APPENDIX B

OPERATIONAL MODE SUMMARY/MISSION PROFILE (OMS/MP)

AND FAILURE DEFINITION AND SCORING CRITERIA (FD/SC)

B.1. SCOPE.

B.1.1 Identification.

This appendix contains the Operational Mode Summary/-Mission Profile (OMS/MP) and Failure Definition and Scoring Criteria (FD/SC) for the CCTT. The OMS/MP describes the anticipated mix of ways the CCTT will be used in carrying out its operational role, the relative frequency of the various missions, the percentage of time it will be exposed to each type of environmental condition during its life, and identifies the tasks, events, durations, operating conditions, and environment for each phase of a mission. The FD/SC describes the guidelines to be used for classifying RAM related incidents reported during testing and for chargeability for the root operational cause of failures, incidents, malfunctions, etc. Scoring in accordance with this paragraph establishes the database to be used by the RAM assessment conference and independent evaluators. (References to regiment and brigade level requirements are P^3I).

B.2. APPLICABLE DOCUMENTS.

This section is not applicable to this appendix.

B.3. REQUIREMENTS.

The following sections identify the OMS/MP and FD/SC guidelines.

B.3.1 Operational mode summary.

a. Wartime. CCTT is a non-system training device that supports training in wartime as well as in peacetime. The major difference between its peacetime operational mode and its wartime operational mode will be in its frequency of utilization. During mobilization, when material and equipment ordinarily will be allocated to the war effort before it becomes available for institutional use, CCTT will be the bridge between training demand and training supply of tanks, fighting vehicles, fire support team vehicles, and other war material ordinarily available for training.

b. Peacetime.

(1) This system will be used to train soldiers and leaders in the performance of collective tasks which must be done in order to accomplish combat missions. The system will be used to train soldiers of tank and fighting vehicle crews, fire support teams, tank and infantry platoons, company/teams, cavalry troops and squadrons, battalion/task forces, and selected combat support and combat service support elements.

(2) The system will be used at the Armor and Infantry Schools for institutional training, and at various locations throughout the Army (active, reserve, and National Guard) to support armor, artillery, infantry, and combined arms unit tactical training. The system will be configured in platoon (4 or 7 simulators), cavalry troop (26 simulators), company/team (31 simulators), company/team and battalion Command

Field Exercise (61 simulators), and battalion task force sets (98-150 simulators). The size of the set in any given location will depend upon the density of combat units located within or adjacent to that location. Institutional sets will be configured to meet institutional training requirements with an approximate size of a battalion task force minus. Platoon size sets in mobile configurations will be used to support United States Army Reserve (USAR) and National Guard (NG) unit tactical training at their respective armories (see para B.3.1h). Any USAR or NG unit in proximity to a CCTT site will have access to the simulation through that site's managing agency.

(3) Units that plan to use a CCTT site will schedule its use through the managing agency for that site. It will be the unit's responsibility to prepare training plans, scenarios, and evaluations in support of their training. Orientation to the equipment will be provided by personnel who are under contract to the Army for the purpose of operating, maintaining, and managing the site. After the unit is oriented to the operation of the simulator modules and emulator stations, the unit enters the simulators much the same as they would enter their actual vehicles or operating centers. From that point onward, the simulation should be nearly transparent to the unit that is undergoing training. The unit may do virtually anything in the simulator that it is capable of doing on the battlefield or on actual terrain during training.

(4) The unit commander who is training one of his subordinate units will evaluate the unit during and after training through the use of a computer- assisted after action review station. This station makes continuous video and data records of all the training unit's activities, and provides the commander the capability to conduct an after action review or to stop at convenient points during the exercise scenario, replay the scenario to that point, and conduct a during action review. At the conclusion of training, the commander evaluates the unit's performance by the standards in the mission training plan, and utilizes the computer-assisted after action review capability to illustrate the positive and negative aspects of the training and to plan remedial training as necessary.

c. The training mission required in both wartime and peacetime consists of 5 major segments as outlined below:

(1) Institutional training of the active force.

(2) Institutional training of USAR and NG.

(3) Unit training of the active force (CONUS and OCONUS).

(4) Unit training of USAR and NG.

(5) Joint operations training (CONUS and OCONUS, both active and USAR and NG).

d. CCTT will be utilized for:

(1) Unit sustainment training, crew through battalion/task force (active/ reserve component units equipped with M2/M3/FIST-V, etc.).

(2) Institutional training bases (Fort Benning, Fort Knox).

e. Unit sustainment training will consist of the following type of events (Figure B-1 indicates notional percentages of use for platoon, company and battalion events by site type).

(1) Platoon training at a platoon level site.

(2) Company (leader only) training at a platoon site.

(3) Single platoon training exercise at a company/team or troop site or company/team Bn CFX site.

(4) Multiple platoon training at a company/team or troop site or company/team Bn CFX site.

(5) Company/team or troop training at a company/team or troop site or company/ team Bn CFX site.

(6) Battalion/squadron (leader and staff only) training at a company/team or troop site or company/team Bn CFX site.

(7) Multiple platoon training at a battalion/task force site.

(8) Company/team or troop training at a battalion/task force site.

(9) Balanced task force training at a battalion/task force site. Squadron (-) training at a battalion/task force site.

(10) Task force training at a battalion/task force site with collocation of other simulation systems, such as AVCATT.

f. Institutional training at the United States Army Infantry School (USAIS) (Fort Benning) will utilize the system as indicated in Figure B-3 for peacetime and in Figure B-4 for wartime for the following courses.

(1) Infantry Officer Basic Course (IOBC).

(2) Infantry Officer Advance Course (IOAC).

(3) Infantry Precommand Course (PCC).

(4) Advanced NCO Course (ANCOC).

(5) Bradley Commander Course (BCC).

(6) Bradley Master Gunner Course (BFV MG CS).

(7) Basic Non-Commissioned Officer Course (BNCOC) MOS 11M, Mechanized Infantryman.

g. Institutional training at the United States Army Armament and Munitions School (USAARMS) (Fort Knox) will utilize the system as indicated in Figure B-5 for peacetime and Figure B-6 for wartime for the following courses:

(1) Armor Officer Basic Course (AOBC).

(2) Armor Officer Basic Course (Reserve Component) (AOBC RC).

(3) Armor Officer Advanced Course (AOAC).

(4) Armor Officer Advance Course (Reserve Component) (AOAC RC).

(5) Armor Precommand Course (PCC).

(6) Advanced Non-Commissioned Officer Course - Scout (ANCOC SCT).

(7) Advanced Non-Commissioned Officer Course - Armor (ANCOC AR).

(8) Third Class Combined Arms Training (TCCAT).

h. Reserve Component (RC) mobile platoons will be utilized in peacetime and wartime as follows:

(1) Weekend training at the armory. Regional utilization of mobile platoon size systems is planned for 42 weekend training sessions per year. Normal sequence intends on setting up on Friday with a readiness for operation no later than ~~NLT~~ 1600 hours for exercise planning until 2200. Training from 0800 to 1800 hours Saturday and Sunday. Movement preparation on Monday. Tuesday through Thursday to cover movement time to next location (44 estimated moves per year).

(2) Periodic training at Unit Training Equipment Sites (UTES), Maintenance Activity Training Equipment Sites (MATES), or Major Training Areas (MTA's) will be accomplished with normal operation extending for up to four two week period(s) instead of curtailing on Monday. Training will usually be accomplished from 0800 to 1800 hours daily. In this mode, mobile simulators may be linked to other systems to provide for higher echelons of training.

(3) Fixed platoon or shared usage of AC fixed sites is envisioned as two 10 hour periods, 0800 to 1800 hours on weekends. Unit densities will vary the number of weekends of fixed site training, however, it is envisioned to be two weekends per month initially.

(4) In wartime, it is envisioned that the mobile simulators will be moved to equipment sites or mobilization sites. Training will correlate to periodic training described above. Training hours will be extended to 20 hours per day, 363 days per year.

B.3.2 Mission profile.

a. Mission profile.

(1) Events. The following events are characteristic of any type of exercise conducted on the system, in either a fixed unit or institutional site:

(a) Event 1: Set up and PM:

1.1 Activate network, emulation stations, and simulators on the network.

1.2 Run diagnostics.

(b) Event 2: Initialize exercise parameters:

2.1 Assign simulator modules.

2.1 Designate into organizations.

2.1.2 Designate vehicle model, i.e., M2 versus M3.

2.1.3 Designate vehicle status, i.e., vehicle Class III and V load levels, maintenance status, etc.

2.1.4 Designate vehicle location on the terrain database, orientation of vehicle.

2.2 Assign supporting emulation stations.

2.2.1 Tactical Air Control Party.

2.2.2 Engineer.

2.2.3 Field artillery fire support.

2.2.4 Logistics.

2.2.5 Maintenance.

2.2.6 Not used.

2.2.7 Mortar platoon.

2.2.8 Aviation support station.

2.2.9 Semi-Automated Forces (SAF).

2.3 Assign controlling parameters:

2.3.1 Ammunition resupply rate by type.

2.3.2 Fuel resupply rates.

2.3.3 Number CAS sorties.

2.3.4 Number and a type of available aviation support assets.

2.4 Assign SAF parameters:

2.4.1 Opposing/friendly forces:

2.4.1.1 Size

2.4.1.2 Types of units.

2.4.1.3 Role.

2.4.1.4 Class III and V support.

(c) Event 3: Train (duration is variable).

3.1 Alert time awaiting exercise action.

3.2 Exercise events.

3.3 After-action review (simulators are in standby/alert mode/or being repositioned to a selected start point).

3.4 Restart for additional repetitions.

(d) Event 4: Standby/alert time.

(e) Event 5: Standby/or shut down.

5.1 PM checks.

5.2 Turn off simulators/power down network.

(f) Daily notional profiles: The profiles of daily basic utilization of the system by events are shown in Figure B-2. Normal operating times are based on 10 and 20 day mission durations. The normal time for event 3 (training) will be in either 4 hour increments or based on mission durations listed in Figures B-7 through B-10.

1) Hours of utilization for institutional training are shown in Figures B-3, B-4, B-5, and B-6.

2) Notional mission profiles are indicated as follows: (Caveat: All examples are notional land times to conduct missions will vary depending on local training situation.)

a) Mech platoon: figure B-7.

b) Tank platoon: figure B-8.

c) Company/team: figure B-9.

d) Battalion task force: figure B-10.

3) Climatic environment:

a) Basic category: 100 percent.

b) Environmental protection: System will be located in fixed sites or mobile shelters.

c) Operating temperature range: 60 to 80 degrees Fahrenheit.

d) Humidity range: 5 percent to 90 percent non-condensing.

e) No movement during operation. Mobile type systems will be transported over 80 percent primary and 20 percent secondary roadways.

4) Processing activities:

a) Input from simulator controls 45 percent

b) Input from emulator stations 25 percent

c) Input from semi-automated OPFOR 30 percent

d) Recording activities: Record data packages 100 percent

TYPE SITE	NO. MOD AVAIL	AVG % USE PLT EVENTS	AVG %USE CO EVENTS	AVG % USE BN EVENTS
Tk Plat	4	75.00%	25.00%	.00%
BFV Plat	7	75.00%	25.00%	.00%
Regt Cav Trp	26	49.00%	33.00%	.00%
Co/Tm	31	29.00%	33.00%	.00%
Co/Tm Bn CFX	61	34.00%	36.00%	13.00%
BN/TF (Bal)	98	41.00%	45.00%	16.00%

Note: Based upon current fielding plan.

FIGURE B-1. Site Utilization By Type Event

LENGTH OF DAY (HOURS)	NUMBER OF EVENT OCCURRENCES DAILY					PMCS HOURS AVAILABLE
	EVENT 1	EVENT 2	EVENT 3	EVENT 4	EVENT 5	
10	1	2	2	1	1	14
16	1	3	3	1	1	8
20	1	4	4	1	1	4
> 24 CONOPS	1	6	7	1	1	0

FIGURE B-2. Daily Notional Utilization

(1) USAIS COURSE TITLE	(2) CLASSES PER YEAR	(3) STUDENTS PER CLASS	(4) HOURS PER CLASS	(5) SIMULATORS PER CLASS	(6) SIMULATOR HOURS PER YEAR
IOBC	13	200	32	67	27872
IOAC	6	185	32	62	11904
PCC	6	20	24	10	1440
ANOC	5	190	24	64	7680
BCC	8	44	40	15	4800
BFV MG CRS	4	44	20	44	3520
BNCOC (11M)	5	40	20	40	4000

Hours available Annually: 147,400
(67 Simulators x 220 Training Days x 10 Hours)
(Only Tank, BFV, and M113A3 modules are counted for institutional training purposes.)
Hours used in institutional training: 61,216

Percent usage for institutional training: 41.53%

FIGURE B-3. United States Army Infantry School Institutional Usage Peacetime

(1) USAIS COURSE TITLE	(2) CLASSES PER YEAR	(3) STUDENTS PER CLASS	(4) HOURS PER CLASS	(5) SIMULATORS PER CLASS	(6) SIMULATOR HOURS PER YEAR
IOBC	25	200	32	67	53600
IOAC	5	185	32	62	9920
PCC	10	44	40	15	6000

Hours available Annually: 486,420
(67 Simulators x 220 Training Days x 10 Hours)
(Only Tank, BFV, and M113A3 modules are counted for institutional training purposes.)
Hours used in institutional training: 69,529

Percent usage for institutional training: 14.29%

FIGURE B-4. United States Army Infantry School Institutional Usage Wartime

(1) USAARMS COURSE TITLE	(2) CLASSES PER YEAR	(3) STUDENTS PER CLASS	(4) HOURS PER CLASS	(5) SIMULATORS PER CLASS	(6) SIMULATOR HOURS PER YEAR
AOBC	16	72	24	18	6912
AOB RC	2	50	46	42	3864
AOAC	4	160	46	42	7728
AOAC RC	2	24	46	14	1288
PCC	5	18	12	12	720
ANCOC SCT	3	80	24	27	1944
ANCOC ARMOR	6	80	20	42	5040
TCCAT	8	150	2	89	1424

Hours available Annually: 160,600
(73 Simulators x 220 Training Days x 10 Hours)
(Only Tank, BFV, and M113A3 modules are counted for institutional training purposes.)
Hours used in institutional training: 28,920

Percent usage for institutional training: 18.01%

Reminder of available hours are anticipated to be shared utilization with MTO&E and TDA unit training requirements.

FIGURE B-5. United States Army Armor School Institutional Usage Peacetime

(1) USAARMS COURSE TITLE	(2) CLASSES PER YEAR	(3) STUDENTS PER CLASS	(4) HOURS PER CLASS	(5) SIMULATORS PER CLASS	(6) SIMULATOR HOURS PER YEAR
AOB MOB	52	96	46	32	76544
AOAC #	0	69	46	23	0
SCT PLT LDR	65	24	24	24	37440
PCC	7	16	24	16	2688
NCO TK CDR	63	100	46	34	98532
USAARMS OCS	52	96	46	32	76544

SOAC is an on-order requirements from Hq DA.

Hours available Annually: 529,980
(73 Simulators x 220 Training Days x 10 Hours)
(Only Tank, BFV, and M113A3 modules are counted for institutional training purposes.)
Hours used in institutional training: 291,748

Percent usage for institutional training: 55.05%

Remainder of available hours will be for unit collective training of crew, platoons, companies or battalions.

FIGURE B-6. United States Army Armor School Institutional Usage Wartime

MISSION	(1) SETUP/PM DIAGNOSTICS #	(2) INITIALIZE EXERCISE ##	(3) TRAINING EXERCISE ###	(4) STANDBY TIME ####	(5) SYSTEM SHUTDOWN #####
MOVEMENT TO CONTACT	.75	.25		.30	.50
Tactical Road March			1.00		
Occupy Assembly Area			1.00		
Prepare for Combat			.25		
Move Tactically			.50		
React to Contact			.25		
Assault Mounted			.25		
Consolidate and Reorganize and After Action Review			.75		
TOTALS:	.75	.25	4.00	.30	.50

FIGURE B-7. Mechanized Infantry Platoon Mission Profile (Notional)

NOTES:

\# System setup, preventive maintenance, and diagnostics are performed each day when exercises are conducted "back-to-back". The time required for this activity is charged to the full day's activities.

\## Initialization requires the input of number and types of vehicles, basic loads, personnel status, maintenance posture, and other vital information from the unit that is to be trained. This requirement must be met prior to each new unit beginning its training.

\### Training exercise time will vary for each mission and for each unit that trains on the simulation. These times are representative; they will vary by as much as the commander deems necessary to meet the training needs of his unit.

Total standby time will vary, however, these numbers are representative of the total time the training unit will be issuing operations orders or fragmentary orders.

The system is expected to require technical expertise to shut down, and the time allocated to this activity is expected to be sufficient to allow an experienced technician to shut down the system.

Note: This mission profile illustrates only a notional application. Times are in hours or fractions of hours.

MISSION/TASK	**(1) SETUP/PM DIAGNOSTICS #**	**(2) INITIALIZE EXERCISE ##**	**(3) TRAINING EXERCISE ###**	**(4) STANDBY TIME ####**	**(5) SYSTEM SHUTDOWN #####**
MOVEMENT TO CONTACT					
Conduct a Hasty Attack	.50	.50		.25	.25
Prepare for Tac Opening			1		
Conduct a Hasty Attack			1.50		
Perform Con and Reorg			.50		
TOTALS:	.50	.50	3	.25	.25

FIGURE B-8. Tank Platoon Mission Profile (Notional)

NOTES:

System setup, preventive maintenance, and diagnostics are performed each day when exercises are conducted “back-to-back”. The time required for this activity is charged to the full day’s activities.

Initialization requires the input of number and types of vehicles, basic loads, personnel status, maintenance posture, and other vital information from the unit that is to be trained. This requirement must be met prior to each new unit beginning its training.

Training exercise time will vary for each mission and for each unit that trains on the simulation. These times are representative; they will vary by as much as the commander deems necessary to meet the training needs of his unit.

Total standby time will vary, however, these numbers are representative of the total time the training unit will be issuing operations orders or fragmentary orders.

The system is expected to require technical expertise to shut down, and the time allocated to this activity is expected to be sufficient to allow an experienced technician to shut down the system.

Note: This mission profile illustrates only a notional application.

MISSION	(1) SETUP/PM DIAGNOSTICS #	(2) INITIALIZE EXERCISE ##	(3) TRAINING EXERCISE ###	(4) STANDBY TIME ####	(5) SYSTEM SHUTDOWN #####
MOVEMENT TO CONTACT	.75	.50	4	1	.50
Attack	.75	.50	4	1	.50
Defend	.75	.50	8	1	.50
Raid	.75	.50	6	1	.50
Ambush	.75	.50	2	.50	.50
Recon & Security	.75	.50	2	.50	.50
Retrograde	.75	.50	4	.50	.50

FIGURE B-9. Company/Team Mission Profile (Notional)

NOTES:

System setup, preventive maintenance, and diagnostics are performed each day when exercises are conducted “back-to-back”. The time required for this activity is charged to the full day’s activities.

Initialization requires the input of number and types of vehicles, basic loads, personnel status, maintenance posture, and other vital information from the unit that is to be trained. This requirement must be met prior to each new unit beginning its training.

Training exercise time will vary for each mission and for each unit that trains on the simulation. These times are representative; they will vary by as much as the commander deems necessary to meet the training needs of his unit.

Total standby time will vary, however, these numbers are representative of the total time the training unit will be issuing operations orders or fragmentary orders.

The system is expected to require technical expertise to shut down, and the time allocated to this activity is expected to be sufficient to allow an experienced technician to shut down the system.

Note: This mission profile illustrates only a notional application.

MISSION	(1) SETUP/PM DIAGNOSTICS #	(2) INITIALIZE EXERCISE ##	(3) TRAINING EXERCISE ###	(4) STANDBY TIME ####	(5) SYSTEM SHUTDOWN #####
Recon & Security	.50	.75	2	1	.50
Movement to Contact	.50	.75	2	1	.50
Attack	.50	.75	2	1	.50
Defend	.50	.75	4	.25	.50

FIGURE B-10. Battalion/Task Force Mission Profile (Notional)

NOTES: Times are in hours or fractions of hours.

This activity is done only once. (At the beginning of the training day.)

This activity is required once per exercise.

This activity is done only once. (At the end of the training day.)

B.3.3 Failure Definition and Scoring Criteria (FD/SC).

B.3.3.1 Mission Essential Functions (MEFs).

The MEF of the system shall be to successfully complete a training exercise without a termination in training, without interruptions in training, or without training degraded to the point that the trainer or instructor determines it is ineffective to continue training. The failure of the following are defined as failures which terminate, interrupt, or degrade training:

a. Training will be terminated when:

(1) There is a failure of the network or control of the network so that communications between one or more nodes, the AAR, SAF, or more than 10 percent of the simulator modules are terminated.

(2) The AAR console cannot provide for the recording, observation, event marking, playback of a simulated exercise communications between the training instructor/observer and the training audience.

(3) The SAF cannot provide representation of semi-automated forces of both friendly and threat formations up to the regiment or brigade level with the following capabilities:

(a) Represent the movement of the vehicles on the simulated terrain database in response to the directions of the SAF operator controls.

(b) Represent the operational characteristics of the vehicle being simulated with the appropriate speed, terrain maneuverability, logistical consumption rates, weapons system capabilities and effects, vulnerabilities, and survivability.

(c) Provide the operator(s) with visual representations which are representative of and relative to the size, movement, shape, and location of the simulated vehicles, cultural features, and terrain.

(d) To provide communications and representations that transmit and receive voice communications within the simulated military radio channels to operator positions and between simulators and emulation stations.

(4) In the opinion of the senior instructor or trainer, that the number and frequency of training interruptions training degradations make continued use of the simulation ineffective.

(5) More than 10 percent of the simulator modules in a given site are no longer mission capable or when more than 10 percent of the training audience of a given exercise could not be trained.

(6) A critical or catastrophic hazard to personnel or equipment exists as defined below:

(a) Catastrophic. Death, system loss, or severe environmental damage.

(b) Critical. Severe injury, severe occupational illness, major system or environmental damage.

b. Training will be interrupted when:

(1) The Operations Center(s) cannot provide:

(a) The ability to have maintenance support to move, fix, and repair deterministic maintenance failures in response to appropriate input by maintenance console operator.

(b) The movement and resupply of ammunition in response to the appropriate input by the logistics console operator.

(c) The movement and resupply of fuel in response to the appropriate input by the logistics console operator.

(d) Fire support functions into the simulation when required for use.

(e) Close air support functions into the simulation when required for use.

(f) Engineer operations functions into the simulation when required for use.

(2) The CCTT simulator module(s) cannot:

(a) Represent the movement of the simulator as a vehicle on the simulated terrain database in response to the functioning of the operators controls.

(b) Represent the operational characteristics of the vehicle being simulated with the appropriate speed, sound, vibrations, terrain maneuverability, logistical consumption rates, weapons system capabilities and effects, vulnerabilities, survivability, and visual systems.

(c) Provide the operator(s) with visual representations which are representative of and relative to the size, movement, shape, and location of the simulated vehicles, cultural features, and terrain.

(d) Provide communications and representations that transmit and receive voice communications within the simulated military radio channels to operator positions and between simulators and emulation stations.

(e) Display the effects of deterministic failures.

(f) Provide a compass capability presented in degrees, depicting the orientation of the long axis of the vehicle on the simulated terrain to grid north.

(3) In the opinion of the senior instructor/trainer determines that a portion of the simulation which he considers essential to his training objective is not operational but the maintainer of the system has indicated can be made operational within a time interval acceptable to the trainer.

c. Training will be degraded when:

(1) The simulation system is no longer capable of conducting more than one exercise simultaneously.

(2) A simulator module loses the following:

(a) One but not all of its visual representations in a single crew position where more than one visual representation is present.

(b) Communications in one but not all the crew positions of the simulated vehicle, if there is more than one crew position.

(c) Any of a simulated vehicle’s characteristics that are not designated as non-mission capable failures in the represented vehicle operators manual.

