Simulator III

Presented By:

kitmeer
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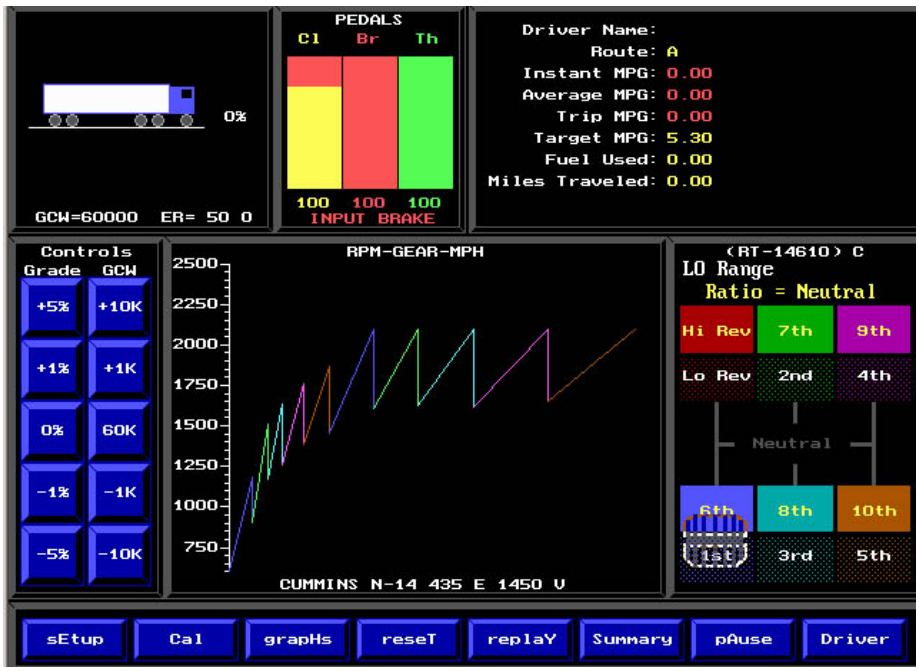
A Technologies International Partner



Specifications

Item	Quantity	Description
1.0	7	

TRAN SIM III DRIVING SIMULATOR

1. Purpose

The purpose of driver training simulator is to teach and exercise on routine the basis and for advanced training task.

2. Base for installation

The simulator that is proposed is to be installed in the driver training center. Driving training center should have building specifications outlined by Shipping Kitmeer/TI requirements for warranty to be valid.

3. Operational Characteristics

Vehicle dynamics for the following vehicle are included;

3.10 *Specifications Used for the Ural:*

I. Vehicle Model: Ural 4320-31
II. Weight: 8950 Kg
III. Wheel Base: 4.2 m
IV. Wheel Width: 2.0 m
V. Num. of Axles: 1 Front, 2 Rear
VI. Engine: Yaroslavl YAMZ-238-M2
VII. Peak HP: 240 @ 2600 RPM
VIII. Peak Torque: 883 @ 1800 RPM
IX. Governed RPM: 2600
X. Transmission: 5 speed
XI. Gear Ratios: 8.05, 4.35, 2.45, 1.48, 1.0
XII. Shift Pattern: Standard H, 1st gear in upper left, Reverse in lower right Axle
XIII. Ratio: 6.34
XIV. Power Steering: Yes
XV. Air Brakes: Yes
XVI. Engine Brake: Yes
XVII. Tire Radius: 0.644 m

3.11 *Specifications Used for the Nasr truck:*

I. Vehicle Model: Nasr (Egyptian made)
II. Weight: 4000 Kg
III. Wheel Base: 4.2 m
IV. Wheel Width: 1.9 m
V. Num. of Axles: 1 Front, 1 Rear

