ANNEX D

SYSTEM REQUIREMENTS DOCUMENT
FOR THE
TACTICAL WHEELED VARIANT (TWV)
INCLUDING
VEHICLE SPECIFIC KITS
FOR
THE COMMON DRIVER TRAINER (CDT) SYSTEM

VERSION 2.0

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SYSTEM REQUIREMENTS DOCUMENT FOR THE TACTICAL WHEELED VARIANT (TWV) INCLUDING VEHICLE SPECIFIC KITS FOR THE COMMON DRIVER TRAINER (CDT) SYSTEM

1. Scope

This System Requirements Document (SRD) describes the requirements for the Tactical Wheeled Variant (TWV) simulated vehicle driver's compartment hardware and software. When the driver's compartment is installed on a Common Driver Trainer (CDT) platform, the collective system becomes a CDT TWV that provides training for drivers of various types of TWV vehicles. The CDT TWV will provide training of TWV vehicles to drivers during New Equipment Training and sustainment training. The trainer will enable training in the critical driver tasks that can be repetitively trained in a simulator. It will also allow training of driver tasks that are dangerous and/or infrequently trained in the "real world" (driving on ice, fording streams, driving under blackout conditions, driving down a steep embankment when coming off an improved road, etc.).

Appendices contain the requirements for vehicle specific kits. Each kit includes the vehicle specific driver's compartment hardware and simulation software needed to convert the base CDT TWV to match a specific vehicle's physical and functional characteristics.

1.1 Background

The U.S. Army has identified a need for initial and sustainment driver training for the various tracked, wheeled and heavy equipment vehicles employed by the Army to accomplish its mission. The training must incorporate a variety of terrains, driving conditions and tactical situations.

A CDT configuration has been developed that is composed of common training subsystem modules. The common modules are the Instructor Operator Station (IOS), computational subsystem, visual/display subsystem, aural/communication subsystem, motion subsystem, After Action Review (AAR) subsystem and Scenario Generation System. The CDT subsystems have documented hardware, software and electrical configurations and interfaces for simulated variant vehicle driver's compartment installation.

The IOS subsystem provides specific overall CDT initialization, setup and control. The IOS also allows the instructor to select training scenarios, monitor and manage scenario execution, modify training scenarios and manage student records.

The computational subsystem provides the computational capability of the CDT. The computational subsystem is composed of various simulation computers which provide simulator control, calculation of variant vehicle operating characteristics (simulated vehicle dynamics and feedback in response to driver input), data interface, and student record keeping.

The visual/display subsystem of the CDT provides a computer generated representation of the synthetic environment to the driver. The 45 degree vertical by 180 degree horizontal field of view can accommodate out the windshield viewing for various wheeled vehicles and both open and closed hatch modes of operation for armored vehicles. The visual data base depicts various types of terrain including flat, hilly, mountainous, urban and desert terrain. The visual data base also depicts various paved road configurations and types, off road obstacles and hazards and a variety of environmental conditions.

The aural/communications subsystem of the CDT provides the simulated vehicle sounds, environmental sounds (e.g., explosion), aural cues and communications matrix between driver trainee(s) and instructor necessary to support the training tasks and instruction.

The motion subsystem consists of a motion platform with 6 degrees of freedom (i.e., roll, pitch, yaw, heave, surge and sway) that simulates vehicle motion and forces (e.g., acceleration, deceleration) in response to driver trainee vehicle control and environmental inputs.

The AAR subsystem of the CDT provides the capability to record the training scenario and provide the instructor the capability to provide visual playback and analysis of driver trainee performance.

The vehicle variant subsystem includes the driver's compartment module and simulation software necessary to provide the configuration and vehicle dynamics of the variant vehicle being simulated. The main components of the driver's compartment module are the controls, instruments, switches, panels, seating and physical structure of the variant vehicle necessary to accomplish the required training tasks. The simulation software provides the driver's compartment control/switch interaction and simulator response for the controls, instruments, switches and panels necessary to accomplish the required training tasks.

1.1.1 TWV Variant

The CDT TWV is a variant for the CDT. This variant shall include the specific modules necessary to provide the configuration and vehicle dynamics of the TWV family of vehicles. The CDT TWV shall use all of the common modules as specified in the CDT Common SRD and the specific modules for the TWV Variant as defined herein. The main components in the specific modules are the driver compartment, swappable vehicle specific dash panels with instruments and controls for the driver, space and visual

constraint modules (if necessary) and the software required to operate the driver compartment and interact with the common modules in the CDT.

1.1.2 TWV Family of Vehicles & Equipment

TWV major variants include the following vehicles and equipment:

- M1083A, Medium Tactical Vehicle (MTV)
- M1120A4, Heavy Expanded Mobility Tactical Truck (HEMTT)
- M915A3, Line Haul Tractor Truck
- M915A5, Line Haul Tractor Truck
- M1095, 5 Ton, Medium Tactical Vehicle Trailer (MTVT)
- M872A4, 34 Ton, Semitrailer
- M1076, Palletized Load System Trailer (PLST)
- M1077, Palletized Load System (PLS)

2.0 Applicable Documents

TM 9-2320-392-10 (Vol. 1-3), Technical Manual Operator's Manual, The M1083A1 Series 5 Ton, 6 X 6 Medium Tactical Vehicles (MTV) dated 1 Jan 2005, 2 Jan 2005 and 3 Mar 2009

TM 9-2320-345-10, Technical Manual Operator's Manual Truck, Load Handling System (LHS), W and W/O Winch, 8x8 M1120A4 dated 10 Oct 2008

TM 9-2320-302-10, Technical Manual Operator's Manual, Truck, Tractor, Line Haul, 52,000 GVWR, 6 X 4, M915A3 dated 10 Dec 2005

TM 9-2320-426-10, Technical Manual Operator's Manual, Truck, Tractor, Line Haul, 66,000 GVWR, 6 X 4, M915A5 dated 10 Jun 2010

TM 9-2330-394-13&P, Operator's, Field Level Manual M1095 Series, 5 Ton, Medium Tactical Vehicle Trailer (MTVT) dated Jan 2005

TM 9-2330-385-10, Technical Manual Operator's Manual, Palletized Load System Trailer (PLST), M1076 dated 10 Apr 2009

TM 9-2320-345-10, Technical Manual Operator's Manual for Truck, Load Handling System (LHS), 8X8, M1120A4 dated 25 February 2014

TM 9-3990-206-10, Technical Manual Operator's Manual, Palletized Load System (PLS) Flatrack, M1077/M1077A1 dated 10 Apr 2009

TM 9-2330-359-14&P, Technical Manual, Semitrailer, Flatbed: Breakbulk/Container, Transporter, 34 Ton, M872, A1, A2, A3 dated Aug 1991

TM 9-2330-331-14&P, Technical Manual, Semitrailer, Flatbed: Breakbulk/Container, Transporter, 34 Ton, M872A4 dated Dec 2005

TM 11-5855-311-12&P-2, Driver's Vision Enhancer (DVE) dated 15 Dec 2008

DRAFT TM 11-7010-485-13&P Movement Tracking System (MTS) Military Rugged Tablet (MRT) Control Station (CS)

DRAFT TM 11-7010-48413&P Movement Tracking System (MTS) Military Rugged Tablet (MRT) Mobile Unit
System Requirements Document for the Common Driver Trainer System, PRF-PT-00430 Version 6.0 dated 27 Jan 2016.

In the event of a conflict between the requirements of this document and those contained in the documents above, the requirements contained in this document take precedence.