(3) In the opinion of the senior instructor/trainer that one or more elements of the simulation system required for use to support his immediate training objectives are not available for training.

B.3.3.2 Classification/chargeability guidelines.

Figure B-11 is a flow chart which provides the classification and chargeability for failure definition and scoring criteria for failures. Below is an explanation of the steps necessary to determine the proper procedures to be taken:

FAILURE DEFINITION AND SCORING CRITERIA INCIDENT SCORING GUIDELINES

STEP 1 - **No Test**

a. Is this incident a "no test?"

b. If the answer is "yes", score as "no test" and stop. If it is "no", proceed to step 2.

c. Amplification: "no test" conditions include:

(1) Malfunctions that can be attributable to sources outside of the simulation system or its hardware, i.e., failure of electrical service to the facility.

(2) Test Peculiar. Malfunctions caused by test instrumentation. Engineering evaluations performed to determine cause of malfunction.

(3) Accidents. Acts of God such as lightning, flood, or earthquake. Accidents caused by crew or operators will be scored on their own merit.

(4) Deliberate Abuse. Incident report which describes willful abuse as cause of failure. (Attributed to persons or persons unknown.)

(5) Not RAM Oriented. Incident reports which describe suggested improvements, human factors problems, etc., and are not pertinent to evaluating RAM. Reports on the consistent inability to meet performance specifications even though no actual malfunctions has occurred.

STEP 2 - **Is training terminated**?

a. Was the incident a malfunction which caused the training exercise to be terminated?

b. If "no", go on to step 3.

c. If "yes", classify the incident as an Operational Mission Failure (OMF) and record the following:

(1) Calendar clock time.

(2) Record clock minutes. (Maint clock minutes and maint man-minutes used).

(3) Identify the component(s). (Spares used and repair parts used by subsystem or component.)

d. Expansion: If training is terminated because one or more subsystem(s) is affected score as an OMF. Subsystems may include the network, work-station(s), simulator(s), or simulator subsystem(s) or any combination thereof. Alternately, if a subjective judgement is made by the person in charge of training that training interruptions are so frequent that training cannot be conducted effectively, score as an OMF. Also an OMF will be scored if a critical or catastrophic hazard exists as defined in paragraph B.3.3.1.a(6).. Then proceed to step 5.

STEP 3 - **Training interruptions**.

a. Was the incident a malfunction which caused the training exercise to be interrupted?

b. If yes, score as an OMF, and record the following:

(1) Record calendar clock minutes.

(2) Record clock minutes. (Maint clock minutes and maint man-minutes used.)

(3) Identify the component(s). (Spares used and repair parts used by subsystem or component.)

c. If no, proceed to step 4.

d. Expansion: If training is interrupted at a frequency and/or at a time which causes an exercise or mission to be incomplete and training to become ineffective because of one or more subsystem(s) is affected score as an OMF. Subsystem(s) may include the network, work-station(s), simulator(s) or simulator subsystem(s) or any combination thereof. Alternately, if a subjective judgement is made by the person in charge of training that training interruptions are so frequent that training cannot be conducted effectively, return to step 2.

STEP 4 - **Training degradations**.

a. Was the incident a malfunction which caused the training exercise or the performance of training to be degraded?

b. If yes, record the following:

(1) Record calendar clock minutes.

(2) Record clock minutes. (Maint clock minutes and maint man-minutes used.)

(3) Identify the component(s). (spares used and repair parts used by subsystem or component.)

(4) Log the type of degradation and it's effect on training objectives.

c. If no, proceed to step 5.

d. Expansion: If training is degraded at a frequency or at a time which causes an exercise or mission to be incomplete and training to become ineffective because of one or more subsystem(s) is affected log the degradation and its affect on training. Subsystem(s) may include the network, workstation(s), simulator(s) or simulator subsystem(s) or any combination thereof. Alternately, if a subjective judgement is made by the person in

charge of training that training interruptions are so frequent that training cannot be conducted effectively or that training objectives cannot be met, return to step 3.

STEP 5 - **Identification of chargeable element**.

a. What operational element was primarily responsible for the incident?

b. Assign to one of the following categories:

(1) Chargeable to Hardware (CH) {Identify Component}.

(2) Chargeable to Software (CS) {Identify Component}.

(3) Chargeable to Operator (CO) {Identify Component}.

(4) Chargeable to Crew (CC).

(5) Chargeable to Maintenance Personnel (CMP).

(6) Chargeable to Manuals (CM).

(7) Chargeable to Support Equipment (CSE) {Identify Component}.

(8) Chargeable to Accident (CA).

c. Amplification. This step assigns chargeability for all failures to the root cause of the failure. Do not assign chargeability to incidents scored as “no test”.

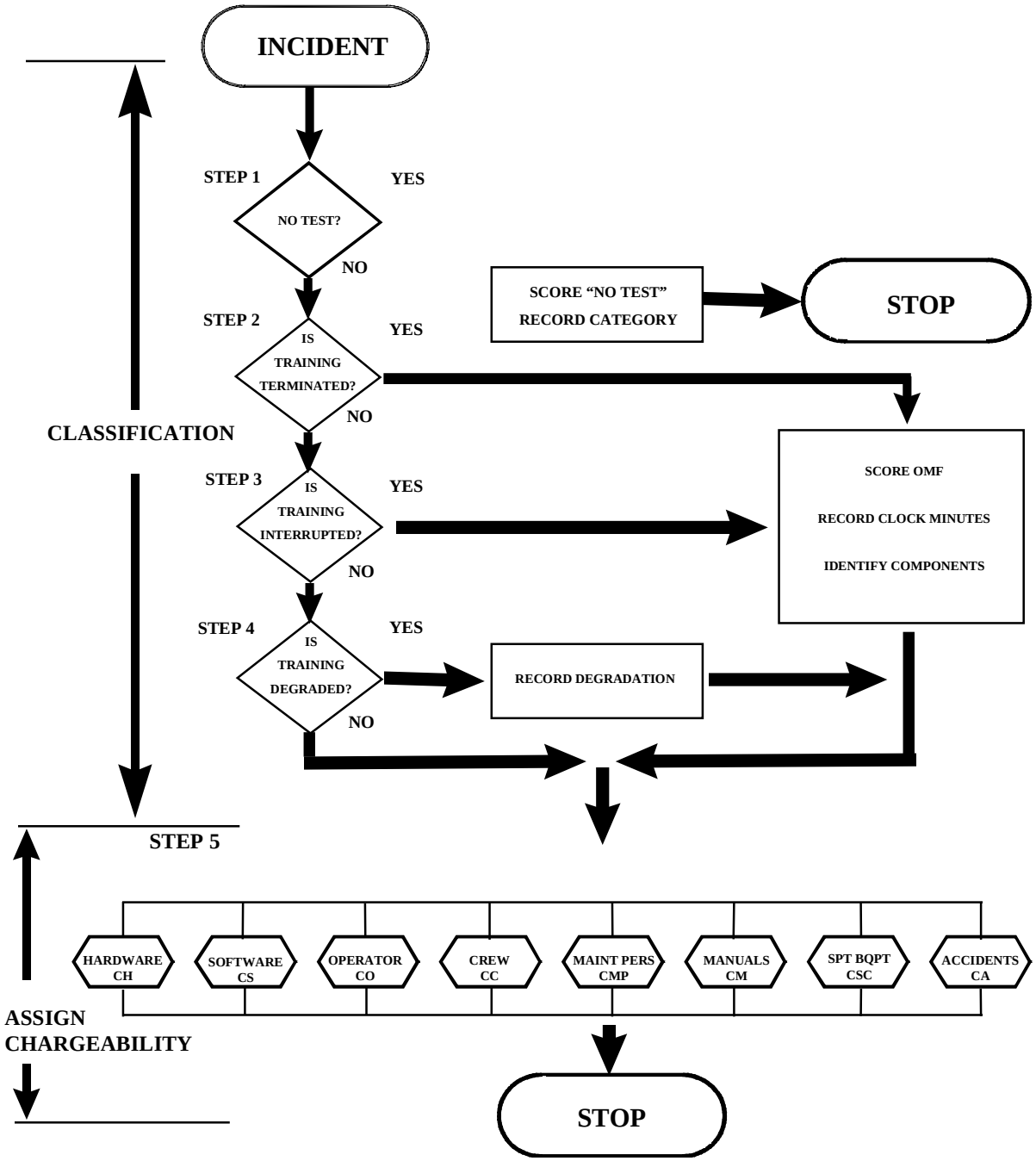

FIGURE B-11. Failure Definition/Scoring Criteria Classification/Chargeability Flow Chart

This page intentionally left blank

APPENDIX C

SYSTEM SAFETY DESIGN VERIFICATION CHECKLIST FOR THE CLOSE COMBAT TACTICAL TRAINER SYSTEM

C.1. SCOPE.

This appendix establishes a partial system safety design verification checklist for the CCTT program. This appendix is a mandatory part of the specification. The information contained herein is intended for compliance.

C.2. APPLICABLE DOCUMENTS.

(This section is not applicable to this appendix.)

C.3. REQUIREMENTS.

C.3.1 Electrical.

C.3.1.1
Are operating personnel protected from accidental contact with voltages in excess of 30 volts?

C.3.1.2
Does each contact, terminal or like device, having voltages between 70 and 500 volts, rms. or DC, with respect to ground, have barriers or guards to minimize accidental contact by operating or maintenance personnel?

C.3.1.3
Are barriers or guards that protect terminals or like devices exhibiting 70-500 volts, clearly marked to indicate highest voltage encountered upon its removal? ~~(ANSI Z535.3/4)~~

C.3.1.4
Are portions of assemblies operating at potentials above 500 volts root mean square (~~,~~RMS) or DC, completely enclosed from the remainder of the assembly, and is the enclosure provided with non-bypassable interlocks?

C.3.1.5
Are enclosures for potentials, which exceed 500 volts, marked “DANGER, HIGH VOLTAGE, XXX VOLTS”, in white on a red background?

C.3.1.6
Do all circuits and capacitors discharge 30 volts or less within no more than two seconds after power is removed?

C.3.1.7
If the answer to question 1.6 is NO, are the high-voltage capacitors of circuits automatically discharged when the case or rack is opened?

C.3.1.8
Are test points provided in equipment where measurement of potentials in excess of 300 volts is required?

C.3.1.9
Are test points designed to require plug-in, not clamp-on, test instruments?

C.3.1.10
Are green or red indicator lamps provided to indicate “power on”?

C.3.1.11
Is sufficient space provided between shield endings and exposed conductors to prevent shorting or arcing?

C.3.1.12
Are electrical conductors designed to prevent insertion of the wrong plug into a receptacle or other mating unit?

C.3.1.13
Are plugs and receptacles coded and marked to clearly indicate mating connectors, where those of similar configuration are in close proximity?

C.3.1.14
Are plugs and receptacles designed to preclude electrical shock and burns while being disconnected?

C.3.1.15
Are male plugs de-energized when disconnected?

C.3.1.16
Are dissimilar plug/receptacle pairs used in units containing explosives?

C.3.1.17
When equipment is designed to operate on more than one type of input power, does the connector design prevent connection or use of improper power?

C.3.1.18
Are single-phase power cables properly color coded: black: hot white: neutral green: ground?

C.3.1.19
Are three-phase power cables coded as in question 1.18, above, with the second and third phases in red and blue, respectively?

C.3.1.20
Are meter terminals protected from voltages of 70 volts or more?

C.3.1.21
Do probes that are part of or accessories to the equipment contain safety guards that prevent contact with the tip and is the length of the exposed portion of the tip not more than 0.75 inches? (This question does not apply if the voltages to be measured are less than (a) 30 volts rms, (b) 60 volts DC, or (c) 24.8 volts DC interrupted at a rate of 10 Hz to 200 Hz.)

C.3.1.22
Are current and voltage overload protection devices provided?

C.3.1.23
Except for antennas and transmission line terminals, are all external parts, surfaces, and shields at ground potential at all times?

C.3.1.24
Is the path from the equipment to ground continuous and permanent?

C.3.1.25
Is the ground wire color coded green or green with yellow stripes? ~~(NFPA 70-87 [400.23])~~

C.3.1.26
Does the ground have capacity to safely conduct any currents that might be imposed thereon?

C.3.1.27
Is the ground wire separate from electrical circuits, i.e., not tied to neutral?

C.3.1.28
Has a test been conducted to determine the amount of leakage current on the grounding conductor? If YES, indicate the amount of current, in milliamperes, that was measured. ~~(NFPA 70-87 [250-21])~~

C.3.1.29
Is the impedance of the path from the equipment tie point to ground sufficiently low to limit the potential drop and to allow the operation of overcurrent devices in the circuits?

C.3.1.30
Does the path from the equipment tie point to ground have sufficient mechanical strength to minimize accidental ground disconnection?

C.3.1.31
Is the ground connection to the chassis or frame secured by one of the following: Spot welded terminal lug, soldering lug, screw, nut, and lockwasher?

C.3.1.32
On transmitting equipment, is a grounding stud provided that permits attachment of a portable shorting rod?

C.3.1.33
Except for RF voltages, are antenna and transmission at ground potential?

C.3.1.34
Do convenience outlets automatically ground the mated plugs of metal-cased portable tools and equipment?

C.3.1.35
Are both the phase and neutral supply voltage lines not connected to the chassis?

C.3.1.36
Are wires and cables supported and terminated to prevent shock and fire? ~~(29 CFR 1910.305)~~

C.3.1.37
Are DC power connections color coded and marked for polarity?

C.3.1.38
Does the main power switch cut off all the complete equipment?

C.3.1.39
Is the main power switch clearly identified?

C.3.1.40
Is the main power switch located on the panel? ~~(29 CFR 1910.303)~~

C.3.1.41
Is physical protection provided from accidental contact with the power input side of the main power switch and the incoming power line connections?

C.3.1.42
Are power switches located such that they cannot be operated by accidental contact?

C.3.1.43
Are provisions provided to deactivate mechanical drive units (switch, circuit breakers, etc) without disconnecting other parts of the equipment?

C.3.1.44
Are means provided to cut off power while installing or replacing an item of equipment or an assembly or part thereof?

C.3.1.45
Are emergency controls readily accessible and clearly identified?

C.3.1.46
Does the equipment use batteries? If YES, indicate whether batteries are the primary or backup power source.

C.3.1.47
Is the battery in the Government inventory? If YES, indicate the battery's nomenclature, e.g., BA-XXX, BB-XXX, etc.

C.3.1.48
Can the battery enclosure or box prevent injury or damage in the event of a violent gas venting or rupture of the battery cells?

C.3.1.49
Are battery compartments vented? ~~(29 CFR 1910.178(g)(2))~~

C.3.2 Mechanical.

C.3.2.1
Are safety covers provided for exposed gears, cams, levers, fans, and belts?

C.3.2.2
Are self-lock or other fail-safe devices incorporated into expandable and collapsible structures, such as shelters, jacks, masts, and tripods, to prevent accidental or inadvertent collapsing or falling?

C.3.2.3
Are positive means provided to prevent mismating of fittings; couplings; fuel, oil, hydraulic, and pneumatic lines; and mechanical linkages?

C.3.2.4
Are doors and drawers and associated catches, hinges, supports, fasteners, and stops designed to prevent accidental injury?

C.3.2.5
Is the installed equipment free of overhanging edges and corners that may cause injuries?

C.3.2.6
Is the equipment likely to remain upright under normal use and in strong wind, considering its means of support and center of gravity?

C.3.2.7
Does the weight of the equipment that is designed to be carried by a single soldier not exceed the following limits?

Weight (lbs)

Handling Function	M&F	M
Equipment designed to be lifted from the floor to five feet or less above the floor.	37	56
Equipment designed to be lifted from the floor to three feet or less above the floor.	44	87
Equipment designed to be carried 33 feet or less.	42	82

Male and Female Population

Male Population Only

C.3.2.8
Does the weight distribution allow easy handling, moving, and positioning?

C.3.2.9
Are suitable carrying handles provided?

C.3.2.10
Are lifting requirements labeled on equipment weighing over 37 lbs?

C.3.2.11
Are safety of relief valves provided for pressurized systems or components?

C.3.3 Environmental.

C.3.3.1

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

C.3.3.2

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

C.3.3.3
Is the release of toxic, corrosive, or explosive fumes or vapors prevented?

C.3.3.4
Are the outer coverings of cables, wires, and other components free of glass fiber materials?

C.3.4 Radiation.

C.3.4.1
Are warning labels provided that indicate the hazardous range of microwave emissions for components that produce a power density in excess of the following limits?

Frequency (f)	Power Density (MHz) mW/cm2
0.01-3	100
3-30	900/f2
30-100	1
100-1,000	100
1,000-300,000	10

C.3.4.2
Have all devices that exceed 10,000 volts been evaluated for X radiation?

C.3.4.3
Are X-ray producing devices shielded to reduce personnel exposure to 2.0 mr/hour or less?

C.3.4.4
Are X-ray producing devices and components in which they are located labeled with an X-radiation hazard warning symbol?

C.3.4.5
Have tests verified no radium or other radioactive materials are present?

C.3.4.6
Are all tubes, knobs, meters, dials, scales, markings, etc., free of radioactive material? If NO, indicate isotope and quantity.

C.3.4.7
Are radiation markings and labels affixed to all parts or components containing radioactive material?

C.3.4.8
Are filters, goggles, or other protective devices provided, and are warning signs posted, for all sources of radio frequency, ultraviolet, infrared, high-energy visible, laser, and any other type of hazardous radiant energy?

C.3.4.9
Is either an FDA classification label or a DA Label 168 affixed to each laser device?

C.3.5 Other Safety, Including Software Safety.

C.3.5.1
Are there provisions to prevent injury from implosion of cathode ray tubes?

C.3.5.2
Is equipment designed to prevent accidental ignition of hazardous atmospheres? (Applicable to equipment that is intended for use in atmospheres of explosive gas of vapors, combustible dusts, or ignitable fibers and flyings.) ~~(NFPA 70-87 [550-2])~~

C.3.5.3
Is a shut-down device or an alarm provided to prevent injury or equipment damage?

C.3.5.4
Is there adequate separation between critical warning lights and other lights?

C.3.5.5
Are audible warning signals distinguishable from other sounds under normal operating conditions?

C.3.5.6
Are warning circuits separate from control circuits?

C.3.5.7
Is the display lighting of aircraft electronics (avionics) compatible to the use of night vision goggles

CLARIFICATION: QUESTIONS C.3.5.8 THROUGH C.3.5.16 PERTAIN TO SYSTEM SOFTWARE. SOFTWARE INCLUDES FIRMWARE. THE TERM HARDWARE INCLUDES THE SYSTEM OR EQUIPMENT AND ITS SUBSYSTEMS AND COMPONENTS

C.3.5.8
Is the system or equipment free of software that (a) could create a hazard, (b) controls hazardous processes or outputs, or (c) controls information upon which the operator must rely in order to make safe decisions? If YES, then skip questions 5.9 through 5.16.

C.3.5.9
Does the software adequately control all hazardous routines and outputs?

C.3.5.10
Does the software allow the operator to take control over the hardware at any time? If the answer is YES, then skip question 5.11.

C.3.5.11
Does the software allow the operator to take control over the hardware when hazardous routines or outputs are involved?

C.3.5.12
Will operator have information needed in order to make safe decisions without reliance upon information generated by the software? If YES, skip 5.13.

C.3.5.13
Is the probability that the software will fail to provide information needed by the operator in order to make safe decisions at an acceptably low level?

C.3.5.14
Is the probability that the software will induce a critical hazard at an acceptably low level?

C.3.5.15
Can the failure of any input or output device cause a critical hazard?

C.3.5.16
Does the system assume or revert to a safe state upon a power failure or upon the failure of any hardware component, such as the primary computer?

C.3.6 Antennas.

C.3.6.1
Are antenna terminals insulated to prevent RF burns?

C.3.6.2
Are antenna tips designed to prevent puncture wounds?

C.3.6.3
Are labels provided to warn against contact with overhead electrical lines?

C.3.6.4
Are lock-out devices provided for remotely-operated antennas?

C.3.6.5
Are safety latches provided that prevent unintended release of the guy cable?

C.3.6.6
Lightning Protection Adequacy ~~(NFPA 70-87 [810-20, 810--57])~~. IF mast is electrically continuous, treat it as the down conductor.

a. If antenna acts as an aerial terminal, conductivity must equal or better that of #8 AWG solid copper. If YES, skip b.

b. If antenna does not act as an aerial terminal, (e.g. dish antenna) does rod extend at least 6 inches above the antenna and meet criteria in a?

c. Is down conductor equivalent to #8 AWG solid copper with a minimum strand size of #17 AWG?

d. Are joints mechanically strong and corrosion resistant?

e. Is resistance of joint less than that of 2 ft. (.6m) of down conductor? [R=.002 ohms or less - negligible resistance]

f. Will the down conductor remain free of bends or kinks after repeated use?

g. Is down conductor straight as possible without any turns not less than 90ø with 8 inch radius in turn? ~~(NFPA 78-13, 3--12.5)~~

h. Is ground rod at least 1/2 inch in diameter, 8 ft. long, copper clad steel or equivalent? ~~(NFPA 78-13, 3-16.1)~~

i. Is ground rod free of paint?

j. Does antenna mast configuration during erection, storage, take-down or operation prevent any component of the lightning protection system from mechanical damage or wear?

k. If mast is electrically continuous and is acting as the down conductor, is the ground stud adequate?

C.3.7 Vehicles, Shelters, Trailers, and Vans.

C.3.7.1
Is the vehicle weight properly distributed and is the vehicle laterally stable?

C.3.7.2
Has the vehicle road-worthiness testing? (e.g. Munson road test)

C.3.7.3
Are entries and exits free of obstructions?

C.3.7.4
Is an emergency exit provided and marked?

C.3.7.5
Are ladders, non-slip surfaces, and guardrails or chains provided for the shelter roof?

C.3.7.6
Do the entryway ladders or steps allow safe entrance and exit?

C.3.7.7
Are adequate instructions provided for placement of detached semi-trailers?

C.3.7.8
Are safety chains provided to prevent the trailer from detaching from the towing vehicle?

C.3.7.9
Are accessories secured or stowed to prevent damage when the vehicle is moving?

C.3.7.10
Will the lifting rings support the total weight of the shelter and the installed equipment?

C.3.7.11
Are ground rod and straps provided?

C.3.7.12
Is a ground stud provided at the power entry box?

C.3.7.13
Is the ground stud identified by a label or other marking?

B - Are the ground pins of the convenience outlets hard wired to the ground stud?

C.3.7.15
Are all outdoor receptacles connected to ground-fault circuit interrupters (GFCI's)? If YES, skip question C.3.7.16.

C.3.7.16
Is the socket configuration of each outdoor receptacle that is not connected to a GFCI unique to its special application and unusable for other applications or as a convenience outlet?

C.3.7.17
Are all ground wire color coated green? ~~(NFPA 70-87 [210-5B; 400-23])~~

C.3.7.18
Has a test been conducted to determine the amount of leakage current on the grounding conductor? If YES, indicate the amount of current, in milli-amperes, that was measured. ~~(NFPA 70- 87 [250-21])~~

C.3.7.19
Except for generators, are all grounds, including GFE, isolated from neutral?

C.3.7.20
Is the power ground wire connected to the ground stud?

C.3.7.21
Proper color coding on indicators? (White: Information; Amber: Caution; Red: Danger; Green: Power On.)

C.3.7.22
Are terminals, plugs, and other exposed parts that may exhibit over 70 volts (convenience outlets excluded), guarded against accidental contact during maintenance?

C.3.7.23
Are safety switches provided to disconnect remotely- located assemblies?

C.3.7.24
Does the floor surface prevent slipping? ~~(29 CFR 1910.22a)~~

C.3.7.25
Are floor surfaces adequately insulated?

C.3.7.26
Are there fire hazards present?

C.3.7.27
Are fire extinguisher's accessible and located near exits? Are they of the proper rating for the application?

C.3.7.28
Are open hatches, covers, lids, and doors positively locked?