Item	Quantity	Description
		VI. Engine: Deutz VII. Peak HP: 118 @ 2300 RPM VIII. Peak Torque: 410 @ 1200 RPM IX. Governed RPM: 2300 X. Transmission: 4 speed XI. Gear Ratios: 8.02, 4.68, 2.74, 1.60, 1.0 XII. Shift Pattern: Standard H, 1st gear in upper left, Reverse in lower right XIII. Axle Ratio: 5.32 XIV. Power Steering: No XV. Air Brakes: Yes XVI. Engine Brake: No XVII. Tire Radius: 0.552 m 3.11 *Specifications Used for the Pegaso truck:* I. Vehicle Model: Pegaso (Spanish made) II. Weight: 9000 Kg III. Wheel Base: 3.8 m IV. Wheel Width: 1.9 m V. Num. of Axles: 1 Front, 1 Rear VI. Engine: G100142 VII. Peak HP: 240 @ 2600 RPM VIII. Peak Torque: 883 @ 1800 RPM IX. Governed RPM: 2600 X. Transmission: 6 speed XI. Gear Ratios: 6.24, 3.64, 2.30, 1.48, 1.00, 0.75 XII. Shift Pattern: Upside down H, 1st gear in lower left, 6th in upper right, XIII. reverse by itself in extended lower left XIV. Axle Ratio: 5.32 XV. Power Steering: Yes XVI. Air Brakes: Yes XVII. Engine Brake: Yes XVIII. Tire Radius: 0.644 m 3.12 Specifications for the Mercedes Tiger APC: I. Vehicle Model: Tiger (Fahd-240) (Egyptian made) II. Weight: 8500 Kg III. Wheel Base: 3.2 m IV. Wheel Width: 2.16 m V. Num. of Axles: 1 Front, 1 Rear VI. Engine: DAIMLER_BENZ OM_352 VII. Peak HP: 168 @ 2800 RPM

Item	Quantity	Description

VIII. Peak Torque: 450 @ 1600 RPM
IX. Governed RPM: 2800
X. Transmission: 5 speed
XI. Gear Ratios: 7.508, 3.986, 2.302, 1.327, 1.00
XII. Shift Pattern: Upside down H, 1st gear in lower left, 5th in upper right
XIII. reverse in upper left
XIV. Axle Ratio: 6.34
XV. Power Steering: Yes
XVI. Air Brakes: Yes
XVII. Engine Brake: No
XVIII. Tire Radius: 0.569 m

3.13 Simulator also includes

I. 51 tractor/trailer combinations
II. 10 removable trailers.
III. Several simulated engine/transmission/trailer combinations
IV. Engine types included are
   1. Cummins
   2. Caterpillar
   3. Detroit
V. Transmissions include
   4. 9 speeds
   5. 10 speeds
   6. 13 speeds
7. Has the ability to be driven with an automatic transmission.

3.1 <u>Essential operational Characteristics</u>

a) <u>Adaptability</u>

a. The driver training simulator is a dynamic system using the latest electro mechanic, computer, electronic and optic elements simulating actual conditions of the vehicle driving on roads or off-roads using actual particular vehicle dynamics.
b. Designed for training and testing the light and heavy military vehicle drivers
c. Cabin allows the driver to form an image of a real car.
d. Control and indication parameters, which are necessary for driving, are functional and/or included in the glass dashboard as functioning gauges.

Item	Quantity	Description
		e. Special emphasis on the function of the gear shift lever, steering wheel and pedals. Realistic like conditions are simulated using vibrations and visual adjustments to conditions. f. The sound simulation must create the sound of engine, horn and surrounding sounds. There must be the voice simulation of the electronic that the instructor can notifies the student of basic mistakes during driving and enables to correct. i. Audio and Vibration System o Internal vehicle audio source emulation includes: ▪ Engine audio source synthesis ▪ Tires and chassis digital audio replay o External audio source emulation includes: ▪ Wind vs. speed (and vehicle aerodynamic model) ▪ Miscellaneous environmental sounds (sirens, traffic etc.) ▪ 3-Dimensional sound directionality (i.e., passing automobiles, ▪ trucks…) o Vibration includes: ▪ Tactile transducer under seat to partially simulate road vibration ▪ Steering wheel feel providing natural tactile stimuli ▪ (bandwidth > 20 Hz, amplitude correlation with tire/roadway ▪ interaction and engine operation, and fully synchronous and ▪ complementary with audio signals) o The audio software includes the following: ▪ Engine sound is specific to each scenario vehicle ▪ Horn sound is specific to 12 scenario vehicle classes ▪ Siren sound is specific to 3 scenario vehicle classes ▪ Other sounds can be associated with the position of any scenario Vehicle ▪ Own cab engine sound is specific to the VDD model ▪ “Static” sounds with fixed spatial position are available ▪ "Dynamic" sounds that can be associated with