3.0 Requirements

3.1 System Level Requirements

The CDT TWV shall consist of the CDT Common Modules hardware and software and the reconfigurable TWV specific module hardware and software as specified herein. The CDT common modules are the IOS, computational subsystem, visual/display subsystem, aural/communication subsystem, motion subsystem, AAR subsystem and Assistant Driver (AD) work station. The CDT common modules have defined configurations, mechanical interfaces, electrical interfaces and software architecture/interfaces. The reconfigurable TWV specific module shall interface to the CDT by the defined interfaces for the CDT modules listed above and shall not degrade the performance of existing CDT variants. The reconfigurable TWV specific module shall be integrated with the CDT common modules for the CDT TWV configuration. The CDT TWV specific module shall consist of the simulated reconfigurable driver's compartment, the CDT TWV common instruments and controls for the driver, an AD work station and the software required to operate the driver's compartment, the AD's work station and interact with the CDT Common Modules. The CDT TWV specific module shall include vehicle specific kits with each kit containing one or more removable dash panel assemblies, the software to provide the specific vehicle performance in response to driver inputs and, if necessary, TWV cab space and visual constraints and auxiliary panels.

3.1.1 Common Module Requirements

3.1.1.1 Instructor Operator Station (IOS)

The IOS shall control the operation of four CDT TWV Student Training Stations (STSs), select/modify training scenarios, monitor simulated vehicle status (e.g., instruments, switches, etc.) monitor driver and AD trainee performance and manage student records in accordance with the requirements of the System Requirements Document for the Common Driver Trainer System, PRF-PT-00430.

The IOS shall have Graphical User Interfaces (GUI) tailored to the operation of the TWV vehicles as follows:

A. The IOS shall display on the Master Display the following information for each STS controlled:

1). STS Designation
2). Vehicle being simulated
3). Scenario odometer
4). Scenario elapsed time
5). Speed
6). Engine Speed (Tachometer reading)
7). Transmission Gear Selector
8). Steering Wheel Position (Graphical indication)
9). Throttle Pedal Position (Graphical Indication)
10). Service Brake Pedal Position (Graphical Indication)
11). Trailer Brake position (Graphical Indication)
12). Parking Brake
13). Trailer Parking Brake
14). Dashboard gauge values
15). Dashboard and auxiliary panel switch status
16). Dashboard and auxiliary panel indicator status
17). Active Malfunction(s)
18). Scoring Events
19). Running score for driver
20). Running score for AD
21). Playback controls
22). AD functions status
23). Convoy Following Distance

B. The Topographical Map display shall be segmented to simultaneously display the topographical map for each STS when in individual or integrated modes. When in networked mode, a single topographical map shall be displayed for the scenario. Each STS shall be shown on the appropriate topographical map with the features defined in System Requirements Document for the Common Driver Trainer System, PRF-PT-00430.

C. The Stealth View display shall be segmented to simultaneously display the stealth view of each STS as defined in System Requirements Document for the Common Driver Trainer System, PRF-PT-00430 paragraph 3.4.1.1.2.4 during individual or integrated modes of operation. The stealth view of each vehicle shall initially be at a default tethered position above and behind the vehicle. The IOS shall have the capability to select a specific STS stealth view for full screen viewing and/or stealth view eye point positioning. When in networked mode, the IOS shall be able to select a networked STS vehicle stealth view to display on the IOS Stealth View display.

D. The IOS shall have STS video displays to simultaneously display the Out The Window (OTW) views, Drivers Vision Enhancer (DVE) view and Closed Circuit TV (CCTV) view of each STS in a segmented display configuration. The IOS

shall have the capability to select a specific STS video view for full screen viewing.

3.1.1.2 Computational Subsystem

The Computational Subsystem shall process all CDT TWV software in accordance with the requirements of the System Requirements Document for the Common Driver Trainer System, PRF-PT-00430. Computational spare for the CDT TWV system shall be defined as each computer shall have a minimum of 10% spare processing capacity, with a total average across all computers of a minimum of 50% under worst case conditions.

3.1.1.3 Visual/display Subsystem

The Visual subsystem shall produce visual imagery for the CDT TWV in accordance with the image generation requirements of the System Requirements Document for the Common Driver Trainer System, PRF-PT-00430.
The visual database(s) used to produce the imagery for the CDT TWV shall be in accordance with the requirements of the System Requirements Document for the Common Driver Trainer System, PRF-PT-00430.
The display system used to display the visual imagery for the CDT TWV shall be in accordance with the display system requirements of the System Requirements Document for the Common Driver Trainer System, PRF-PT-00430.
The AD work station shall have the STS OTW imagery displayed on flat screen, color monitors to provide the same Field Of View (FOV) seen by the driver.

3.1.1.4 Aural/Communication Subsystem

The aural/communications system used in the CDT TWV, including the AD work station, shall be in accordance with the requirements of the System Requirements Document for the Common Driver Trainer System, PRF-PT-00430.

3.1.1.5 Motion Subsystem

The motion system for the CDT TWV shall be in accordance with the requirements of the System Requirements Document for the Common Driver Trainer System, PRF-PT-00430.

3.1.1.6 After Action Review (AAR)

The AAR system for the CDT TWV shall be in accordance with the requirements of the System Requirements Document for the Common Driver Trainer System, PRF-PT-00430. The AAR system shall be combined with the AD work station to present the AAR output on one of the Assistant Driver/Vehicle Commander (AD/VC) work station monitors.

3.1.1.7 Scenario Generation System

The Scenario Generation System for the CDT TWV shall be in accordance with the requirements of the System Requirements Document for the Common Driver Trainer System, PRF-PT-00430.

3.1.2 Operational Requirements

The CDT TWV requirements for physical space, power requirements, safety limitations/considerations, system start times, setup times and reconfiguration times shall be in accordance with the requirements of the System Requirements Document for the Common Driver Trainer System, PRF-PT-00430.

3.2 Variant Requirements

The CDT TWV shall include a reconfigurable driver's compartment, AD work station, vehicle specific kits and simulation software that provide the physical configuration, controls, instruments, vehicle operation and vehicle dynamics of each of the supported vehicles in the TWV family of vehicles . The main components of the driver's compartment are the controls, instruments, switches, panels, seating and physical structure of the TWV vehicle version necessary to accomplish the required training tasks. When configured as a specific TWV vehicle driver's compartment, the simulation software shall provide the driver's compartment control and switch interaction and simulator response for the controls, instruments, switches and panels necessary to accomplish the required TWV training tasks. The simulation software shall provide realistic vehicle dynamic responses to driver control inputs and simulated training environment interactions. The driver's compartment shall provide the status of hardware and software to the CDT system through the defined interfaces during CDT daily readiness tests. During initialization, the system shall check the installed configuration and provide an indication to the instructor/operator which specific TWV configuration is installed and provide an error message if there are any reconfigurable components mismatches or components not installed.

The main components of the AD work station shall be the monitors for the driver's cab OTW imagery (left, center and right), an intra-vehicle communication system and computer workstation (Central Processing Unit (CPU), keyboard, etc.) with a touch screen display. The monitors display the same imagery that the driver views OTW of the cab. The computer workstation is used to simulate the controls, instruments, switches and panels of the variant vehicle necessary for the AD to accomplish the required training tasks.

3.2.1 Variant Training Requirements

The CDT TWV shall train the training tasks listed in the following paragraphs to be performed by the student(s), the performance to be assessed by the system and monitored

by the instructor. The training tasks generally reflect the numerous and varied skills that comprise the task of operating a TWV vehicle.