C.3.7.29
Are hinged or sliding components (except for the equipment rack shelf) latched or otherwise secured to prevent unintended movement?

C.3.7.30
Do the racks or cabinets contain stops to prevent drawers from extending beyond their intended limits?

C.3.7.31
Are fuel line that are inside the shelter made as short as possible?

C.3.7.32
Is there a heater fuel shut-off valve inside the shelter?

C.3.7.33
Is a fuel line or adapter provided for connection to the external fuel tank or container?

C.3.7.34
Is the heater exhaust pipe located as far as possible from the fuel intake valve?

C.3.7.35
Does the heater exhaust pipe routing prevent the concentration of carbon monoxide in the shelter?

C.3.7.36
Are fuel cans located outside the shelter and at a safe distance from the heater?

C.3.7.37
Are battery compartments forced-air ventilated to the outside?

C.3.7.38
Is a warning device provided to indicate when either the battery vent lid or door is closed or when the ventilation fan is inoperable?

C.3.7.39
Are warning labels provided to indicate possible explosive gas accumulations?

C.3.7.40
Is the vehicle exhaust sufficiently separated from shelter openings to avoid an accumulation of carbon monoxide in the shelter?

C.3.7.41
Is there adequate overhead clearance?

C.3.7.42
Are walls fastenings sufficient to prevent equipment from breaking away, falling, or accidentally dislodging?

C.3.7.43
Are ceilings, walls, and other surfaces adjacent to aisles free of electrical switches that are vulnerable to breakage by accidental collision? If the answer is YES, then skip question C.7.44.

C.3.7.44
Do such switches contain metal shafts that pose a hazard when exposed?

C.3.8 Health Hazards.

C.3.8.1

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

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

C.3.8.2

a. Are hazardous or potentially hazardous materials (e.g., toxics, flammables, ignitables, corrosives, reactives, explosives, oxidizers, carcinogens, etc.) used or required

(operation, maintenance and/or storage)? (29 CFR 1910.1200). If your response is YES, answer questions b, c, C.8.3, and C.8.4.

b. Can non-hazardous materials be substituted?

C.3.8.3
Are potential exposures to hazardous materials during use, maintenance, and disposal controlled to levels below the Occupational Safety and Health Administration, (OSHA) Permissible Exposure Limit (PEL), American Conference of Governmental Industrial Hygienists (ACGIH), Threshold Limit Values (TLV), and/or National Institute of Occupational Safety and Health (NIOSH), Recommended Exposure Limits (REL), (use the most stringent standard)?

C.3.8.4
Is personal protective equipment (PPE) required for use of hazardous materials listed in C.3.8.2.b

C.3.8.5
Is the shelter required to be occupied during normal operations?

C.3.8.6
Is the vehicle to be occupied during normal operations of the shelter?

C.3.8.7

a. Is the shelter air conditioned and/or heated to prevent heat and cold stress to occupants? (ACGIH TLVs, ANSI/HFS 100-1988D [5.8.1]). If your response is YES, answer question b.

b. Is the system's ECU sufficient to maintain temperatures within the shelter between 60-86oF?

C.3.8.8

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

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

C.3.8.9

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

b. Are personnel required to be in or near vehicles with generators operating and/or the vehicle engine idling during normal operating conditions? If your response is YES, answer question c.

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

Substances	Permissible Limits (Pparts Pper Mmillion (PPM))	
	8 Hr TWA	STEL

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

C.3.8.10

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

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

C.3.8.11

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

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

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

This page intentionally left blank

APPENDIX D

SEMI-AUTOMATED FORCES (SAF)

D.1. SCOPE.

This appendix establishes the requirements for the SAF Configuration Item. This appendix is a mandatory part of the specification. The information contained herein is intended for compliance. SAF provides CCTT the capability to supplement manned simulators with sufficient friendly and enemy forces to complete the battlefield inexpensively and efficiently.

D.1.1 Definitions.

The following definitions are applicable to this appendix.

a. Platform - The lowest level of SAF control (e.g. single vehicles, single aircraft, single weapons, dismounted infantry fireteam).

b. Unit - Any possible level of control (e.g. battalion, company, platoon, platform).

D.2. APPLICABLE DOCUMENTS.

(This section is not applicable to this appendix)

D.3. REQUIREMENTS.

The behavior of the SAF units ~~will~~shall be controlled by the SAF configuration item. The SAF units shall be capable of operating as independent elements or as supplements to manned simulators. The SAF units ~~will~~shall be under limited operator control at the SAF workstations. The CCTT SAF software shall provide the SAF units behavior based on the operator's inputs from the workstations and will be indistinguishable from the manned simulators.

D.3.1 SAF configuration.

Any reference to SAF shall assume the system created by the combination of both SAF hardware and software components. A fixed site system shall consist of 10 SAF workstations, and a mobile CCTT system shall have 2 SAF workstations. A fixed site set of 10 SAF workstations shall have the capability of controlling both BLUFOR and OPFOR units in one to five simultaneous exercises as defined in 3.2.1. A mobile set of 2 SAF workstations shall be capable of supporting one exercise. Although multiple training exercises may take place simultaneously, a single SAF workstation shall control SAF units of only one force (BLUFOR or OPFOR), and in only one exercise.

D.3.1.1 SAF HWCI.

D.3.1.1.1 SAF workstation.

Each SAF workstation shall provide a PVD and a SAF control display to control and monitor the performance of the SAF units. The SAF workstation shall be designed to control up to a battalion task force (i.e. up to 120 SAF platforms). As a Preplanned Product Improvement (P^3I), a SAF workstation shall support a regiment or brigade of SAF platforms.

D.3.1.1.1.1 PVD.

Each SAF workstation shall provide a map display (PVD) of the gaming area. The 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. The SAF map display shall be capable of displaying all unit symbology, terrain features, contour lines, unit location, unit movement, direct and indirect fire, and overlays.

At the platform level, the operator shall be able to select an alternate top-down view icon of the platform. The operator shall be able to select the scale of the top-down view icon of platforms from a set of discrete scale choices. The top-down view icon of a platform on the SAF map display shall change to show the platform's orientation, main weapon orientation, turret direction, and discrete damage levels. The operator shall be able to select symbols on the SAF map display to be at the battalion, company, platoon or platform level.

The operator shall be able to identify an area on the map display to expand to cover the entire screen. The maximum area selected shall be the entire terrain map. The feature to expand any area of the SAF map display shall allow the operator to identify the area to be expanded. The SAF system shall allow an operator to specify a scale factor for drawing the map display with a maximum scale factor of the entire terrain map. The time for the SAF to draw or re-draw the map display shall not exceed fifteen seconds.

D.3.1.1.1. Display operation.

SAF operators shall be able to interact with SAF displays through a combination of text entry and graphical interaction, as appropriate. The operator shall be able to view a display of events, changes of state, or reporting requirements that occur to units under that workstation's control. The SAF operator displays shall allow SAF exercise initiation and editing in conjunction with the map display.

D.3.1.1.1.3 Keyboard and input devices.

The SAF workstation shall provide a keyboard and pointing device to permit operator response.

D.3.1.1.2 Network interface.

The CCTT design must allow multiple SAF workstations to be placed on the LAN locally (or as a P3I on the Long Haul Network) subject to the network capabilities specified by the requirements of Section 3.7.4.1.

D.3.1.1.3 Communications network.

To provide voice communication, two simulated radios shall be provided at each SAF workstation to interface with the CCTT voice communication system.

The communications system shall be configurable such that a SAF operator will have access to the communications nets to provide SAF control. Two separate simultaneous communications nets per SAF workstation shall be provided.

D.3.1.1.4 Computer system.

Computer equipment shall be provided to support fixed site and mobile SAF configurations as defined in D.3.1.

In lieu of the worst case processing conditions as defined in 3.7.3.1.4c., the worst case processing load for all SAF capabilities at a fixed site shall be defined as five SAF workstations each controlling a battalion task force of up to 120 SAF platforms (controlling a maximum of 600 platforms at a fixed site). The worst case processing load for all SAF capabilities at a mobile unit shall be a combined total of up to 120 SAF platforms using one or both SAF workstations.

The system design shall support the expansion of the SAF workstation to control a regiment of SAF platforms.

D.3.1.1.4.1 Printer.

SAF workstations shall be capable of printing hardcopies of the SAF exercise overlays on the PVD, and units created by the SAF unit editor to the system printers at any time.

D.3.1.1.4.2 Database storage capacity.

Although only one terrain database shall be in use (selected) for an exercise at any given time, the SAF shall have enough mass storage capacity to simultaneously accommodate three complete terrain databases (see 6.2). The time required to initialize for an exercise any one of the terrain databases, which are available on a SAF workstation, shall be less than 5 minutes. The SAF operator shall be able to replace one of terrain databases stored on a SAF workstation with a new compiled database in less than 1 hour.

D.3.1.1.5 Furniture and chairs.

The areas within the various CCTT installations that the SAF HWCI items ~~will~~ reside shall have the furniture, chairs and equipment racks provided to accommodate one SAF operator at each SAF workstation. The chairs provided shall meet the human factors engineering provisions of ANSI/HFS 100-1988 and have casters.

This page intentionally left blank

APPENDIX E

M113A3 APC MANNED MODULE

E.1. SCOPE.

This appendix establishes requirements for the M113A3 Armored Personnel Carrier (APC) manned module. This appendix is a mandatory part of the specification. The information contained herein is intended for compliance.

E.2. APPLICABLE DOCUMENTS.

(This section is not applicable to this appendix.)

E.3. REQUIREMENTS.

E.3.1 M113A3 APC simulator module.

The APC simulator shall be designed to replicate the performance characteristics of the M113A3, full tracked armored personnel carrier and associated systems as described in E.3.1.1 through E.3.1.2.3. The M113A3 shall be capable of mounting and dismounting an infantry unit in the visual database.

E.3.1.1 Performance characteristics.

The following paragraphs contain the unique performance requirements that shall be provided with the M113A3 manned module.

E.3.1.1.1 Visual display system.

The M113A3 visual requirements are stated in Appendix A.

E.3.1.1.2 Vehicle weapon systems.

The vehicle weapons system for the M113A3 manned module shall have the capability for target sighting, aiming and firing of the M2 .50 Cal. Machine Gun and M257 Smoke Grenade Launcher. The simulated vehicle weapons system components shall replicate the operational equipment in both design and performance. The vehicle weapons system shall consist of:

a. M2 .50 Cal. Machine Gun.

b. M257 Smoke Grenade Launcher.

These components in combination with the other simulated systems in the M113A3 simulation system shall provide the crew the capability to engage targets from a stationary position with a precision that matches real world results.

E.3.1.1.3 M113A3 APC weapons ammunition.

E.3.1.1.3.1 M113A3 APC Ammunition.

The M113A3 simulation system shall simulate the following vehicle weapons and ammunition:

a. M2 .50 Cal. Machine Gun, (A534 API-T).

b. M257 Smoke Grenade Launcher System (Smoke Grenade Arming Firing Unit) using the L8A3 RP smoke grenades.

E.3.1.1.3.2 M113A3 APC DI Stowed Ammunition.

The M113A3 simulation system shall stow the following ammunition for DI battlefield resupply:

a. Javelin and~~/or~~ Dragon Anti-Tank Missile.

b. AT-4 (84mm, M136).

c. 5.56mm Ball & linked Tracer (A064)

d. 5.56mm Ball (M855), Tracer (M856)

e. 40mm Grenade (M433 single grenades)

f. 7.62mm Machine Gun A141, Ball, Tracer

g. Claymore anti-personnel mines (M18), Anti-personnel mines (M16A1), and Anti-Tank (M21) mines.

E.3.1.1.4 Support Systems.

E.3.1.1.4.1 Electrical System.

The electrical system shall be capable of simulating the following operating states:

a. Engine off, master power off.

b. Engine off, master power on.

c. Engine running, alternator working.

d. Engine running, alternator not working.

Based on the operating state the electrical system is in, the associated problems and abilities shall be reflected in the M113A3 simulation system. The problems and abilities shall be replicated in the M113A3 simulation system just as they would occur in the operational equipment.

E.3.1.1.4.2 Hydraulic System.

The ramp hydraulic pump shall be virtual (no physical ramp). The operation of the ramp hydraulic pump shall be simulated. The ramp hydraulic pump shall provide simulated hydraulic pressure for raising and lowering the virtual M113A3 ramp.

E.3.1.1.5 Depletable resource management.

Depletable resource management shall cover the management, consumption, and resupply of both fuel and ammunition. The fuel for the M113A3 manned module shall be based on the fuel contained in the M113A3's fuel tanks. The resupply of fuel shall be accomplished through

coordination with the ALOC and shall occur with the use of a fuel carrier. The maximum ammunition capacity for the M113A3 simulation system shall be based on the internal storage capabilities of the actual M113A3 for the weapons identified in E.3.1.1.3. The identification, transfer, and resupply of ammunition shall be the responsibility of the vehicle commander. The resupply of all ammunition shall be coordinated through the ALOC. In all cases, the monitoring of, use of, and resupplying of the M113A3's fuel and ammunition shall be based on the implementation of representative time and depletion parameters. The Resupply Operations shall include:

a. Simulated Transfer of:

(1) Fuel from a fuel carrier to the M113A3

(2) Fuel from a fuel pre-stock to the M113A3

(3) Ammunition from an ammunition truck,

(4) Ammunition from another M113A3

(5) Ammunition from another manned module with comparable ammunition stocks

(6) Ammunition from prepositioned ammunition stocks

b. Reload times for the weapons listed in paragraph E.3.1.1.3.

c. Depletion rates.

(1) Fuel available related to M113A3 consumption rate.

(2) Ammunition basic allowance for the various weapons listed in E.3.1.1.3.

E.3.1.1.6 Damage and Failure.

The list of components that are modeled for combat damage stochastic failure, and deterministic failures shall be as defined in Table E-I.

Table E-I. M113A3 Failures and Damage

Component/System	Deterministic	Stochastic	Combat Damage
Air Filter		X	
Alternator		X	X
Antenna			X
Batteries		X	X
Bilge Pump		X	X

Table E-I. M113A3 Failures and Damage			
Component/System	**Deterministic**	**Stochastic**	**Combat Damage**
Commander			X
Driver			X
Drown	X		
Engine Assembly			X
Engine Cooling System		X	X
Engine Oil System		X	X
Engine Starter		X	X
Fuel Filter		X	
Intercom		X	X
Left Idler Wheel			X
Left Roadwheel 1			X
Left Roadwheel 2			X
Left Roadwheel 3			X
Left Roadwheel 4			X
Left Roadwheel 5			X
Left Sprocket			X
Left Track	X	X	X
Machine Gun Inoperative		X	X
Radio A		X	X
Right Idler Wheel			X
Right Roadwheel 1			X
Right Roadwheel 2			X
Right Roadwheel 3			X
Right Roadwheel 4			X
Right Roadwheel 5			X
Right Sprocket			X
Right Track	X	X	X
Rollover	X		
Service Brake		X	
Transmission Assembly		X	X

Table E-I. M113A3 Failures and Damage			
Component/System	**Deterministic**	**Stochastic**	**Combat Damage**
Transmission Oil Filter		X	

E.3.1.1.7 Sound generation system.

A sound and vibration generation system shall be provided. The sound system shall be completely separate from the communication system, and the sounds and vibrations shall be presented independently from any headphone system. The sounds and vibrations shall be of such fidelity, quality, realism, and volume that crew members experience the cues, stresses, and distractions of a "real life" combat situation. Vibrations shall only be generated for the commander and driver positions. The sounds shall be of sufficient volume so that the distractions provided to the crew members shall equal that found in an actual situation, but in no case shall 95 dB be exceeded for steady state noise (measured external to the CVC helmet). Table E-II lists the sound cues that shall be provided in the M113A3 simulation system.

Table E-II. M113A3 SOUND CUES
SOUND CUE
Engine start to idle
Engine noise related to Revolutions Per Minute (RPM)
Engine idle to stop
Starter
Transmission noise related to RPM
Collisions with objects (scraping and hard collisions)
Track noise - related to speed for terrain types simulated in CCTT
Track popping (about to be thrown)
Horn
Fuel Transfer pump
Bilge pumps
Ramp lock
Ramp unlock
Lowering ramp - begin
Lowering ramp - continuous
Lowering ramp - end
Raising ramp - begin
Raising ramp - continuous

Table E-II. M113A3 SOUND CUES
SOUND CUE
Raising ramp - end
Fire M2 .50 Caliber Machine Gun
Fire M257 Smoke Grenade Launcher
Friendly and hostile main gun fire
Friendly and hostile missile launch
Friendly/hostile machine rocket launch
Generic explosive round (main gun, missile, rocket) hit
Generic explosive round (main gun, missile, rocket) miss
Generic kinetic round hit
Friendly and hostile machine gun fire - large caliber
Friendly and hostile machine gun fire - small caliber
Friendly and hostile mine hit
Friendly and hostile bomb hit
Friendly and hostile bomb miss
Friendly and hostile artillery hit
Friendly and hostile artillery miss
Wheeled vehicle - large class
Wheeled vehicle - small class
Tracked vehicle
Aircraft - rotary wing class
Aircraft - fixed wing class

E.3.1.1.7.1 Sound synchronization.

The sound system shall be synchronized with the visual displays and the M113A3 controls within the system latency requirements, as defined in paragraph 3.2.2.1, and within the module latency requirements, as defined in paragraph 3.2.2.2.

E.3.1.1.7.2 Sound generator.

The sound generation system shall have the ability of generating a minimum of eight sounds simultaneously with full parametric control of frequency and volume. The sound generation system shall meet the spare input and output ~~I/O~~ channel requirements of 3.7.3.1.4.

E.3.1.1.7.3 Spatial positioning.

The sounds shall be synchronized with the actions causing the sounds and shall be presented to allow personnel the ability to identify the distance (amplitude and time delay) of the events causing the sounds.

E.3.1.1.7.4 Sound quality.

The sound generator shall provide sound cues over a frequency range of ~~25~~30 hertz (Hz) ~~+/- 5 Hz~~ to a minimum of 12,000 Hz +/- 3dB.

E.3.1.1.8 Communication system.

A communication system shall be provided to the M113A3 manned module as described in section 3.7.6 of this specification.

E.3.1.2 Physical characteristics.

The following paragraphs contain the detailed physical requirements for the individual crew stations within each M113A3 simulator system. The M113A3 crew compartment shall exist as a consolidated enclosure for the driver's station, and commander's station. The crew stations shall be located relative to each other as they are in the actual vehicle. Each crew station shall include a seat replicating the respective seat found in the operational M113A3 vehicle. The M113A3 modules shall provide the controls, switches, indicators and space constraints described below:

E.3.1.2.1 Drivers station.

The following buttons, controls, gauges, lights, and switches shall be provided at the driver's station in the locations and panels as found in the actual M113A3.

a. MASTER SWITCH panel shall contain an operational master power switch and 3 dimensional dummy components:

   (1) MASTER SWITCH shall be a three position pull to turn rotary switch which shall turn carrier electrical power on or off.

   (2) Utility outlet shall be a full size mockup of the real connector and shall be operational but nonfunctional.

   (3) Auxiliary power receptacle shall be a full size mockup of the real connector and shall be operational but nonfunctional.

b. Driver's instrument panel shall be simulated and shall contain the following active switches and indicators.

   (1) START switch shall be a momentary pushbutton which shall engage the engine starter.

   (2) BATTery GENerator INDICATOR shall be a functional gauge which shall indicate battery and generator conditions as follows:

(a) Left red zone: Indicates low battery charge with engine off.

(b) Yellow zone: Indicates normal battery voltage with engine off. Indicates generator not charging with engine running.

(c) Green zone: Indicates generator charging normally with engine running.

(d) Right red zone: Indicates generator overcharging with engine running.

(3) FUEL TANK switch shall be a two position toggle switch which allows driver to read fuel level in LEFT and RIGHT external fuel tanks.

(4) FUEL LEVEL indicator shall be a meter assembly with the following positions (E, 1/4, 1/2, 3/4, F) which shall indicate level of fuel in LEFT and RIGHT external fuel tanks as selected using the FUEL TANK switch.

(5) Light switch assembly shall be simulated and fully functional.

(a) Panel light switch shall be a four position rotary switch which shall control the panel lights as follows

1) PANEL BRT position: Panel lights are brightly lit

2) OFF position: Panel lights are off.

3) DIM position: Panel lights are dimly lit.

4) PARK position: Stop lights and tail lights are lit.

(b) Lights UNLOCK switch shall be a spring-loaded, two-position lever. When held in the UNLOCK position, this lever will allow Driving Lights switch to be moved from BO MARKER to BO DRIVE, from OFF to STOP LIGHTS, and from STOP LIGHTS TO SERVICE DRIVE. The lever shall return to the locked position when released.

(c) Driving lights/main lights switch shall be a five position rotary switch, which shall control exterior lights as follows:

1) B.O. DRIVE position: Enables the I.R. - B.O. SELECT switch to choose either infrared (non-functional) or blackout mode (functional) for night driving.

2) B.O. MARKER position: Blackout marker lights are lit. Blackout stoplight lights when brakes are applied.

3) OFF position: All exterior lights are off.

4) STOPLIGHT position: Stoplight lights when brakes are applied.

5) SERvice DRIVE position: Service headlights and taillights are lit. Stoplight lights when brakes are applied.

(6) Speedometer and/ Odometer shall be an active gauge and an active 6 digit display. The speed gauge shall represent the carrier speed in miles per hour, and the odometer shall indicate total carrier distance traveled in miles.

(7) MASTER SWITCH ON indicator shall be a red colored indicator which shall come on when the Master Switch is in the ON position.

(8) Engine coolant TEMPerature indicator shall be a functional gauge which shall indicate the engine operating temperature in degrees Fahrenheit.

(9) RPM HUNDREDS gauge (tachometer) shall be a functional gauge indicating the engine speed in revolutions per minute(RPM). The engine hour meter shall be a six digit inactive display.

(10) TRANSmission FILTER CLOGGED warning light shall be a red colored indicator which shall come on when the transmission filter is clogged and the engine is running.

(11) PARKING BRAKE indicator light shall be a red colored indicator which shall come on when the parking brake is set.

(12) Instrument panel lights shall be two RED colored indicators which are controlled by the panel lights switch.

(13) I.R. POWER switch shall be a two position toggle switch which shall be operational but nonfunctional.

(14) I.R.-B.O. SELECT switch shall be a two position toggle switch which shall be functional only in the BO position.

(15) AIR BOX HEATER switch shall be operational but nonfunctional.

(16) BILGE PUMPS switch(FRONT and REAR) shall be a two position toggle switch which shall turn front and rear bilge pumps on and off.

(17) BILGE PUMPS lights shall be two red colored indicators which shall light when the BILGE PUMPS switch is moved to the ON position.

(18) HEADLIGHTS HI BEAM indicator light shall be a red colored indicator which shall light when headlight high beams are on.

(19) TRANSmission OIL LOW PRESSure warning light shall be a red colored indicator which shall come on when the transmission oil pressure is low.

c. Driver's Front Warning Light Panel shall be simulated and contain the following switches and indicators:

(1) ENGINE COOLANT LOW LEVEL warning light shall be a red colored indicator which shall come on when the coolant level is too low for safe operation.

(2) TRANS OIL - HI TEMP warning light shall be a red colored indicator which shall come on when the transmission oil temperature is too high for safe operation.

(3) ENGINE OIL - LOW PRESSure warning light shall be a red colored indicator which shall come on when the oil pressure is too low for safe operation. Light shall go off 10 +/- 1 seconds after engine starts.

(4) STEERING LOCKED indicator light shall be a red colored indicator which shall come on when steering wheel is locked in center position.