Item	Quantity	Description

any
- scenario object are available
- Software design improvements for greater reliability and
- maintainability

b) Training

The training is required to be conducted individually for drivers

❖ Theoretical training

The training covers the detailed functions and parameters of car system as related to the driver

❖ Individual Training

The training should give the trainee actual feeling of a real car

I. Take up with driver equipment,(handles, pedals etc)
II. Corrects operation of driver and motor control devices
III. Basic driving skills such as engine start-up, engine setting, gear shifting and improvement
IV. Driving in suburban, rural, desert and freeway terrain, included
V. Vehicle coordination and other operational tasks covered
VI. Driving at day and night or in low visibility for Fog, haze, rain, snow, ice

System Characteristics

3.2 System Characteristics

The system has the following characteristics

a) full function light and heavy military vehicle **(please see full specification list in 3.2 listed above)**

b) The driving trainer cabin represents a car interior with the drivers seat and space necessary for driving

c) The cabin is equipped with parts that are located in the some way as in

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Item	Quantity	Description
		the real car located on the cabin frame; steering wheel , gear shift lever, pedals, dash board, hardbacks , seat and safety belt. Offers the following features: I. Simulated manual transmission with functional II. Hi-Lo Range and Splitter switches. III. Three (3) large visual display screen IV. 43-inch plasma displays with 1024 x 768 resolution. V. Sound system with 5 speakers. VI. Functional, truck-like accelerator, brake and clutch. VII. Standard truck-like functioning gauges including: VIII. Speedometer IX. Tachometer X. Other fixed value gauges included to give a truck-like feel are: a. Primary air pressure b. Secondary air pressure c. Oil pressure d. Oil temperature e. Battery Voltage f. Fuel XI. Functional Switches: XII. Parking brake XIII. Trailer air supply XIV. Ignition key XV. Ignition start XVI. 2-cylinder engine brake XVII. 4-cylinder engine brake XVIII. Lights XIX. Truck-like steering wheel with turn signal indicator. XX. Adjustable truck seat with seat belt.

Item	Quantity	Description
		i. A glass dash is included with the following - d) Wide -angle type of driver screen for realistic back ground in various terrains, cross country and urban environment Commercial gas-plasma monitors Monitors provide a bright, sharp image Monitor configuration consists of three each, 43” diagonal wide-aspect ratio (16 x 9) monitors with an XGA-compatible resolution @ 70 Hz. e) Initial Start-up time is approximately, 10 minutes f) System can be delivered in 220v or 110 volt upon. g) Operator’s Console Windows™-Based Operator/Instructor’s Station A. Includes multiple display areas and icon control buttons. B. A single GUI screen provides all the functions required for one instructor to control all the training and simulator control functions for up to 4 linked simulators. C. The operator can control and manipulate individual vehicles in the driving scenario while the scenario is running. D. Allows the operator to select the vehicle type and dynamics to be driven by the student. E. The trainee’s drive can be recorded and played back. D. The behavior of the scenario vehicles that can be controlled include vehicle: Speed Lane position Parking position Forward/reverse direction Obedience to rules of road (stop or yield, etc) Driver drunkenness (DUI characteristics, 5 levels of

Item	Quantity	Description
		BAC up to BAC.10), and Aggressiveness h) Facility for self-evaluation, instructor evaluation for individual and group along with database. i) An extensive database and library for the instructors to develop various exercises for individual and group training incorporation terrain, environment are included. Databases included A. Suburban City Driving Suburban city driving Includes multiple lane roads with operational traffic lights, stop signs, speed and caution signs, street signs, gas station, large parking lot, police station, neighborhoods, malls, civic centers, crosswalks, residential, commercial properties and open areas. 10 Road Miles B. Suburban2 Same as Suburban but includes an extended canyon area to the north terminating at a railroad station. Features new residential area with large homes, narrow bridge and railroad crossing at steep angle to road. Small warehouse with loading dock, connected to large parking area. Used for backing exercises. 13.8 Road Miles C. Freeway Divided Freeway includes mountain area, runaway ramps, on/off ramps and rest area. (Road Miles based on both directions – approx. 23 miles one direction. Plus side roads and ramps.) 46 Road Miles D. Freeway w/ Snow Same as freeway but in a snow environment.

Item	Quantity	Description

46 Road Miles

E. Rural

Two lane rural driving. Includes narrow 2-lane roads, winding lanes, small roadside villages, farms, hilly roads hiding oncoming traffic, blind intersections, and branching "Y" type roads, with appropriate signage.

