawing with a mouse, graphics tablet or a light pen; or selecting choices from windows, pull-down menus,

dialog boxes, or icons. Entries and edits to AAR PVD tactical overlays shall be possible at any time prior to, during, or after (during playback of) the simulation. The AAR console operator shall at any time be able to store and recall AAR PVD tactical overlays.

a. The AAR PVD shall display icons representing all vehicle and dismounted infantry identities and their absolute condition (operating or destroyed), exclusive of position and cover.

b. The AAR PVD shall display terrain contour lines based on a 10 meter contour interval, switchable on and off.

c. The AAR PVD shall display natural and man-made terrain features. This shall include, but not be limited to, roads, forest areas, building, bridges, mine fields, rivers, etc. Applicable features shall show their absolute condition (e.g., if bridges are crossable or uncrossable, buildings are standing or destroyed, mine fields are breached or etc.). The AAR PVD shall also display individual terrain features, such as trees, at appropriate zoom levels which provides the operator an indication of partial visibility.

d. The AAR PVD shall display weapon trajectories - path, source, destination.

e. The AAR PVD shall display tactical overlays (versus overlays used by SAF), switchable on and off.

f. The AAR console shall allow the operator to selectively choose the area presented (full or partial gaming area) on the AAR PVD.

g. The AAR console shall allow the operator to selectively display (on or off) a shaded representation (color-coded for terrain type, similar to an Army 1:50000 map) of the topography of the land.

h. The AAR operator shall be able to print the tactical overlays.

3.7.2.2.1.2 Visual display.

The AAR console shall have a visual display which meets the requirements of appendix A. The AAR visual display shall provide a view of the visual environment.

3.7.2.2.1.3 Menu display.

The menus used to control the functions of the AAR console shall be displayed on the AAR menu display. The AAR menu display shall have sufficient size, color capacity, and image resolution to display information as required herein and shall meet the human factors engineering provisions of ~~ANSI/HFS 100-1988~~ANSI/HFS 100-88.

3.7.2.2.2 Real-time AAR.

The ability to accomplish the requirements stated in 3.7.2.2 and 3.7.2.2.7 of this specification shall also be provided to the AAR operator during the real-time operation of the training exercise. Updates to the displayed information shall occur as they are actually happening in the training exercise.

3.7.2.2.3 Operator control.

The AAR operator shall control the movement of the eyepoint through the data base by one or more control devices. The AAR eyepoint control device(s) shall provide control over the pitch, roll, yaw, vertical, lateral, and horizontal movement through the visual database. The AAR operator shall have the capability to alter the display or select a different display in either real-time or non-real-time environments.

a. Line-of-sight modes - The AAR operator shall have the capability of operating in three line-of-sight modes, which are the slaved mode, the independent mode, and the tether mode. The system shall not allow the AAR eyepoint to drop below the terrain surface. If the eyepoint moves more than 1 kilometer (km) during a LOS mode switch, the visual display update shall occur as limited by the hardware capabilities. If the eyepoint moves less than 1 km, the visual display update shall not exceed two seconds.

   (1) Slaved LOS mode - When operating in the slaved LOS mode the AAR operator shall be able to select and display the line-of-sight for either the gunner or commander's crew position within any manned module. When in the slaved LOS mode, the visual display shall identify which vehicle and crew position is being displayed. The AAR operator shall be capable of displaying eyepoint with the magnifications available to the particular crew member for each vehicle.

   (2) Independent LOS mode - The AAR operator shall have the capability to position the AAR eyepoint anywhere in the gaming area from ground level up to and including an altitude of 300 meters. The AAR operator shall also have the capability to lock any combination of the AAR eyepoint parameters to the current state. Default settings for AAR eyepoint parameters shall be provided. The AAR eyepoint shall be capable of three power and ten power magnification.

   (3) Tether LOS mode - The AAR operator shall have the capability to tether (direction and velocity) the eyepoint to any vehicle in the visual database. When the AAR eyepoint is in tether mode, the same AAR eyepoint parameter controls shall be provided as for the independent mode. A capability shall be provided to lock the AAR eyepoint to the hull orientation of the tethered vehicle, when operating in tethered LOS mode.

b. Normal, thermal and light intensifier scenes shall be selectable by the AAR operator.

c. Display exercise information similar to that provided to the MCC such as module configuration, module status (operational), casualty status, ammunition and fuel status on the AAR menu display. MCC-type exercise information shall be at the single module level up to the company level on AAR menu display. MCC-type exercise information for enemy status shall also be provided on AAR menu display.

d. MCC-type exercise information displays shall be active during realtime recording and also during playback, on AAR menu display.

e. The AAR visual display shall provide a simulated compass reading indicating the AAR eyepoint orientation in the visual database.

f. The AAR operator shall have the capability to adjust the sensitivity of the AAR eyepoint control device(s).

3.7.2.2.4 Storage and Replay.

The AAR console shall have the capability to store all network data and communications traffic. The AAR operator shall be able to replay a complete selected training exercise for after action review. After record mode is selected by the AAR operator, the training exercise from that point on shall be recorded (both audio and visual) with coded time marks for every minute.

a. When in replay mode, the replayed data on the AAR visual display shall be identical to the same data that would have been displayed if the real-time AAR display option was selected.

b. The AAR operator shall have the capability to selectively choose any replay start time within the recorded exercise. The actual replay start time shall be within plus or minus one minute of the requested start time.

c. The AAR operator shall have the capability to play back at a selectively variable speed up to 5:1 faster than real-time.

d. The AAR console shall be capable of recording and storing complete exercises, regardless of length, without loss of data. Sufficient storage space shall be provided to store the magnetic media containing two months worth of recorded exercise training data. It is estimated that an average exercise shall not exceed eight hours. The data stored, by the AAR console, shall be capable of long term off-line storage. The data stored, by the AAR console, shall contain exercise identification information, including date. AAR shall display exercise identification information on the AAR menu display when media is loaded.

e. The AAR operator shall have the capability to advance the playback to the next time-stamped message on the voice annotation channel.

f. The AAR console shall show graphically estimated time remaining on data storage media.

3.7.2.2.5 AAR console printer.

AAR shall be able to share printers over the network.

3.7.2.2.6 Data collection.

Automatic data collection, reduction and analysis shall be a selective option capability provided to the AAR console. Once selected, the data collection, reduction and analysis shall cover all modules and stations in the CCTT system providing data from individual modules to platoon and company size groups for a given exercise.

The data collected by AAR shall be provided from stored record files in raw data format. The data collected by AAR shall be provided in a statistical format relating the individual performances (i.e. individual modules, platoon, or company) and group performance as selected by the operator. The statistical reports shall be displayed or printed by the AAR printer as

requested by the AAR operator for individual module, platoon, or company levels through the use of menus.

a. The statistical reports shall include killer-victim scoreboard (equipment and personnel)
   (1) Friendly force on enemy force
   (2) Enemy force on friendly force.
b. The statistical reports shall include Field-of-View (FOV) report
   (1) Who was in the FOV of whom
   (2) When did this occur
   (3) What were the coordinates of each party.
c. The statistical reports shall include Direct fire report
   (1) Who fired when
   (2) Who fired at whom
   (3) What weapon and ammunition was used
   (4) What were the results
   (5) How many weapons platforms did not engage enemy targets.
d. The statistical reports shall include Indirect fire report
   (1) Number of missions
   (2) Rounds fired
   (3) Percent effective
   (4) Percent ineffective
   (5) Unit requesting.
e. The statistical reports shall include What weapon killed what target with what type of ammunition.
f. The statistical reports shall include What was the ammunition expenditure
   (1) What was the amount of each type of ammunition expended
   (2) Who expended what ammunition.
g. The statistical reports shall include mine field report (results)
   (1) Number of minefields
   (2) Number of mines per minefield
   (3) Number of friendly vehicles passing through the minefield
   (4) Number of friendly vehicles killed
   (5) Number of enemy vehicles passing through the minefield
   (6) Number of enemy vehicles killed.

h. The statistical reports shall include TACP (results).

i. The statistical reports shall include a DAMAGE report which contains the information:

(1) Who had failures

(2) What were the failures

(3) When did the failures occur

(4) Where did the failures occur

(5) What was the cause of the failures (stochastic, deterministic, etc.).

j. The statistical reports shall include What were the personnel casualties.

k. The statistical reports shall include What was the loss exchange ratio (enemy loss versus ~~/~~friendly loss).

l. The statistical reports shall include What was the force exchange ratio (enemy loss versus~~/~~ total enemy force) to ~~/~~(friendly loss~~/~~ versus total friendly force).

During the exercise statistical data reports reflecting current or accumulated exercise data shall be available on the AAR console upon AAR operator request.

3.7.2.2.7 AAR communications.

The AAR console shall record all radio communication traffic for the selected exercise. The recorded communications shall be played back in time sequence with the visual during after action review. The AAR console shall provide at least four CCTT radios with speakers, with the capability to select the radio frequency and volume for each.

3.7.2.2.8 Additional AAR capabilities.

During replay, the AAR operator shall be able to select the voice annotation channel as one of the four channels routed to loudspeakers. The AAR console shall allow the AAR operator to make time-stamped verbal annotations, during real-time exercise only.

The AAR console shall allow the AAR operator to make textual annotations. The AAR console, at the AAR operator request, shall display or print a list of all textual annotations. The AAR console shall allow input, update, display and print of text. The AAR operator ~~will~~shall use this capability for review of unit training objectives and~~/~~ ARTEP/MTL.

The AAR shall record the visual displayed on the large screen display as well as at least one of the four voice channels (including the verbal annotations) to a recording device capable of creating a videotape for provision as part of a take home package provided to the training audience.

The AAR shall generate and display the intervisibility region around an object on the AAR PVD. The AAR shall combine intervisibility regions to show coverage area on the AAR PVD.

The AAR shall toggle between the last 2 images displayed on the PVD in less than 1 second.

AAR shall record exercise data at any recording-capable AAR console should the local AAR data logging device be unable to record.

An AAR shall record only one exercise at a time.

The AAR operator shall be provided a voice instruction channel to allow communication to a single module~~/~~ or workstation~~–~~, ~~–~~a group of modules and ~~/~~workstations, or all modules~~/~~ and workstations ~~-~~participating in the exercise that AAR is assigned. The AAR operator shall be able to communicate on any active radio channel assigned to the same exercise as the AAR station.