TWV Driver Training Tasks:

a. Enter driver's compartment
b. Check door lock
c. Adjust driver's seat
d. Fasten seat belt
e. Check driver compartment fire extinguisher-manual
f. Perform systems check (M1083A1, M1120A4, M915A3 and M915A5)
g. Check warning and hazard lights
h. Operate the Container Handling Unit
i. Operate the Load Handling System
j. Operate Central Tire Inflation System (CTIS)
k. Check Hazard lights
l. Check, monitor Driver's Instrument Panel
m. Operate driving controls
n. Operate transmission
o. Operate transfer case
p. Operate engine brake
q. Operate trailer brake
r. Operate steering
s. Operate brakes
t. Operate service lights
u. Slow/fast forward driving
v. Reverse driving
w. Motor pool parking
x. Decelerate smoothly to a halt
y. Operate the DVE night vision device
z. Shut down engine/vehicle
aa. Secure the station
bb. Adjust the driver's seat (adjust for ingress/egress or operation)
cc. Operate the vehicle in extreme cold (winter conditions)
dd. Respond to malfunctions
ee. Check Door status
ff. Vehicle starting (normal and cold start)
gg. Vehicle shutdown
hh. Drive on narrow roads
ii. Drive on urban roads
jj. Drive on highway / Interstate highways
kk. Drive in towns
ll. Navigate Overhead obstacles
mm. Drive in a convoy
nn. Fording

oo. Drive in mountains
pp. Drive on side slopes under 20 degrees
qq. Drive on steep hills
rr. Drive on plains terrain
ss. Drive on rolling hills
tt. Drive on forest trails
uu. Drive in dessert conditions
vv. Drive during inclement weather
ww. Tactical road march
xx. Drive over logs / obstacles
yy. Drive on inclines under 45 degrees
zz. Drive onto railroad car
aaa. Respond to Ground Guide commands
bbb. Cross Bridges
ccc. Cross assault bridges
ddd. Loading on Watercraft
eee. Loading on Aircraft
fff. Herringbone formation
ggg. Minefield crossing
hhh. React to Improvised Explosive Device (IED) identification, explosion or ambush
iii. Operate Truck with Trailer

TWV AD Training Tasks:

a. Navigate using the Joint Capabilities Release Logistics (JCR-LOG)
b. Send and Receive text messages with the JCR-LOG
c. Operate the vehicle communications system
d. Assist in IED/Threat/Ambush recognition
e. Clear vehicle blind sides

3.2.1.1 Malfunction/Emergency Condition Training Requirements

The CDT TWV shall simulate the following emergency conditions/malfunctions:

a. Vehicle Control - The vehicle control criteria shall be monitored continuously during scenario execution. A vehicle control error shall be produced in accordance with the following criteria:
    i. Loss of Steering
    ii. Loss of Brakes
    iii. Loss of Brakes from overheating
    iv. Loss of Trailer brakes
    v. Loss of Engine Power

vi. Flat Tire

The CDT TWV shall train the driver to react to the following indicators:

i. Annunciator Panel Fault Indicator
ii. Check Engine Indicator
iii. Engine Oil Pressure Indicator
iv. Engine Coolant Temperature Indicator
v. Restricted Airflow Indicator
vi. Low Air Pressure Indicator
vii. Low Fuel Indicator
viii. React to Transmission Control Malfunction Indicator
ix. Transmission Fluid Temperature Indicator
x. Transmission Locked
xi. Transmission Fault Indicator
xii. Low Battery Voltage Indicator
xiii. Anti-lock Braking System (ABS) Fault Indicator
xiv. Park Brake On Indicator

b. AD's Station (ADS) Controls and Functions – The ADS controls and functions shall be monitored continuously during scenario execution. A control or function error shall be produced in accordance with the following criteria:
   i. JCR-LOG not powering on
   ii. JCR-LOG loses signal and information
   iii. JCR-LOG communications drop

3.2.2 Specific Reconfigurable TWV Module Requirements

3.2.2.1 Simulated Driver Compartment

The CDT TWV driver's compartment shall be reconfigurable between supported vehicles in the TWV family of vehicles. The driver's compartment shall be composed of common components listed in paragraph 3.2.2.1.1 below and specific components listed in paragraphs 3.2.2.1.2 and 3.2.2.1.3 below or the vehicle specific appendices depending on the configuration selected. The specific components shall be, to the maximum extent possible, easily installed and removed to configure the driver's compartment properly for the specific vehicle configuration. The specific hardware configuration along with the specific simulation software shall define the driver's compartment as one of the supported TWV vehicles. The specific driver's compartment configuration shall simulate the physical and functional characteristics of the supported TWV vehicle with sufficient fidelity to adequately train the students in the training tasks listed in paragraph 3.2.1 above or the vehicle specific appendices depending on the configuration selected. When a vehicle specific kit is installed, the CDT TWV driver's compartment configuration shall replicate all instruments, indicators, gauges, controls, lights, switches, displays, driver's door, and the components listed in paragraph 3.2.2.1.1, 3.2.2.1.2 and 3.2.2.1.3 below or

the vehicle specific appendices to Annex D depending on the configuration selected to support the training tasks defined in paragraph 3.2.1 of each vehicle specific Appendix. All instruments, indicators, gauges, controls, lights switches, displays and components of the driver's compartment that are non-tactile (i.e., viewed but not touched) and not used for training shall be dimensionally accurate to within +/- 20%. All non-tactile instruments, indicators, gauges, controls, lights, switches, displays and components of the driver's compartment used for training shall be dimensionally accurate to within +/- 15%. All tactile instruments, indicators, gauges, controls, lights, switches, displays and components of the driver's compartment used for training shall be dimensionally accurate within a tolerance of +/- 0.25 inches.

The location within the driver's compartment of tactile and non-tactile components that are used for training shall be accurate within +/-2.0 inch and maintain the relation between adjacent components within +/-.25 inches. Non-tactile components that are not used for training shall be located within +/-3.0 inches of their actual position. All measurements shall be made from a single reference point.

The CDT TWV driver's compartment shall include universal mounting locations, interfaces and cabling to support installation and use of the CDT TWV kits specified in the appendices.

Items normally present in the driver compartment of the vehicle, but not critical for training the required driver tasks shall be presented in mock-up form with the same size, shape and location as the vehicle components. Detachable devices (i.e. DVE night vision device) on the vehicles used to drive the vehicle shall also be simulated. The vehicle body, windshield and windows and, if appropriate, external frame assemblies shall be replicated to provide appropriate visual and human factor obstructions. The driver's compartment shall include a cross cab fresh air circulation and exchange system with sufficient airflow to maintain the internal temperature within +5 degrees F of the temperature outside the driver's compartment.

The cab exchange time(s) and interfaces shall be In Accordance With (IAW) the System Requirements Document for the Common Driver Trainer System, PRF-PT-00430.

Re-configuring from one CDT TWV vehicle specific kit to another CDT TWV vehicle specific kit shall be achievable by a two person crew in less than 30 minutes, with a desired objective time of 15 minutes.

Each vehicle specific kit shall include one or more ruggedized storage containers for storing accessory panels, switchboxes, vision restriction plates and space restrictors. Vehicle specific dashboards shall be stored on either fixed or mobile racks capable of holding multiple dashboards. Whenever possible, all components required to simulate a particular vehicle or family of vehicles shall be stored within a single storage container. All storage containers shall meet the requirements for a two-man lift.

3.2.2.1.1 Driver's Compartment Subsystem Common Components

The driver's compartment subsystem shall simulate the following common components of the driver's compartment for the TWV vehicles:

Driver's Door
Steering Column and Wheel
Throttle
Service Brake Pedal
Driver's Seat including 3 point seat belt system
DVE Night Vision Device

The CDT TWV baseline vehicle cab shall replicate the the overall drivers position dimensions of the M1083A1 MTV. Right hand side of cab can be truncated due to overall CDT cab width requirements.

Reconfiguration of the driver's compartment subsystem between supported vehicles in the TWV family of vehicles shall not require removal or replacement of any of the Driver's Compartment Subsystem Common Components.

The Driver's Compartment Common Components shall have the following capabilities and characteristics:

3.2.2.1.1.1 Driver's Door

The driver's door assembly shall be representative of the four simulated TWV vehicles. The door shall have an approximate overall dimension of 41 inches wide by 55 inches tall. The door shall have a rectangular shape (no wheel well cutouts) with the front upper edge conforming to the windshield slant. The driver's door window shall be permanently secured in the closed position. A latch mechanism shall be provided to secure the door in the fully closed position. A door opening handle representative of the TWV vehicles shall be provided on the inside and outside of the door. The door shall be safety interlocked to the motion subsystem to allow motion only when the door is in the fully closed and secured position. The driver's door shall include mounting devices for mounting space and vision constraint modules included in vehicle specific kits, if applicable.