(5) HORN Button shall be a pushbutton which shall sound the carrier horn which shall only be audible in the M113 Manned Module.

d. Intercom switch box shall be capable of selecting both intercom and radio channel through the use of the MONITOR switch, a 5 position rotary switch. The intercom volume shall be controlled through the VOLUME knob which shall be functional. The intercom panel shall contain two jacks to allow connection of a real CVC helmet to the intercom system.

e. Steering wheel shall be a functional assembly and when rotated shall provide the range of motion of the M113A3 steering wheel assembly. Deflections of the steering wheel from the center position shall cause the carrier to turn. Clockwise deflection(as viewed from above) shall cause the carrier to turn to the right. Counterclockwise deflection shall cause the carrier to turn to the left. Steering control deadband shall be 10 degrees +/- 5 degrees. Amount of travel of the steering wheel assembly shall be 60 degrees +/- 9 degrees. Breakaway force of the steering mechanism shall be 4.0 pounds +/- 2.5 pounds. Ending force shall be 24.0 pounds +/- 4.0 pounds. Specified breakaway and ending forces shall apply to deflection in either direction.

f. Fuel cutoff control shall be a two position handle assembly that when pulled shall stop fuel flow and when pushed in shall start fuel flow to the engine. The force required for handle movement shall be constant force of 20.0 pounds +/- 4.0 pounds. The travel distance for handle movement shall be 1.25 inches +/- 0.5 inches.

g. Transmission controller shall be a seven position lever assembly that selects the driving range of the carrier automatic transmission. The SL (steering lock) position shall lock the steering wheel in the center position. This position shall be used during starting, idling, and engine shut down. The R(reverse) position shall be used for backing the carrier on land and in the water. The PV(pivot carrier) position shall be used to turn the carrier on its own center. The 1-4 position shall be used to drive the carrier in normal forward operation. The 1-3 position shall be used when climbing and going down slight grades, driving cross country at high speeds, and driving on roads at moderate speeds. The 1-2 position shall be used when climbing and going down medium grades, driving cross country at slow speeds, and while in the water. The 1 position shall be used when climbing and going down steep grades, and when entering and leaving the water. This range shall provide maximum traction, low speed maneuvering, and engine braking. The transmission controller shall be actual equipment.

h. Accelerator pedal upper and lower shall be simulated as follows:

(1) Upper accelerator pedal shall be operational and functional.

(2) Lower accelerator pedal shall be a functional assembly that when operated shall control engine speed. The force required for pedal movement shall be 8.0 pounds +/- 2.0 pounds breakaway and 22.0 pounds +/- 4.0 pounds ending. The travel distance for pedal movement shall be 2.0 inches +/- 0.5 inches at the center of the pedal.

i. Driver's Periscopes - Four vision blocks (periscopes) shall be provided to the driver and shall display scenes generated by the visual system as specified in Appendix A.

j. Dome light shall be simulated and fully functional. The panel shall have a three position rotary switch which selects blackout or white light. The switch shall have a spring loaded, mechanical only, release button which shall prevent motion from blackout to white, by using a physical block, until button is pressed allowing traversal. The panel shall contain a blackout light and a white light. The dome light shall be located on the left side of the carrier near the driver.

k. Ramp actuating handle shall be fully simulated by the following components:

(1) Ramp locking handle shall be a two position lever assembly that when operated simulates locking the ramp in the raised position and unlocking the ramp for lowering. The force required for handle movement shall be 4.5 pounds. +/- 1.0 pound. for opening and 25.0 pounds +/- 5.0 pounds for closing. The amount of travel for handle movement shall be 100.0 degrees +/- 15.0

(2) Ramp control handle shall be a two position lever assembly that when operated simulates raising and lowering the ramp. The force required for handle movement shall be 1.0 pound +/- 0.5 pounds breakaway and 6.0 pounds +/- 1.0 pound ending.

The amount of travel for handle movement shall be 45.0 degrees +/- 7.0 degrees in either direction.

(3) Ramp lock release button shall be a mechanical release button and when depressed shall release the ramp locking handle for movement. The force required for button movement shall be 6.0 pounds +/- 2.0 pounds.

l. Night vision goggles shall be functionally replicated as follows:

(1) A trainer unique momentary pushbutton switch shall be provided to the driver which will enable and disable the night vision capability for both the driver and the commander. The commander will not have independent control of his night vision capability.

m. Drivers seat shall be fully simulated in the functionality of the operational M113A3.

(1) Driver's seat assembly shall be a seat assembly to provide all adjustments and range of motion required for closed hatch driving as on the M113A3 driver's seat assembly. The back rest shall provide back support as on the M113A3 driver's seat back rest.

(2) Horizontal control handle shall be a two position lever assembly mechanically connected to lock and release the driver's seat. The horizontal control handle shall mechanically allow the seat to be moved to the front or the rear. The handle shall be pulled up while the correct position is being selected. When positioned correctly, the handle shall be released to lock the seat in place.

(3) Vertical control handle shall be a two position lever assembly mechanically connected to lock and release the driver's seat. The vertical control handle shall mechanically allow the seat to be raised or lowered. The handle shall be pulled up while the correct position is being selected. When positioned correctly, the handle shall be released to lock the seat in place.

(4) The drivers seat assembly shall be provided with a mechanically operable seat belt.

n. Brake pedals upper and lower shall be simulated as follows:

(1) Upper brake pedal shall be operational and functional. The travel distance for pedal movement shall be 4.0 inches +/- 2.0 inches.

(2) Lower brake pedal shall be a functional assembly that when operated shall slow and stop the carrier. The force required for pedal movement shall be 4.0 pounds +/- 1.0 pounds breakaway and 45.0 pounds +/- 10.0 pounds ending. The travel distance for pedal movement shall be 4.0 inches +/- 2.0 inches.

o. Beam selector switch shall be a pushbutton switch that when operated shall select high or low headlight beams.

p. Parking brake handle shall be a two position handle assembly that when operated shall engage and disengage the parking brake. The force required for handle movement shall be 2.0 pounds +/- 1.0 pound breakaway and 12.0 pounds +/- 3.0 pounds ending. The travel distance for handle movement shall be 90 degrees +/- 5 degrees.

q. Tow start handle shall be a two position handle assembly that is operational but nonfunctional.

r. Air cleaner indicator shall be simulated using a functional gauge which shall show the status of the air cleaner element with green to red indications.

s. Hand throttle control shall be a push-pull assembly that when operated shall allow engine speed to be controlled by hand. The force required for handle movement shall be 2.5 pounds +/- 1 pound. The travel distance for handle movement shall be 1.5 inches +/- 0.5 inches.

t. Driver's condition indicator - shall be a trainer unique 2 lamp assembly. An amber lamp shall be illuminated when the driver is considered to be wounded; a red lamp shall be illuminated when the driver is considered dead.

u. Driver's Head Tracker - is a trainer unique item which shall provide feedback indicating where driver's head is located and shall be used for vision block control in the driver's periscopes.

E.3.1.2.2 Commanders station.

The following buttons, controls, gauges, lights, and switches shall be provided at the commander's station in the locations and panels as found in the actual M113A3.

a. Commander's Periscopes - Five vision blocks (periscopes) shall be provided to the commander which shall display scenes generated by the visual system as specified in Appendix A.

b. Intercom switch box shall be capable of selecting both intercom and radio channels, through the use of the MONITOR switch, a 5 position rotary switch. The intercom volume shall be controlled through the VOLUME knob which shall be simulated by a rotational control. The intercom panel shall contain two jacks to allow connection of a real CVC helmet to the intercom system.

c. SMOKE grenade ARM-OFF switch shall be a two position lever locked toggle switch (locked in the OFF position) used to arm and disarm the smoke grenade FIRE switch.

d. SMOKE grenade ARM-OFF indicator light shall be a red colored indicator which shall illuminate when the smoke grenade FIRE switch is armed (Arm-Off switch is in Arm position).

e. SMOKE grenade FIRE switch shall be a pushbutton switch with a protective skirt. The switch when pressed, shall Fire smoke grenades from the discharger tubes on the exterior of carrier.

f. Commander's seat assembly shall be a seat assembly to provide all adjustments and range of motion required for closed hatch operation as on the M113A3 commander's seat assembly. The back rest shall provide back support as on the M113A3 commander's seat back rest.

(1) Vertical control handle shall be a two position lever assembly mechanically connected to allow the commander's seat to be raised or lowered. The handle shall be pushed in while the correct position is being selected. When positioned correctly, the handle shall be released to lock the seat in place.

(2) Seat lock handle shall be a handle assembly mechanically connected to release the seat from the stowed position. The handle shall be pulled forward to release the commander's seat from the stowed position. The seat shall be lowered until it locks in the down position.

(3) The commanders seat assembly shall be provided with a mechanically operable seat belt.

g. Cupola controls shall allow for the simulated movement of the commanders cupola gun ring and control of the M2 .50 caliber machine gun.

(1) A two-axis joystick shall be provided which allows for the movement of a simulated .50 caliber machine gun sight horizontally and vertically within the commander vision blocks.

(2) A fire button shall be provided that allows for the simulated firing of the .50 caliber machine gun.

h. Dome light shall be simulated and fully functional. The panel shall have a three position rotary switch which selects blackout or white light. The switch shall have a spring loaded, mechanical only, release button which shall prevent motion from blackout to white, by using a physical block, until button is pressed allowing traversal. The panel shall contain a blackout light and a white light. The dome light shall be located on the right side of the carrier near the commander.

i. SINCGARS Radio - The SINCGARS (RT-1523A) shall be compatible with organizational requirements except as indicated in 3.7.6 for vehicle and headquarters

radio configurations and shall allow for communication with the Operations Center (OC) and other desired units. It shall simulate the following controls:

(1) ANT connector shall be a dummy 3-D connector which shall have a dummy cable. The dummy cable shall connect to the RF power amplifier, for long range capabilities.

(2) CHAN (channel) switch shall select manual, preset and cue frequencies. This switch shall be an 8 - position rotary switch with pointer knob which utilizes the following positions:

(a) CUE - This position shall allow the operator to preset single channel (SC) frequency for the CUE channel or select the preset CUE frequency.

(b) MAN - This position shall allow the operator to preset SC frequency for the MAN channel or select the preset MAN frequency.

(c) 1 - This position shall allow the operator to preset a SC frequency for channel 1. This position shall also select the preset SC frequency when in SC mode and the FH hopset when in FH mode for channel 1. The loading of preset FH channels or COMSEC keys shall be simulated using the external interface unit.

(d) 2 - This position shall allow the operator to preset a SC frequency for channel 2. This position shall also select the preset SC frequency when in SC mode and the FH hopset when in FH mode for channel 2. The loading of preset FH channels or COMSEC keys shall be simulated using the external interface unit.

(e) 3 - This position shall allow the operator to preset a SC frequency for channel 3. This position shall also select the preset SC frequency when in SC mode and the FH hopset when in FH mode for channel 3. The loading of preset FH channels or COMSEC keys shall be simulated using the external interface unit.

(f) 4 - This position shall allow the operator to preset a SC frequency for channel 4. This position shall also select the preset SC frequency when in SC mode and the FH hopset when in FH mode for channel 4. The loading of preset FH channels or COMSEC keys shall be simulated using the external interface unit.

(g) 5 - This position shall allow the operator to preset a SC frequency for channel 5. This position shall also select the preset SC frequency when in SC mode and the FH hopset when in FH mode for channel 5. The loading of preset FH channels or COMSEC keys shall be simulated using the external interface unit.

(h) 6 - This position shall allow the operator to preset a SC frequency for channel 6. This position shall also select the preset SC frequency when in SC mode

and the FH hopset when in FH mode for channel 6. The loading of preset FH channels or COMSEC keys shall be simulated using the external interface unit.

(3) RF PWR switch shall be a 4 position rotary switch with pointer knob, with the following positions:

(a) LO - This position shall set the operation of transmission power to low.

(b) M - This position shall set the operation of transmission power to medium.

(c) HI - This position shall set the operation of transmission power to high.

(d) PA - This position shall set the operation of transmissions for use with the power amplifier, or high power if power amplifier is not connected to the RT.

(4) MODE Switch - This switch shall be a 3 - position rotary switch with pointer knob, with the following positions:

(a) SC - This position shall set the Receiver/Transmitter to SC (single channel) mode.

(b) FH- This position shall set the Receiver/Transmitter to FH (frequency hopping) mode.

(c) FH-M - This position shall set the Receiver/Transmitter to FH-M (frequency hopping master) mode. The operator shall be required to pull the switch to go into the FH-M position.

(5) RXMT connector shall be a dummy 3-D connector.

(6) FCTN~~(function)~~ Switch - This switch shall be a 9 - position rotary switch with pointer knob, with the following positions:

(a) STBY - This position shall turn off receiver/transmitter (RT) while maintaining memory. The operator shall be required to pull the switch knob in order to go to the STBY position.

(b) TST - This position shall cause the normal self test indicators to be displayed on the keyboard display.

(c) LD - This position shall load SC frequencies, and shall also allow the operator to receive ERF data from a RT operating in FH-M mode.

(d) SQ ON - This position shall turn on the RT and activate the squelch.

(e) SQ OFF - This position shall turn on the RT and deactivate the squelch.

(f) RXMT - This position shall be nonfunctional. The retransmit mode of the RT shall not be simulated.

(g) REM - This position shall disable the RT's front panel controls.

(h) Z-FH - This position shall clear the RT of all FH data. The operator shall be required to pull the switch knob in order to go to the Z-FH position.

(i) OFF - This position shall turn off all power to the RT. This function shall also erase the RT's memory. The operator shall be required to pull the switch knob in order to go to the OFF position.

(7) DIM Control - This shall be a active control which replicates the appearance and function of the corresponding actual knob.

(8) Keyboard Display shall display all information concerning the operation of the RT including SC frequencies, FH data, error messages, data rates as well as keyboard entries. The display shall consist of 8 full 5 by~~X~~ 7 dot matrix characters that are alphanumeric with the capability to display special characters. The seventh 5 ~~X~~by 7 dot matrix character shall be capable of displaying no dots on column number one, on column number two only displaying dots on rows one, three, five, and seven that have the capability to be lighted individually, no dots on column number three, and capable of lighting all the dots on columns four and five at the same time. The eighth dot matrix character shall also be capable of displaying dots arranged in the form of a diamond. All displays shall be dimmable. Color of display shall be green.

(9) Keypad shall be responsible for the entering data into the RT. The keypad shall consist of the following 16 pushbutton keys:

(a) CMSC 1 - Shall display the COMSEC key identifier number on the display and enter the number '1' into the system.

(b) * 2 - Shall enter the number '2' into the system. The special feature activated by this key on the actual RT shall not be selectable or simulated.

(c) SYNC 3 - Shall place the RT into 'late entry' status allowing the RT to re-enter the network. Also shall enter the number '3' into the system.

(d) FREQ - Shall allow the operator to load and clear SC frequencies in the RT.

(e) DATA 4 - Shall display the RT's operational data rate and enter the number '4' into the system.

(f) 5 - Shall enter the number ’5’ into the system.

(g) 6 - Shall enter the number ’6’ into the system.

(h) ERF OFST - Shall transmit ERF data to net members when RT is operating in FH-M mode. Also shall load/check SC offset frequencies.

(i) CHG 7 - Shall change current information on display to another available selection. Shall also enter the number ’7’ into the system.

(j) 8 - Shall enter the number ’8’ into the system.

(k) LOUT 9 - Shall enter the number ’9’ into the system. Shall also retrieve the frequency lockout sets from permanent memory if the RT is operating as Frequency Hop Master.

(l) TIME - Shall be used to check RT FH sync time clock.

(m) CLR - Shall clear data from display if error was made during entry. Shall also be used to clear data from RT memory.

(n) LOAD 0 - Shall load data into holding memory in RT and to retrieve data from permanent memory into holding memory. Shall also be used to enter the number ’0’ into the system.

(o) STO- Shall transfer data from RT holding memory onto permanent memory.

(p) BATT CALL - Shall be non-functional.

(10) COMSEC switch shall be responsible for controlling the communication security modes of the RT. It shall be a 5 - position rotary switch with pointer knob, with the following positions:

(a) PT - This position shall place the RT into plain text mode. The operator shall be required to pull the knob in order to place the knob into this position.

(b) CT - This position shall place the RT into cipher text mode.

(c) TD - This position shall be non-functional.

(d) RV - This position shall prepare the RT to receive a remote fill of COMSEC variables from the NCS.

(e) Z - This position shall clear COMSEC keys. The operator shall be required to pull the knob in order to place the knob into this position.

(11) VOL WHSP control shall be a rotational knob used for audio volume control. The knob shall also provide a pullout position which shall be non-functional.

(12) HUB Connector - Dummy cover that shall not be removable.

(13) AUD/FILL connector shall be a dummy 3-D connector.

(14) AUD/DATA connector shall be a dummy 3-D connector connected to the mounting adapter by a dummy cable.

j. Radio Mounting - the SINCGARS shall be mounted in a long range radio configuration.

(1) This mounting shall replicate the AN/VRC-90A configuration, which contains the following components:

(a) Amplifier-adapter, vehicular (mounting adapter) AM-7239B/VRC.

(b) Amplifier, radio frequency AM-7238A/VRC.

(c) Receiver-transmitter, radio RT-1523 A

(d) Loudspeaker control unit, LS-671/U.

(2) Mounting adapter shall have one SINCGARS receiver-transmitters as described in E.3.1.2.2.i. The mounting adapter shall have a simulated Radio Frequency Amplifier connected, and shall also have the following components:

(a) CB1 (power) switch shall be a two position tripable toggle switch with an ON and OFF position.

(b) Indicator lamp and lens shall be a green dimmable indicator. The indicator shall flash for 3 +/- 1 seconds after the CB1 switch is moved to the ON position, then stays lit. The lens shall allow the indicator to be dimmed by turning clockwise.

(c) The (AUD/DATA B J2) connector shall be a 3-D dummy connector.

(d) The (AUD/DATA A J3) connector shall be a 3-D dummy connector.

(e) The (DATA B J4) connector shall be a 3-D dummy connector.

(f) The (DATA A J5) connector shall be a 3-D dummy connector with a dummy cable connected to the AUD/DATA connector on the bottom radio.

(g) The (SPKR J6) connector shall be a 3-D dummy connector.

~~(2)~~ (3) The Radio frequency amplifier shall be connected to the mounting adapter. The Radio frequency amplifier shall have the following components:

(a) The (J1) connector shall be a dummy connector. A dummy cable which represents the connection to a vehicle antenna shall be connected to the J1 connector.

(b) The (J2) connector shall be a dummy connector. A dummy cable which also connects to the ANT connector of the RT mounted in the mounting adapter shall be connected to the J2 connector.

k. Commander's Condition Indicator - shall be a trainer unique 2 lamp assembly. An amber lamp shall be illuminated when the commander is considered to be wounded; a red lamp shall be illuminated when the commander is considered dead.

l. Commander's Head Tracker - is a trainer unique item which shall provide feedback indicating where commander's head is located and shall be used for vision block control in the commander's periscopes.

m. ROUNDS IN STORAGE - shall be a trainer unique panel used to monitor the storage and control the removal of ammo from the 0.50 caliber ammo storage area. The following components shall be provided:

(1) ROUNDS IN STORAGE shall be a 4 digit display that indicates the simulated number of ammo rounds in the ammo storage area.

(2) FILL WEAPON AMMUNITION BOX shall be a pushbutton switch that initiates the simulated transfer of an ammo can from the storage area to the 0.50 caliber machine gun ammunition box.

n. ROUNDS IN AMMUNITION BOX - shall be a trainer unique panel indicating the number of rounds in the ammunition box.

o. MACHINE GUN - shall be a trainer unique panel used to control and monitor the loading and unloading of the 0.50 caliber machine gun. The following components shall be provided:

(1) LOAD or UNLOAD shall be a pushbutton switch that when depressed will initiate the loading of the 0.50 caliber machine gun if unloaded or unload the 0.50 caliber machine gun if loaded.

(2) LOADED indicator shall be a red indicator that illuminates when the 0.50 caliber machine gun is loaded. The indicator shall flash during the simulated load time.

(3) UNLOADED indicator shall be a green indicator that illuminates when the 0.50 caliber machine gun is unloaded. The indicator shall flash during the simulated unload time.

p. Audio frequency amplifier (AM 1780/VRC) shall be functionally replicated as follows:

(1) MAIN PWR switch shall be a three position rotary switch with pointer knob and shall have active positions labeled “NORM”, “INT ONLY”, and “OFF”. No radio transmission shall be possible when MAIN PWR is in INT ONLY position. The entire communications system shall be turned off when MAIN PWR switch is in OFF position.

(2) INT ACCENT switch shall be a two position rotary switch with pointer knob and active positions labeled “ON” and “OFF”. Intercom and radio sound levels shall be equal when INT ACCENT switch is set to OFF. Radio sound levels shall be lower than intercom when INT ACCENT switch is set to ON.

(3) RADIO TRANS switch shall be a three position rotary switch with pointer knob and shall have active positions labeled “CDR + CREW”, “CDR ONLY”, and “LISTENING SILENCE”. Entire crew shall be able to transmit on radio with RADIO TRANS switch in CDR + CREW position. Only tank commander shall be able to transmit on radio when RADIO TRANS switch is in CDR ONLY position. No radio transmission shall be possible with RADIO TRANS switch in LISTENING SILENCE position.

(4) POWER CKT BKR switch shall be a two position trippable toggle type circuit breaker.

(5) POWER light shall be a green lamp and shall indicate when power is applied to the communication system.

(6) INSTALLATION switch shall be a three position rotary switch requiring a flat blade screwdriver to change switch setting and shall have active positions labeled “INT ONLY”, “OTHER”, and “RETRANS”.

(7) AUDIO INPUT jacks shall be non-operational and non-functional.

(8) LINE jacks shall be non-operational and non-functional.

q. Simulated compass (grid azimuth indicator) shall be a three digit display depicting the orientation of the long axis of the vehicle on the simulated terrain referenced to grid north. The simulated compass shall be available inside the compartment only after the vehicle has been stationary for 15 seconds.

E.3.1.2.3 External interface unit.

The M113A3 manned module shall be provided with an External Interface Unit (EIU) that consists of an entry device and display device. The EIU shall be used to control and monitor the following functions:

a. Exercise number.

b. Vehicle identification number.

c. Notification of a self-repair being completed.

d. Initiation and termination of fuel transfers.

e. Initiation and termination of ammo transfers.

f. Connection and disconnection of a tow kit to another vehicle.

g. External munitions loading.

h. Damage assessment.

i. Load SINCGARS hopset and COMSEC data.

APPENDIX F

M1A1 MANNED MODULE

F.1. SCOPE.

This appendix establishes requirements for the M1A1 manned module. This appendix is a mandatory part of the specification. The information contained herein is intended for compliance.

F.2. APPLICABLE DOCUMENTS.

(This section is not applicable to this appendix.)

F.3. REQUIREMENTS.

F.3.1 M1A1 Simulator Module.

The M1A1 simulator shall be designed to replicate the performance characteristics of the M1A1 vehicle and associated systems as described in F.3.1.1 through F.3.1.2.3. These characteristics shall enable the M1A1 simulators to operate in the CCTT environment and shall provide the manned crew the system performance specified herein.

F.3.1.1 Performance Characteristics.

The following paragraphs contain the unique performance requirements that shall be provided with the M1A1 simulator system.

F.3.1.1.1 Visual Display System.

The visual display system shall meet the requirements stated in Appendix A.

F.3.1.1.2 Fire Control System.

The fire control system for the M1A1 simulation system shall replicate the capability for target acquisition, aiming and firing of the 120 mm main gun, 0.50 caliber machine gun, M240 7.62 mm coaxial machine gun and M250 smoke grenade launcher. The simulated fire control system components shall replicate the operational equipment in both design and performance. The fire control system shall consist of:

a. Gunner’s Primary Sight (GPS)

b. Gunner’s Auxiliary Sight (GAS) with browpad

c. Gunner’s control panel

d. Gunner’s control handles

e. Laser Range Finder (LRF)

f. Commander’s GPS extension

g. Commander’s control handles

h. Commander’s Weapon Station (CWS)

These components in combination with the other simulated systems in the M1A1 simulation system shall provide the tank crew the capability to engage targets from both stationary and on the move positions with a precision that matches real world results. The simulated fire control

system shall accurately incorporate sighting reticles and fire control models and shall enable precision gunnery techniques in simulated battle field environments.