CCTT shall support a synchronized mode for at most 2 groups of AAR consoles. In synchronized mode, there shall be one controlling AAR console and one to four slaved AAR consoles. The slaved AAR consoles shall replicate the PVD and visual displays of the controlling AAR console. The controlling and slaved AAR consoles shall be restricted to adjacent rooms.

3.7.2.3 Maintenance console.

The system shall have a maintenance console (MC) separate from the MCC. The maintenance console shall consist of equipment which shall communicate with and have the capability to control the CCTT network and the system. The MC shall provide controls and displays for performance monitoring, including monitoring the network, IAW 3.2.6.2.1.2, fault localization IAW 3.2.6.2.1.3 and daily readiness check IAW 3.2.6.2.1.1. The full use of the maintenance console shall not require more than one person. The MC shall not require mounting of storage media during start up, trainer operation, and shut down. The maintenance console shall provide a graphical status of the module conditions using colors. The display shall identify those modules which are operational, their exercise number, pending failures, ongoing PM and~~/~~ FL, and PM~~/~~ and FL status using various colors. The maintenance console shall be capable of performing each and every MCC function independently or simultaneously with the MCC, excluding the network manager. The maintenance console shall be capable of downloading new CCTT software versions and terrain databases to the modules and other workstations via the CCTT network. The MC shall incorporate password protection. From system startup, the MC shall record the time at power-up for each module, console and workstation, the time at exercise initialization, and the time an exercise ended. The MC shall provide the capability to display and print the recorded time described above for each module.

3.7.3 Trainer system processing resource.

The CCTT system processing resource shall consist of all computer system hardware and system software. The CCTT system processing resource shall meet all functional, operational simulation, control, processing, and design requirements of this specification. The requirements of sections 3.7.3 through 3.7.3.1.4 shall not apply to the image generator.

3.7.3.1 Computer system hardware.

All computer system hardware shall consist of ~~COTS~~commercial processing systems. In addition, all of the following items shall be ~~COTS~~commercial: peripherals, controllers, cables, and interface (~~I~~input and output~~/O~~ equipment which is used to interface to computer peripherals, networks, or trainer unique ~~I~~input and ~~/O~~output devices).

3.7.3.1.1 System composition.

The hardware architecture shall maximize the use of a common family of processors and provide a common set of system interfaces and peripherals in common configurations.

3.7.3.1.2 Processor requirements.

The system displays and indications shall have minimal discernible stepping, oscillating, or jittering. ~~The system dynamic response requirements of this specification shall be utilized to develop the iteration rate structure and processor input/output design.~~ Sufficient installed memory shall be provided for each processor so that the computer system can store and execute the complete trainer operational program and still meet the spare requirements stated in this specification. Communication between individual processors and between other portions of the system shall be provided with the speed and channel capacity to meet trainer performance specified herein.

3.7.3.1.3 Peripherals.

Peripherals shall be provided as necessary for operation of the system. Peripheral equipment and associated software shall be provided to allow the installation of updates to all software (for both contractor developed and commercial software), and to provide for software backup and restoration.

a. The fixed site shall have five network printers, four color printers and one black-and-white printer. Each Mobile OC Trailer shall have two network printers, one color printer and one black-and-white printer. Black and white printers shall be rated for a duty cycle of no less than 35,000 pages per month. Color printers shall be rated for a duty cycle of no less than 8,000 pages per month. Printers shall have a maximum desktop footprint of 20 inches~~"~~ wide x 18~~"~~ inches deep and a maximum height of 18~~"~~ inches. Electrostatic or thermal printing mechanisms requiring special paper shall not be used.

3.7.3.1.4 Spare requirements.

Spare memory, disk space, CPU time, and I/O channels shall be provided as follows.

a. Spare memory. At least 30 percent of the installed memory for each processor shall be available as spare. At least 30 percent of any shared memory (or other memory configuration such as reflective memory) shall also be available as spare. Expansion capabilities to 50 percent spare memory shall be provided for both processor and shared memory with the only requirement being the addition of memory, without any other hardware changes. All spare memory shall be addressable by the delivered processor and operating system.

b. Spare disk. At least 25 percent of the available formatted storage capacity of each installed disk media unit (magnetic, optical, or other equivalent technology) shall be available as spare. The capability to expand spare disk capacity to at least 50 percent by allowing additional disk storage to be populated in the processor shall be provided.

c. Spare processing time available in any contiguous 1-second period of time on all host processors shall be greater than or equal to 50 percent (25 percent for CGF) on average, including periodic and aperiodic processes. Spare processing time shall be verified under worst case trainer operating conditions, as defined below, while 30 percent of the processor's memory is unused (spare). Worst case trainer operating conditions shall occur when the trainer is supporting an 851 entity Battalion level single exercise. ~~The~~

~~Battalion level single exercise scenario to be used shall be agreed to by STRICOM and the contractor.~~

d. The spare ~~I/O~~ channel capacity for each type of ~~I/O~~input and output channel shall be equal to 20 percent of the total installed ~~I/O~~input and output channel capacity. ~~I Spare i~~input~~/~~ and output ~~capacity. I/O~~ channels shall be defined to include all analog-to-digital, discrete interface devices, and all serial and parallel computer interface ports excluding channels used to interface to the computer's peripherals and to the main simulator network. Exceptions: In lieu of installed spare input and output~~I/O~~ channel capacity, spare ~~I/O~~ card slots may be provided to accommodate input and output c~~e I/O c~~hannel expandability.

e. The bandwidth used on the CCTT system LAN and interfaces shall not exceed more than 60 percent of the maximum useable bandwidth while processing a total of 1700 entities.

3.7.4 Network system.

The CCTT network system shall cover the utilization of the CCTT system Local Area Network (LAN) for the fixed and mobile sites and the eventual connection of a Long Haul Network (LHN) to any of these type sites. (Note LHN is a P3I item). The CCTT system LAN shall be composed of ~~COTS~~ commercial hardware and software.

3.7.4.1 Local Area Network Capabilities.

The system LAN used in CCTT shall be provided with the following capabilities:

a. The CCTT system network and required interfaces shall be able to support a minimum of 1700 entities per fixed site battalion TOC including communications operating concurrently in real-time. (Note: An entity is a manned or emulated vehicle, aircraft, weapon and dismounted infantry).

b. A minimum of 100 of the 1700 entity count shall be manned modules (M1A1, M2A2/M3A etc.) with the remainder being emulated.

c. The capability to operate with an entity count of 1700 shall be provided without saturation of the CCTT system LAN.

d. The execution of an exercise or multiple exercises totaling a combined count of 851 entities shall not result in any restrictions to real time training or cause abnormal visual effects or delays.

e. The network shall have a long-haul expansion capability without requiring any hardware modifications to the simulators or the network.

f. The CCTT system LAN shall be able to support a module being removed or added to the network during training without affecting the remaining modules on the CCTT system LAN.

g. A module or workstation processor which becomes incapable of accepting operator, or network inputs (i.e. 'hung') shall not affect the operation of the network

h. The CCTT network system shall provide data transfer for both voice simulation data and digital communications data.

i. The network interface adapter shall provide the capability to selectively control the generation of host processor interrupts.

j. The network system shall be easily expandable subject only to a limitation of 1000 physical connections.

k. The CCTT system LAN shall have the capability to interconnect multiple CCTT mobile configurations with each other and with collocated fixed site CCTT systems. The composite of these interconnections shall constitute the CCTT system LAN for the purposes of this specification.

3.7.4.2 LAN communication protocol.

The CCTT communication protocol profile shall be compliant with the International Standards Organization (ISO) Open Systems Interconnect (OSI) 7-layer architecture model:

a. The CCTT application level protocol and message format shall conform to IEEE 1278.1~~a~~.

b. The Transport and Network layer functions and services shall be interoperable with User Datagram Protocol/Internet Protocol.

c. The Data Link Layer functions and services shall be provided by the IEEE 802.2 Logical Link Control protocol, which provides for interoperability among LANs and by the FDDI Media Access Control Protocol.

d. The Physical layer shall use ~~the~~ ANSI ~~X3T9~~approved Fiber Distributed Data Interface (FDDI) Physical Layer Medium Dependent, FDDI Physical Layer Protocol, FDDI Token-Ring Media Access Control, and FDDI Station Management standards.

e. The CCTT communications protocol profile shall provide multicast services to the CCTT applications.

3.7.4.3 Network Manager.

A network manager function shall be provided for the CCTT system LAN. The network manager shall measure the performance of the network elements, analyze the state of the network, and log significant network events to support post-exercise analysis of network activity. The network manager function shall provide a graphical interface for reporting maintenance and performance information to the operator. The network manager function shall provide a graphical depiction of the on-line status of all network nodes. The network manager function shall allow an operator to monitor and graph packet, bandwidth, and error rates on the CCTT system LAN. The network manager function shall allow network interface performance thresholds to be set at nodes on the CCTT system LAN. The network manager function shall cause an operator alert to be generated when a threshold is exceeded. The network manager function shall reside in the Maintenance Console.

3.7.4.4 Physical Connectivity LAN.

The CCTT system LAN shall be configured as a dual ring of one or more FDDI concentrators. The CCTT FDDI concentrators shall be interconnected by dual multi-mode fiber optic cables. All CCTT modules and workstations shall be connected to the FDDI concentrators by multi-mode fiber optic cables. All fiber optic cables shall use standard MIC connectors to interface to the concentrator and to the processor FDDI LAN interface adapters. All modules or workstations which occur once in a CCTT system shall be connected to two different concentrators when more than one concentrator is present. All modules or workstations which occur multiple times in a CCTT system shall be connected to one concentrator.

3.7.5 Visual system.

The CCTT visual requirements are stated in appendix A.

3.7.6 Communication system.

The CCTT communications system shall provide two-way communication which simulate radio, FED, AFATDS, and intercom communications. The communications, except intercom, shall be accomplished via digital data packets on the local area networks. This capability shall be able to support the one to five separate exercises that may occur as identified in 3.2.1. The CCTT communications shall provide a total of sixty simultaneous communication channels for each CCTT system. The communication systems shall meet a 60 dB signal-to-noise ratio and a 60 dB crosstalk requirement.