3.2.2.1.1.2 Steering Column and Wheel

The Steering Wheel of the TWV cab shall be representative of the TWV vehicles simulated and 18 inches in diameter. The steering column shall have the capability to tilt and telescope to accommodate the different steering wheel angles and heights of the TWV vehicles being simulated. The Column and Wheel shall be positioned in the cab to be able to be adjusted to a representative configuration for each of the TWV vehicles being simulated. The steering wheel/column shall have a turn signal control (left) and a

trailer brake hand control lever (right). The turn signal control shall have a push button on the end of the control and a pull switch (pull turn signal stalk towards the steering wheel) capability. The steering wheel shall have a button cap switch in the center that is programmable to be active. The pull switch capability and the push button shall be programmable to the function of the vehicle being simulated (i.e., headlight dimmer, horn). The steering simulation shall represent the appropriate force feel cues, sensitivity, deflection and number of turns lock to lock required for steering and turning each of the simulated vehicles.

3.2.2.1.1.3 Throttle

The throttle pedal shall have the representative dimensions, range of motion, adjustments and position as the TWV family of vehicles throttle pedal. The simulation shall represent the appropriate force feel cues and deflection required for accelerating each of the simulated vehicles.

3.2.2.1.1.4 Service Brake Pedal

The service brake pedal shall have the representative dimensions, range of motion, adjustments and position as the TWV family of vehicles service brake pedal. The simulation shall represent the appropriate force feel cues and deflection required for decelerating each of the simulated vehicles. The service brake shall utilize compressed air to provide the feel and aural cues representative of actual vehicle operation.

3.2.2.1.1.5 Driver's Seat

The driver's seat shall have the representative dimensions, controls, range of motion, adjustments and position as the TWV family of vehicles driver's seat. Fore and aft adjustment shall accommodate the seat to dash/steering wheel dimensions of the simulated vehicles. The seat height adjustment shall accommodate the seat height above floor dimension for each of the simulated vehicles. The driver's seat shall have the capability of being air suspended or locked at a specific height depending on the simulated vehicle.

3.2.2.1.1.6 DVE Night Vision Device

The CDT TWV driver's compartment shall include a DVE system. The DVE shall be mounted in the CDT TWV cab in the same location as operational vehicle cabs within the tolerances specified in paragraph 3.2.2.1. The DVE support shall replicate the size, shape and adjustability of the operational system. A power and signal connector shall be provided. The DVE shall replicate the image (sensor location, field of view and image characteristics) of the simulated TWV vehicle's DVE. The gain, level, brightness and white hot/black hot controls shall be operational and modify the displayed image as in the operational system. The look angle of the DVE shall be controlled by the Pan and Tilt

Module (PTM) controller. The PTM controller shall be located based on the variant specific location. The PTM controller shall function IAW TM 11-5855-311-12&P-2.

3.2.2.1.2 Specific Driver's Compartment Hardware Components

The CDT TWV baseline vehicle cab shall include the following specific hardware components:

a. Interchangeable Dashboard Panels
b. Cab Windshield
c. Auxiliary panels
d. Space Constraints

3.2.2.1.2.1 Interchangeable Dashboard Panels and Equipment

The CDT TWV driver's compartment shall include removable dashboard assemblies, consisting of all gauges, switches, controls and indicators of the specific vehicle being simulated. The TWV cab shall include universal mounting locations to position each vehicle's dashboard assemblies in the proper position relative to the driver, driver's seat and windshield. These dashboard assemblies shall represent the simulated TWV vehicle with sufficient fidelity to adequately train the students in the training tasks listed in paragraph 3.2.1 above or the vehicle specific appendices depending on the configuration selected.

3.2.2.1.2.2 Cab Windshield

The CDT TWV cab shall have a windshield opening that reflects the windshield opening of the M1083A1 MTV (right hand/passenger side of windshield can be truncated due to CDT overall cab width requirements). For the other TWV vehicles, if necessary, field of view restrictors shall be installed to replicate the smaller or split field of view.

The CDT TWV baseline vehicle cab shall replicate the overall driver's position dimensions of the M1083A1 MTV.

3.2.2.1.2.3 Auxiliary Panels

The CDT TWV driver's compartment shall include removable auxiliary panels, consisting of any gauges, switches, controls and indicators of the specific vehicle being simulated not located on the dashboard assemblies. The TWV cab shall include universal mounting locations to position each vehicle's auxiliary panels in the proper position relative to the driver, driver's seat and dashboard assemblies. These auxiliary panels shall represent the simulated TWV vehicle with sufficient fidelity to adequately train the students in the training tasks listed in paragraph 3.2.1 above or the vehicle specific appendices depending on the configuration selected.

3.2.2.1.2.4 Space Constraints

The CDT TWV driver's compartment shall include removable space constraints, consisting of assemblies which limit arm, leg and head movements that replicates the specific vehicles. The TWV cab shall include universal mounting locations to position each space constraint assembly in the proper position relative to the driver, driver's seat and dashboard assemblies.

3.2.2.1.3 Additional Driver's Compartment Components

In addition, the following components not found in the TWV vehicle cabs but required to provide adequate training and safety shall be provided:

3.2.2.1.3.1 Emergency lighting

The driver's compartment shall have an battery operated, electrically charged, emergency light that provides sufficient lighting for rapid and safe exit during emergency conditions. The emergency lighting shall be illuminated immediately when the CDT loses electrical power.

3.2.2.1.3.2 Fresh Air Circulation Exchange

The driver's compartment shall have constant, cross cab,fresh, forced air circulation to minimize driver stress.

3.2.2.1.3.3 Fire Detection/Warning System

A smoke detector shall be located inside the driver's compartment. The smoke detector shall interface with the CDT smoke and fire detection system to initiate proper simulator action if smoke or fire is detected. The driver's compartment shall have an audio and visual alarm (prominently visible to the driver) that interfaces with the CDT smoke and fire detection system to alert the driver to an emergency condition.

3.2.2.1.3.4 Emergency Stop

There shall be an emergency stop switch in the driver's compartment that is easily accessible by the driver. The emergency stop switch shall interface with the CDT safety system.

3.2.2.1.3.5 Door & Driver's Seatbelt Interlock

There shall be a driver's compartment door and seatbelt interlock. The interlocks shall inhibit any motion system response if the door is not closed properly or the seat belt is not fastened correctly. The interlocks shall pause the simulation, inhibit any motion

system response to simulation control inputs and settle the motion system to the fully lowered position in a controlled manner when the door is opened or the seatbelt unbuckled during a training scenario.

3.2.2.1.3.6 Cab Auxilliary Lighting

There shall be a switchable light or lights in the TWV cab. The light shall be of sufficient brightness and location to support student transfers, dashboard and auxiliary panel installation and cab maintenance.

3.2.2.1.4 Assistant Driver's Work Station

3.2.2.1.4.1 Assistant Driver's Workstation Hardware Components

The CDT TWV shall include an AD's station capable of training crew coordination tasks by using a crew intra-vehicular communication system, cab OTW imagery monitors (left, center and right) and a computer workstation with touch screen monitor capable of simulating the AD's controls and indicators.

3.2.2.1.4.2 Assistant Driver's Workstation Software Components

The AD's workstation software shall stimulate or simulate the JCR-Log system to include the following:

a. Create SPOT report
b. Create Medical Evacuation (MEDEVAC) request
c. Create MAYDAY message
d. Respond to a Log Task Management Message
e. Process messages in Flash, Immediate, Priority, or Routine (FIPR)
f. Process Warning messages
g. Process Received messages
h. Create Position Report
i. Create Bridge Report
j. Create Obstacle Report
k. Employ Quick Send functions
l. Conduct Local Tag Collection

3.2.2.2 Vehicle Simulation

3.2.2.2.1 Vehicle Dynamics Performance

The CDT TWV shall simulate the vehicle dynamics of each simulated vehicle to the level of detail required to support the training tasks in paragraph 3.2.1 above. Vehicle dynamics shall include steering feel, steering response, acceleration, deceleration,braking and suspension response. The vehicle dynamics simulation shall provide models of the

power train (e.g., engine, transmission, etc.), suspension (e.g., springing, damping, range of travel, etc.), and moments of inertia of each vehicle. The parameters for these models shall be evaluated at 60 Hz to assure smooth and accurate simulation. Terrain topography and surface characteristics shall be determined and combined with control inputs from the driver compartment to provide inputs to the models of the engine, transmission, steering, brakes, suspension, and hull. The vehicle dynamics model shall also respond to nearby explosions. The magnitude of the response shall be a function of explosion size and location (distance and azimuth). The vehicle dynamics simulation results shall drive the visual displays, motion cues, aural cues, and instrumentation in the driver compartment. The vehicle dynamic performance shall be modeled based on data provided by Government Subject Matter Experts.