F.3.1.1.3 M1A1 Weapons and Ammunition.

The M1A1 simulation system shall simulate the following weapons and ammunitions:

a. 120 mm main gun,
   (1) M829 APFSDS -T Cartridge,
   (2) M830 HEAT-MP -T Cartridge,
a. M2 0.50 Cal. Machine Gun, (A534 API-T),
b. M240 7.62 mm coaxial machine gun, A141, Ball, Tracer,
c. M250 smoke grenade launcher system using the L8A3 RP smoke grenades.

F.3.1.1.4 Support Systems.

F.3.1.1.4.1 Electrical System.

The electrical system shall be capable of simulating the following operating states:

a. Engine off, master power off.
b. Engine off, master power on, turret power on.
c. Engine running, alternator working, turret power on.
d. Engine running, alternator broken, turret power on.
e. Engine off, master power on, turret power off.
f. Engine running, alternator working, turret power off.
g. Engine running, alternator broken, turret power off.

Based on which operating state the electrical system is in, the associated problems and abilities shall be reflected in the M1A1 simulation system. These problems and abilities shall be replicated in the M1A1 simulation systems just as they would occur in the operational equipment.

F.3.1.1.4.2 Hydraulic System.

The hydraulic system shall cover the use of both the main and auxiliary hydraulic pumps. The operation of the slewing of the turret, elevation of the gun, the opening and closing of the ammunition door, and the setting of the parking brake shall take into account the status of the hydraulic system. The operation of the two hydraulic pumps and the associated systems shall be reflected in the M1A1 simulation system replications of the operational equipment.

F.3.1.1.5 Depletable Resource Management.

Depletable resources management shall cover the management, consumption, and resupply of both fuel and ammunition. The fuel for the M1A1 simulation system shall be based on the use of three fuel tanks as found in the actual M1A1 tank. The management of maintaining fuel in the rear tank and the associated transfer of fuel from the own fuel tanks shall be the responsibility of

the tank crew through normal operations at their respective stations. The resupply of fuel shall be accomplished through coordination with the ALOC and shall occur with the use of a fuel carrier. The ammunition for the M1A1 simulation system shall be based on the storage capabilities of the actual M1A1 tank for weapons and ammunition identified in F.3.1.1.3. In all cases, the monitoring of, use of and resupplying of the M1A1 tank's fuel and ammunition shall be based on the implementation of representative time and depletion parameters. The Resupply Operations shall include:

a. Simulated Transfer of:

(1) Fuel from one internal tank to another within a module

(2) Fuel from a fuel carrier and fuel pre-stock to the M1A1 tank

(3) Ammunition from the ready rack to the breach

(4) Ammunition from the hull storage rack to the ready rack.

(5) Ammunition from the semi-ready rack to the ready rack

(6) Ammunition from an ammunition truck or another M1A1, M1A2, and Manned Module with comparable ammunition

(7) Ammunition from prepositioned ammunition stocks

(8) Reload times for the weapons listed in paragraph F.3.1.1.3

F.3.1.1.6 Damage and Failure.

The list of components that are modeled for combat damage, stochastic failure, and deterministic failure shall be as defined in Table F-I.

Table F-I. M1A1 Failures and Damage

Component/System	Deterministic	Stochastic	Combat Damage
Air Filter		X	
Antenna A and B			X
Ballistic Computer		X	
Cmdr's GPS Extension Optics		X	
Cmdr's Power Control Handle		X	
Coax Gun Inoperative		X	X

Table F-I. M1A1 Failures and Damage			
Component/System	**Deterministic**	**Stochastic**	**Combat Damage**
Commander			X
Driver			X
Drown	X		
Electronics			X
Engine Assembly			X
Engine Loss of Power		X	
Engine Oil Filter		X	
Engine Oil Pump		X	
Engine Oil System			X
Engine Pilot Relay		X	
Engine Shutdown		X	
Engine Starter	X	X	X
Fuel Filter		X	
Fuel Transfer Motor		X	
GPS Both		X	X
GPS Day		X	X
GPS Reticle		X	
GPS Reticle Adjust		X	
GPS Thermal		X	X
Gun Elevation Drive Filter	X	X	
Gun Elevation Drive Servo	X	X	
Gun Elevation Drive Valve	X	X	
Gunner			X
Gunner’s Auxiliary Sight		X	
Gunner’s Power Control Handles		X	
Hull Ammunition			X
IgnitorIgniter		X	

Table F-I. M1A1 Failures and Damage			
Component/System	**Deterministic**	**Stochastic**	**Combat Damage**
Intercom			X
Laser Range Finder	X	X	
Left Idler Wheel			X
Left Roadwheel 1			X
Left Roadwheel 2			X
Left Roadwheel 3			X
Left Roadwheel 4			X
Left Roadwheel 5			X
Left Roadwheel 6			X
Left Roadwheel 7			X
Left Sprocket			X
Left Track	X		X
Loader			X
Mirror Elevation Drive		X	
MRS Optics		X	
Oil Cooler		X	
Oil Cooler Fan		X	
Parking Brake		X	
Radio A			X
Radio B			X
Right Idler Wheel			X
Right Roadwheel 1			X
Right Roadwheel 2			X
Right Roadwheel 3			X
Right Roadwheel 4			X
Right Roadwheel 5			X
Right Roadwheel 6			X
Right Roadwheel 7			X
Right Sprocket			X
Right Track	X		X

Table F-I. M1A1 Failures and Damage			
Component/System	**Deterministic**	**Stochastic**	**Combat Damage**
Rollover	X		
Transmission Assembly		X	X
Transmission Oil Filter		X	
Transmission Oil System			X
Turret Ammo Ready			X
Turret Ammo Semi			X
Turret Ammunition			X
Turret Azimuth Drive Filter	X	X	
Turret Azimuth Drive Servo	X	X	
Turret Azimuth Drive Valve	X	X	
Turret Stabilization		X	

F.3.1.1.7 Sound Generation System.

A sound and vibration generation system shall be provided. The sound system shall be completely separate from the communication system, and the sounds and vibrations shall be presented independently from any headphone system. The sounds and vibrations shall be of such fidelity, quality, realism, and volume that the commander, gunner, loader, and driver shall experience the cues, stresses, and distractions of a “real life” combat situation. The sounds shall be of sufficient volume so that the distractions provided shall equal that found in an actual situation, but in no case shall 95 dB be exceeded for steady state noise (measured external to the CVC helmet). Table F-II lists the sound cues that shall be provided in the M1A1 simulation system.

Table F-II. M1A1 Sound Cues
SOUND CUE
Engine start to idle
Engine stop
Engine noise related to Revolutions Per Minute (RPM)

Table F-II. M1A1 Sound Cues
SOUND CUE
Transmission noise related to RPM
Parking brake set
Parking brake release
Track noise related to speed for terrain types simulated in CCTT
Track popping (about to be thrown)
Turret traverse noise related to turret RPM
Main gun couple
Main gun uncouple
Gun elevate
Gun hitting upper or lower limits
Open Breech/ load round/ close breech
Close Breech/ unload round/ close breech
Fuel transfer pump
Bilge Pump
Auxiliary hydraulic pump
Cupola Rotation
NBC system main and coax blower
Collisions with objects (scraping and hard collisions)
Fire main gun / discharge casing
Fire .50 caliber machine gun
Fire 7.62 mm machine gun
Fire smoke grenade launcher
Friendly and hostile main gun fire
Friendly and hostile missile launch
Friendly and hostile rocket launch
Generic explosive round (main gun, missile, rocket) hit
Generic explosive round (main gun, missile, rocket) miss
Generic kinetic round kit
Friendly and hostile machine gun fire - large caliber
Friendly and hostile machine gun fire - small caliber

Table F-II. M1A1 Sound Cues
SOUND CUE
Friendly and hostile mine hit
Friendly and hostile bomb hit
Friendly and hostile bomb miss
Friendly and hostile artillery hit
Friendly and hostile artillery miss
Wheeled vehicle - large class
Wheeled vehicle - small class
Tracked vehicle
Aircraft - rotary wing class
Aircraft - fixed wing class

F.3.1.1.7.1 Sound Synchronization.

The sound system shall be synchronized with the visual displays and the M1A1 controls within the system latency requirements, as defined in paragraph 3.2.2.1, and within the module latency requirements, as defined in paragraph 3.2.2.2.

30.1.1.7.2 Sound Generator.

The sound generation system shall have the ability of generating a minimum of eight sounds simultaneously with full parametric control of frequency and volume. The sound generation system shall meet the spare input and output~~I/O~~ channel requirements of 3.7.3.1.4.

F.3.1.1.7.3 Spatial Positioning.

The sound system shall provide for spatial positioning of the sound cues. The sounds shall be synchronized with the actions causing the sounds and shall be presented to allow personnel the ability to identify the distance (amplitude and time delay) of the events causing the sounds. For the Popped Hatch, the sounds shall be synchronized with the actions causing the sounds and shall be presented to allow personnel the ability to identify the direction of the events causing the sounds.

F.3.1.1.7.4 Sound Quality.

The sound generator shall provide sound cues over a frequency range of 30 hertz (Hz) to a minimum of 12,000 Hz. +/- 3 dB.

F.3.1.1.8 Communication System.

A communication system shall be provided to the M1A1 simulation system as described in section 3.7.6 of this specification.

F.3.1.2 Physical Characteristics.

The M1A1 crew compartment shall exist as two separate enclosures: an enclosure for the driver's station, and an enclosure for the tank commander, the gunner, and the loader stations. Each of these stations shall include seats replicating those respective seats (including full range of motion and adjustments) found in the operational M1A1 tanks as well as the controls, indicators and other pieces of equipment. The module enclosure base shall provide support for all module components and shall incorporate forklift provisions to facilitate handling and transportation. Functional controls, indicators, and other pieces of equipment shall have proper coloring and labels. All items must be located in the same position as the actual vehicle within the tolerance of this specification. The modules shall provide the controls, switches, indicators and space constraints required to meet the training tasks while avoiding negative training. Some of these items shall be fully replicated while others shall be mock-ups to provide the tactile sensations and space constraints of the actual vehicle. The controls and indicators shall replicate in design, performance, and function their real world counter-parts that are found in the operational M1A1. Realistic control loading and physical limits of travel shall be provided for simulated crew member controls.

F.3.1.2.1 Driver's Station.

The following controls, switches, gauges, and lights shall be provided at the driver's station in the locations and panels as found in the actual M1A1.

a. The following controls, indicators, and other pieces of equipment shall be simulated (functional):

(1) Service brake shall control simulated hydraulic operation of brakes in the transmission. The service brake pedal assembly shall simulate the M1A1 tank service brake pedal assembly. Deflecting the brake pedal shall result in additional resistance to the rotation of the vehicle tracks. The service brake shall only be functional when the engine is running. In the event of an engine shutdown, the service brake shall be non-functional when vehicle speed is below 3 MPH. Maximum deflection of the service brake pedal shall be 15 degrees +/- 2.25 degrees. Breakaway force shall be 12.5 pounds +/- 4.0 pounds and ending force shall be 54 pounds +/-8 pounds, both measured 10 inches from the pivot point.

(2) Parking brake assembly shall consist of the parking brake pedal and the parking brake release handle.

(a) The parking brake pedal shall operate the brakes in the transmission. The parking brake pedal shall simulate the M1A1 tank parking brake pedal. Pressing the parking brake when it is not already engaged and the parking brake release handle is not pulled shall activate the parking brake inhibiting movement of the tracks. The parking brake shall take into account the current state of the hydraulic system. Maximum deflection of the parking brake pedal

shall be 13 degrees +/-5 degrees. Ending force shall be 51 pounds +/-8.0 pounds measured on the pedal 7.25 inches from the parking brake pivot axis.

(b) The parking brake release handle shall be an assembly which shall release the parking brake. The parking brake release handle shall simulate the M1A1 tank parking brake release handle. Pulling the release handle shall disengage the parking brake, allowing the tracks to rotate. The parking brake release shall be functional at all times. The force required to disengage the parking brake shall be 53 pounds +/-8 pounds. Total travel of the parking brake release shall be 5.75 in +/-0.9 in. The parking brake shall disengage at 5.5 in +/-0.8 in.

(3) Steering and/ Throttle control assembly shall consist of the steering control, the throttle control, the transmission control, intercom buttons and adjustment knob.

(a) Deflection of the steering control from center position shall command the vehicle to turn. The steering control shall only be functional when the engine is running and the loss of steering malfunction is not active. In the event of an engine shutdown or activation of the loss of engine power malfunction while the vehicle is moving, the steering control shall be non-functional when vehicle speed is below 3 MPH. Steering control deadband shall be 14 degrees +/-3 degrees. Breakaway force of the steering mechanism shall be 17 pounds +/- 3 pounds applied 7.5 inches from the centerline of the steering assembly. Ending force shall be 35 pounds +/- 7 pounds applied 7.5 inches from the steering assembly pivot axis. Specified breakaway and ending forces shall apply to deflection in either direction.

(b) The throttle control shall be physically and functionally replicated. The throttle control shall have a deadband of 2.5 degrees +/- 1.5 degrees. Maximum deflection shall be 62 degrees +/- 9.3 degrees. Breakaway torque of the throttle control shall be 4 in-lbs +/- 2 in-lbs. Ending torque shall be 10 in-lbs +/- 5 in-lbs. Deflection of the throttle control from the full forward position shall cause additional fuel flow in the engine dynamics model. The throttle control shall only be functional when the engine is running and the loss of engine power malfunction is not active.

(c) The transmission shift control shall provide 5 gear selections: neutral (N), pivot (PVT), reverse (R), drive (D) and low (L). Transmission selections shall modify the action of the engine output. The transmission control shall only be functional when the engine is running.

(d) The left and right intercom press to talk buttons shall enable the driver to talk over the communications subsystem without removing his hands from the steering/throttle control.

(e) The steering/throttle control adjustment knob shall be functional and shall provide the capability to adjust steering/throttle assemblies position.

(4) Driver's instrument panel shall be functionally replicated. All indicator responses shall be controllable via software. The following switches and indicators on the Driver's Instrument panel shall be replicated and function as described:

(a) MAINTENANCE MONITOR indicators shall function as described, with each indicator discretely simulated:

1) ENGINE OIL LOW indicator - This amber indicator shall be illuminated while the engine is running and the engine oil level is low or when a lamp test is performed.

2) CABLE DISCONNECTED indicator - This amber indicator shall be illuminated when a lamp test is performed.

3) CIRCUIT BREAKER OPEN indicator - This amber indicator shall be illuminated when a virtual/active circuit breaker in the hull of the vehicle has been opened or when a lamp test is performed.

4) HYDRAULIC SYSTEM malfunction indicator - This amber indicator shall be illuminated to indicate a hydraulic system malfunction exists while the engine is running or when a lamp test is performed.

5) NOT IN OPERATION indicator - This amber indicator shall be illuminated only when a lamp test is performed.

6) ENGINE OIL CLOGGED FILTER indicator - This amber indicator shall be illuminated while the engine is running and a engine oil filter clogged condition exists or when a lamp test is performed.

7) TRANSMISSION OIL CLOGGED FILTER indicator - This amber indicator shall be illuminated when the engine is running and a transmission oil clogged filter condition exists or when a lamp test is performed.

8) PRIMARY FUEL CLOGGED FILTER indicator - This amber indicator shall be illuminated while the engine is running and a primary fuel filter clogged condition exists or when a lamp test is performed.

9) AIR CLEANER CLOGGED FILTER indicator - This amber indicator shall be illuminated when the engine is running and an air cleaner clogged filter condition exists or when a lamp test is performed.

10) REAR FUEL PUMP-R INOPERATIVE indicator - This amber indicator shall be illuminated when a lamp test is performed.

11) REAR FUEL PUMP-L INOPERATIVE indicator - This amber indicator shall be illuminated when a lamp test is performed.

12) FUEL CONTROL FAULTY indicator - This amber indicator shall be illuminated when a lamp test is performed or under the following conditions:

a) The backup battery is being used to supply voltage due to insufficient voltage supplied by the electrical system.

b) A clogged fuel filter condition exists.

c) An engine failure or starter failure occurs during engine starting.

d) The engine is damaged.

13) SPARE indicator - This amber indicator shall be illuminated only when a lamp test is performed.

(b) ENGINE indicators shall function as described, with each indicator discretely simulated:

1) OIL TEMP HIGH indicator - This red indicator shall be illuminated when the engine is running and a high oil temperature condition exists or when a lamp test is performed.

2) OIL PRESS LOW indicator - This red indicator shall be illuminated when the engine is running and a low oil pressure condition exists or when a lamp test is performed.

3) OVERSPEED indicator - This red indicator shall be illuminated whenever the engine is running and the engine speed is more than 3100 RPM.

4) 2ND SHOT switch - This switch shall be a 2-position toggle switch with red guard/cover. Setting this 2-position toggle switch to the ON position shall cause the engine to be shutdown and the engine shutdown sequence aural cue to be activated. Any existing simulated fire shall be extinguished and the engine shutdown.

5) 1ST SHOT DISCHARGED indicator - This amber indicator shall be illuminated when a lamp test is performed.

6) FIRE indicator - This red indicator shall be illuminated when a lamp test is performed.

7) Engine RPM gauge indicator - The rotational speed of the engine shall be indicated on this gauge whenever the vehicle master power is on. The RPM gauge shall have a range of 0-3600 with a full scale accuracy of +/- 100 RPM.

8) Internal engine RPM gauge light - This red indicator shall be illuminated whenever the vehicle master power is on.

9) Engine GAS OVERTEMP indicator - This red indicator shall be illuminated when a lamp test is performed.

10) TANK SELECTOR switch - This switch is a 3-position, rotary switch which shall have detents and stops at each end of the switch. Setting this switch to the right or left front tank selection when the rear tank is less than 1/8 full shall cause fuel to be transferred from the selected tank to the rear fuel tank.

11) Fuel gauge indicator - This indicator shall indicate the amount of fuel remaining in the fuel tank selected by the tank selector switch whenever the vehicle master power is on.

12) Internal fuel gauge light - This red indicator shall be illuminated whenever the vehicle master power is on.

13) LOW FUEL LEVEL indicator - This amber indicator shall be one discrete output which shall be illuminated whenever the vehicle master power is on and the fuel level in the rear fuel tank is below 1/8 full; light shall go out by the time 3/8-full is indicated.

14) Transmission OIL TEMP HIGH indicator - This red indicator shall be illuminated when a lamp test is performed.

15) Transmission OIL PRESS LOW indicator - This red indicator shall be illuminated the engine is running and transmission oil pressure is lost or when a lamp test is performed.

16) Transmission DAMAGED-INSPECT indicator - This red indicator shall be illuminated when the engine is running and a transmission failure exists or when a lamp test is performed.

17) VEHICLE SPEED gage indicator - Whenever vehicle master power is on this gage shall indicate vehicle speed based upon the rotational speed of

the transmission. The gauge shall have a range of 0 to 96 with a full scale accuracy of +/- 2 MPH.

18) Internal Vehicle speed gauge light - This red indicator shall be illuminated whenever the vehicle master power is on.

19) Odometer indicator - This indicator shall be a seven digit numeric indicator which shall simulate the distance the vehicle has traveled in kilometers.

20) ELECTRICAL SYSTEM gauge indicator - This indicator shall indicate voltage whenever the vehicle master power is on. The indicated voltage shall reflect the current electrical system status.

21) Internal Electrical system gauge light - This red indicator shall be illuminated whenever the vehicle master power is on.

22) LOW BAT CHARGE indicator - This amber indicator shall be one discrete output and shall be illuminated when electrical system voltage is low or a lamp test is performed.

(5) Driver's master panel shall be functionally replicated. The following switches and indicators on the Driver's Master panel shall be replicated and function as described:

(a) PERSONAL HEATER switches and ~~/~~indicators shall function as described:

1) HIGH/LOW temperature switch - This shall be physically and functionally replicated with the exception that it will not cause air temperature to be modified.

2) Personnel Heater indicator - This green indicator shall be one discrete output and illuminated when a lamp test is performed or when the personnel heater run/fan switch is in the START or RUN/FAN positions.

3) RUN/FAN switch - This switch shall be a 3-position toggle switch. This switch shall cause the personnel heater indicator to be activated whenever the switch is in the START or RUN/FAN position.

(b) Night Periscope switches and ~~/~~indicators shall function as described:

1) NIGHT PERISCOPE indicator - This green indicator shall be one discrete output and illuminated when the vehicle master power is on and the Night Periscope switch is in the on position or a lamp test is performed.

2) Night Periscope ON/OFF switch - This switch shall be a 2-position toggle switch. The switch shall control power to the power cable which supplies the night vision device with simulated power.

(c) Bilge Pump switches and ~~/~~indicators shall function as described:

1) BILGE PUMP indicator - This green indicator shall be one discrete output and shall illuminate when the vehicle master power is on and the Bilge Pump switch is in the on position.

2) Bilge Pump ON/OFF switch - This switch shall be a 2-position toggle switch. The switch set to the ON position shall cause the aural cue to be activated and the Bilge Pump indicator to be illuminated.

(d) Smoke Generator switches and~~/~~ indicators shall function as described:

1) SMOKE GENERATOR indicator - This green indicator shall be one discrete output and shall illuminate when the engine is running and the Smoke Generator switch is set to the ON position or a lamp test is performed.

2) Smoke Generator ON/OFF switch - This switch shall be a 2-position toggle switch.

(e) LIGHTS switch - this switch shall be a 4-position rotary switch with push-to-turn between the OFF and STOP LIGHTS ONLY position. The switch shall turn simulated power on/off to outside blackout markers, stop light, and service lights (headlights).

(f) High Beam switches and ~~/~~indicators shall function as described:

1) HIGH BEAM indicator - This green indicator shall be one discrete output and illuminated when the service lights are on and the High Beam switch is in the ON position.

2) High Beam ON/OFF switch - This switch shall be a 2-position toggle switch. Setting the switch to the ON position shall cause the high beam indicator to be illuminated if the service lights are on.

(g) Vehicle Master Power switches and ~~/~~indicators shall function as described:

1) VEHICLE MASTER POWER indicator - This green indicator shall be one discrete output and illuminated when the Vehicle Master Power switch is in the ON position.

2) VEHICLE MASTER POWER switch - This switch shall be a 3 position toggle switch momentary to the up (ON) and down (OFF) positions. The switch set to the ON position shall illuminate the vehicle master power green indicator, all gauges lights, and all gauges on the Driver's Instrument Panel begin to function. Setting the vehicle master power switch to the OFF position shall inhibit the functioning of all driver compartment switches and indicators except for the following: Parking Brake, Parking Brake Release, Hydraulic Pressure gauge.

(h) PARKING SERVICE BRAKES ON indicator - This red indicator shall be one discrete output and illuminated when the service brake pedal is depressed for more than 2 minutes (+/- 5 seconds) with engine running and vehicle master power is on or a lamp test is performed or parking brake pedal is depressed.

(i) Engine switches and ~~/~~indicators shall function as described:

1) STARTED indicator - This green indicator shall be one discrete output and shall illuminate for 10 seconds (+/- 1 second) when the engine startup sequence is completed or a lamp test is performed.

2) PUSH TO START switch - This switch shall be a pushbutton and pressing this pushbutton for approximately one second shall cause the engine startup sequence to begin if vehicle master power is on, there is fuel in the rear fuel tank, the transmission is in neutral, and the engine is not already running.

3) ABORT indicator - This amber indicator shall be one discrete output and illuminated whenever an engine start sequence has been aborted by a engine failure or when a lamp test is performed.

4) TACTICAL IDLE switch - This switch shall be a 2-position toggle switch with active positions "ON" and "OFF". Setting this switch to the ON position when the engine is running shall cause the engine idle speed to be increase from 900 RPM (+/- 30 RPM) to 1300 (+/- 50 RPM).

5) SHUTOFF switch - This switch shall be a 2-position lever lock toggle switch and setting this switch to the SHUTOFF position when engine is running shall shutdown the engine and activate the engine shutdown sequence aural cue. The switch shall return to the center position when released.