3.7.6.1 Radio Communication System.

Radio communication shall provide module-to-module, module to OC, module to blue SAF units, OC to higher headquarters and, OC to blue SAF units communication during real-time exercise operation. Communications shall only be possible when speaking on the same frequency or hopset, and shall be limited in the sense that a message can only be heard when in the listening position. During multiple transmissions on the same hopset (frequency hopping mode), a receiver shall receive the signal which arrives first at the receiver's location with adequate signal strength to be recognized and treat other signals as interfering signals. During multiple transmissions on the same frequency (single channel mode), a receiver shall receive the signal with the highest signal strength at the receiver's location or, if the signal strengths are the same, the transmission initiated first.

The ability to communicate and the quality of transmission (noise and signal level) shall be affected by distance, terrain, and interference in the exercise gaming area. The quality of transmission shall be determined at each receiver's location relative to the transmitter location based upon the terrain database. The quality of transmission shall be based on a Frequency Modulation (FM) propagation model such as the Terrain Integrated Rough Earth Model (TIREM) developed by the Electromagnetic Compatibility Analysis Center (ECAC). The frequency and channel selection shall be provided at each position where external communication occurs in the operational vehicle and OC. The effects of CRYPTO and frequency hopping mosaics shall be simulated to include cryptographic related aural tones.

3.7.6.2 SINCGARS Radios.

The CCTT radio communication system shall replicate the appearance, control, and operation of SINCGARS radios. Seven SINCGARS models shall be replicated to include 87, 88, 89, 90, 91, 92, and PRC119. Each and every M1A1, M1A2, and M2A2/M3A2 module shall have two SINCGARS radio receiver-transmitters. These radios shall be individually activated during initialization to simulate a command vehicle.

The SINCGARS radio simulation shall provide the following minimum capabilities:

a. Communication among exercise participants as specified in paragraph 3.7.6.1,

b. Frequency selection with and without preset channels,

c. Volume control,

d. The M1A2 simulator shall communicate real-time battlefield data via the Inter-Vehicular Information System (IVIS) with other M1A2s.

3.7.6.3 Manned Module Communication System.

A communication system shall be provided to each manned module providing radio and intercom communications capabilities to the crew positions defined in table I (Specific crew position communication requirements for the DI module are addressed in Section 3.7.10.5).

The capabilities shall include an intercom system for use within the manned module (with the exception of the DI module) and a CCTT SINCGARS radio system for use in the CCTT system to communicate with the Operations Center (OC) and other desired units as described in 3.7.6.1. This shall be accomplished utilizing the Intercommunication Unit Controls (IUC). Each crew compartment shall be provided with a speaker which allows for the monitoring of radio communications. The speaker shall be provided with a volume control.

Table I. Manned Module Intercommunication Unit Control Allocation

Module	Driver	Com-mander	Gunner	Loader	Target-ing	Commu-ni-cation	Obser-ver	Troop Com-part-ment
M113APC	**X**	**X**						
M1A1	**X**	**X**	**X**	**X**				
M2A2/ M3A2	**X**	**X**	**X**					**X (3)**
M1A2	**X**	**X**	**X**	**X**				
M981 FIST-V	**X**				**X**	**X**	**X**	
HMMWV	**X ***						**X ***	

*Note: The communication system provided for the HMMWV simulation system shall provide a CCTT SINCGARS radio capability.

3.7.6.3.1 Intercommunication Unit Control.

The intercom and radio control box at each crew member position shall be comprised of the following equipment:

a. Monitor switch.

b. Volume control.

c. Interconnecting jack for operation with the CVC helmet (squad headset in M2A2/M3A2 Troop Compartment).

d. Transmit/Intercom switch as found at each crew position of the actual vehicle.

(1) Tank Commander's and Loader's stations (M1A1 and M1A2)

3.7.7 SAF.

All requirements for SAF are contained in Appendix D.

3.7.8 M1 family of vehicles simulator modules.

All unique requirements for the M1A1 simulator module are contained in Appendix F. All unique requirements for the M1A2 simulator module are contained in Appendix H.

3.7.9 M2A2/M3A2 Bradley Fighting Vehicle (BFV) simulator module.

All unique requirements for the M2A2./M3A2 simulator module are contained in Appendix G.

3.7.10 DI module.

The DI module shall operate in two modes - the dismounted infantry mode and the dismounted scout mode. In the dismounted infantry mode, the DI module shall consist of a platoon leader and forward observer position and two squad leader positions. In the dismounted scout mode, the DI module shall consist of a platoon leader position and two scout section leader positions. The DI module shall operate on the CCTT terrain database.

3.7.10.1 Physical characteristics.

The DI module shall consist of three compartments. One of the compartments ~~will~~shall be the infantry platoon leader and forward observer position (also used by the scout platoon leader). The other two compartments ~~will~~shall be infantry squad leader positions (also used by the scout section leaders). The three DI module compartments shall share the same enclosure. The three DI module compartments shall operate isolated from each other.

This section contains the minimum physical requirements for the individual positions within the DI module.

3.7.10.1.1 Platoon leader and FO position.

The platoon leader and forward observer position shall provide the simulation requirements for both the platoon leader and forward observer. The forward observer position visual scene shall be controlled (on/off) at the platoon leader position. The platoon leader position shall provide a 180 degree horizontal by 30 degree vertical field of view when the forward observer position's visual scene is off. The platoon leader position shall provide a not less than 108 degree horizontal by 30 degree vertical field of view when the forward observer position's visual scene is on, however, retention of the full field of view is desired. The forward observer position shall

provide a 36 degree horizontal by 30 degree vertical field of view when on. The platoon leader and forward observer position visual shall each be able to slew 360 degrees to the right or to the left from any point. The platoon leader and forward observer position visual shall each be able to slew in pitch 90 degrees up from the zero degree line of sight of the current position (standing, kneeling, or prone). The platoon leader and forward observer position visual shall each be able to slew in pitch 45 degrees down from the zero degree line of sight of the current position (standing, kneeling, or prone). The platoon leader and forward observer position default pitch for the visual scene shall be the zero degree line of sight from the standing, kneeling, or prone position. Visual anomalies related to visual priority and visual database paging shall be allowed for platoon leader and forward observer when the forward observer is active.

The platoon leader position shall provide a minimum of six square feet of work surface and one chair. The forward observer position shall provide one chair. The chairs for the platoon leader and forward observer position shall be upholstered in cloth, padded, and have armrests, adjustable height, adjustable backrest, a swivel base, and casters. Chairs and worksurfaces shall conform to the human factors engineering criteria and requirements of ~~ANSI/HFS 100-1988~~ANSI/HFS 100-88.

The DI module controls for the platoon leader and forward observer position shall meet applicable location and design requirements of ~~ANSI/HFS 100-1988~~ANSI/HFS 100-88. The DI module indicators for the platoon leader and forward observer position shall meet applicable location and design requirements of ~~ANSI/HFS 100-1988~~ANSI/HFS 100-88.

3.7.10.1.2 Squad leader's position.

The squad leader position shall provide the simulation requirements for the squad leader. The squad leader position shall provide a visual with a 180 degree horizontal by 30 degree vertical field of view. The squad leader position visual shall be able to slew 360 degrees to the right or to the left from any point. The squad leader position visual shall be able to slew in pitch 90 degrees up from the zero degree line of sight of the current position (standing, kneeling, or prone). The squad leader position visual shall be able to slew in pitch 45 degrees down from the zero degree line of sight of the current position (standing, kneeling, or prone). The squad leader position default pitch for the visual scene shall be the zero degree line of sight from the standing, kneeling, or prone position. The squad leader position shall provide a minimum of six square feet of work surface and one chair. The chair for the squad leader position shall be upholstered in cloth, padded, and have armrests, adjustable height, adjustable backrest, a swivel base, and casters. Chairs and worksurfaces shall conform to the human factors engineering criteria and requirements of ~~ANSI/HFS 100-1988~~ANSI/HFS 100-88.

The DI module controls for the squad leader position shall meet applicable location and design requirements of ~~ANSI/HFS 100-1988~~ANSI/HFS 100-88. The DI module indicators for the squad leader position shall meet applicable location and design requirements of ~~ANSI/HFS 100-1988~~ANSI/HFS 100-88.

3.7.10.2 Simulation performance characteristics.

The DI module shall provide the capability to fire at targets with a probability of hit based on distance to the target. The DI module shall provide the capability to identify targets as friend or foe from reasonable ranges. The DI module shall provide soldier movement capabilities taking

into account terrain, load, and fatigue effects. The DI module shall replicate real world delays associated with ammunition transfers.

The following paragraphs contain the minimum performance requirements for the dismounted infantry module system.

3.7.10.2.1 Weapons.

The platoon leader position, forward observer position, and squad leader positions shall have the capability to employ and engage the M16A2 Rifle. The platoon leader and forward observer positions shall have the capability to employ and engage the M249 Squad Automatic Weapon (SAW), M47 Dragon, AT4 Antitank Weapon, M203 Grenade Launcher, M60 Machine Gun, and Anti-Armor Weapon System-Medium (AAWS-M) (Javelin).

The platoon leader and squad leader positions shall have the capability to select the rate of fire for the M16A2 Rifle, M249 Squad Automatic Weapon (SAW), and M60 Machine Gun.

The DI module shall provide the capability to replenish ammunition, personnel, and weapons resources from an infantry, scout, or supply vehicle.

The DI module shall simulate muzzle velocity, maximum effective range, sustained rate of fire, rapid rate of fire, and cyclic rate of fire for the M16A2 Rifle. The DI module shall simulate muzzle velocity, maximum range, sustained rate of fire, rapid rate of fire, and cyclic rate of fire for the M249 Squad Automatic Weapon (SAW). The DI module shall simulate muzzle velocity, minimum range, and maximum range for the M47 Dragon. The DI module shall simulate muzzle velocity, minimum range, and maximum range for the AT4 Antitank Weapon. The DI module shall simulate muzzle velocity and maximum range for the M203 Grenade Launcher. The DI module shall simulate muzzle velocity, maximum range, sustained rate of fire, rapid rate of fire, and cyclic rate of fire for the M60 Machine Gun. The DI module shall simulate muzzle velocity, minimum range, and maximum range for the Anti-Armor Weapon System-Medium (AAWS-M) (Javelin).

The DI module shall simulate the visual effects of impacting rounds for the M16A2 Rifle, M249 Squad Automatic Weapon (SAW), M47 Dragon, AT4 Antitank Weapon, M203 Grenade Launcher, M60 Machine Gun, and Anti-Armor Weapon System-Medium (AAWS-M) (Javelin).