3.2.2.2.1.1 Engine Model

The following operational parameters of the engine shall be simulated:

a. Engine torque - The engine output torque shall be derived as a function of engine speed, load due to terrain topography and tractability, and throttle angle.

b. Engine speed - The rotational speed of the engine shall be determined as a function of throttle position, load torque, and engine/transmission inertia. The tachometer in the driver's compartment (if equipped) and the engine speed aural cue shall be driven by this output.

c. Fuel consumption - The fuel consumption shall be determined as a function of throttle position. The fuel level in the fuel tanks shall be determined by subtracting the fuel used from the amount of fuel remaining in the tanks. The fuel gauges in the driver compartment shall be driven by the amount of fuel remaining in the tanks. The fuel system model for each vehicle shall replicate the fuel tank capacities for that vehicle. All fuel tanks shall be full at the start of each training scenario. Activation of the low fuel malfunction shall reduce the fuel level in the fuel tank(s) to less than 12% of capacity in 8 minutes.

3.2.2.2.1.2 Transmission Model

The following output parameters of the transmission shall be simulated:

a. Transmission operation – The transmission model shall simulate the number of gear ratios in the specific TWV vehicle. The transmission model shall allow for full automatic shifting in drive or driver selection of the gear desired with the gear selection controls.

b. Gear selections - The automatic gear selections (both up and down) shall be determined by the position of the transmission shift selector

on the vehicle dashboard, the vehicle speed, throttle angle and engine load. The gear selection shall limit the range of output of the transmission dynamics model as appropriate for the selected gear.

3.2.2.2.1.3 Steering and Brake Model

The steering and brake model shall be a physics-based model of the actual real world performance of each simulated TWV vehicle. The position of the service brake pedal and the engaged/disengaged status of the parking brake shall be input to the brake model. Appropriate real time brake force parameters shall be determined and applied to the CDT motion control software.

3.2.2.2.1.4 Suspension Model

The model of the suspension system shall include computation of the forces acting on the suspension components. The effects of the terrain on each wheel, including slope and height shall be combined with the forces due to the mass and momentum of the hull to determine the suspension force acting on the hull. Pitch torque and roll torque shall be computed as inputs to the hull model by transferring the combined forces on the own vehicle through the damping and spring characteristics of the suspension at each wheel.

3.2.2.2.1.5 Hull Model

The position, velocity, and acceleration of the own vehicle center of gravity shall be determined in six degrees of freedom by the hull model. Inputs from the power train, suspension, and terrain models shall be combined to resolve the updated vehicle position and derive the velocities and accelerations.

3.2.2.2.2 Malfunctions and Emergency Conditions

The CDT TWV shall meet the requirements listed in the list of malfunctions and emergency conditions for each supported TWV vehicle. All the malfunctions and emergency conditions listed herein shall present the appropriate feedback (e.g., abnormal vehicle dynamics, instrument readings, aural cues, etc.) to the driver trainee consistent with the operation and performance of the specific vehicle. For each vehicle's Malfunction and Emergency Conditions, all relevant driver's compartment indicator's and warnings shall operate IAW the specific vehicle operator's manual. All relevant warning verbal messages, caution alert tones, and indicators shall operate IAW the specific vehicle operator's manual. All malfunctions and emergency conditions shall be able to be programmed to activate at specified points in scripted scenarios and cleared by the instructor or initiated and cleared by the instructor in free play scenarios unless otherwise specified herein. The CDT TWV shall score the student's performance in response to emergency conditions and malfunctions based on the student's ability to

perform the correct, timely responses to the emergency conditions and malfunctions. The CDT TWV shall include the following malfunctions and emergency conditions:

b. Vehicle Control - The vehicle control criteria shall be monitored continuously during scenario execution. A vehicle control error shall be produced in accordance with the following criteria:

1. Skidding and/or sliding

i. Due to turning – An error shall be assigned due to improper turning when the own vehicle slides across the terrain for at least one (1) second and the rate of turn commanded from the steering/throttle control at the onset of the slide exceeds six (6) degrees per second. The own vehicle shall be considered to be skidding or sliding when the difference between the own vehicle speed and the drive wheels speed is greater than two (2) Miles Per Hour (MPH).

ii. Due to Braking - An error shall be assigned due to improper braking when the own vehicle slides across the terrain for at least one (1) second, and the service or parking brake was applied at the onset of the slide. The own vehicle shall be considered to be skidding or sliding when the difference between the own vehicle speed and the wheel speed is greater than two (2) MPH.

iii. Due to acceleration - An error shall be assigned due to improper acceleration when the own vehicle slides across the terrain for at least one (1) second, and , neither the service or parking brake was applied at the onset of the slide and the throttle was applied at the onset of the slide. The own vehicle shall be considered to be skidding or sliding when the difference between the own vehicle speed and the wheel speed is greater than two (2) MPH.

iv. Due to terrain – An error shall be assigned for skidding and/or sliding due to poor terrain selection when the own vehicle slides across the terrain for at least one (1) second and the criteria for other causes for a slide or skid are not met. The own vehicle shall be considered to be skidding or sliding when the difference between the own vehicle speed and the wheel speed is greater than two (2) MPH. Skid scoring shall be inhibited while exiting the mud, or ice and while any wheel is in contact with any loose gravel type terrain.

2. Loss of Mobility

i. Due to a mired own vehicle – An error shall be assigned for loss of mobility due to a mired own vehicle when the terrain type on which the own vehicle is located indicates that it is impassable.

ii. Due to bellied own vehicle – An error shall be assigned for loss of mobility due to a bellied own vehicle when a collision is detected on the underside of the own vehicle chassis.

3. Collisions

i. Hard Collisions – An error shall be assigned whenever a collision occurs with hard collision objects at speeds greater than 3 MPH.
ii. Slow Speed Hard Collisions - An error shall be assigned whenever a collision occurs with hard collision objects at speeds less than or equal to 3 MPH.
iii. Soft Collisions – An error shall be assigned whenever a collision occurs with soft collision objects at any speed.

c. Equipment Malfunction

1. Loss of Engine Power - Indicators are lack of response to throttle control and reduction of speed to idle. Steering and brake response is reduced by 50% and the hydraulic pressure gauge (if applicable) reads low simulating loss of hydraulic pressure. When these symptoms occur, the driver has 30 seconds to:

i. Maintain control of the vehicle
ii. Apply service brake lightly
iii. Move to right as far as possible
iv. Halt vehicle
v. Apply parking brake
vi. Place the transmission in Neutral (N)
vii. Apply hazard flasher
viii. Notify instructor

2. Loss of Steering - Indication is a lack of response of the steering control. When this occurs, the driver has 30 seconds to:

i. Maintain control of the vehicle
ii. Apply service brake lightly
iii. Move to right as far as possible
iv. Halt vehicle
v. Apply parking brake
vi. Place the transmission in Neutral (N)
vii. Apply hazard flasher
viii. Notify instructor

3. Loss of Brakes - Indication is a lack of response the brake pedal (brake fade). When this occurs, the driver has 30 seconds to:

i. Maintain control of the vehicle
ii. Apply service brake lightly
iii. Engage engine brake
iv. Downshift transmission
v. Move to right as far as possible
vi. Halt vehicle
vii. Apply parking brake
viii. Place the transmission in Neutral (N)
ix. Apply hazard flasher
x. Notify instructor