31.5 Road Miles

j) The application Software User Interface to be provided in English.

Utilization Maintenance and Reliability

a) ***Utilization***

I. The simulator of driving training center will be utilized in static training establishment in permanent structures. It focuses on the training of individual drivers as well as group coordination.

b) ***Reliability:-***

I. The system has hardware (and software) complying with the requirements to international industry standards with minimum downtime of failures and corresponding simple maintenance/repairs (listed below).

c) ***Maintenance :-***

I. The system is user-friendly

II. Requires minimum maintenance

III. Easy accessibility and commercial off the shelf replaceable computer parts for the majority of the system.

IV. Modular components with Built in Test Equipment and fault and analysis/diagnosis abilities.

V. A schedule for typical user maintenance procedure will be delivered with system. Image Trading Enterprises will coordinate any warranty related issues to be resolve with Kitmeer/TI. If the user supply's an analog phone

Item	Quantity	Description
		line at the facility Kitmeer/TI can dial into the system from their Salt Lake City location to assist in diagnosing problems at no add ional cost to the user.

d) ***Technical Literature and Documentation*** :-

I. Documents are in English

II. Includes user manual

III. Specifications manual

IV. Operating instructions

V. Maintenance schedules

VI. Technical manual with circuit diagrams

VII. Troubleshooting techniques

VIII. Log books

IX. Tools for machine are not included. The tools required to repair and maintain system are standard screwdrivers, etc.

e) ***Up- gradation and Spare parts-***

I. Standard manufacturers recommended spare parts required for the initial two years exploitation to be delivered with the system at seller's cost.

II. Spare part installation training will be conducted at time of installation, commissioning and formal training at user site.

III. System is upgradeable with easy part replacements and software upgrades

f) ***Training-***

I. Training will be given to the instructors and maintenance/repair technicians at the user premises by the manufacturer.

II. The number of instructors and repair technician should be the typical number of people required to operate the number of simulators ordered. Reasonable additional personnel requests will be considered provided the learning environment can effectively provide a comfortable learning environment.

g) ***Installation and Commissioning*:-**

Item	Quantity	Description

I. The simulators and all accessories will be installed and commissioned at the user specified location.

h) ***Warranty:-***

I. The warranty will be valid for two years from the date of commissioning of the system at the user's location.

i) .***Delivery Schedule***:-

I. The complete system should be delivered and commissioned at the user's location with negotiable period of time.

Full Technical Specifications:

[1] Glass Dash

The Simulator has a Glass Dash that includes a Center Panel and the SimCommander Panel to the right of the driver.

[2] The SimCommander Panel

Touch screen allows the instructor or the driver to control the Basic functions of the VS III. There are three operating modes:

A) Scenario used to load scenarios

B) Drive used to start the scenario and display other functioning gauges and switches including:
Primary air pressure
Secondary air pressure
Water Temperature

C) Lesson used to load a series of scenarios created to support specific course

[3] Driver Station

Offers the following features:

B. Simulated manual transmission with functional

C. Hi-Lo Range and Splitter switches.

D. Three (3) large visual display screen

E. using a 43-inch plasma displays with 1024 x 768 resolution.

F. Sound system with 5 speakers.

G. Functional, truck-like accelerator, brake and clutch.

H. Standard truck-like functioning gauges including:
Speedometer
Tachometer

I. Other fixed value gauges included to give a truck-like

Item	Quantity	Description
		feel are: Primary air pressure Secondary air pressure Oil pressure Oil temperature Battery Voltage Fuel J. Functional Switches: Parking brake Trailer air supply Ignition key Ignition start 2-cylinder engine brake 4-cylinder engine brake Lights K. Truck-like steering wheel with turn signal indicator. L. Adjustable truck seat with seat belt. [4] Visual System Description A. Eye Distance to Screen 32 to 40 inches (adjustable depending on seat position) B. Horizontal Field of View (FOV) :180° at 34” eyepoint, slew able to 270° C. Vertical FOV: Scene Edge Matching: 3 side by side monitors Rear View Mirrors: Driver’s side, center and right side [5] Image Generation Image Generator: PC based (Open GL format) Update Rate: 70 Hertz Refresh Rate: 70 Hertz (flicker free) Resolution @ 70 Hz: 1024 x 768 XGA Polygons @ 70 Hz: >6000 for the system Photo Texture: Time of Day: Day, dusk, night Illumination: Headlights, taillights, directional and wig wag lights, EVO, Left and Right Alley lights and Overhead Takedown lights Weather Effects: Fog, haze, rain, snow, ice