The DI module shall simulate a visual muzzle flash for the M16A2 Rifle, M249 Squad Automatic Weapon (SAW), and M60 Machine Gun. The DI module shall simulate a visual launch signature for the M47 Dragon, AT4 Antitank Weapon, and the Anti-Armor Weapon System-Medium (AAWS-M) (Javelin).

3.7.10.2.2 Movement.

The platoon leader position shall provide a digital direction indicator (simulated compass) for sighting targets and navigating on the terrain database. The forward observer position shall provide a digital direction indicator (simulated compass) for sighting targets and navigating on the terrain database. The digital direction indicator (simulated compass) for the platoon leader's position shall provide the compass reading for the platoon leader's current view direction (the center of the center visual monitor). The digital direction indicator (simulated compass) for the forward observer's position shall provide the compass reading for the forward observer's current view direction (the center of the forward observer's visual scene). The platoon leader's visual

shall provide a compass azimuth sighting wire located in the center of his visual scene. The forward observer's visual shall provide a compass azimuth sighting wire located in the center of his visual scene.

The squad leader position shall provide a digital direction indicator (simulated compass) for navigation on the terrain database. The digital direction indicator (simulated compass) for the squad leader position shall provide the compass reading for the squad leader's current view direction (the center of the center visual monitor). The squad leader position visual shall provide a compass azimuth sighting wire located in the center of the center monitor.

The DI module shall provide the capability to move the simulated soldier across the terrain in any direction by crawling, walking, or running, at an appropriate speed. The DI module shall provide the capability to walk across the terrain in any direction at an appropriate speed. The DI module shall provide the capability to run across the terrain in any direction at an appropriate speed. The squad leader shall have the capability to select either fireteam.

The DI module shall provide the leader the capability to select an individual soldier using the visual scene. The squad leader shall have the capability to control the weapons of either fireteam. When the squad leader positions are unmanned, the platoon leader shall have the capability to select either squad. When the squad leader positions are unmanned, the platoon leader shall have the capability to control the weapons of either squad.

Each of the DI module positions shall provide a plan view display showing the units controlled by the position and their orientation, when identified by the leader, with respect to the terrain. The DI module plan view display shall provide the leader the capability to direct his unit elements movements. In the dismounted infantry mode, the squad leader can direct his two fireteams and the platoon leader can direct his two unmanned squads by invoking semi-automatic controls. In the dismounted scout mode, the section leader can direct his individual scout members and the platoon leader can direct his two unmanned sections by invoking semi-automatic controls. The DI module shall provide the leader the capability to direct his unit element movements using the visual scene. The squad leader shall have the capability to move each of his fireteams independently. The squad leader shall have the capability to select the fireteam movement formation (wedge or file). The squad leader shall have the capability to select the squad movement formation (line, column, or file). When the squad leader positions are unmanned, the platoon leader shall have the capability to select the platoon movement formation (line or column). When the squad leader positions are unmanned, the platoon leader shall have the capability to move each of his squads independently. When the squad leader positions are unmanned, the platoon leader shall have the capability to select the squad movement formation (line or column).

The platoon leader and forward observer positions shall provide the capability to view the terrain with line of sight conditions from the standing, kneeling, or prone position. The squad leader position shall provide the capability to view the terrain with line of sight conditions from the standing, kneeling, or prone position. The squad leader position shall provide the capability to view the terrain from either of his two fireteam eyepoints. When the squad leader positions are unmanned, the platoon leader and forward observer position shall provide the capability to view the terrain from each of the platoon's fireteam eyepoints. The DI module shall provide reports of

enemy sightings to the leader from his subordinate units. The platoon leader and forward observer positions and the squad leader positions shall provide the capability for eye/head movement independent of body movement.

The platoon leader, forward observer, and squad leaders shall be able to visually identify their own vehicle on the terrain database through the use of the vehicle marking system. The mounted soldiers shall be capable of identifying their own dismount elements within a distance of 100 meters. The DI module shall provide the capability to engage dismounted enemy. The DI module shall provide the capability to engage enemy armor. The DI module shall provide the capability to engage enemy aircraft. The DI module shall provide the capability to disengage dismounted enemy. The DI module shall provide the capability to disengage enemy armor. The DI module shall provide the capability to disengage enemy aircraft.

The DI module shall provide the capability to mount an M2A2/M3A2 BFV. The DI module shall provide the capability to mount an M113A3 APC. The DI module shall provide the capability to mount a troop-carrying rotary wing aircraft. The DI module shall provide the capability to dismount right or left from an M2A2/M3A2 BFV, as selected by the leader. The DI module shall provide the capability to dismount right or left from an M113A3 APC, as selected by the leader. The DI module shall provide the capability to dismount right or left from a troop-carrying rotary wing aircraft, as selected by the leader.

The DI module shall provide the capability to perform squad-level reorganization. Reorganization consists of re-establishing command and control, re-manning key (M60, M249, M203, Anti-Armor Weapon System-Medium (Javelin), M47 Dragon) weapons, and redistributing ammunition. The DI module shall provide the capability to perform platoon-level reorganization. Reorganization consists of re-establishing command and control, re-manning key (M60, M249, M203, Anti-Armor Weapon System-Medium (Javelin), M47 Dragon) weapons, and redistributing ammunition. The DI module shall provide the capability to perform squad-level consolidation. The DI module shall provide the capability to perform platoon-level consolidation.

The DI module shall provide the capability to employ fire support. The DI module shall provide the capability to cross fordable water obstacles. The DI module shall provide the capability to cross defile. The DI module shall provide the capability to move using bounding overwatch. The DI module shall provide the capability to react to an ambush. The DI module shall provide the capability to perform an ambush. The DI module shall provide the capability to defend against an air attack.

The DI module shall provide the capability to emplace mines. The DI module shall provide the leader the capability to direct the emplacement of M18A1 Claymore mines using the visual scene. The DI module shall provide the capability to emplace obstacles. The DI module shall provide the capability to mark minefields. The DI module shall provide the capability to breach a permanent or semi-permanent minefield and to clear a hasty minefield. The DI module shall provide the capability to breach obstacles. The DI module shall provide the leader the capability to direct his unit elements' mine and obstacle emplacement and breaching activities using the visual scene.

The DI module shall provide the capability to use 7 power binoculars. The DI module shall provide the capability to use image-intensifying night vision goggles.

The DI module shall provide the capability to perform an assault. The DI module shall provide the capability to react to enemy contact. The DI module shall provide the capability to break contact.

The DI module shall provide the leader the capability to assign sectors of fire using the visual scene.

3.7.10.2.3 Fire control system.

The DI module shall provide a Forward Entry Device (FED) digital message capability to the forward observer at the platoon leader and forward observer position. The DI module shall provide the capability to select a sector for unit fires. The DI module shall provide the capability to select point targets. The DI module shall provide the capability to select fields of fire for selected weapons.

3.7.10.2.4 Depletable resource management.

The DI module shall manage ammunition, personnel, and weapons as depletable resources. The DI module shall provide the capability to manage the resupply of ammunition, personnel, and weapons. The DI module shall provide status information reflecting the current weapon, ammunition, and personnel resource situation.

The DI module ammunition load shall be based on the transport capabilities of the squad, platoon, M2A2/M3A2 BFV, and M113A3 APC. The Dragon weapon resources shall be limited by the storage capacity of the M2A2/M3A2 BFV, the M113A3 APC and the trade-off with the TOW II missile. The DI module shall monitor the depletion of ammunition resources based on actual usage. The platoon leader position shall have the capability to perform battlefield resupply using a pre-stock. The squad leader position shall have the capability to perform battlefield resupply using a pre-stock. The platoon leader position shall have the capability to perform battlefield resupply using an appropriate vehicle. (Vehicle resupply ~~will~~shall require prior coordination with the ALOC.) The squad leader position shall have the capability to perform battlefield resupply using an appropriate vehicle. (Vehicle resupply ~~will~~shall require prior coordination with the ALOC.) The DI module shall allow a resupply operation to begin when the unit to be resupplied is within 200 meters of a pre-stock or appropriate vehicle.

The DI module shall monitor the use and resupply of ammunition based on the ammunition transfer time from soldier to weapon. The DI module shall monitor the use and resupply of ammunition based on the ammunition transfer time from an infantry, scout, or supply vehicle to a soldier. The DI module shall monitor the use and resupply of ammunition based on the ammunition transfer time from pre-stock to soldier.

The DI module shall provide the platoon leader the capability to reorganize squads. The DI module shall provide the platoon leader the capability to combine squads. The DI module shall provide the squad leader the capability to reorganize fireteams. The DI module shall provide the squad leader the capability to combine fireteams. The DI module shall notify both squad leaders when the platoon leader combines squads. The DI module shall allow squad-level reorganization when troop strength falls below 50 percent of the squad's initial strength. The DI module shall

allow platoon-level reorganization when troop strength falls below 50 percent of the platoon's initial strength.

3.7.10.3 Controls and indicators .

This section contains the requirements for controls and indicators provided to the individual positions within the DI module.

3.7.10.3.1 Platoon leader and FO position.

When the squad leader positions are unmanned, the DI module shall provide the platoon leader and forward observer position a squad status report for each of the platoon's squads. The DI module shall provide troop strength, current location, current activity and ammunition as part of a squad status report.

3.7.10.3.2 Squad leader's position.

The DI module shall provide the squad leader position a fireteam status report for each of the squad's fireteams.

3.7.10.4 Visual displays.

The visual requirements are stated in appendix A. The DI module shall use the specific manning levels (from one soldier to platoon size numbers) set during initial condition setup for units controlled by the DI module positions. The DI module shall be capable of displaying individual soldiers and groups of soldiers in the standing, kneeling, or prone position. The DI module shall be capable of displaying soldiers armed with a rifle, an automatic rifle, or an anti-tank weapon. The DI module shall be capable of displaying individual soldiers and groups of soldiers whose individual movements follow the terrain. The DI module shall be capable of displaying the correct number of remaining combat ready soldiers as casualties and fatalities occur within units.

3.7.10.5 Communications system.

The communication system shall provide a CCTT SINCGARS radio communications capability to the DI module, as specified in 3.7.6. The squad leader position shall be provided with one simulated SINCGARS radio. The platoon leader position shall be provided with two simulated SINCGARS radios. The forward observer position shall be provided with one simulated SINCGARS radio. The communication system shall provide for normal communications between the platoon leader, squad leaders, M2A2/M3A2 BFV, and other modules. The communication system shall provide for normal communications between the platoon leader, the company headquarters, and the Operations Center.