4. Flat Tire (1 or more, cab or trailer) - After the malfunction is activated, if the malfunction involves a front tire, any attempt to steer causes a series of jolts through the steering and motion subsystems and aural cues heard through the CDT TWV sound subsystem.. Any other flat tire malfunction shall produce vibrations through the motion subsystems and aural cues heard through the CDT TWV sound subsystem. When any flat tire malfunction occurs, the driver has 30 seconds from the start of the blown tire aural cues to:

i. Maintain control of the vehicle
ii. Apply service brake lightly
iii. Downshift transmission
iv. Move to right as far as possible
v. Halt vehicle
vi. Apply parking brake
vii. Place the transmission in Neutral (N)
viii. Apply Hazard flasher
ix. Notify instructor

5. Low Fuel - When the Low Fuel indication is illuminated (approximately 8 minutes after executing the low fuel malfunction) during a scripted or free play scenario, the trainee shall execute the following sequence of responses within 30 seconds:

i. Maintain control of the vehicle
ii. Apply service brake lightly
iii. Move to right as far as possible
iv. Halt vehicle
v. Apply parking brake
vi. Place the transmission in Neutral (N)
vii. Apply Hazard flasher
viii. Notify instructor

6. Low Engine Oil Pressure - This malfunction is available only when the engine is running. Activation reduces the oil pressure gauge reading and illuminates the Engine Oil Pressure Low indicator or check engine indicator (depending on TWV variant – see Annex A D appendixes for specfic vehicle indications). If the driver has not completed the response sequence below within 30 seconds of activation, the engine will shut down. Once the engine shuts down, any attempt to restart the engine results in an additional scoring deduction.

   i. Maintain control of the vehicle
   ii. Apply service brake lightly
   iii. Move to right as far as possible
   iv. Halt vehicle
   v. Apply parking brake
   vi. Place the transmission in Neutral (N)
   vii. Apply hazard flasher
   viii. Shut off engine
   ix. Notify instructor

7. High Water Temperature - This malfunction is available only when the engine is running. Activation increases the water/coolant temperature gauge reading and illuminates the High Water Temperature indicator or check engine indicator (depending on TWV variant – see Annex A D appendixes for specfic vehicle indications). If the driver has not completed the response sequence below within 30 seconds of activation, the engine will shut down. Once the engine shuts down, any attempt to restart the engine results in an additional scoring deduction.

   i. Maintain control of the vehicle
   ii. Apply service brake lightly
   iii. Move to right as far as possible
   iv. Halt vehicle
   v. Apply parking brake
   vi. Place the transmission in Neutral (N)
   vii. Apply hazard flasher
   viii. Shut off engine
   ix. Notify instructor

   High Transmission Oil Temperature - This malfunction is available only when the engine is running. Activation increases the Transmission Oil Temperature Gauge reading (if equipped) and illuminates the High Transmission Oil Temperature or check transmission indicator (depending on TWV variant – see Annex A D appendixes for specfic vehicle indications). If the driver has not completed the response sequence below within 90 seconds of activation, the transmission will transfer no power to the drive wheels.

i. Maintain control of the vehicle
ii. Apply service brake lightly
iii. Move to right as far as possible
iv. Halt vehicle
v. Apply parking brake
vi. Place the transmission in Neutral (N)
vii. Apply hazard flasher
viii. Shut off engine
ix. Notify instructor

3.2.2.3 Visual Simulation

The CDT TWV shall utilize the visual simulation subsystem of the CDT. The visual simulation shall include the CDT image generators (standard visible environment and sensor image generators), CDT display system and CDT visual system data bases.

3.2.2.3.1 Visual Scenes

The CDT TWV shall utilize the CDT visual environment data bases as specified in the System Requirements Document for the Common Driver Trainer System, PRF-PT-00430. The CDT TWV OTW imagery shall have any fixed obstructions (e.g., hood, fenders, etc.) visible in the driver's FOV displayed in the visual scene as a fixed entity. The rear view mirror images shall be part of the OTW images for each TWV vehicle. The large rectangular mirror and the smaller convex mirror below shall be displayed on both the left and right side of the vehicle. The rear view mirror images shall be the correct perspective to include size, shape, frame and location, as viewed from the driver's seat, for particular vehicle being simulated. The simulated eye point height of the displayed image shall be the same as that realized by the driver in the specific TWV vehicle.

3.2.2.3.2 Display Configuration

The CDT display system provides a 180 degree horizontal by 45 degree vertical real time image of the training environment from a defined eye point. The driver's eye point shall be located to optimize the use of the available FOV (i.e., 180 degree horizontal FOV and mid display vertical positioning).

3.2.2.3.3 Sensor Image Simulation

The visual simulation system shall provide a sensor simulation capability that replicates the DVE with the PTM controller available in the actual vehicle. The capability to change pointing direction and image source shall be the same as in the actual vehicle. The sensor simulation modes shall be available at all times, where appropriate, during a simulation session. The sensor simulation shall utilize the visual databases with

additional descriptors and object data necessary to generate images with the fundamental characteristics of the sensor being simulated. The simulated sensor imagery shall include the effects of artificial illumination (e.g., headlights, flares, weapons flashes, and cultural light sources).

3.2.2.3.4 Image Display Subsystem.

The Image Display Subsystem for the CDT TWV shall be in accordance with the requirements of the System Requirements Document for the Common Driver Trainer System, PRF-PT-00430.

3.2.2.3.4.1 Detailed Training Environment and Model Requirements.

The CDT TWV training environments, at a minimum, shall conform to the following requirements:

a. Training Postures:
    i. Normal Driving
        1. Full Day
        2. 25 Percent Ambient Light
        3. 50 Percent Ambient Light
        4. Night Using Headlights
        5. Night Using Blackout Markers (Convoy)
        6. Bright Night (Starlight and moon light)
        7. Dark Night
        8. weather and visibility.
    ii. Adverse Conditions
        1. Full Day
        2. 25 Percent Ambient Light
        3. 50 Percent Ambient Light
        4. Night Using Headlights
        5. Night, Using Blackout Markers
        6. Night, Using DVE
        7. Bright Night (Starlight and moonlight)
        8. Dark Night
        9. Weather and visibility.

b. Terrain/Environmental Features and Conditions:
    i. Villages (several types, small with narrow streets, and medium size cluttered street with parked cars and other obstacles such as vendor stands and pedestrians).
    ii. Hills.
        1. The TWV vehicle shall operate in a maximum grade of 45 degree and maximum side slope 20 degrees. However, the CDT databases shall have hills with values greater than these.

2. Steep hills with a variety of paved and unpaved roads.
3. Mountainous terrain with steep winding roads, roll-outs, tunnels, and near vertical cliffs.

iii. Obstacles:
1. Fallen logs (trees)
2. Ditches of various widths and lengths
3. Walls of various heights
4. Steep inclines (several shall be greater than 60 degrees grade or 30 degrees slope, and including knife edge ridges).
5. Overhead obstacles (bridges, power or telephone wires, tunnels).
6. Mine fields with and without markers (allows driver to negotiate around marked mines)
7. Pipes
8. Simple Obstacles (log cribs, berms, abatis)
9. Deep and shallow water fording locations.
10. Wadi
11. Farm complexes.
12. Urban complexes.
13. Dragon teeth.
14. Road craters.
15. Concertina wire.
16. Bridges.

iv. Fields
1. Plowed and grass covered.
2. Flat grassy areas.
3. Farm areas with cultivated fields.

v. Woods (light and dense)

vi. Vegetation (bushes, trees, rocks, etc.)

vii. Roads:
1. Major highways (high-speed autobahns).
2. Secondary roads (with sharp turns, hills, etc.).
3. Trails (narrow, unimproved, narrow roads, tank trails).
4. Road signs.
5. Narrow paved roads.
6. Canal Roads
7. Roads with soft shoulders.

viii. Terrain/Soil types:
1. Concrete.
2. Bridge.
3. Asphalt.
4. Cobblestone.
5. Rocky terrain.
6. Trail.
7. Grass.
8. Gravel, loose rocks.