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Item	Quantity	Description
		Transparency: Yes Color: 32 bit Other Moving Vehicles/Objects: Over 60 with rotating wheels, a total of 127 objects available in addition to “own vehicle” per driving station [6] Audio and Vibration System A. Internal vehicle audio source emulation includes: Engine audio source synthesis Tires and chassis digital audio replay B. External audio source emulation includes: Wind vs. speed (and vehicle aerodynamic model) Miscellaneous environmental sounds (sirens, traffic etc.) 3-Dimensional sound directionality (i.e., passing automobiles, trucks…) C. Vibration includes: Tactile transducer under seat to partially simulate road vibration Steering wheel feel providing natural tactile stimuli (bandwidth > 20 Hz, amplitude correlation with tire/roadway interaction and engine operation, and fully synchronous and complementary with audio signals) D. The audio software includes the following: Engine sound is specific to each scenario vehicle Horn sound is specific to 12 scenario vehicle classes Siren sound is specific to 3 scenario vehicle classes Other sounds can be associated with the position of any scenario Vehicle Own cab engine sound is specific to the VDD model “Static” sounds with fixed spatial position are available "Dynamic" sounds that can be associated with any scenario object are available Software design improvements for greater reliability and maintainability [7] Monitors: Commercial gas-plasma monitors Monitors provide a bright, sharp image at an economic price. Monitor configuration consists of three each, 43” diagonal

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Item	Quantity	Description
		wide-aspect ratio (16 x 9) monitors with an XGA-compatible resolution @ 70 Hz. [8] Scenario Models Models provided to appear in scenario as other vehicles and objects: 1. Variety of cars 2. Variety of trucks, small and large 3. Emergency vehicles, including operational wigwag lights 4. Pedestrians 5. Road Barriers 6. Bicycles 7. Motorcycles 8. Animals 9. Traffic Signals [9] Databases included A. Suburban City Driving Suburban city driving Includes multiple lane roads with operational traffic lights, stop signs, speed and caution signs, street signs, gas station, large parking lot, police station, neighborhoods, malls, civic centers, crosswalks, residential, commercial properties, and open areas. 10 Road Miles B. Suburban2 Same as Suburban but includes an extended canyon area to the north terminating at a railroad station. Features new residential area with large homes, narrow bridge and railroad crossing at steep angle to road. Small warehouse with loading dock, connected to large parking area. Used for backing exercises. 13.8 Road Miles C. Freeway Divided Freeway includes mountain area, runaway ramps, on/off ramps and rest area. (Road Miles based on both directions – approx. 23 miles one direction. Plus side roads and ramps.)

Item	Quantity	Description
		46 Road Miles D. Freeway w/ Snow Same as freeway but in a snow environment. 46 Road Miles E. Rural Two lane rural driving. Includes narrow 2-lane roads, winding lanes, small roadside villages, farms, hilly roads hiding oncoming traffic, blind intersections, and branching "Y" type roads, with appropriate signage. 31.5 Road Miles [10] Operator's Console Windows™-Based Operator/Instructor's Station A. Includes multiple display areas and icon control buttons. B. A single GUI screen provides all the functions required for one instructor to control all the training and simulator control functions for up to 4 linked simulators. C. The operator can control and manipulate individual vehicles in the driving scenario while the scenario is running. D. Allows the operator to select the vehicle type and dynamics to be driven by the student. E. The trainee's drive can be recorded and played back. D. The behavior of the scenario vehicles that can be controlled include vehicle: Speed Lane position Parking position Forward/reverse direction Obedience to rules of road (stop or yield, etc) Driver drunkenness (DUI characteristics, 5 levels of BAC up to BAC.10), and Aggressiveness [11] Simulator Mode I The Simulator can be operated in the Simulator I mode with a Big Screen Format with all of the features of our popular Simulator to teach: A. Entry Level Shifting Skills B. Advanced Progressive Shifting Techniques C. Fuel Management D. Driving trucks with different engines, transmissions, axle ratios, and tire sizes