3.7.10.5.1 Radio capabilities.

The DI module simulated SINCGARS radios shall provide frequency selection with preset channels. The DI module simulated SINCGARS radios shall provide frequency selection without preset channels. The DI module simulated SINCGARS radios shall provide volume control.

3.7.10.6 Sound generation system.

A sound generation system shall be provided for each of the DI module's three compartments. The DI module sound generation system shall be separate from the communication system and the sounds shall be presented independently of any headphone system (e.g. multiple loudspeakers). The DI module sound generation system shall provide a realistic combat sound environment with realistic cues and distractions. Table II lists the sound cues that shall be provided in the DI simulation system. The DI module sound generation system shall provide sounds of sufficient volume to distract the operator, similar to actual combat, without exceeding 81dBA for steady state noise or 140 dBP for impulse noise (measured at the ear).

Table II. DI Manned Module Sound Cues
EXTERNAL SOUND CUES
Wheeled vehicle, large class - engine noise based on velocity
Wheeled vehicle, small class - engine noise based on velocity
Tracked vehicle - engine noise based on velocity
Aircraft, rotary wing class - engine noise based on velocity
Aircraft, fixed wing class - engine noise based on velocity
Collision of objects - same as HMMWV sound cues adjusted for distance and objects colliding
BLUFOR M16A2/M249 firing - use M16A2 sound for both
OPFOR Small Arms firing - use AK-74 sound for all
Friendly/Hostile Medium Machine gun firing - use M60 Machine gun sound for all
Friendly/Hostile Heavy Machine gun firing - use .50 Caliber machine gun sound for all
Friendly/Hostile Grenade Launcher firing - use M203 sound for all
Friendly/Hostile tank main gun firing - use M1A1 120mm sound for all
Friendly/Hostile automatic gun firing - use M2/M3 25mm sound for all
Friendly/Hostile mortar firing - use 120mm mortar sound for all
Friendly/Hostile missile/rocket launch
MLRS launch
Generic small explosion (grenades)
Generic large explosion (main gun, missile, rocket) hit
Generic large explosion (main gun, missile, rocket) miss
Generic kinetic round hit
Friendly/Hostile mine hit
Friendly/Hostile bomb hit
Friendly/Hostile bomb miss

Table II. DI Manned Module Sound Cues
EXTERNAL SOUND CUES
Friendly/Hostile artillery hit
Friendly/Hostile artillery miss

3.7.10.6.1 Sound Synchronization.

The DI module sound generation system shall be synchronized with the visual displays within the system latency requirements (defined in paragraph 3.2.2.1). The DI module sound generation system shall be synchronized with the dismounted infantry controls within the module latency requirements (defined in paragraph 3.2.2.2).

3.7.10.6.2 Sound generator.

The DI module sound generation system shall be capable of generating a minimum of eight sounds simultaneously with full parametric control of frequency and volume. The sound generation system shall meet the spare I/O channel requirements of 3.7.3.1.4.

3.7.10.6.3 Spatial Positioning.

The DI module sound generation system shall provide for spatial positioning (direction and distance) of the sound cues for each of the three DI module operator positions. The spatial positioning of sounds should be such that operators may identify the direction and approximate distance of the event causing the sounds. The DI module sound generation system shall synchronize the sound cues with the actions causing the sounds.

3.7.10.6.4 Sound quality.

The DI module sound generation system shall provide sound cues over a frequency range of 30 Hertz (Hz) to a minimum of 12,000 Hz, +/-3 decibels (dB).

3.7.11 M981 Fire Support Team Vehicle (FIST-V) simulator module.

All unique requirements for the M981 FIST-V simulator module are contained in Appendix I.

3.7.12 M113A3 APC simulator module

All unique requirements for the M113A3 APC simulator module are contained in Appendix E.

3.7.13 HMMWV simulator module

All unique requirements for the HMMWV simulator module are contained in Appendix J.

3.8 Mobile CCTT requirements.

M1A1 Tanks, M2A2/M3A2 Bradley Fighting Vehicles (BFV), Dismounted Infantry (DI) simulator modules, ~~and~~ workstations and~~/~~ consoles shall be installed in semitrailers to provide a mobile training capability. Mobile CCTT systems shall be grouped as follows (see 6.2).

a. M1A1 platoon set.

(1) Two semitrailers with two M1A1 simulators each.

(2) One semitrailer with the workstations~~/~~ and consoles as required by 3.8.1.

(3) One semitrailer with a portable power supply as required by 3.8.5.

b. M2A2/M3A2 platoon set.

(1) Two semitrailers with two M2A2/M2A3 simulators each.

(2) One semitrailer with 1 DI simulator (1 platoon leader and 2 squad leader positions)

(3) One semitrailer with the workstations and ~~/~~consoles as required by 3.8.1.

(4) One semitrailer with a portable power supply as required by 3.8.5.

All system, manned module ~~and,~~ workstation~~/~~ and console requirements shall apply to Mobile CCTT unless specifically stated otherwise herein. When being utilized for training Mobile CCTT shall derive all power though the power system of 3.8.5. The semitrailers shall contain and transport all Mobile CCTT equipment and interconnecting cables.

3.8.1 Workstations.

The Mobile CCTT design shall provide the following collocated workstations:

a. The ALOC and UMCP stations shall be combined into a common station capable of being operated by one individual.

b. The FDC, FSE, and FABTOC functions shall be combined into a common station capable of being operated by one individual.

c. The CES station shall be designed so that it is operated by one individual.

d. The 2 SAF stations (blue force and red force) shall be designed so that they can be operated by one or two individuals.

e. Each site shall provide a combined AAR and MCC station with seating for 16 persons. The AAR shall be represented as described in paragraph 3.7.2.2 without large screen.

3.8.2 Environmental conditions.

Mobile CCTT shall withstand the following environmental conditions without deformation, cracking, damage, and unusual wear of internal and external components.

3.8.2.1 Non-operational climatic environment.

During transit, site nonuse, and storage the trailer structures, equipment exterior of the structures, and other Mobile CCTT equipment located exterior to space capable of being environmentally controlled by the environmental control system (ECS) shall accept ambient temperatures within the following extremes, with 0~~%~~ percent to 95~~%~~ percent relative humidity non-condensing:

a. Low extreme: Minus 46°C (-51°F) with no solar load.

b. High extreme: Plus 52°C (+125°F) plus a solar load of 1120 watts per square meter (W/m^2) (355 $BTU/ft^2/hr$) on the semitrailer exterior skin.

These conditions shall not affect the semitrailer operation for transit.

Equipment located within space capable of being environmentally controlled by the ECS shall withstand the temperature extremes of 3.2.7.2.

3.8.2.2 Operational climatic environment.

Training shall take place, without degradation, within the Mobile CCTT semitrailers when outside ambient temperatures and humidity are within the following extremes:

a. Low temperature extreme: Minus 40oC (-40oF) with no solar load.

b. High temperature extreme: Plus 52oC (+125oF) plus a solar load of 1120 watts per square meter (W/m2) (355 BTU/ft2/hr) on the semitrailer exterior skin. Plus 46oC (+115oF) for PPS maintenance room.

c. Relative Humidity: 0 percent~~%~~ to 95 percent~~%~~ noncondensing for temperatures below 80oF; and as characterized by a curve connecting the following data points for temperatures in the range of +80oF to +125oF.

Temperature in ^{O}F	Relative Humidity
80	95 percent~~%~~
86	90~~%~~ percent
105	60~~%~~ percent
125	03~~%~~ percent

All components of the Mobile CCTT configuration shall be fully functional within this temperature range. Set-up and dismantling of Mobile CCTT for training shall not be affected within this temperature range.

3.8.2.3 Lightning protection.

Lightning protection for all equipment components in all semi-trailers shall be provided by surge protection at the trailer electrical power input and down conductors on opposite sides of the trailer, and shall conform to NFPA 780-97.

3.8.3 Shock and vibration.

Mobile CCTT shall be designed such that it shall not be damaged, nor shall performance be degraded when it is subjected to the shock and vibrational stresses produced during transit conditions as described in 3.8.4.7 and normal use. All equipment shall be mounted or have provisions for securing in a manner that precludes damage and shifting during transit.

3.8.4 Semitrailers.

Each Mobile CCTT semitrailer shall be in accordance with the following requirements. Dimensions and tolerances shall be such that standard commercial parts shall be interchangeable. All Mobile CCTT semitrailers shall comply with Department of Transportation (DoT) and Federal Highway Administration regulations for transportation on the U.S. Interstate System without requiring special permits. All Mobile CCTT semitrailers shall comply with Federal Motor Vehicle Safety Standards.

3.8.4.1 Identification marking and data plates.

Semitrailers shall have identifying labels per the requirements of 3.4 and 3.4.4 in locations where they ~~will~~shall be both visible and legible. Semitrailers shall provide for the attachment of vehicle license plates.

3.8.4.2 Color.

Semitrailer exteriors shall be white in accordance with FED-STD-595 color number 17875.

3.8.4.3 Corrosion prevention.

Semitrailers and accompanying hardware such as stairs and platforms shall be fabricated from compatible materials, inherently corrosion resistant or treated to provide protection against corrosion and deterioration. Underbody corrosion prevention compounds shall meet the requirements of MIL-PRF-62218~~B~~.

3.8.4.4 Wood.

Wood shall not be used as a structural component of the semitrailer.

3.8.4.5 Wood treatment.

Wood surfaces shall be treated to resist deterioration from water intrusion and damage from insects.

3.8.4.6 Weights, loads and dimensions.

3.8.4.6.1 Net weight.

The net weight of the complete semitrailer shall include the chassis weight and the weight of all attachments, accessories, and equipment (excluding internal Mobile CCTT equipment). The net weight shall be the minimum practicable.

3.8.4.6.2 Rated payload capacity.

The rated payload capacity, evenly distributed over the load space, shall be that required to support all internal Mobile CCTT equipment and personnel, but shall not be less than 10,886 Kilograms (Kg) (24,000 pounds).

3.8.4.6.3 Gross weight.

The Gross Vehicle Weight (GVW) of the semitrailer shall consist of its net weight plus its rated payload. The GVW shall not exceed ICC limits on gross semitrailer weight to include running gear.