9. Dirt.
10. Cultivated field.
11. Mud
12. Hard Sand
13. Loose Sand.
14. Swamp
15. Snow
16. Ice
17. River Ford
18. River Ford Shore
19. River
20. Water

ix. Weather Conditions:
1. Snow
2. Ice.
3. Black Ice
4. Rain (slick roads, mud).
5. Low visibility (fog, haze, smoke, 25 percent ambient light, 50 percent ambient light, dark).
6. Dust
7. Sandstorm
8. Wind.

x. Training Features/Environments/Conditions:
1. Desert Terrain
2. European Terrain (Winter, Winter with snow and Summer).

xi. Special training requirements:
1. Bridges (highway, tactical, assault)
2. Tunnels (one and two lane).
3. Convoys.
4. Opposing traffic.
5. Road Signs
6. Motor Pool area with rows of parked vehicles with empty spaces available.
7. Loading dock/rail load/HETS (Heavy Equipment Transport System)/ship loading
8. Ability to train with DVE
9. Appropriate trees, bushes, and shrubs for the various types of terrain and climate.
10. Appropriate buildings for the various types of terrain environment (Desert, U.S. Military Bases and European).

xii. Miscellaneous:
1. Drive with traffic.
2. Drive without traffic.
3. Drive in convoys.

4. Congested urban driving environment with traffic, parked vehicles, pedestrians, construction situations, detours, slow moving conditions, highway conditions, highway entrances and exit ramps, building and other constraints to movement and visibility.

xiii. Simulated Vehicle Models shall include (stationary and moving):

Model
Light Wheeled Vehicle – Civilian Examples: Chevy Caprice Taxi, Fiat Sedan, Toyota pickup truck, or similar
Medium Wheeled Vehicle – Civilian Examples: FedEx Truck, VW Van/Ambulance, or similar Heavy Wheeled Vehicle – Civilian Examples: Volvo Cargo Truck or similar Motorcycles, Bicycles, Scooters
Vehicle – Friendly Military Examples: M1A1, Challenger, M60A3, LECLERC, AMX 30/10rc, Merkava – II, LEO I/II, Centurion, AAAV
MRAP Vehicle Variants Navistar MaxxPro, GDLS-RG31, Caiman, BAE RG33L, FPI Cougar, M-ATV TWV Vehicle Variants. M1083A1 MTV, M1120A4 HEMTT, M915A3 and M915A5.
Vehicle – Threat Examples: T80, T72, BMP2, BRDM-2

1. Explosions (mines, artillery rounds, Improvised Explosive Devices).
2. Cities.
3. Streams and rivers with various sizes of bridges with various weight limits and various depths of streams with fording locations.
4. Simulated Human Models and States shall include:

Model	**Type**	**State**
Dismounted Noncombatant – Civilian (man)	Unarmed	Standing/Walking/Running/Falling/Dead
Dismounted Noncombatant – Civilian (woman)	Unarmed	Standing/Walking/Running/Falling/Dead
Dismounted Noncombatant – Civilian (child)	Unarmed	Standing/Walking/Running/Falling/Dead
Dismounted Noncombatant – Civilian (man - group)	Unarmed	Standing/Walking/Running/Falling/Dead
Dismounted Noncombatant – Civilian (woman - group)	Unarmed	Standing/Walking/Running/Falling/Dead
Dismounted Noncombatant – Civilian (child – group)	Unarmed	Standing/Walking/Running/Falling/Dead

Dismounted Combatant – Ground Guide	Unarmed	Standing/Walking/Displaying Hand and Arm Signals from Field Manual (FM) 21-60, Chapter 2
Animals	Unarmed	Standing/Walking/Running/Falling/Dead
Threat Human Models		
Dismounted – Civilian (man, woman and/or child)	Armed	Standing/Walking/Running/Falling/Dead
Dismounted	Armed	Rocket Propelled Grenade (RPG) Teams
Mounted	Armed	Riding in bed of civilian truck

3.2.2.3.5 Visual Effects

The visual effects produced by the CDT TWV shall occur simultaneously with the condition causing the effect. The following operating or environmental conditions listed in priority order shall produce appropriate visual effects to the driver trainee:

a. Own vehicle hit by RPG.
b. Own vehicle hit by an IED
c. Own vehicle triggering a mine.
d. Nearby Explosion. Visual effect is active only when friendly and/or enemy fire is enabled and produces the visual effect of an explosion when a simulated round impacts or IED detonates within 100 meters or closer to the vehicle. When triggered, the visual effect shall appear at a random location anywhere within the driver's FOV and randomly within a range of 25 – 100 meters from the own vehicle.

3.2.2.4 Aural Cue and Communications

The CDT TWV shall utilize the aural cues of the CDT to produce realistic or authentic aural cues in response to vehicle operation (movement, malfunctions, and gun fire) and interaction with the physical (terrain interaction) and tactical environment (weapons effects). The CDT TWV shall meet the general aural cue and communications requirements as specified in the System Requirements Document for the Common Driver Trainer System, PRF-PT-00430. The aural cues produced by the CDT TWV shall occur simultaneously with the condition causing the sound. The following operating or environmental conditions listed in priority order shall produce appropriate aural responses to the driver trainee:

a. Appropriate warning horns, tones, buzzers, etc.
b. Own vehicle hit by RPG.
c. Own vehicle hit by small arms fire.
d. Own vehicle hit by an IED.
e. Own vehicle triggering a mine.
f. Hard Collision when the vehicle collides with an object. Aural cue shall be representative of the collision object.

g. Collision when own vehicle collides with another vehicle in the database. Aural cue shall be representative of the collision object.
h. Nearby Explosion. Cue is active only when friendly and/or enemy fire is enabled and produces the sound of an explosion when a simulated round impacts or IED detonates within 200 meters or closer to the vehicle.
i. Soft/Glancing Collision. Produces the sound of scraping metal. Activated when the vehicle has a Soft/ Glancing Collision with an object in the database.
j. Engine startup – Simulates the starter motor and starting engine sound.
k. Engine running – Varies appropriately with engine Revolutions Per Minute (RPM) (including transmission gear changes)
l. Load handling or palletized loading system operation
m. Towed trailer sounds if appropriate (brake chatter, tire hop, air expulsion, etc.)
n. Braking sounds (air brakes).

3.2.2.5 Scoring Criteria

There shall be specific criteria for vehicle and trainee performance that will be monitored for evaluation against predetermined parameters. A scoring event shall occur if a specific criterion is either not met or exceeded depending on the criterion being evaluated. Scoring events shall be presented to the instructor in a scrolling log window when they occur with a time tag during both pre-programmed and free play scenarios. Scoring events shall be used to adjust the trainee's numerical score and retained in the trainee's record only during pre-programmed scenarios. Scoring events during free play scenarios shall be for instructor information and AAR and shall not be retained in the trainee's record.

a. Driver's Compartment Controls and Functions – The driver's compartment controls and functions shall be monitored continuously during scenario execution. A control or function error shall be produced in accordance with the following criteria:

1) MASTER POWER/IGNITION Switch – An error shall be assigned when the MASTER POWER or ignition switch is turned OFF while the vehicle is moving.
2) PARKING BRAKE – An error shall be assigned when the parking brake is engaged while the own vehicle is moving at greater than three (3) MPH
3) Startup – An error shall be assigned when the vehicle is energized (MASTER POWER or Ignition Switch to ON) and any of the following conditions are true:
    a. The SHIFT CONTROL Selector is not set to NEUTRAL (N)
    b. The PARKING BRAKE is not set.
4) Vehicle Startup – An error shall be assigned for vehicle startup if an attempt is made to start the engine and any of the following conditions are true:

a. The LIGHTS are not turned OFF
b. Any of the vehicle electronics or communications systems are ON
c. The SHIFT CONTROL Selector is not set to NEUTRAL (N)
d. The PARKING BRAKE is not set.