6) STARTER ONLY ENGAGED switch - This switch shall be a 2-position momentary toggle switch. Setting this switch to the ON position when the vehicle power is on and the engine is not running shall activate the starter motor aural cue.

(j) PANEL LIGHTS indicators and ~~/~~switches shall function as described:

1) TEST switch - When vehicle master power is on, pressing this pushbutton shall set all driver's compartment panel indicators (DIP, DMP and DAP) and gauge illuminators to full brightness for as long as the button is pressed.

2) Panel Light control - This switch shall provide variable control of the brightness of all indicators and internal gauge illuminators on the driver's instrument panel (except for the ENGINE FIRE indicator), driver's master panel, and driver's alert panel (when PNL DIM switch is pressed). When vehicle master power is cycled from off to on, the brightness shall be reset to full intensity.

(6) Driver's Alert panel shall be functionally and physically replicated. The following switches and indicators on the Driver's Alert panel shall be replicated and function as described:

(a) MASTER CAUTION indicator - This amber indicator shall be one discrete output and illuminated whenever the vehicle master power is on and any of the amber caution indicators in the Driver's compartment are illuminated or a lamp test is performed.

(b) PNL DIM switch - This switch shall be a pushbutton and depressing this switch when vehicle master power is on shall cause the brightness of the master caution and master warning indicators to be controlled by the adjustment of the Panel Lights control.

(c) RESET switch - This switch shall be a pushbutton and pressing this switch when Master Caution indicator is illuminated shall extinguish all amber caution indicators. The Master Warning indicator shall be extinguished when the Reset button is pressed if it was illuminated by the Engine Overspeed or Engine Gas Overtemp indicators.

(d) MASTER WARNING indicator - This red indicator shall be one discrete output and illuminated whenever vehicle master power is on and any red warning indicators in driver compartment are illuminated or when a lamp test is performed. When the Master Warning indicator is illuminated due to the Engine Overspeed or Engine Gas Overtemp indicators, the Reset button must be pressed to extinguish the Master Warning indicator.

(7) Driver's Night Vision Viewer (NVV) - shall be simulated version of the AN/VVS-2 NVV and shall interface to the visual system. Installing the simulated NVV shall cause the visual system to display a graphical night vision replication of the surrounding terrain which shall be presented whenever simulated power is available

to the viewer. The driver shall be able to install and remove the driver's night viewer.

(a) Off-Bright Knob - shall be an active control which shall simulate the removal of power from the NVV when in the OFF position (rotated fully counter-clockwise) and shall increase the level of brightness of the driver's NVV when rotated clockwise.

(b) Power Jack - shall be a connector which allows connection of the driver's night vision viewer to the vehicle power. The status of this connection shall be used to determine whether display of night vision or normal vision terrain is to be simulated.

(c) NVV storage - A trainer unique stowage location shall be provided in the driver compartment.

(d) NVV Rotate - shall be a trainer unique active control that shall simulate slewing the NVV imagery +/- 45 degrees in azimuth.

(8) Intercom/Radio Box - shall be functionally replicated. The following switches and indicators on the intercom and radio box shall be replicated and function as described:

(a) Monitor switch - This switch shall be a 5-position rotary switch. Active switch positions shall be labeled "ALL", "A", "INT ONLY", "B" and "C".

(b) Volume control - This switch shall be one rotational control which shall control the sound volume.

(c) Left connector (J803) shall allow for connection of an actual CVC helmet. The left connector shall also be used to detect the rear (intercom) CVC helmet switch position.

(d) Right connector (J802) shall allow for connection of an actual CVC helmet. The right connector shall also be used to detect the forward (radio) CVC helmet switch position and interface to the CVC helmet microphone and earphones (for both simulated intercom and radio).

(e) Remote cable - This cable shall be a dummy cable representing the interconnect of the driver's intercom switches on the Steering/Throttle control (T-Bar) to the Intercom Control Box.

(9) Domelight assembly - shall be functionally replicated as described:

(a) Domelight lamp shall be a bright light capable of illuminating driver's position.

(b) On, ~~/~~off and brightness control shall be a rotational control with a switch and shall control the level of brightness of the domelight lamp.

(10) Hatch Opening Crank - shall be provided as a space constraint (except for the handcrank).

(11) Driver's Seat - shall be functionally replicated. The seat shall have a full range of motion and adjustments except for the ability to move the seat into the open hatch position. The seat shall function as follows:

(a) Seat height control lever - shall allow for adjustment of seat height,

(b) Upper seat back lever - shall allow for adjustment of upper seat back,

(c) Seat manual control lever shall not be functional.

(d) The seat shall be capable of simulating vehicle vibrations.

(12) Driver's Headrest - shall be functionally replicated. The headrest shall have a full range of motion and adjustments. Adjustment controls shall be as follows.

(a) Headrest adjustment knob.

(b) Headrest Spring Latch.

(13) Driver's Periscopes - Three vision blocks (periscopes) shall be provided to the driver which shall display scenes generated by the visual system as specified in Appendix A.

(a) Periscope adjustment knobs - These knobs are located on either side of the driver's periscopes and shall be physically and functionally replicated. When loosened, they allow the mirror on the periscope to be adjusted.

(14) Driver's NBC hookups are as follows:

(a) Mask air duct socket shall be physically and functionally replicated.

(b) Cooling Vest air duct socket shall be physically replicated.

(c) Cooling Vest air duct socket cap shall be physically and functionally replicated.

(15) Driver's Head Tracker - is a trainer unique item which shall provide feedback indicating where driver's head is located and shall be used for vision block control in the driver's periscopes.

(16) Driver's Condition indicator - shall be a trainer unique 2 lamp assembly. An amber lamp shall be illuminated when the driver is considered to be wounded; a red lamp shall be illuminated when the driver is considered dead.

(17) Driver's Parking Brake System Hydraulic Pressure Gauge - shall be functionally replicated, shall indicate parking brake system hydraulic pressure, and shall have a range of 0 - 2000 psi.

(18) NVV Power Cable - shall be functionally replicated. The cable shall interface with the power receptacle on the simulated NVV.

(19) NVV Power Cable Stowage receptacle - shall be physically replicated and shall interface with the NVV power cable for stowage.

F.3.1.2.2 Turret Compartment.

F.3.1.2.2.1 Tank Commander's Station.

The following controls, switches, gauges, and lights shall be provided at the Tank commander's station in the locations and panels as found in the actual M1A1.

a. The following controls, indicators, and other pieces of equipment shall be simulated (functional):

(1) Tank commander's panel shall contain operational and functional components as follows: All indicators shall light when PANEL LIGHTS TEST pushbutton is pressed. All indicator responses shall be controllable via software.

(a) VEHICLE MASTER POWER shall be functionally replicated as follows:

1) VEHICLE MASTER POWER light shall be a green dome lamp and shall illuminate when power is on in tank electrical system.

2) VEHICLE MASTER POWER switch shall be three position toggle switch momentary to the up and down positions and shall turn vehicle electrical power on and off.

(b) TURRET POWER shall be functionally replicated as follows:

1) TURRET POWER light shall be a green dome lamp and shall illuminate when turret electrical power is on.

2) TURRET POWER switch shall be a three position toggle switch momentary to the up and down positions and shall turn electrical power to the turret on and off. Turret power shall automatically reset to off if vehicle power is lost. This switch shall also turn vehicle master power on.

(c) MANUAL RANGE shall be functionally replicated as follows:

1) MANUAL RANGE BATTLE SGT switch shall be a black pushbutton with skirt and shall direct the ballistic computer to use a preset range value for selected ammunition instead of automatic range inputs.

2) ADD/DROP switch shall be a three position toggle switch and shall increment the selected range value when toggled to the up position and shall decrement the selected range value when toggled to the down position.

(d) AUX HYDR POWER shall be functionally replicated as follows:

1) AUX HYDR POWER indicator shall be a green dome lamp which indicates that auxiliary hydraulic power is applied.

2) AUX HYDR POWER switch shall be a three position toggle switch and shall turn on auxiliary hydraulic power when toggled to the up position (ON) or shall turn off auxiliary power when toggled to the down position (OFF).

(e) GRENADES shall be functionally replicated as follows:

1) GRENADES SALVO 1 switch shall be a red pushbutton switch with a black skirt and shall launch six grenades, three from each side, if the grenade firing circuit is armed.

2) GRENADES SALVO 2 switch shall be a red pushbutton switch with a black skirt and shall launch six grenades, three from each side, if the grenade firing circuit is armed.

3) GRENADES READY/SAFE switch shall be a two position toggle switch and shall arm the grenade firing circuit in the “READY” position and shall disarm the grenade firing circuit in the “SAFE” position.

(f) PANEL LIGHTS shall be functionally replicated as follows:

1) PANEL LIGHTS TEST switch shall be a black pushbutton switch with a black skirt and shall light all commander’s panel indicators when this switch is pressed.

2) PANEL LIGHTS TEST knob shall be a rotational control and shall control the brightness level of all panel indicators.

(g) WARNING lights shall be functionally replicated as follows:

1) ENGINE FIRE lamp shall be a red dome indicator and shall illuminate when there is an engine fire or the panel light test button is pressed.

2) CKT BKR OPEN lamp shall be a yellow dome indicator and shall illuminate when a virtual (~~/~~active) circuit breaker in the turret of the vehicle is in the "OFF" position or the panel light test button is pressed.

3) FIRE CONTROL malfunction lamp shall be a red dome indicator and shall illuminate when a failure occurs in the fire control system, or the panel light test button is pressed.

4) LOW BAT CHG lamp shall be a yellow dome indicator and shall illuminate when the battery charge is low or the panel light test button is pressed.

(h) NBC MODE shall be functionally replicated as follows:

1) NBC MAIN MODE shall function only while the engine is operating. The NBC MAIN mode shall only function to operate the NBC MAIN blower. The blower used by the NBC main mode shall be the same blower that is used by the NBC backup mode. MAIN switches/indicators shall function as described:

a) ON lamp shall be a green dome indicator and shall illuminate when the NBC main mode is on (indicating only that the blower is on) or the panel light test button is pressed.

b) NBC MODE MAIN switch shall be a three position toggle switch momentary to the up and down positions and shall control NBC MAIN MODE. Moving the switch to the on position shall only cause the blower to turn on, the ON lamp to illuminate, and the OFF lamp to turn off. Moving the switch to the off position shall only cause the blower to turn off, the OFF lamp to turn on, and the ON lamp to turn off.

c) OFF lamp shall be a red dome indicator and shall illuminate when the NBC main mode is off (indicating only that the blower is turned off) or the panel light test button is pressed.

2) NBC BACKUP MODE shall only function to operate the NBC BACKUP blower. The blower used by the NBC mode backup shall be the same blower that is used by the NBC main mode.

a) ON lamp shall be a green dome indicator and shall illuminate when the NBC backup mode is on (indicating only that the blower is on) or the panel light test button is pressed.

b) NBC MODE BACKUP switch shall be a three position toggle switch momentary to the up and down positions and shall control NBC BACKUP MODE. Moving the switch to the on position shall cause the blower to turn on, the ON lamp to illuminate, and the OFF lamp to turn off. Moving the switch to the off position shall cause the blower to turn off, the OFF lamp to turn on, and the ON lamp to turn off.

c) OFF lamp shall be a red dome indicator and shall illuminate when the NBC backup mode is off (indicating only that the blower is off) or the panel light test button is pressed.

(i) AIR TEMP WARMER/COOLER shall be physically and functionally replicated with the exception that it will not affect air temperature.

(j) NBC ALARM switches and ~~/~~indicators shall function as described:

1) CHEMICAL lamp shall be a red dome indicator and shall illuminate when the light test button is pressed.

2) NUCLEAR lamp shall be a red dome indicator and shall illuminate when the light test button is pressed.

3) ALARM MUTE switch shall be physically replicated.

(k) NBC WARNING indicators shall function as described:

1) CREW PRESS LOW lamp shall be a yellow dome indicator and shall illuminate when the light test button is pressed.

2) FILTER CLOGGED lamp shall be a yellow dome indicator and shall illuminate when the light test button is pressed.

3) OVERHEAT SPONSON IN lamp shall be a yellow dome indicator and shall illuminate when the light test button is pressed.

4) OVERHEAT SPONSON OUT lamp shall be a yellow dome indicator and shall illuminate when the light test button is pressed.

(2) Intercom and /radio box shall be functionally replicated. The following switches, connectors and controls shall be replicated and function as described:

(a) MONITOR switch shall be a five position rotary switch. Active switch positions shall be labeled “ALL”, “A”, “INT ONLY”, “B” and “C”.

(b) VOLUME control shall be one rotational control and shall control the sound volume.

(c) Left connector (J803) shall allow for connection of an actual CVC helmet. The left connector shall also be used to detect the rear (intercom) CVC helmet switch position.

(d) Right connector (J802) shall allow for connection of an actual CVC helmet. The right connector shall also be used to detect the forward (radio) CVC helmet switch position and interface to the CVC helmet microphone and earphones (for both simulated intercom and radio).

(e) Remote cable - This cable shall be a dummy cable representing the interconnect of the commander’s intercom switches on the CWS power control handle to the Intercom Control Box.

(3) Domelight shall function as described:

(a) Domelight lamp shall be a light capable of illuminating commander’s position.

(b) On, /off and brightness control shall be a rotational control with a switch, and shall control the level of brightness of the domelight lamp.

(4) Commander’s power control handle (TCH) shall be functionally replicated. The TCH shall control main gun elevation and turret traverse during powered operation. Button on handle shall control laser rangefinder and trigger shall fire main gun or coaxial machine gun. Traverse throw shall be +/- 91 degrees +/- 5 degrees. Elevation throw shall be 28 degrees +/- 4 degrees. Depression throw shall be 30 degrees +/- 4 degrees. The ending force for traverse torque and elevation torque shall be 40 +/- 10 in-lb and 25 +/- 10 in-lb, respectively. Elevation rate versus handle deflection shall be as follows:

(a) Elevation rate versus handle deflection shall be as follows:

An elevation rate of 0.0 +/- 0.0 mils/second for a deflection of 0.0 degrees.
An elevation rate of 0.0 +/- 1.0 mils/second for a deflection of 2.8 degrees.
An elevation rate of 24.3 +/- 2.4 mils/second for a deflection of 19.6 degrees.
An elevation rate of 44.5 +/- 4.5 mils/second for a deflection of 21.2 degrees.

An elevation rate of 450.0 +/- 45.0 mils/second for a deflection of 30.0 degrees.

(b) The elevation rate plotted as a function of handle deflection shall be linear (constant slope) between the breakpoints specified above. The tolerance for elevation rates between the breakpoints specified above is +/- 10 percent~~%~~ of the expected elevation rate.

(c) A traverse rate of 0.0 +/- 0.0 mils/second for deflection of 0.0 degrees. A traverse rate of 0.0 +/- 1.0 mils/second for deflection of 1.7 degrees. A traverse rate of 20.4 +/- 2.0 mils/second for deflection of 30.0 degrees. A traverse rate of 48.2 +/- 3.5 mils/second for deflection of 34.5 degrees. A traverse rate of 750.0 +/- 75.0 mils/second for deflection of 90.0 degrees.

(d) The traverse rate plotted as a function of handle deflection shall be linear (constant slope) between the breakpoints specified above. The tolerance for traverse rates between the breakpoints specified above is +/- 10 percent~~%~~ of the expected traverse rate.

(e) TCH neutral position shall be within +/- 2 degrees of mechanical center. The switches shall return to normal (de-energized) position when the force on the switch is removed.

1~~).~~ Palm switch shall be a pushbutton switch and shall remove control of turret from gunner's handles and shall give control to the commander. Squeezing the palm switch shall also start the stabilization system if GPS FIRE CONTROL MODE switch is in NORMAL.

2) Laser pushbutton shall operate laser rangefinder.

3) Trigger shall fire the main gun or coaxial machinegun.

4) Left and right deflection shall control turret azimuth movement.

5) Elevation and depression deflection shall control gun elevation movement.

(5) Commander's GPS extension shall display scenes as generated by the visual system as specified in Appendix A. The GPS shall show tank commander the target, gun sighting view and data.

(a) A sensor shall be provided to determine when the sight is in use and when activated, the GPS extension sight shall display simulated GPS imagery. Browpad shall have an adjusting screw.

(b) Diopter adjustment shall allow for simulated focusing of the GPS extension eyepiece on reticle pattern.

(6) Commander's weapon station (CWS) shall be functionally simulated. The following switches and indicators on the CWS shall be replicated and function as described:

(a) The 0.50 caliber machine gun ammo supply, load and unload functions as follows:

1) ROUNDS IN STORAGE - shall be a trainer unique panel used to monitor the storage and control the removal of ammo rounds from the 0.50 caliber ammo storage area. The following components shall be provided:

a) ROUNDS IN STORAGE shall be a 4 digit display that indicates the simulated number of ammo rounds in the ammo storage area.

b) FILL WEAPON AMMUNITION BOX shall be a pushbutton switch that initiates the simulated transfer of rounds from the storage area to the 0.50 caliber machine gun ammunition box.

2) ROUNDS IN AMMUNITION BOX - shall be trainer unique panel indicating the number of rounds in the ammunition box.

3) MACHINE GUN - shall be a trainer unique panel used to control and monitor the loading and unloading of the 0.50 caliber machine gun. The following components shall be provided:

a) LOAD/UNLOAD shall be a pushbutton switch that when depressed shall initiate the loading of the 0.50 caliber machine gun if unloaded or unload the 0.50 caliber machine gun if loaded.

b) LOADED indicator shall be a green indicator that illuminates when the 0.50 caliber machine gun is loaded. The indicator shall flash during the simulated unload time.

c) UNLOADED indicator shall be a green indicator that illuminates when the 0.50 caliber machine gun is unloaded. The indicator shall flash during the simulated unload time.

(b) CWS sight shall display scenes as generated by the visual system as specified in Appendix A. A sensor shall be provided to determine when the sight is in use and when activated, the CWS sight shall display simulated CWS imagery.

(c) CWS manual traverse ring shall be functionally replicated and shall traverse commander's weapon station during manual operation.

1) Traverse range shall be 360 degrees and shall continually rotate without limit.

(d) CWS elevation crank handle shall include a button on the handle for weapon firing and shall control manual elevation of commander's weapon. The elevation handle shall be activated in both power and manual modes of operation.

1) Elevation and depression limits shall be 65 degrees +/- 2 degrees and 10 degrees +/- 2 degrees, respectively.

2) Caliber .50 elevation and ~~/~~depression rate shall be 71 mils/revolution +/- 5 percent~~%~~.

(e) CWS safety switch shall function as described:

1) SAFE/ARMED switch shall be a three position lever locked momentary toggle switch that must be pulled to go into the "ARMED" positions. The switch shall return to the center position from either the "ARMED" or "SAFE" positions when released. The positions ARMED, center and SAFE shall be active. When set to right (ARMED) position, the weapon firing circuit shall be armed. When set to left (SAFE) position, the weapon firing circuit shall be disarmed.

2) ARMED lamp shall be a red dome light and shall illuminate when commander's weapon is armed or shall illuminate when PANEL LIGHTS TEST pushbutton on commander's panel is pressed.

(f) CWS motor/brake assembly shall be physically and functionally replicated. This motor/brake assembly shall also provide the aural cues for commander's cupola movement.

(g) CWS Power Control Unit (PCU) shall be functionally but not physically replicated.

(h) CWS Power Control Handle shall be functionally replicated and contain operational and functional components described below. This handle shall traverse commander's weapon station during power operation when palm switch is depressed and thumb control on handle is moved. The maximum CWS traverse speed shall be 450 mils/sec, +/- 50 mils/sec. The CWS traverse speed shall be variable from 0 mils/sec to the maximum speed based on thumb control deflection.

1) Palm switch shall be physically and functionally replicated.

2) Thumb control on handle shall be physically and functionally replicated.

3) Intercom and ~~/~~radio switch shall enable the commander to talk over the communications subsystem without removing his hands from the power control handle.

(7) Commander's seat assembly shall replicate the actual M1A1 commander's seat including full range of motion and adjustments. The seat shall function as follows:

(a) Footrest bar - shall be capable of being placed in the stowed and non-stowed positions.

(b) Height adjustment knob - shall allow for adjustment of seat height.

(c) The seat shall have the capability of simulating vehicle vibrations.

(8) Commander's lower platform shall be physically and functionally replicated.

(9) MANUAL/POWER lever shall be a two position handle assembly with active positions labeled "MANUAL" and "POWER". This lever shall select powered or manual azimuth operation of CWS.

(10) Tank Commander's condition indicator - shall be a trainer unique 2 lamp assembly. An amber lamp shall be illuminated when the tank commander is considered to be wounded; a red lamp shall be illuminated when the tank commander is considered dead.

(11) Commander's NBC hookups are as follows:

(a) Mask air duct socket shall be physically and functionally replicated.

(b) Cooling Vest air duct socket shall be physically replicated.

(c) Cooling Vest air duct socket cap shall be physically and functionally replicated.

(12) Commander's head tracker is a trainer unique item which shall provide feedback indicating where commander's head is located and shall be used for vision block control in the commander's cupola.

(13) Commander's arm guard shall be physically and functionally replicated. The following related items ~~will~~ shall be replicated as follows:

(a) Hook shall be physically and functionally replicated.

(b) Latch shall be physically and functionally replicated.

(14) Commander's knee guard shall be physically and functionally replicated.

(15) Commander's arm rest and/ oddment box shall be physically replicated but shall not open.

(16) Commander's Vision Blocks - 6 vision blocks (periscopes) shall be provided to the commander which shall display scenes generated by the visual system as specified in Appendix A.

(17) Commanders Hatch Assembly (Hatch cover, handle). For the commander's popped hatch (CPH) version, the hatch cap, when closed, shall be able to be opened by handles. A hinging mechanism shall cause the cap to move to an opening of approximately four inches (this spacing shall replicate the actual vehicle). The popped hatch view shall cover a 360-degree field of view and shall be obstructed by structures replicating the vision block housings, machine gun mounts, commander's weapon sight tube, hatch hinge mechanisms, and a modified machine gun.

(18) Control-Monitor shall replicate the actual C-11291/VRC Control-Monitor used with SINCGARS in the operational M1A1 as follows:

(a) RADIO switch - shall be a three position rotary switch. The "1" and "2"positions shall be active. The "1" position shall enable control of settings on SINCGARS RT-A. The "2" position shall enable control of setting on SINCGARS RT-B. The "3" position shall have no effect.

(b) FCTN switch - shall be a seven position rotary switch with the following positions:

1) TEST - shall cause the Control-Monitor to display normal (non-failed) self test indications on the digital displays.

2) RF - shall enable the selection of RF power level of the currently selected RT. The selectable values for the RF power level shall be low, medium, high, and power amplified. The selected value shall change when the INIT switch is activated

3) RT MODE - shall enable the selection of the radio channel of the currently selected RT. The selectable values for mode shall be Off, Single-Channel, Frequency-Hopping, and Frequency Hopping Master. The selected value shall change when the INIT switch is activated.

4) CHAN - shall enable the selection of the radio channel of the currently selected RT. The selectable values for channel shall be Man, Cue, 1, 2,

3, 4, 5 , and 6. The selected value shall change when the INIT switch is activated.

5) VAR - shall enable the selection of the active COMSEC variable of the currently selected RT. The selectable values for COMSEC mode shall be plain-text and cipher text. The selected value shall change when the INIT switch is activated.

6) COMSEC - shall enable the selection of active COMSEC mode of the currently selected RT. The selectable values for COMSEC mode shall be plain text and cipher text.

7) CONTROL - shall be non-functional.

(c) INIT switch - shall be a three position toggle switch, spring loaded to the center position. When moved to the UP position, the switch shall increase the value of the setting currently selected by the FCTN switch. When moved to the DN position, the switch shall decrease the value of the setting currently selected by the FCTN switch.

(d) DIM knob - shall be a rotational knob used to control the brightness of the LED displays of the Control-Monitor.

(e) RT MODE display - shall be a red LED display which shall display an illuminated marker adjacent to the current mode of the RT selected by the RADIO switch.