3.8.4.6.4 Dimensions.

Dimensions and clearances shall be measured with the semitrailer fully loaded with its associated Mobile CCTT equipment, and the tires and suspension system adjusted to normal road conditions.

3.8.4.6.4.1 External dimensions.

Overall semitrailer length shall not exceed 14.6304 meters (m) (48 ft), overall semitrailer width shall not exceed 2.5908 meters (m) (102 in.), and height shall not exceed 3.81m (150in). Ground clearance for landing gear and leveling jacks shall not be less than 30.480 centimeters (cm) (12 in).

3.8.4.6.4.2 Interior dimensions.

The inside body dimensions shall be as follows:

a. Interior semitrailer width shall be the maximum allowable considering necessary insulation and structural reinforcement for equipment mounting.

b. Interior semitrailer height--the distance from the floor to the bottom of lights, cable runs, and other protuberances over the aisles and standing work spaces--shall not be less than 1.981 m (78in). However, when the occupants seldom stand to perform normal operations, the ceiling height may be reduced to 1.893 m (74.5 in)~~, unless otherwise directed by the Government~~.

c. The minimum opening for personnel access shall be 1.93 m (76 in) high and 760 mm (30 in) wide.

3.8.4.7 Performance.

The semitrailer, fully equipped and loaded with rated payload, shall show no evidence of damage when tested as specified herein, and when towed over improved roads (smooth concrete or paved asphalt) at 105 Kilometers per hour (Km/hr) (65 mph) and improved gravel roads at 49 km/hr (30 mph). The semitrailer fully equipped and loaded with rated payload shall show no evidence of damage when towed over unimproved roads (unpaved, unstabilized road having a occasional chuck-hole or exposed rock) at an average speed of five miles per hour with a maximum speed of fifteen miles per hour.

3.8.4.7.1 Turning ability.

The semitrailer shall assume a 90 degree angle to the coupled towing vehicle without cramping and without damage to the semitrailer and the towing vehicle. The semitrailer shall be able to be towed and backed-up when coupled to a towing vehicle.

3.8.4.7.2 Tracking ability.

The semitrailer shall conform to the tracking requirements of ~~DoT Federal Motor Carrier Safety Regulations, section 393.70(a)~~49 CFR 97.

3.8.4.7.3 Brake performance.

Service brakes shall comply with the performance requirements of ~~DoT Federal Motor Carrier Safety Regulations, section 393.52~~49 CFR 97~~ and the SAE Handbook~~.

3.8.4.7.4 Slope and grade.

The semitrailer, with payload, shall operate on a 0 to 20 percent grade and 0 to 12 percent side slope up and down the respective grades and slopes without malfunction. When the semitrailer is on the inclines specified herein, the semitrailer shall not interfere with components of the towing vehicle except where the upper fifth wheel plate is coupled to the towing vehicle fifth wheel.

3.8.4.8 Suspension system.

The semitrailer shall be furnished with a commercially available air-ride suspension system and shall be equipped with an air-ride upper fifth wheel. The suspension system shall attenuate the road-induced vibration and shock to the payload for the road conditions specified herein. The air suspension shall provide for automatic self load leveling air controls. Air release valve(s) shall be provided to facilitate semitrailer leveling. The suspension system shall be designed for lifting the semitrailer off the ground. The suspension shall be supported so as not to bottom on the air bag

and shock absorbers when lifted. The supports shall not inhibit the normal travel of the air-ride suspension. The suspension system shall withstand the weight of the semitrailer, the payload, and a snow load of 2 Kilopascal (KPa) (42 lbs/ft^2) distributed over the entire roof. Clearance shall preclude interference between tires and all parts of the semitrailer under the operating conditions specified herein.

3.8.4.9 Axles.

Axle ratings shall be at least equal to the load imposed, but shall in no case be less than 9,072 Kg (20,000 pounds) per axle measured at the ground. The wheel bearings and axle spindles shall be oil lubricated. The hubcaps shall have a means for visual determination of oil level. The hubs shall be fitted with leakproof seals. Provisions for venting, or another method of withstanding internal pressure buildup, and for replenishing the oil supply shall be provided.

3.8.4.10 Wheels, rims, tires and tubes.

3.8.4.10.1 Wheels, rims and tires.

Semitrailers shall be furnished with tubeless, radial tires. Rims and tire ratings shall conform to Tire and Rim Association (TRA) recommendations for the type and size of tires furnished. Tires and rim sizes shall be the same for all wheels of the semitrailer. Tires shall be of a rated capacity at least equal to the load imposed on each tire, measured at each wheel at the ground, with the semitrailer loaded with its rated payload (3.8.4.6.2).

3.8.4.10.2 Drum balancing.

Drums shall be balanced.

3.8.4.11 Rear wheel splash and stone throw protection.

The rear wheels shall have mud flaps at the rear. Splash and stone throw protection shall not be less than 6~~"~~ inches from the road surface when the semitrailer is loaded.

3.8.4.12 Brakes.

3.8.4.12.1 Service brakes.

Service brakes shall be provided for the semitrailer. Service brakes shall be of the full air type. The braking system shall be equipped with all components required for a complete air brake system. Gladhands shall conform to SAE J318. Air hose location shall comply with SAE J702. The braking system shall be installed in a manner which provides road clearance for travel over uneven terrain and protection against damage caused by objects striking components. No part of the braking system shall extend below the bottom of wheel rims.

3.8.4.12.2 Parking brakes.

Spring or air diaphragm mechanical lock type parking brakes shall be provided. The parking brake shall be automatically applied upon disconnection of the emergency air line and under emergency braking conditions. The parking brakes shall remain in the applied condition with no additional application and despite depletion of all air pressure. Parking brakes shall hold the semitrailer, with rated payload, on a 20 percent grade despite the depletion of the compressed air supply.

3.8.4.13 Upper fifth wheel plate.

The upper fifth wheel plate shall be designed for coupling to a full oscillating and fore and aft rocking fifth wheel and shall support a fifth wheel 91.440 cm (36 in) in diameter. The kingpin shall conform to SAE J700. The forward end of the upper fifth wheel plate or skid plate shall have a turned-up lip for ease of coupling.

3.8.4.14 Landing gear and leveling jacks.

The semitrailers shall be supplied with two independently operated, vertical lift, nonrotating landing legs. The landing legs shall be equipped with self-leveling skid pads. Supports for crank extension shafts and clips for holding cranks when folded shall be provided if applicable. The landing gear shall withstand, without deformation, the combined static and dynamic forces due to proportion of gross weight sustained and the forces resulting from impact during coupling and uncoupling operations. When placed in travel position, the landing gear legs shall remain positively locked. The landing gear shall be protected to preclude the entrance of foreign matter, which would impair its functioning or mechanical efficiency. The landing gear shall have a range of adjustments to vary the height of the upper 5th wheel plate, at centerline of kingpin, from 1.194 m (47 in) to at least 1.321 m (52 in) from the ground. With the semitrailer coupled to a towing tractor the clearance under the fully retracted landing gear shall exceed the semitrailer ground clearance, but shall in no case be less than 30.5 cm (12 in). Two leveling jacks shall be provided on the rear of the semitrailer and shall conform to the same requirements as the landing gear. As a minimum, the landing gear and leveling jacks shall provide leveling of the semitrailer when on a slope of up to 5 degrees over the short dimension of the semitrailer and 1 degree over the long dimension of the semitrailer.

3.8.4.15 Level indicators.

Four level indicators shall be provided and shall be mounted on the exterior walls of the semitrailer. One shall be located on each side in a readable location and all four shall be protected from accidental damage. The level indicators shall permit readout of front-to-rear and side-to-side tilt within +/- 5 degrees.

3.8.4.16 Lifting and tiedown attachments.

When set up at a mobile site, the tie down attachments ~~will~~shall prevent the fully loaded semitrailer from tipping and falling over due to wind speeds up to and including 202 Km/hr (125 mph). Tiedowns shall include the attachment points on each semitrailer and the cables, straps, or other means of tying down each semitrailer. Tiedown attachments shall not be removable and shall be labeled. A minimum of two curbside and two roadside tiedowns per trailer shall be provided. Maximum shipping weight (MSW) shall be defined as the GVW of the semitrailer.

3.8.4.17 Rear end protection.

Rear end protection (bumper) shall be furnished in accordance with ~~DoT Federal Motor Carrier Safety Regulations~~49 CFR 97.

3.8.4.18 Lubrication.

Lubrication means shall be provided for all parts of the equipment normally requiring lubrication. The lubricating points shall be easily visible and accessible. Where high lubrication pressure will damage grease seals and other parts, fittings with a pressure release mechanism shall be utilized.

3.8.4.19 Body construction.

Semitrailer body construction shall meet requirements as specified herein.

3.8.4.19.1 Platform.

The platform shall withstand the load of all equipment and personnel to be located within, but in no case shall the platform capacity be less than the rated payload capacity of 3.8.4.6.2.

3.8.4.19.2 Side wall and roof framing.

Outside side wall frame members shall be full length and support the roof loads of 3.8.4.19.3.

3.8.4.19.3 Roof.

The roof shall withstand, without permanent deformation and degradation, the following:

a. A load of at least 115 Kg (253.5 lbs) concentrated in an area of one square foot at any location on the roof.

b. A snow load of at least 2 KPa (42 lbs/ft2) distributed over the entire roof.

A drip molding, rain gutter, or tarp shall be provided over the doors.

3.8.4.19.4 Front end.

The front end shall have beveled or rounded corners which sacrifice a minimum of interior cube. The front end shall conform to the swing radius requirement of 133.350 cm (52.5 in) maximum and shall be in accordance with DoT bulkhead requirements.

3.8.4.19.5 External doors.

Door gaskets shall be installed with corners tightly fitted to provide a complete seal. Doors shall permit folding back against the body sides and shall be provided with a means for holding each door in the fully open position. A method for securely latching the doors in the fully closed position shall be provided. A lock and key shall be provided for each door. One key shall open all semitrailer body door locks. Doors for personnel ingress and egress shall be operable by personnel wearing arctic gloves. Doors shall have dimensions in accordance with 3.8.4.6.4.2.c. Personnel doors shall open from the inside when padlocked on the outside.

3.8.4.19.5.1 Rear doors.

If rear doors are provided they shall not be used as a personnel entrance/exit.