5) Vehicle Shutdown – An error shall be assigned if the VEHICLE MASTER POWER or Ignition Switch is turned OFF and any of the following conditions are true:
   a. The DVE switch is ON
   b. The LIGHTS are not turned OFF
   c. Any of the vehicle electronics or communications systems are ON
   d. The SHIFT CONTROL Selector is not set to NEUTRAL (N)
   e. The PARKING BRAKE is not set.

b. Vehicle Control - The vehicle control criteria shall be monitored continuously during scenario execution. A vehicle control error shall be produced in accordance with the following criteria:

1.) Skidding and/or sliding

a. Due to turning – An error shall be assigned due to improper turning when the own vehicle slides across the terrain for at least one (1) second and the rate of turn commanded from the steering/throttle control at the onset of the slide exceeds six (6) degrees per second. The own vehicle shall be considered to be skidding or sliding when the difference between the own vehicle speed and the wheel speed is greater than two (2) MPH.
b. Due to Braking - An error shall be assigned due to improper braking when the own vehicle slides across the terrain for at least one (1) second, and the service or parking brake was applied at the onset of the slide. The own vehicle shall be considered to be skidding or sliding when the difference between the own vehicle speed and the wheel speed is greater than two (2) MPH.
c. Due to acceleration - An error shall be assigned due to improper acceleration when the own vehicle slides across the terrain for at least one (1) second, and, neither the service or parking brake was applied at the onset of the slide and the throttle was applied at the onset of the slide. The own vehicle shall be considered to be skidding or sliding when the difference between the own vehicle speed and the wheel speed is greater than two (2) MPH.
d. Due to terrain – An error shall be assigned for skidding and/or sliding due to poor terrain selection when the own vehicle slides across the terrain for at least one (1) second and the criteria for other causes for a slide or skid are not met. The own vehicle shall be considered to be

skidding or sliding when the difference between the own vehicle speed and the wheel speed is greater than two (2) MPH. Skid scoring shall be inhibited while exiting the water during a water fording task and while any wheel is in contact with any sandy type terrain.

2.) Loss of Mobility

a. Due to a mired own vehicle – An error shall be assigned for loss of mobility due to a mired own vehicle when the terrain type on which the own vehicle is located indicates that it is impassable.
b. Due to bellied own vehicle – An error shall be assigned for loss of mobility due to a bellied own vehicle when a collision is detected on the underside of the own vehicle hull.

3.) Collisions

a. Hard Collisions – An error shall be assigned whenever a collision occurs with hard collision objects at speeds greater than 3 MPH.
b. Slow Speed Hard Collisions - An error shall be assigned whenever a collision occurs with hard collision objects at speeds less than or equal to 3 MPH.
c. Soft Collisions – An error shall be assigned whenever a collision occurs with soft collision objects at any speed.

4.) Special Action Scoring – Special action scoring shall supersede conflicting normal training criteria and be applied only during the performance of the special training actions listed below:

a. Ground Guide Control – An error shall be assigned whenever the following occurs during ground guide control:

1.) Vehicle speed exceeds 5.0 MPH
2.) Failure to respond to ground guide commands within 10 seconds after the command is initially given.
3.) Turn left in response to a ground guide command to turn right for more than 6.5 seconds.
4.) Turn right in response to a ground guide command to turn left for more than 6.5 seconds.
5.) Acceleration in response to the ground guide command to stop for more than 6.5 seconds.
6.) Turning in response to ground guide command to stop for more than 6.5 seconds.
7.) Forward motion in response to ground guide command to move in reverse for more than 6.5 seconds.

8.) Rearward motion in response to the ground guide command to move forward for more than 6.5 seconds.

b. Water Fording – An error shall be assigned whenever any of the following occurs during a water fording maneuver:

1.) SHIFT SELECTOR not set to RANGE 1 while in the water.
2.) Bank gradient exceeds 40% on entering or exiting the water.
3.) Water depth at selected fording site exceeds 36 inches.
4.) Throttle greater than 30% while entering the water.
5.) Vehicle speed exceeding 8 MPH while in the water.
6.) Failure to accelerate when exiting the water.

c. Convoy Driving

1.) Vehicle Speed – An error shall be assigned if the vehicle speed during convoy driving exceeds the maximum speed specified in the scenario description.
2.) Vehicle Interval – An error shall be assigned if the distance between own vehicle and the vehicle immediately in front of own vehicle varies from the prescribed distance by +/- 25 meters or more. Vehicle interval scoring shall start 15 seconds from the initial start of the leading vehicle.
3.) Ideal path
(a.) Off-Road Ideal Path - An error shall be assigned if the own vehicle deviates more than +/- 15 meters in off road scenarios.
(b.) On-Road Ideal Path – An error shall be assigned if the own vehicle does not maintain the same lane as the leading vehicle. An error shall be assigned if the own vehicle does not change lanes within 10 seconds of the leading vehicle changing lanes. Standard stay in lane, lane change and turning scoring criteria shall be applied otherwise.

d. Transport Loading – An error shall be assigned whenever any of the following occurs when executing a transport loading or unloading exercise:

1.) Responses to ground guide as defined in Ground Guide Control above.
2.) Speed in excess of 5 MPH while under Ground Guide Control.
3.) Movement outside of the prescribed vehicle boundaries (i.e., off the edge of the trailer, contacting the inside of an aircraft transport, etc.)

e. Bridge Crossing - An error shall be assigned whenever any of the following occurs when executing a bridge crossing exercise:
    1.) Responses to ground guide as defined in Ground Guide Control above.
    2.) Speed in excess of 5 MPH while under Ground Guide Control.
    3.) Movement outside of the prescribed vehicle boundaries

3.2.2.6 After Action Review Subsystem

The AAR system used in the CDT TWV shall be in accordance with the requirements of the System Requirements Document for the Common Driver Trainer System, PRF-PT-00430.

3.2.2.7 Training Scenarios

The CDT TWV shall have access to all training scenarios previously developed for other CDT variant vehicles. The CDT TWV shall provide 40 TWV scenarios that are based on current fielded CDT databases available for the Program of Instruction (POI). The scenarios for each specific vehicle are intended to train Soldiers and Leaders using the crawl, walk, and run method of training. All tasks and elements from the Training Tasks in paragraph 3.2.1 shall be included in the 40 preprogrammed scenarios.

The CDT TWV shall also provide non-preprogrammed (free-run) scenarios, which have no-predefined ideal paths or training tasks to be completed and allows the student to travel anywhere in the terrain database (within the limits of terrain traversability).

3.3 Interoperability

The CDT TWV has no requirements to interoperate with any external system.

4.0 ACRONYMS LIST

AAR	After Action Review
ABS	Anti-lock Braking System
AD	Assistant Driver
AD/VC	Assistant Driver / Vehicle Commander
ADS	AD's Station
CDT	Common Driver Trainer
CPU	Central Processing Unit
CTIS	Central Tire Inflation System
CCTV	Closed Circuit TV
CS	Control Station
DVE	Driver Vision Enhancer
FIPR	Flash, Immediate, Priority, or Routine
FM	Field Manual
FOV	Field Of View
GUI	Graphical User Interface
GVWR	Gross Vehicle Weight Rating
HEMTT	Heavy Expanded Mobility Tactical Truck
HETS	Heavy Equipment Transport System
Hz	Hertz
IED	Improvised Explosive Device
IOS	Instructor Operator Station
JCR-LOG	Joint Capabilities Release - Logistics
LHS	Load Handling System
MAYDAY	Distress call
MEDEVAC	Medical Evacuation
MPH	Miles Per Hour
MRT	Military Rugged Tablet
MTS	Movement Tracking System
MTV	Medium Tactical Vehicle
MTVT	Medium Tactical Vehicle Trailer
N	Neutral
OTW	Out The Window
PLS	Palletized Load System
PLST	Palletized Load System Trailer
POI	Program of Instruction
PM GCTT	Product Manager for Ground Combat Tactical Trainers
PTM	Pan & Tilt Module
RPG	Rocket Propelled Grenade
RPM	Revolutions Per Minute
SRD	System Requirement Document
STS	Student Training Station
TWV	Tactical Wheeled Variant

USA PEO STRI	US Army Program Executive Office Simulation Training and Instrumentation