(f) RF power display - shall be a red LED which shall display an illuminated marker adjacent to the current RF power level of the RT selected.

(g) CHAN display - shall be a red, single character, 7-segment LED display which displays the characters 0, 1, 2, 3, 4, 5, 6, and C according to the current radio channel of the RT selected by the RADIO switch. The CHAN display shall also be capable of displaying the characters “F”, “G”, and “U” during the Control-Monitor self-test function.

(h) COMSEC/CONTROL mode display - shall be a red LED which shall display an illuminated marker adjacent to the current COMSEC mode of the RT selected by the radio switch. The CONTROL mode portion of the display shall display an illuminated marker adjacent to the “m” label.

(19) Commander’s Curtain Assembly - shall be physically replicated.

F.3.1.2.2.2 Gunner's Station.

The following controls, switches, gauges, and lights shall be provided at the gunner's station in the locations and panels as found in the actual M1A1.

a. The following controls, indicators, and other pieces of equipment shall be simulated (functional):

(1) Gunner's Power Control handles (GCH) shall contain the following operational and functional components. Traverse throw shall be +/- 91 degrees +/- 5 degrees. Elevation and depression throw shall be +/- 30 degrees +/- 3 degrees. Elevation and traverse rates versus handle deflection shall be same as commander's control handle. Traverse torque and elevation torque shall be 40 +/- 10 in-lb and 20 +/- 5 in-lb, respectively. TCH neutral position shall be within +/- 2 degrees of mechanical center. The switches shall return to normal (de-energized) position when the force on the switch is removed.

(a) Palm switches shall function as follows:

1) Left palm switch shall be physically and functionally replicated.

2) Right palm switch shall be physically and functionally replicated.

(b) Trigger switches shall function as follows:

1) Left trigger switch shall be a red pushbutton switch. Squeezing this switch with gunner's station powered up and either palm switch depressed shall fire main gun or coaxial machine.

2) Right trigger switch shall be a red pushbutton switch. Squeezing this switch with gunner's station powered up and either palm switch depressed shall fire main gun or coaxial machine.

(c) Laser switches shall function as follows:

1) Left laser switch shall be a red pushbutton switch. Pressing this switch with gunner's station powered up and either palm switch depressed shall operate laser rangefinder.

2) Right laser switch shall be a red pushbutton switch. Pressing this switch with gunner's station powered up and either palm switch depressed shall operate laser rangefinder.

(d) Power elevation and traverse shall be simulated as follows:

1) Rotating gunner's handles backward shall elevate weapons. Rotating gunner's handles forward shall depress weapons.

2) Rotating gunner's handles clockwise shall traverse turret right. Rotating gunner's handles counterclockwise shall traverse turret left.

(e) Manual elevation shall be simulated as follows:

1) Cranking manual elevation handle clockwise shall elevate main gun and coaxial machinegun Cranking handle counterclockwise shall lower main gun and machinegun. The manual elevation assembly shall drive the simulated gun at a rate of 10.175 mils +/- 5 percent~~%~~ per revolution of the handcrank. With main gun pointed to the front of the vehicle, gun depression shall be limited to 10 degrees. Gun elevation shall be limited to 20 degrees for 360 degrees turret travel while operating the manual elevation handle assembly.

2) Squeezing palm switch shall allow for rotation of manual elevation handle.

3) Emergency trigger shall be a red pushbutton switch and shall fire main gun or machine gun in the normal, emergency, or manual mode of operation.

(f) Manual traverse shall be simulated as follows:

1) Cranking manual traverse handle clockwise shall traverse turret right. Cranking handle counterclockwise shall traverse turret left. Nominal rates of 5 and 10 mils per crank revolution shall be simulated. One revolution of the hand traverse crank shall rotate the turret 10.561 mils +/- 5 percent~~%~~ when the 10 mil rate is selected and 5.28 mils +/- 5~~%~~ percent when the 5 mil rate is selected. The manual handcrank shall provide 360 degrees of simulated turret traverse rotation.

2) Squeezing palm switch shall allow for rotation of manual drive handle.

3) Blasting machine shall be physically and functionally replicated.

(2) Gunner's Primary Sight (GPS) shall contain operational and functional components as follows:

(a) GPS eyepiece shall display scenes generated by the visual system as specified in Appendix A.

1) Diopter adjustment shall allow for simulated focusing of the GPS extension eyepiece on reticle pattern.

2) A sensor shall be provided to determine when the sight is in use and when activated, the GPS sight shall display simulated GPS imagery. Browpad shall have an adjusting thumbscrew and shall have left and right holding grooves.

(b) GPS upper panel assembly shall contain operational and functional components as follows:

1) FIRE CONTROL MODE switch shall be a three position magnetically held (EMERGENCY and MANUAL positions) toggle switch. Active switch positions shall be labeled “NORMAL”, “EMERGENCY” and “MANUAL”.

2) FIRE CONTROL MODE lights shall be simulated as follows:

a) EMERGENCY lamp shall be an amber dome light and shall illuminate when FIRE CONTROL MODE switch is set to the EMERGENCY position or PANEL LIGHTS TEST pushbutton is pressed.

b) NORMAL lamp shall be a green dome light and shall illuminate when FIRE CONTROL MODE switch is set to the NORMAL position or PANEL LIGHTS TEST pushbutton is pressed.

c) MANUAL lamp shall be a white dome light and shall illuminate when FIRE CONTROL MODE switch is set to the MANUAL position or PANEL LIGHTS TEST pushbutton is pressed.

3) PANEL LIGHTS TEST switch shall be a black pushbutton switch with skirt and shall turn on all GPS and Thermal Imaging System (TIS) indicator lights to full brightness.

4) PANEL LIGHTS control shall be a rotational control for lamp dimming and shall control brightness of GPS (upper and lower panels) and TIS indicator lights.

5) MRS OUT/IN lever shall be a two position lever assembly with active positions “OUT” and “IN” and shall control mirror that allows Muzzle Reference Sensor (MRS) reticle to appear in GPS optical system.

6) DEFROSTER switch shall be a mechanical control which replicates the appearance and movement of the corresponding actual control. This control shall be non-functional.

7) DEFROSTER lamp shall be a green dome lamp and shall illuminate only when PANEL LIGHTS TEST pushbutton is pressed.

8) RETICLE knob shall be a mechanical control which replicates the appearance and movement of the corresponding actual control. This control shall adjust brightness of the GPS reticle.

9) Unity window shall display scenes generated by the visual system as specified in Appendix A.

10) GPS ballistic door handles shall be replicated and function as follows:

a) DAY handle shall be a two position handle assembly with “DAY” written on the handle and shall simulate opening the left ballistic door by squeezing finger lever on top and turning clockwise.

b) THERMAL handle shall be a two position handle assembly with “THERMAL” written on the handle and shall simulate opening the right ballistic door by squeezing finger lever on top and turning counterclockwise.

(c) GPS lower panel assembly shall contain operational and functional components as follows:

1) NORMAL MODE DRIFT AZ knob shall correct for turret azimuth drift in stabilized (normal) sighting system. This knob shall have “PUSH TO TURN” written on it in white letters.

2) NORMAL MODE DRIFT EL knob shall correct for elevation drift in stabilized (normal) sighting system. This knob shall have “PUSH TO TURN” written on the it in white letters.

3) FLTR/CLEAR/SHTR switch shall be a three position 120 degree rotary switch and shall have a pointer knob with active positions labeled “FLTR”, “CLEAR”, and “SHTR”. This switch shall position clear window or shutter in the GPS day optic system, and shall have no effect in the filter position.

4) GUN SELECT switch shall be a three position magnetically held (MAIN and COAX positions) toggle switch with active positions labeled “MAIN”, “SAFE” and “COAX”. This switch shall select main gun or coaxial machine gun firing circuit for firing or trigger safe so neither gun will fire. Switch shall reset to safe when power is turned off. If switch is set to COAX with engine running, the NBC main system shall turn on (blower only).

5) GUN SELECT lamps shall be simulated as follows:

a) MAIN lamp shall be a green dome lamp and shall illuminate when GUN SELECT switch is set to MAIN or PANEL LIGHTS TEST pushbutton is pressed.

b) TRIGGER SAFE lamp shall be a white dome lamp and shall illuminate when GUN SELECT switch is in the SAFE position or PANEL LIGHTS TEST pushbutton is pressed.

c) COAX lamp shall be a green dome lamp and shall illuminate when GUNSELECT switch is set to COAX or PANEL LIGHTS TEST pushbutton is pressed.

6) AMMUNITION SELECT switch shall be a four position rotary switch with positions labeled “SABOT”, “MPAT”, “STAFF”, and “HEAT”. This switch shall input ammunition (SABOT or HEAT) type data into the ballistic computer when GUN SELECT switch is set to MAIN or trigger SAFE. The “MPAT” and “STAFF” positions shall be non-functional.

7) AMMUNITION SELECT lamps shall be simulated as follows:

a) SABOT lamp shall be a green dome lamp and shall illuminate when AMMUNITION SELECT switch is set to SABOT and GUN SELECT switch is set to MAIN or TRIGGER SAFE. This lamp shall also illuminate if PANEL LIGHTS TEST pushbutton is pressed.

b) HEAT lamp shall be a green dome lamp and shall illuminate when AMMUNITION SELECT switch is set to HEAT and GUN SELECT switch is set to MAIN or TRIGGER SAFE. This lamp shall also illuminate if PANEL LIGHTS TEST pushbutton is pressed.

c) MPAT lamp shall be non-functional.

d) STAFF lamp shall be non-functional.

8) MAGNIFICATION switch shall be a two position lever assembly with positions “3X” and “10X” active. This switch shall select optical 3X or 10X magnification for GPS day optical system.

(d) Laser Rangefinder (LRF) shall contain operational and functional components as follows:

1) RANGE switch shall be a three position toggle switch with active positions labeled “SAFE”, “ARM 1ST RTN”, and “ARM LAST RTN”.

This switch shall set first or last return, or safe mode of LRF. LRF shall return to safe when turret power is turned off, but switch shall not trip to safe position.

2) Test shall be a dummy connector with cover.

(e) Image Control Unit (ICU) shall contain operational and functional components as follows:

1) CONTRAST shall adjust contrast of TIS image.

2) POLARITY shall be a two position toggle switch with active positions labeled “WHITE HOT” and “BLACK HOT”. This switch shall select white or black presentation of hot objects in TIS image.

3) RETICLE shall be used to adjust reticle intensity from white to black in TIS image.

4) TRU READY lamp shall be a green dome lamp and shall illuminate when thermal receiver is ready for operation or shall illuminate if PANEL LIGHTS TEST pushbutton is pressed.

5) FAULT lamp shall be a yellow dome lamp and shall illuminate if PANEL LIGHTS TEST pushbutton is pressed.

6) SYMBOLS shall be used to adjust brightness of range, multiple returns, ready-to-fire symbol, and fire control fault “F” symbol in the GPS field of view. This knob shall be used for both day and TIS operation.

7) SENSITIVITY shall adjust brightness of TIS image.

8) THERMAL MODE shall be a three position toggle switch with active positions labeled “OFF”, “STBY”, and “ON”. This switch shall select OFF, ON, or STBY mode of TIS.

9) THERMAL TEST UNIT TEST PATTERN shall be a five position rotary switch with active positions labeled “OFF”, “PCU”, “ICU”, “EU”’ and “TRU”. Each switch position, excluding OFF position, shall bring up a specific test pattern in the GPS.

10) BORESIGHT shall be replicated and function as follows:

a) AZ knob shall be a mechanical control which replicates the appearance and movement of the corresponding actual control. This control shall be non-functional.

b) EL knob shall be a mechanical control which replicates the appearance and movement of the corresponding actual control. This control shall be non-functional.

(f) Thermal Receiving Unit (TRU) shall contain operational and functional components as follows:

1) THERMAL MAGNIFICATION control shall be a two position lever assembly with “3X” and “10X” positions active. This lever shall select 3X or 10X magnification for TIS image.

2) FOCUS control shall be mechanical control which replicates the appearance and movement of the corresponding actual control. This control shall be non-functional.

3) ANTI-GLARE switch shall be a five position rotary switch with active positions labeled “1”, “2”, “3” , “4” and “5” and shall have a pointer knob. Position 1 shall be no filter; filter positions 2, 3, and 4 shall have no effect on thermal image; and position 5 shall be shutter and shall be used when TIS is in standby and off.

(3) Intercom and ~~/~~radio box shall be functionally replicated. The following switches, connectors, and controls shall be replicated and function as described:

(a) MONITOR switch shall be a five position rotary switch. Active switch positions shall be labeled “ALL”, “A”, “INT ONLY”, “B” and “C”.

(b) VOLUME control shall be one rotational control which shall control the sound volume.

(c) Left connector (J803) shall allow for connection of an actual CVC helmet. The left connector shall also be used to detect the rear (intercom) CVC helmet switch position.

(d) Right connector (J802) shall allow for connection of an actual CVC helmet. The right connector shall also be used to detect the forward (radio) CVC helmet switch position and interface to the CVC helmet microphone and earphones (for both simulated intercom and radio).

(e) Gunner’s remote (foot) intercom switch shall enable the gunner to talk over the intercom.

(f) Remote cable - This cable shall be a dummy cable representing the interconnect of the gunner’s remote (foot) intercom switch to the Intercom Control Box.

(4) Domelight shall function as described:

(a) Domelight lamp shall be a bright light capable of illuminating gunner's position.

(b) On/off brightness control shall be a rotational control with a switch which shall be capable of controlling the level of brightness of the domelight lamp.

(5) Gunner's Auxiliary Sight (GAS) shall contain operational and functional components as follows:

(a) A sensor shall be provided to determine when the sight is in use when activated, the GAS sight shall display simulated GAS imagery. Browpad shall have an adjusting screw and shall have left and right holding grooves.

(b) GAS browpad adjustment knob shall be physically and functionally replicated.

(c) Boresight AZ adjustment shall be a pictorial representation of the actual control. This control shall be non-functional.

(d) Boresight EL adjustment shall be a pictorial representation of the actual control. This control shall be non-functional.

(e) RETICLE select switch shall be a two position rotary switch with positions labeled "SABOT/STAFF" and "HEAT/MPAT" and shall have a pointer knob. This switch shall select between two separate focal plane ballistics reticles (SABOT and HEAT).

(f) Reticle brightness adjust shall adjust reticle to desired brightness.

(g) FILTER select switch shall be a two position rotary switch with "IN" and "OUT" positions active and shall have a pointer knob. Filter knob shall provide for normal viewing in both the IN (left) and OUT (right) positions.

(h) GAS eyepiece shall display scenes generated by the visual system as specified in Appendix A.

(i) Focus (diopter) ring adjustment shall allow for simulated focusing of the GAS eyepiece on reticle pattern.

(6) Computer Control Panel (CCP) shall contain operational and functional components as follows:

(a) TEST switch with ~~/~~lamp shall be a white square pushbutton with "TEST" engraved in black. When pressed with the proper conditions present, this

switch shall initiate computer self test and lamp shall remain illuminated during entire test.

(b) NO GO lamp shall be a red flat lens lamp with “NO GO” engraved in black. This lamp shall illuminate in some instances during computer self test to indicate a failed system.

(c) AMMO TEMP switch with ~~/~~lamp shall be a white square pushbutton with “AMMO TEMP” engraved in black. Lamp shall illuminate when pushbutton is pressed. This pushbutton shall set computer for manual input of ammunition temperature data, and shall show previous data (if any) on display.

(d) AMMO SUBDES switch with ~~/~~lamp shall be a white square pushbutton with “AMMO SUBDES” engraved in black. With appropriate gun selection and ammunition selection made, the lamp shall illuminate when pushbutton is pressed; the lamp shall flash if AMMUNITION SELECT switch is changed after an ammunition dependent function is selected. This pushbutton shall set computer for manual input of ammunition subdesignation code, and shall show previous data (if any) on display.

(e) BS ADJUST switch with ~~/~~lamp shall be a white square pushbutton with “BS ADJUST” engraved in black. With appropriate gun selection and ammunition selection made, the lamp shall illuminate when pushbutton is pressed; the lamp shall flash if AMMUNITION SELECT switch is changed after an ammunition dependent function is selected. This pushbutton shall set computer for manual input of battle sight range data, and shall show previous data (if any) on display.

(f) MAINT DATA switch with~~/~~ lamp shall be a white square pushbutton with “MAINT DATA” engraved in black. This switch shall be used for unit maintenance only.

(g) ON-OFF switch shall be a two position toggle switch and shall turn CCP power on and off.

(h) PWR light shall be a green flat lens lamp with “PWR” engraved in white and shall illuminate when CCP is on.

(i) BARO PRESS switch with ~~/~~lamp shall be a white square pushbutton with “BARO PRESS” engraved in black. This pushbutton shall set computer for manual input of barometric pressure data, and shall show previous data (if any) on display.

(j) AIR TEMP switch with /lamp shall be a white square pushbutton with “AIR TEMP” engraved in black. This pushbutton shall set computer for manual input of air temperature data, and shall show previous data (if any) on display.

(k) MRS switch with /lamp shall be a white square pushbutton with “MRS” engraved in black. This pushbutton shall indicate that MRS is set in manual adjustment of fire control system and computer to compensate for gun tube droop.

(l) RANGE switch with /lamp shall be a white square pushbutton with “RANGE” engraved in black. This pushbutton shall cancel automatic range data and set computer for manual range input and shall show previous data (if any) on display.

(m) LEAD switch/lamp shall be a white square pushbutton with “LEAD” engraved in black. This pushbutton shall cancel automatic lead data and set computer for manual input of lead data and shall show previous data (if any) on display.

(n) CANT switch/lamp shall be a white square pushbutton with “CANT” engraved in black. This pushbutton shall cancel automatic cant data and set computer for manual input of cant data and shall show previous data (if any) on display.

(o) CROSSWIND switch with /lamp shall be a white square pushbutton with “CROSSWIND” engraved in black. This pushbutton shall cancel automatic crosswind data and set computer for manual input of crosswind data and shall show previous data (if any) on display.

(p) CCP display shall be a five character seven segment display capable of displaying decimal point to the left of each character. This display shall show previously stored information when input button is pressed and shall show new information entered using numbered pushbuttons or RETICLE ADJUST toggle switch. The display characters shall flash if input is higher or lower than preset limits.

(q) ZERO switch/ with lamp shall be a white square pushbutton with “ZERO” engraved in black. This pushbutton shall set computer for input of zero corrections for selected ammunition type.

(r) BORESIGHT switch with /lamp shall be a white square pushbutton with “BORESIGHT” engraved in black. This pushbutton shall set computer for input of corrections.

(s) Keypad shall be consist of the following pushbutton switches and shall enter data on computer display after an input button is pressed:

1) Seven switch shall be a white square pushbutton switch with “7” engraved in black.

2) Eight switch shall be a white square pushbutton switch with “8” engraved in black.

3) Nine switch shall be a white square pushbutton switch with “9” engraved in black.

4) Four switch shall be a white square pushbutton switch with “4” engraved in black.

5) Five switch shall be a white square pushbutton switch with “5” engraved in black.

6) Six switch shall be a white square pushbutton switch with “6” engraved in black.

7) One switch shall be a white square pushbutton switch with “1” engraved in black.

8) Two switch shall be a white square pushbutton switch with “2” engraved in black.

9) Three switch shall be a white square pushbutton switch with “3” engraved in black.

10) Decimal point switch shall be a white square pushbutton switch with “.” engraved in black.

11) Zero switch shall be a white square pushbutton switch with “0” engraved in black.

12) Dash switch shall be a white square pushbutton switch with “-” engraved in black.

(t) RETICLE ADJUST shall be a five position toggle switch spring loaded to center and shall have “U”, “D”, “L”, “R” and center positions active. This switch shall move GPS reticle up, right, down, or left during MRS correction operations.

(u) ENTER switch with ~~h/~~lamp shall be a white rectangular pushbutton with “ENTER” engraved in black. This pushbutton shall enter data on computer display into computer memory for use in ballistic solutions.

(v) CLEAR switch with lamp shall be a white rectangular pushbutton with "CLEAR" engraved in black. This pushbutton shall clear display of any manual-entry numbers before ENTER pushbutton has been pushed; display shall reset to original numbers. CLEAR shall be also used to correct an incorrect manual entry, but must be used before ENTER pushbutton is pushed.

(w) LR indicator shall be a split legend two lamp white indicator with "L" and "R" engraved in black.

(x) UD indicator shall be a split legend two lamp white indicator with "U" and "D" engraved in black.

(y) Cover plate shall be a metal hinged protective cover covering the AMMO SUBDES, BS ADJUST and MAINT DATA pushbuttons.

(7) Gunner's seat assembly shall replicate the actual M1A1 gunner's seat and shall include the full range of motion and adjustments. The seat shall function as follows:

(a) Height adjustment lever - shall allow for adjustment of seat height.

(b) Forward/back adjusting lever - shall allow for adjustment in the forward and backward direction.

(c) The seat shall have the capability of simulating vehicle vibrations.

(8) Gunner's NBC hookups are as follows:

(a) Mask air duct socket shall be physically and functionally replicated.

(b) Cooling vest air duct socket shall be physically replicated.

(c) Cooling vest air duct socket cap shall be physically and functionally replicated.

(9) Gunner's Condition indicator - shall be a trainer unique 2 lamp assembly. An amber lamp shall be illuminated when the gunner is considered to be wounded; a red lamp shall be illuminated when the gunner is considered dead.

(10) Hydraulic pressure gage is a mechanical control which replicates the appearance of the corresponding actual control. This control shall be non-functional.

(11) Gunner's chest rest shall be functionally and physically replicated and shall have a chest rest adjustment knob.

(12) Coaxial machine gun charging cable shall be physically replicated. Activation of the handle shall clear a 7.62mm machine gun misfire.

(13) Spent ammunition box shall be a partial mock-up for a space constraint.

(14) Ammunition Temperature Gauge - shall be a non-functional pictorial representation.

F.3.1.2.2.3 Loader's Station.

The following controls, switches, gauges, and lights shall be provided at the Loader's station in the locations and panels as found in the actual M1A1.

a. The following controls, indicators, and other pieces of equipment shall be simulated (functional):

(1) Loader's Panel (LP) shall contain operational and functional components as follows:

(a) MAIN GUN STATUS lights shall be functionally replicated as follows:

1) ARMED light shall be a yellow dome lamp and shall illuminate when main gun firing circuit is armed or when PANEL LIGHTS TEST pushbutton on commander's panel is pressed.

2) SAFE light shall be a yellow dome lamp and shall illuminate when turret power is applied and main gun firing circuit is not armed or when PANEL LIGHTS TEST pushbutton on commander's panel is pressed.

(b) TURRET BLOWER switch shall be a two position switch with active positions labeled "ON" and "OFF". This switch shall provide the loader the ability to control the NBC MAIN system (turn on and ~~/~~off the blower) provided it is not already operating.

(c) GUN/TURRET DRIVE switch shall be a three position lock lever toggle switch with active positions labeled "EL UNCPL", "POWERED", and "MANUAL". This switch shall set gun and turret drive system to powered, manual, or elevation uncoupled mode.

(d) EL UNCPL light shall be a white dome lamp and shall illuminate when GUN/TURRET DRIVE switch is set to EL UNCPL position.

(e) POWERED light shall be a yellow dome lamp and shall illuminate when GUN/TURRET DRIVE switch is set to POWERED position. POWERED position shall allow gunner and tank commander to operate fire control system in stabilized mode.

(f) MANUAL light shall be a white dome light and shall illuminate when GUN/TURRET DRIVE switch is set to MANUAL.

(2) Knee switch shall be pushbutton activated knee guard switch. Actuation of the knee switch shall cause the ammo door to open (under normal conditions). Release of the knee switch shall cause the door to close. The Knee switch shall be capable of being stowed in up position.

(3) Ready ammunition door shall be functionally and physically replicated. The door shall automatically open and close when the ammunition door knee switch is activated. The weight of the door shall be less than that of the actual M1A1 ready ammunition door for safety reasons. Full door travel from closed to open shall take 1.5 seconds +/- 0.5 seconds and 2.0 seconds +/- 0.5 seconds from open to closed.