3.8.4.19.5.2 Other external doors.

Other exterior doors shall be provided as follows:

a. One or more emergency exit(s) shall be provided for safety purposes and shall provide access to and egress from the working spaces of the semitrailer. Each emergency exit shall be in accordance with best commercial standards. Location of the emergency exit(s) shall be dictated by the interior layout of the semitrailer. Marking and lighting of

the emergency exit(s) shall be provided and shall conform to ~~DoT Federal Motor Carrier Safety Regulations~~49 CFR 97.

b. An external door or access panel in the ECS section of the semitrailer shall be provided which shall meet ECS installation and maintenance access requirements.

c. Additional external doors shall be installed as semitrailer layout and maintenance access dictate.

3.8.4.19.6 Thermal protection.

The semitrailer body shall be adequately insulated so that the body insulating efficiency shall not be reduced through the wall, door, floor, and roof sections. The insulation shall be properly vented to prevent the formation of ice and water between the walls. The average heat-loss per square foot per degree Fahrenheit of the semitrailer shall not exceed 0.3 BTU per hour.

3.8.4.20 Interior construction.

The interior construction shall be such that the interior acoustical noise ~~will~~shall not cause personnel injury, interfere with voice or any other communications, cause fatigue, or in any other way degrade overall system effectiveness.

3.8.4.20.1 Walls and partitions.

The interior walls and partitions shall be securely fastened in place. They shall provide acoustical damping.

3.8.4.20.2 Ceiling.

The ceiling material shall provide acoustical damping. A false ceiling may be provided with spacing for ECS ducts, lighting installations, and access for air flow and temperature sensor maintenance.

3.8.4.20.3 Floors.

The interior floor shall provide a safe walking surface free of hazards (such as cables). The floor shall withstand a concentrated load of 300 ~~l~~lbs~~s per square foot/~~.ft2.

3.8.4.20.4 Interior doors.

Interior doors shall provide sound isolation. Doors for personnel access shall be at least 1.93m (76 in) high and 760 mm (30 in) wide.

3.8.4.21 Lighting.

3.8.4.21.1 Semitrailer marker lighting.

All semitrailer marker lights and reflectors shall be protected from damage by mounting in recessed or otherwise guarded locations. All electrical wiring shall conform to SAE J1292. Clearance and identification lights shall be constructed for easy removal and replacement of lamps and lenses without the use of special tools.

3.8.4.21.1.1 Twelve volt direct current system.

A 12 volt direct current (VDC) lighting system shall be provided to power semitrailer lights.

3.8.4.21.1.2 Receptacle, 12VDC.

The front of the semitrailer shall be equipped with a 7 contact, 12VDC receptacle conforming to SAE J560 with the connectors connected and color coded as specified therein. The receptacle shall be provided with a self-closing cover. The receptacle shall be located in accordance with SAE J702.

3.8.4.21.1.3 Interconnected 24VDC system.

Hardware to operate the 12VDC system (see 3.8.4.21.1.1) from a towing vehicle equipped with a nominal 24VDC electrical system shall be provided. The 12 contact receptacle of 3.4.21.1.4 shall be provided with resistance in each circuit to reduce the voltage provided by the towing vehicle from a nominal 24VDC to within the maximum rated voltage of the semitrailer electrical components..

3.8.4.21.1.4 Receptacle, 24VDC.

The front of the semitrailer shall be equipped with a 12 contact, 24VDC receptacle and cover conforming to MS75021, part number MS75021-1. The receptacle shall be connected to the lights such that the normal 12V turn signal lights ~~will~~shall function both as turn signals and stop lights, and normal 12V stop lights ~~will~~shall not be operational when the semitrailer is connected to a towing vehicle with a 24V power supply. The receptacle shall be located in accordance with SAE J702.

3.8.4.21.2 Interior lighting.

3.8.4.21.2.1 Normal lighting.

Recessed light fixtures shall be supplied in sufficient quantity to provide adequate lighting levels for all personnel areas. Illumination levels shall be distributed so as to reduce glare and specular reflection. Capability for dimming shall be provided. Adequate illumination shall be provided for maintenance tasks. General and supplementary lighting shall be used as appropriate to insure that illumination is compatible with each task situation. Portable lights should be provided for personnel performing visual tasks in areas where fixed illumination is not provided.

3.8.4.21.2.2 Emergency lighting.

Emergency lighting shall be provided for all personnel areas. The lighting units shall be in compliance with NFPA 101-97 ~~(Life Safety Code)~~, and shall be UL listed. The battery power supply furnished shall be 12 volt. A switch shall be provided to disable the lamps during storage and transit. A battery charge indicator shall be provided.

3.8.4.21.3 Exterior lighting.

Exterior lighting shall be supplied in sufficient quantity to provide adequate lighting levels in for the set up and dismantling of the mobile configuration and for night operations. The exterior lighting units shall be supplied with a 12 volt battery power supply. The exterior lighting units shall utilize the 12 volt battery power supply. A switch shall be provided to disable the lights during storage and transit. A battery charge indicator shall be provided. Portable lights sh~~ould~~all be provided for personnel performing visual tasks in areas where fixed illumination is not provided.

3.8.4.21.4 Battery charging system.

A battery charging system, which operates from the 120 volt, 60 Hz, electrical system as required by 3.8.4.31 shall be provided. The system shall charge batteries used to power emergency and exterior lighting.

3.8.4.22 External platforms, railings, and stairways.

External platforms, railings, and stairways shall be provided for access to and egress from the semitrailer doors which serve as entrance and~~/~~ exit doors. These platforms, railings, and stairways shall be set up, dismantled, stored, and transported by two people without having to enter the semitrailer. A platform shall be provided at the top of each stairway to permit opening of the doors from the outside. The platforms and stairways shall have a type of tread to permit drainage. The upper surface of each tread shall have a non-skid pattern. The platforms and stairways shall have independently operating adjustable legs to provide a means of height adjustment to compensate for uneven terrain. Step surfaces shall remain level and horizontal. Collapsible railings shall be provided on both sides of each stairway and around each platform. Provisions shall be made for the secure stowage of platforms, railings, and stairways while in transit. One or more removable ladders shall be provided for access to all maintenance door(s) on the exterior of the semitrailer. One or more protective enclosures (such as a tarp) shall be provided to be used to shelter the external maintenance door(s) from the environment during foul weather maintenance. The platforms, railings, and stairways shall be in accordance with ~~29 CFR~~ 29 CFR 98~~1910.24 (OSHA)~~.

3.8.4.23 Environmental Control System (ECS).

An ECS shall be provided as specified herein. The ECS shall automatically control the environment within the semitrailer when at a stationary location for Mobile CCTT training. The ECS shall be designed for adjustment of control point temperature via thermostat. After initial power up of the ECS, the time required for the ECS to bring the interior temperature of the semitrailer from the temperature extremes specified in 3.8.2.2 to 23.0 +/- 0.5 degrees C (73.4 +/- 1.0 degrees F) shall not exceed four hours. After this initialization period, the ECS shall maintain (with the tolerances specified in 3.8.4.23.3) the semitrailer interior temperature at the thermostatically selected temperature for all semitrailer exterior temperatures within the extremes specified in 3.8.2.2. The ECS units shall be isolated from the semitrailer body to preclude vibrations from being transmitted to the semitrailer body.

3.8.4.23.1 Cooling unit(s).

If two separate cooling units are provided, a~~n automatic~~ switching arrangement shall be provided to alternate operation of the units when the cooling load is low and requires operation of only one unit.

3.8.4.23.2 Heating.

Two high temperature limit switches (primary and supplementary) shall be. The primary limiting switch shall be an automatic resetting type and shall automatically open all contact holding coil circuits when the temperature of the surface nearest the heating elements exceeds the normal operating range. The supplementary temperature limiting switch shall be a manual reset type and shall automatically open all heater contact holding coil circuits when the temperature of the surface nearest the heating elements reaches a temperature which may cause equipment damage

and a hazard to personnel. The supplementary temperature limit switch shall be located in a readily accessible location and be manually reset without removing panels from the heater enclosure. An air proving switch or similar device shall be incorporated which shall de-energize the heaters in case of fan failure. Heaters ~~will~~shall be U~~.~~L~~.~~ approved.

3.8.4.23.3 Control circuits.

The control thermostat for the ECS shall have a +/- 0.8°C (+/- 1.5°F) response differential. Control set-point shall be adjustable. The control system shall respond to control point temperature changes to maintain the thermostat set-point +/- 0.8°C (+/- 1.5°F) at the controller and +/- 2°C (+/- 3.6°F) throughout the semitrailer at a level of 5 feet above the floor. Necessary switches, thermostats, and humidistats shall be provided and installed. Controls shall provide for the following: (excluding PPS Environemental Control Unit (ECU))

a. An ”OFF” setting which de-energizes the entire ECS.

b. A ”FAN” setting which de-energizes the entire ECS with exception of the evaporator fan (in case of excess relative humidity in ”FAN” mode, humidistat overrides ”FAN” and starts cooling and heating unit).

c. An ”AUTO/COOL” setting which energizes and de-energizes the cooling unit and heater as conditions require.

d. A manual switch which shall be variable in order to select from 0 to 100 percent return air with outside ambient air.

3.8.4.23.4 Air filters.

Air filters for the ECS shall be placed in the return air plenum in a manner that both return air and outside air flow through a filter prior to reaching the cooling coil. Filters shall be sized for a face velocity not to exceed 91.4 meters per minute (300 ft/min). Filters shall be located in an easily accessible position for replacement and inspections.

3.8.4.23.5 Maintainability.

All ECS equipment shall be maintainable without removing it from the semitrailer.

3.8.4.24 Humidity control.

An electrically powered device, which may be part of the ECS of 3.8.4.23, shall be provided and shall automatically control the interior humidity level of the semitrailer. The device shall maintain the interior humidity at a level beneficial to both equipment and personnel. The device shall automatically increase and decrease the semitrailer interior humidity (except for the ECS area if isolated from the trainer area) during periods of site use. A water supply tank for the humidity device shall be located within the semitrailer. A non-powered method for controlling humidity to prevent interior equipment damage during periods of storage shall also be provided.

3.8.4.25 Fire extinguishers.

Fire extinguishers shall be furnished in accordance with paragraph 3.3.3.2 and shall be provided with brackets to secure the fire extinguishers during both transit and site use.

3.8.4.26 Alarm system.

3.8.4.26.1 Security Alarm.

An electronic alarm system operating from a rechargeable battery power source shall be provided in each semitrailer and shall sound an external noise source (siren) in the event of an unauthorized entry into the semitrailer. A battery power source, battery charger, siren, and all wiring, sensors, and control circuitry shall be provided. A means shall be provided to set and disarm the system from inside the semitrailer.

3.8.4.26.2 Fire Detection System.

A fire detection system shall be provided which shall detect the onset of a possible emergency. The system shall meet with NFPA ~~Code~~ 101-97 for the design of the fire detection system and shall meet NFPA 70-96 and NFPA 72-96 for the installation, test, and maintenance of the system. Components used in the fire detection System shall be UL approved.

3.8.4.26.2.1 Simulator Module Fire Detection System.

Mobile CCTT Module fire detection system - ~~E~~each CCTT manned module compartment shall provide a fire detection system which detects the onset of a possible emergency. The system shall meet the NFPA ~~Code~~ 101-97 for the design of the fire detection system and shall meet NFPA 70-96 and NFPA 72-96 ~~(Aug 1993)~~ for the installation, test, and maintenance of the system. Components used in the fire detection system shall be UL approved. The system shall also meet the following:

a. Power and signal cable groups shall be isolated from fire alarm cables.

b. Activation of the module fire detection system shall sound an alarm inside the module compartment(s) and shall trigger internal alarms in compartments of all modules and shall trigger all internal and external semitrailer fire detection system alarms in the mobile CCTT configuration.

c. Simulator module fire detection system strobe lights shall be provided on the exterior of the semi-trailers. One strobe light per simulator module shall be mounted near the entry door for that semitrailer and shall be illuminated in the event of a fire in the associated module. Activation of one simulator module's fire detection system shall not trigger strobes on any other module.

d. Activation of a module's fire detection system shall deactivate power within the module.

e. Each module's fire detection system shall incorporate a battery backup ability that ~~will~~shall allow the fire detection system to remain operational for a minimum of twenty four (24) hours after the removal of power.

f. Activation of the facility fire detection system shall not trigger strobes on any modules or semitrailers.

g. Activation of the facility's fire detection system shall activate the internal alarms in all compartments, all modules, and all semitrailers.

3.8.4.26.2.2 Semitrailer Fire Detection System.

In addition to the simulator module fire detection system, each Mobile CCTT semitrailer shall be provided with a fire detection capability which shall detect the onset of a possible emergency.

The semitrailer fire detection system shall also meet the following:

a. Power and signal cable groups shall be isolated from fire alarm cables.

b. The system shall provide an output interface for the facility fire alarm system and shall trigger the facility alarm when connected to the facility.

c. The system shall incorporate a battery backup ability that shall allow the system to remain operational for a minimum of twenty four (24) hours after the removal of power.

d. Activation of the system shall sound the internal and external alarms of the semitrailer and shall trigger all semitrailer and simulator module alarms within the Mobile CCTT configuration.

e. For semitrailers with simulator modules, activation of the semitrailer fire detection system shall trigger the strobe of the simulator module nearest the fire on the outside of the affected semitrailer.

f. For semitrailers without simulator modules, the semitrailer fire detection system strobe lights shall be installed on the exterior of the semitrailers. One strobe light per semitrailer compartment shall be mounted near the entry door for that compartment and shall be illuminated in the event of a fire in the associated compartment. Activation of one of the semitrailer compartment's fire detection systems shall not trigger strobes on any other module or semitrailer.

g. Activation of the system shall deactivate all power within the semitrailer with exception of emergency lighting.

3.8.4.26.2.3 Manual Fire Alarm Stations.

Manual fire alarm stations shall be located at each door of each semitrailer. Each manual fire alarm shall provide for the following:

a. Activation of the manual fire alarm shall sound the internal and external alarms of the semitrailer and shall trigger all other semitrailer and simulator module alarms within the Mobile CCTT configuration.

b. Activation of the manual fire alarm shall shut off all power in the semitrailer with exception of emergency lighting.

c. Activation of the manual fire alarm shall illuminate the strobe on the outside of the affected semitrailer nearest to the manual pull station.

3.8.4.27 Telephone system.

The semitrailer shall contain a telephone with all telephones (multi-trailer configuration) connected on the same telephone line. External telephone cables and attachments shall be furnished so that the telephone system operates properly when the telephone cable is connected to an appropriate service point. A means shall be provided to secure the telephones during transit.

3.8.4.28 Furniture and chairs.

The semitrailer shall be furnished with all the furniture and chairs necessary for that portion of the Mobile CCTT configuration to be located within the particular semitrailer. Chairs shall be of the same design and construction as specified for the fixed site version of CCTT. All tables and work surfaces shall be of sturdy construction and shall be finished with a high-pressure laminate. All furniture shall be securely mounted to the semitrailer. A means for securing chairs during transit shall be provided.

3.8.4.29 Provisions for maintenance work space.

Maintenance work space may be located in one or more semitrailers. In addition to aisle space and general equipment accessibility, work space shall be provided with the following features:

a. Location shall be convenient to the storage area for data and publications.

b. Use during training shall not interfere with instructors.

c. Illumination shall be sufficient for reading technical data as specified in 3.8.4.21.2.1.

d. A raised work surface shall be provided to facilitate use of maintenance publications and data by two technicians. The work surface shall be a minimum of 61 cm (24 in) by 122 cm (48 in) horizontal.

3.8.4.30 Provisions for storage of support equipment and materials.

Adequate and convenient storage facilities shall be provided for the following:

a. Contractor maintenance level tools and test equipment identified on the Government-approved tools and test equipment list of the contract.

b. Contractor maintenance level spare parts required to adequately support mobile operations.

c. Operations and maintenance manuals and other technical documentation (including drawings) required to support the system and identified on the Government-approved custody and inventory record.

d. Carry-on units, cables, magnetic tapes and discs, printer paper, hard copy device paper, and all other non-mounted trainer equipment.

e. Undercarriage storage may be utilized for stowage of stairways, platforms, railing, and with provisions for latching them in both the fully open and closed positions. Each door shall be provided with a lock and key. One key shall open all undercarriage door locks. Access to the undercarriage storage compartments shall be from the exterior of the semitrailer only.

Storage facilities may be provided in semitrailers or a maintenance van or both. All doors and drawers shall have provisions for latching to ensure security during transit. Compartments and storage cabinets shall be compartmented to segregate different types of items and be provided with slide-out or removable bins or drawers for small, loose piece parts. Shock mounting shall be provided for test equipment and items sensitive to vibration. However, all equipment shall be easily removed for portable use in the maintenance function. In addition, stored items shall occupy no more than 80 percent of the storage space.

Storage facilities shall be illuminated to a level equivalent to maintenance areas and shall have provisions for air exchange with the semitrailer interior for temperature and humidity equalization. Accessibility (except for undercarriage storage) shall be provided only from the interior of the semitrailer.

3.8.4.31 Electrical system.

A 120V, 60 Hz electrical system shall be installed in the semitrailer in accordance with the ~~National Electric Code (~~NFPA 70-96~~-1990)~~ and as specified herein. The semitrailer shall be provided with emergency circuit breaker(s) in accordance with section 645-10 of NFPA 70-961~~990~~.

3.8.4.31.1 Internal.

The following shall be provided:

a. Power for computers, simulators, and lighting and for electrical receptacles as necessary for maintenance equipment.

b. Extra electrical receptacles, in addition to those necessary for computers and equipment, a minimum of four per compartment. Receptacles shall be in accordance with 3.2.4.5.4. If both conditioned and unconditioned power receptacles are provided, conditioned power receptacles shall be visibly different in color or marking from unconditioned receptacles.

c. Light switches, to operate the interior semitrailer lighting of 3.8.4.21.2.1, a minimum of one per external door.

3.8.4.31.2 External utility assemblies.

External electrical assemblies shall be rated weatherproof in accordance with ~~the National Electric Code (~~NFPA 70-961~~990)~~.

3.8.4.32 External panels and cables.

A means shall be provided at one location of the semitrailer for connecting semitrailer power, communications, and trailer-to-trailer cabling. Externally mounted connectors shall be provided at a panel and shall be sheltered from the elements.

Watertight protective caps shall be provided for all external cable and panel connectors for use in transit. These protective caps shall be securely attached to their associated connectors to preclude loss. Cable jackets and connector connections shall be resistant to cracking and deteriorating when exposed for long periods of time to water, snow, freezing, and sunlight. All external connections and cables shall be weatherproof.

Storage for cables shall be provided. A suitable means (such as connector keying) shall be provided to preclude incorrect cable connections. All cables shall travel from trailer-to-trailer without impeding vehicular and personnel traffic and shall be protected from damage from such traffic. All cables shall be of 150ft length.

3.8.4.33 Usable life of trailer.

The semitrailer shall have a usable life of 15 years with only routine maintenance and refurbishment accomplished during the 15 year period of time.

3.8.5 Portable Power System (PPS).

The PPS shall provide all power for the Mobile CCTT configuration. The PPS shall meet the required needs of Mobile CCTT. Power line conditioners and regulators shall be provided and installed to protect the equipment from power fluctuations, sags, surges, and transients.

The PPS shall derive power from two separate sources as follows:

a. Electrical generators.

b. Connection to 480V, 3 phase, raw commercial site power via 2 Crouse-Hinds E0400-1686 power distribution systems (see 6.1) each providing a maximum of 300A.

The PPS shall provide on-site selection via a switch of any one of the sources of 3.8.5.a through b. The PPS shall power the entire Mobile CCTT configuration from the selected source alone. The PPS shall be equipped with the electrical generator(s) which may be located within one or more semitrailers. Generator(s) shall be powered by diesel fuel and shall have a power factor of no less than a value of 0.8. Smoke output from the generator(s) shall be minimized. All cables and connectors to connect the PPS to the commercial site power shall be provided.

3.8.5.1 Design.

The PPS design shall meet the requirements of ~~the National Electrical Code (~~NFPA 70~~-96-1990)~~.

3.8.5.2 Power distribution.

The PPS shall house the main service panel for all semitrailers. Feeders shall be run from this panel to the Mobile CCTT semitrailers. Meters and associated circuitry shall be provided which shall measure and display the voltage and current of each phase.

3.8.5.3 Noise.

The noise shall be attenuated to the maximum extent practicable, but shall not exceed 80 dBA around the PPS trailer, or 70 dBA at distance of 7 meters. Hearing protection shall not be required at the Mobile CCTT training site.

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