(a) Safety switch shall be an edge activated switch. This switch shall be capable of stopping the movement of the ready ammunition door.

(b) Door closure assurance latch and lock shall be functionally but not physically replicated. The functionality of the lock and latch shall be simulated based upon the door position.

(c) Door closing actuator shall be functionally but not physically replicated. The door shall be opened and closed by a trainer unique actuator located behind the door.

(d) Door closing actuator release pin shall not be replicated.

(e) Door lockshaft shall not be replicated.

(4) Intercom and ~~/~~radio box shall be functionally replicated. The following switches, connectors, and controls shall be replicated and function as described:

(a) MONITOR switch shall be a five position rotary switch. Active switch positions shall be labeled “ALL”, “A”, “INT ONLY”, “B” and “C”.

(b) VOLUME control shall be one rotational control which shall control the sound volume.

(c) Left connector (J803) shall allow for connection of an actual CVC helmet. The left connector shall also be used to detect the rear (intercom) CVC helmet switch position.

(d) Right connector (J802) shall allow connection of an actual CVC helmet. The right connector shall also be used to detect the forward (radio) CVC helmet switch position and interface to the CVC helmet microphone and earphones (for both simulated intercom and radio).

(5) Domelight shall function as described:

(a) Domelight lamp shall be a bright light capable of illuminating loader's position.

(b) On, ~~/~~off and brightness control shall be a rotational control with a switch which shall be capable of controlling the level of brightness of the domelight lamp.

(6) Loader's periscope shall rotate through 360 degrees and shall display scenes generated by the visual system as specified in Appendix A.

(a) Periscope adjustment knobs - These knobs are located on either side of the loader's periscopes and shall be physically and functionally replicated. When loosened, they allow the mirror on the periscope to be adjusted.

(b) Vertical Field-of-View (FOV) Switch - shall be a three position switch which controls the pitch of the loaders periscope FOV. The three positions shall move the Loader's vertical FOV up and down between -4.5 degrees and +4.5 degrees.

(7) The turret networks box shall be replicated, by providing, as a minimum, the circuit breaker panel as follows:

(a) Circuit breakers 3, 12, 19, and LAMP RESET shall be operational and functional.

(b) Placement of the circuit breaker panel within the crew compartment shall be exempt from the tolerance requirements of section 3.6.f.

(8) Audio frequency amplifier (AM 1780/VRC) shall be functionally replicated as follows:

(a) MAIN PWR switch shall be a three position rotary switch with pointer knob and shall have active positions labeled "NORM", "INT ONLY" and "OFF". No radio transmission shall be possible when MAIN PWR switch is in INT ONLY position. The entire communications system shall be turned off when MAIN PWR switch is in OFF position.

(b) INT ACCENT switch shall be two position rotary switch with pointer knob and active positions labeled "ON" and "OFF". Intercom and radio sound levels shall be equal when INT ACCENT switch is set to OFF. Radio sound level shall be lower than intercom when INT ACCENT switch is set to ON.

(c) RADIO TRANS switch shall be a three position rotary switch with pointer knob and active positions labeled "CDR + CREW", "CDR ONLY", and "LISTENING SILENCE". Entire crew shall be able to transmit on radio with RADIO TRANS switch in CDR + CREW position. Only tank commander

shall be able to transmit on radio with RADIO TRANS switch in CDR ONLY position. No radio transmission shall be possible with RADIO TRANS switch in LISTENING SILENCE position.

(d) POWER CKT BKR switch shall be a two position trippable toggle type circuit breaker.

(e) POWER light shall be a lamp and shall indicate when power is applied to the communications system.

(f) INSTALLATION switch shall be a three position rotary switch requiring flat blade screwdriver to change switch setting and shall have active positions labeled “INT ONLY”, “OTHER”, and “RETRANS”.

(g) AUDIO INPUT jacks shall be replicated as follows:

1) Left jack shall be non-operational and non-functional.

2) Right jack shall be non-operational and non-functional.

(h) LINE jacks shall be replicated as follows:

1) Left jack shall be non-operational and non-functional.

2) Right jack shall be non-operational and non-functional.

(i) Amplifier cover shall be physically and functionally replicated.

(9) Two SINCGARS radios (RT-1523A) shall be functionally and physically replicated. The SINCGARS radios shall be compatible with organizational requirements, except as indicated in 3.7.6, for vehicle and headquarters radio configurations and shall allow for communication with the Operations Center (OC) and other desired units. Each radio shall simulate the following controls:

(a) ANT connector shall be a dummy 3-D connector which shall have a dummy cable. The long range (lower) radio shall connect to the RF power amplifier. The short range (upper) radio shall connect to the chassis (representing connecting to the vehicle antenna).

(b) CHAN (channel) switch shall select manual, preset and cue channels. This switch shall be an 8 - position rotary switch with pointer knob which utilizes the following positions:

1) CUE - This position shall allow the operator to preset SC frequency for the CUE channel or select the preset CUE frequency.

2) MAN - This position shall allow the operator to preset SC frequency for the MAN channel or select the preset MAN frequency.

3) 1 - This position shall allow the operator to preset a SC frequency for channel 1. This position shall also select the preset SC frequency when in SC mode and the FH hopset when in FH mode for channel 1. The loading of preset FH channels or COMSEC keys shall be simulated using the external interface unit.

4) 2 - This position shall allow the operator to preset a SC frequency for channel 2. This position shall also select the preset SC frequency when in SC mode and the FH hopset when in FH mode for channel 2. The loading of preset FH channels or COMSEC keys shall be simulated using the external interface unit.

5) 3 - This position shall allow the operator to preset a SC frequency for channel 3. This position shall also select the preset SC frequency when in SC mode and the FH hopset when in FH mode for channel 3. The loading of preset FH channels or COMSEC keys shall be simulated using the external interface unit.

6) 4 - This position shall allow the operator to preset a SC frequency for channel 4. This position shall also select the preset SC frequency when in SC mode and the FH hopset when in FH mode for channel 4. The loading of preset FH channels or COMSEC keys shall be simulated using the external interface unit.

7) 5 - This position shall allow the operator to preset a SC frequency for channel 5. This position shall also select the preset SC frequency when in SC mode and the FH hopset when in FH mode for channel 5. The loading of preset FH channels or COMSEC keys shall be simulated using the external interface unit.

8) 6 - This position shall allow the operator to preset a SC frequency for channel 6. This position shall also select the preset SC frequency when in SC mode and the FH hopset when in FH mode for channel 6. The loading of preset FH channels or COMSEC keys shall be simulated using the external interface unit.

(c) RF PWR switch shall be a 4 position rotary switch with pointer knob, with the following positions:

1) LO - This position shall set the transmission power to low.

2) M - This position shall set the transmission power to medium.

3) HI - This position shall set the transmission power to high.

4) PA - This position shall set the operation of transmissions for use with the power amplifier, or high power if power amplifier is not connected to the RT.

(d) MODE Switch - This switch shall be a 3 - position rotary switch with pointer knob, with the following positions:

1) SC - This position shall set the Receiver/Transmitter to SC (single channel) mode.

2) FH - This position shall set the Receiver/Transmitter to FH (frequency hopping) mode.

3) FH-M - This position shall set the receiver-transmitter to FH-M (frequency hopping master) mode. The operator shall be required to pull the switch to go into the FH-M position.

(e) RXMT connector shall be a dummy 3-D connector which shall have a dummy cable connected to the RXMT on the other RT in the radio mount.

(f) FCTN (function) Switch - This switch shall be a 9 - position rotary switch with pointer knob, with the following positions:

1) STBY - This position shall turn off receiver-transmitter (RT) while maintaining memory. The operator shall be required to pull the switch knob in order to go into the STBY position.

2) TST - This position shall cause the normal self test indications to be displayed on the keyboard display.

3) LD - This position shall allow the operator to load SC frequencies, and shall also allow the operator to receive ERF data from an RT operating in FH-M mode.

4) SQ ON - This position shall turn on the RT and activate the squelch.

5) SQ OFF - This position shall turn on the RT and deactivate the squelch.

6) RXMT - This position shall be non-functional.

7) REM - This position shall disable the RT’s front panel controls.

8) Z-FH - This position shall clear the RT of all FH data. The operator shall be required to pull the switch knob in order to go into the Z-FH position.

9) OFF - This position shall turn off all power to the RT. This function shall also erase the RT's memory. The operator shall be required to pull the switch knob in order to go to the OFF position.

(g) DIM Control - This shall be an active control which replicates the appearance and function of the corresponding actual knob.

(h) Keyboard Display shall display all information concerning the operation of the RT including SC frequencies, FH data, error messages, data rates as well as keyboard entries. The display shall consist of 8 full 5 ~~X~~by 7 dot matrix characters that are alphanumeric with the capability to display special characters. The seventh 5 ~~X~~by 7 dot matrix character shall be capable of displaying no dots on column number one, on column number two only displaying dots on rows one, three, five, and seven that have the capability to be lighted individually, no dots on column number three, and capable of lighting all the dots on columns four and five at the same time. The eight dot matrix character shall also be capable of displaying dots arranged in the form of a diamond. All displays shall be dimmable. Color of display shall be green.

(i) Keypad shall be responsible for the entering data into the RT. The keypad shall consist of the following 16 pushbutton keys:

1) CMSC 1 - Shall display the COMSEC key identifier number on the display and enter the number '1' into the system.

2) * 2 - Shall enter the number '2' into the system. The special feature activated by this key on the actual RT shall not be selectable or simulated.

3) SYNC 3 - Shall place the RT into 'late entry' status allowing the RT to re-enter the network. Also shall enter the number '3' into the system.

4) FREQ - Shall allow the operator to load and clear SC frequencies in the RT.

5) DATA 4 - Shall display the RT's operational data rate and enter the number '4' into the system.

6) 5 - Shall enter the number '5' into the system.

7) 6 - Shall enter the number '6' into the system.

8) ERF OFST - Shall transmit ERF data to net members when RT is operating in FH-M mode. Also shall load/check SC offset frequencies.

9) CHG 7 - Shall change current information on display to another available selection. Shall also enter the number ’7’ into the system.

10) 8 - Shall enter the number ’8’ into the system.

11) LOUT 9 - Shall enter the number ’9’ into the system, and shall also retrieve frequency lockout sets from permanent memory if the RT is operating as a Frequency Hop Master.

12) TIME - Shall be used to check RT FH sync time clock.

13) CLR - Shall clear data from display if error was made during entry. Shall also clear data from RT memory.

14) LOAD 0 - Shall load data into holding memory in RT and to retrieve data from permanent memory into holding memory. Shall also enter the number ’0’ into the system.

15) STO - Shall transfer data from RT holding memory onto permanent memory.

16) BATT CALL - Shall be non-functional.

(j) COMSEC switch shall be responsible for controlling the communication security modes of the RT. It shall be a 5 - position rotary switch with pointer knob, with the following positions:

1) PT - This position shall place the RT into plain text mode. The operator shall be required to pull the knob in order to place the knob into this position.

2) CT - This position shall place the RT into cipher text mode.

3) TD - This position shall be non-functional.

4) RV - This position shall prepare the RT to receive a remote fill of COMSEC variables from the NCS.

5) Z - This position shall clear COMSEC keys. The operator shall be required to pull the knob in order to place the knob into this position.

(k) VOL/WHSP control shall be a rotational knob used for audio volume control. This knob shall also provide a pull out position which shall be non-functional.

(l) HUB Connector - Dummy cover that shall not be removable.

(m) AUD/FILL connector shall be a dummy 3-D connector.

(n) AUD/DATA connector shall be a dummy 3-D connector. In vehicular installations, a dummy 3-D cable shall connect to the AUD/DATA and the DATA A or DATA B connector of the mounting adapter.

(10) SINCGARS Radios shall be mounted in a short/long range radio configuration.

(a) This mounting shall replicate the AN/VRC-89A configuration which contains the following:

1) Amplifier-adapter, vehicular (mounting adapter) AM-7239B/VRC.

2) Amplifier, radio frequency AM-7238A/VRC.

3) Receiver-transmitter, radio RT-1523A.

4) Receiver-transmitter, radio RT-1523A.

5) Loudspeaker control unit, LS-671/U.

(b) The mounting adapter shall have two (2) SINCGARS receiver-transmitters as described above. The mounting adapter shall have a simulated Radio Frequency Amplifier connected, and shall also have the following components:

1) CB1 (power) switch shall be a two position trippable toggle switch with an ON and OFF position.

2) Indicator lamp and lens shall be a green dimmable indicator. The indicator shall flash for 3 +/- 1 second after CB1 switch is moved to ON position, then stay lit. The lens shall allow the indicator to be dimmed by turning clockwise.

3) The (AUD/DATA B J2) connector shall be a 3-D dummy connector.

4) The (AUD/DATA A J3) connector shall be a 3-D dummy connector.

5) The (DATA B J4) connector shall be a 3-D dummy connector with a dummy cable connected to the AUD/DATA connector on the top radio.

6) The (DATA A J5) connector shall be a 3-D dummy connector with a dummy cable connected to the AUD/DATA connector on the bottom radio.

7) The (SPKR J6) connector shall be a 3-D dummy connector.

(c) The radio frequency amplifier shall be connected to the mounting adapter. The radio frequency amplifier shall have the following components.

1) The (J1) connector shall be a dummy connector. A dummy cable which represents the connection to a vehicle antenna shall be connected to the J1 connector.

2) The (J2) connector shall be a dummy connector. A dummy cable which also connects to the ANT connector of the RT mounted in the bottom position of the mounting adapter shall be connected to the J2 connector.

(11) MAIN GUN LOAD/UNLOAD switch shall be a trainer unique switch, When depressed, this switch shall initiate the virtual task of loading the main gun when unloaded and unloading the main gun when loaded.

(12) BREECH OPEN/CLOSE switch shall be a trainer unique, three position, spring-loaded to center switch. Activating the switch to the upper position shall initiate the virtual task of opening the main gun breech and activating the switch to the lower position shall initiate the virtual task of closing the breech.

(13) MAIN GUN STATUS - shall be a trainer unique panel that is used to monitor the status of the 120mm main gun. The panel shall contain the following:

(a) ROUND LOADED shall indicate that a virtual round is loaded in the breech.

(b) ROUND UNLOADED shall indicate that a virtual round is not loaded.

(c) BREECH CLOSED shall indicate that the breech is closed.

(d) BREECH ACCESSIBLE shall indicate that the breech is in a position to be opened.

(e) BREECH OPENED shall indicate that the breech is opened.

(f) STUB DEFLECTOR UP shall indicate that the stub deflector is in the up position.

(g) STUB DEFLECTOR DOWN shall indicate that the stub deflector is in the down position.

(14) The coax machine gun ammo supply, load and unload functions as follows:

(a) CANS IN STORAGE - shall be a trainer unique panel used to monitor the storage and control the removal of cans of ammo from the 7.62mm storage area. The following components shall be provided:

1) CANS IN STORAGE shall be a 2 digit display that indicates the simulated number of ammo cans in the ammo storage area.

2) TRANSFER A CAN TO READY shall be a pushbutton switch that indicates the simulated transfer of an ammo can from the storage area to the 7.62mm coaxial machine gun feed chute.

(b) ROUNDS IN READY BOX - shall be a trainer unique panel indicating the number of rounds in the ready box.

(c) MACHINE GUN - shall be a trainer unique panel used to control and monitor the loading and unloading of the 7.62mm coaxial machine gun. The following components shall be provided:

1) LOAD/UNLOAD shall be a pushbutton switch that when depressed initiates the simulated loading of the 7.62mm coaxial machine gun if unloaded or the simulated unloading of the 7.62mm coaxial machine gun if loaded.

2) LOADED indicator shall be a red indicator that illuminates when the 7.62mm coaxial machine gun is loaded. The indicator shall flash during the simulated load time.

3) UNLOADED indicator shall be a green indicator that illuminates when the 7.62mm coaxial machine gun is unloaded. The indicator shall flash during the simulated unload time.

(15) Coax ammunition ready box shall be a mock-up.

(16) Coax ammunition feed chute shall not be replicated.

(17) Azimuth travel lock shall not be replicated.

(18) Loader’s seat assembly shall replicate the actual M1A1 loader’s seat and shall include the full range of motion and adjustments except that the seat back shall not fold down. The seat shall include the following:

(a) Height adjustment lever

(b) Swing latch

(c) Seat back

(d) The seat shall have the capability of simulating vehicle vibrations.

(19) Ready rack ammo status shall be eighteen trainer unique indicators. These indicators shall indicate the number of virtual rounds being stored. If rounds are being stored, these indicators shall indicate what type, “SABOT” or “HEAT”.

(20) SEMI-READY AMMUNITION RACK - shall be a trainer unique panel used to monitor the storage and control the removal of rounds from the semi-ready rack. The following components shall be provided:

(a) AMMO DOOR OPEN/CLOSE switch shall be a pushbutton switch that when depressed initiates the simulated opening of the semi-ready rack door if closed or the simulated closing of the semi-ready rack door if open.

(b) AMMO DOOR OPEN indicator shall be a red indicator that illuminates when the semi-ready rack is open. The indicator shall flash during the simulated opening time.

(c) AMMO DOOR CLOSED indicator shall be a green indicator that illuminates when the semi-ready rack is closed. The indicator shall flash during the simulated closing time.

(d) HEAT indicator shall be a two digit display that indicates the number of virtual HEAT rounds stored in the semi-ready rack. The display shall be blank when the AMMO DOOR CLOSED indicator is illuminated.

(e) REMOVE FROM RACK switch shall be a pushbutton switch that initiates the removal of a virtual HEAT round from the semi-ready rack. The switch shall be inoperative when the AMMO DOOR CLOSED indicator is illuminated.

(f) APFSDS indicator shall be a two digit display that indicates the number of virtual SABOT rounds stored in the semi-ready rack. The display shall be blank when the AMMO DOOR CLOSED indicator is illuminated.

(g) REMOVE FROM RACK switch shall be a pushbutton switch that initiates the removal of a virtual SABOT round from the semi-ready rack. The switch shall be inoperative when the AMMO DOOR CLOSED indicator is illuminated.

(21) HULL AMMUNITION RACK - shall be a trainer unique panel used to monitor the storage and control the removal of rounds from the hull ready rack. The time delays associated with the manual operation of the ammunition door, door clamps,

and clamp bar shall be simulated in the design of the ammunition transfer. The panel shall be active only when the turret is positioned between 300 and 310 degrees (0 degrees is when the main gun is pointing forward and aligned with vehicle centerline). The following components shall be provided:

(a) AMMO DOOR OPEN/CLOSE switch shall be a pushbutton switch that when depressed initiates the simulated opening of the hull ammo door if closed or the simulated closing of the hull ammo door if open.

(b) AMMO DOOR OPEN indicator shall be a red indicator that illuminates when the hull ammo door is open. The indicator shall flash during the simulated opening time.

(c) AMMO DOOR CLOSED indicator shall be a green indicator that illuminates when the hull ammo door is closed. The indicator shall flash during the simulated closing time.

(d) HEAT indicator shall be a two digit display that indicates the number of virtual HEAT rounds stored in the hull ammo rack. The display shall be blank when the AMMO DOOR CLOSED indicator is illuminated.

(e) REMOVE FROM RACK switch shall be a pushbutton switch that initiates the removal of a virtual HEAT round from the hull ammo rack. The switch shall be inoperative when the AMMO DOOR CLOSED indicator is illuminated.

(f) APFSDS indicator shall be a two digit display that indicates the number of virtual SABOT rounds stored in the hull ammo rack. The display shall be blank when the AMMO DOOR CLOSED indicator is illuminated.

(g) REMOVE FROM RACK switch shall be a pushbutton switch that initiates the removal of a virtual SABOT round from the hull ammo rack. The switch shall be inoperative when the AMMO DOOR CLOSED indicator is illuminated.

(22) Loader's NBC hookups are as follows:

(a) Mask air duct socket shall be physically and functionally replicated.

(b) Cooling Vest air duct socket shall be physically replicated.

(c) Cooling Vest air duct socket cap shall be physically and functionally replicated.

(23) Loader's Condition indicator - shall be a trainer unique 2 lamp assembly. An amber lamp shall be illuminated when the loader is considered to be wounded; a red lamp shall be illuminated when the loader is considered dead.

(24) Shoulder guard shall be physically and functionally replicated.

(25) Knee guard shall be physically and functionally replicated.

(26) Safety guard shall be physically and functionally replicated. The following related items will be replicated as follows:

(a) Frame shall be physically and functionally replicated.

(b) Latch bolt shall be physically and functionally replicated.

(27) Foot guard shall be physically and functionally replicated.

F.3.1.2.2.4 120 mm Main Gun.

The following controls, indicators, and other pieces of equipment shall be provided in the locations as found in the actual M1A1.

(a) The following controls, indicators, and other pieces of equipment shall be simulated as follows:

1) Breechblock shall be a mock-up.

2) SAFE/ARMED switch handle shall be a two position handle assembly for arming and disarming main gun firing circuit.

3) Coaxial machine gun mount shall be a mock-up.

4) Replenisher shall not be replicated.

5) Elevation travel lock shall not be replicated.

6) Ejection chute shall be a mock-up.

7) Zero degree elevation switch shall not be replicated.

8) Machine gun firing solenoid shall be a mock-up.

9) 7.62 mm coaxial machine gun shall be a partial mockup. The forward portion of the 7.62 mm coaxial machine gun shall not be replicated due to the fact that it falls outside of the boundaries of the M1A1 module.

10) Smoke box shall not be replicated.

11) Electronics Rack shields and guards shall be mock-ups. The following items (which fall behind these shields) shall not be represented:

a) Computer Electronics Unit (CEU)

b) Gun/Turret Drive Electronics (GTD)

c) Line-of-Sight Electronics (LOS)

d) Thermal Imaging Control Unit (TEU)

e) Thermal Imaging Control Power Control Unit (PCU)

12) Hull to t~~T~~urret Slipring guards shall be mock-ups. The hull to t~~T~~urret slipring which falls behind the shields) shall not be represented.

F.3.1.2.2.5 Trainer Unique - Common.

The following controls, indicators, and other pieces of equipment shall be trainer unique equipment common to all M1A1 simulation systems.

a. The following controls, indicators, and other pieces of equipment shall be simulated as follows:

(1) Simulated compass (grid azimuth indicator) shall be a three-digit display depicting the orientation of the long axis of the vehicle on the simulated terrain referenced to grid north. The simulated compass shall function, inside the compartment, only after the vehicle has been stationary for 15 seconds.

(2) Turret/hull reference indicator shall be a series of indicators displaying the direction/orientation of the turret relative to the hull, +/- 15 degrees.

F.3.1.2.2.6 Commander's Popped Hatch Unique Components.

The following controls, indicators, and other pieces of equipment shall be provided in the locations as found in the actual M1A1, except as stated otherwise.

a. The following controls, indicators, and other pieces of equipment shall be simulated (functional):

(1) Binocular capability shall be provided by a trainer unique device as follows:

(a) A momentary pushbutton switch shall be provided which, when depressed, will enable the binocular capability on the CPH display.

(b) A two axis joystick shall be provided which, when the momentary pushbutton is depressed, shall slew the binocular reticle in azimuth and the CPH imagery in elevation.

(2) Night vision goggles shall be functionally replicated as follows:

(a) A trainer unique momentary pushbutton switch shall be provided which will enable and disable the night vision capability.

(b) When the night vision capability is activated, the CPH shall display night vision imagery.

F.3.1.2.3 External Interface Unit.

The M1A1 manned module shall be provided with an External Interface Unit (EIU) that consists of an entry device and display device. The EIU shall be used to display the following information:

a. Exercise number

b. Vehicle identification number.

The EIU shall be used to control and monitor the following M1A1 functions:

a. Initiation and termination of self-repairs

b. Initiation and termination of fuel transfers

c. Initiation and termination of ammo transfers

d. Connection and disconnection of a tow kit to another vehicle

e. External munitions loading

f. Damage assessment

g. Load SINCGARS hop set and COMSEC data.