SPECIFICATION

Item	Quantity	Description
		E. VS I Vehicle Dynamics: The Simulator offers an extensive array of simulated engines, transmissions, axle ratios, and tire sizes. Users can choose from more than: 240 engine types 140 transmissions 33 axle ratios 300 tire sizes Engine types include the most popular types: Cummins Volvo Detroit Diesel Caterpillar Ford Mack Navistar Transmissions include: 9 speeds 10 speeds 13 speeds 15 speeds 18 speeds Non-synchronized VS I Driver Information Screen The information presented on the screen in front of the driver is pictured above. This screen provides the driver with useful learning cues including: RPM shift point curve Fuel Mileage Shifting pattern for selected transmission Vehicle load and road grade % Clutch, brake, and accelerator pedal application Clutch brake applied F. VS I Driver Performance Report A printable summary report is available as part of the Simulator. Some of the information reported includes: Shifting history from gear to gear. Speed at start and finish of the shift RPM at the start and finish of the shift Sync error Time to complete the shift Clutch brake application Distance in feet between shifts

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Item	Quantity	Description
		Total distance traveled Fuel used Trip miles per gallon Average shift time

Literature

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Simulator Description—Subject to Change

Introduction

Kitmeer/TI 's Simulator III provides high fidelity real-world driving environments and vehicle behaviors to train and improve driver decision-making and behavior over a wide range of vehicle maneuvers. The following features are standard on the Simulator III:

- 180° view using 3-channels each with 1024 x 768 image resolution at a 70 Hz update rate using Kitmeer/TI 's Direct X-based image generation software (IG) and PC-based image generation hardware.
- Glass dash in the Simulator III adds greater flexibility in replicating gauges and their placement in various types of vehicles.
- SimCommander allows the instructor control of the simulator at the simulator's dash using a touch screen, in addition to the normal control at the OpCon.
- Two graphical rear-view mirrors are provided as insets within the two-side channel views.
- Functional brake, clutch and accelerator pedals are included in the operator cab.
- Kitmeer/TI's PC based digital sound system simulating normal vehicle operating sounds, including engine, skidding and collisions.
- Kitmeer/TI's 3D road surface database model is provided.
- Kitmeer/TI's operator interface software (OpCon) is provided on the OpCon computer and remotely on the simulator's SimCommander screen to provide a user-friendly environment from which the instructor can control the training process.
- Kitmeer/TI's multiple vehicle dynamics software (MDYN) is used with a road surface sampling rate of at least 960 Hz.
- All subsystems, including vehicle dynamics, sound, visual, mechanical and scenario control, operate in a correlated manner, synchronized with one-another in real-time.
- Multiple interactive driving scenarios are provided.

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Vehicle Driver's Station

Kitmeer/TI's Simulator III has a rugged truck-like look with an open seat driver's station. It has a manual transmission, which is mounted on the right side providing real gearbox feel.

TranSim VS III Glass Dash

Glass Dash

The Simulator has a Glass Dash that includes a Center Panel and the SimCommander Panel to the right of the driver.

The Center Panel displays a number of functioning gauges including speedometer, tachometer, oil pressure, oil temperature, battery voltage, and fuel. It also contains a Warning Light sub panel.

Glass Dash Center Panel

The SimCommander Panel is a touch screen that allows the instructor or the driver to control the basic functions of the VS III. There are three operating modes:

1. Scenario used to load scenarios
2. Drive used to start the scenario and display other functioning gauges and switches including:
    - Primary air pressure
    - Secondary air pressure
    - Water Temperature
3. Lesson used to load a series of scenarios created to support s specific course.

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Other Driver's Station Features

The driver's station also offers the following features:

- Simulated manual transmission with functional Hi-Lo Range and Splitter switches.
- Three (3) large visual display screen using a 43-inch plasma displays with 1024 x 768 resolution.
- Sound system with 5 speakers.
- Functional, truck-like accelerator, brake and clutch.
- Standard truck-like functioning gauges including:
  - Speedometer
  - Tachometer
- Other fixed value gauges included to give a truck-like feel are:
  - Primary air pressure
  - Secondary air pressure
  - Oil pressure
  - Oil temperature
  - Battery Voltage
  - Fuel
- Functional Switches:
  - Parking brake
  - Trailer air supply
  - Ignition key
  - Ignition start
  - 2-cylinder engine brake
  - 4-cylinder engine brake
  - Lights
- Truck-like steering wheel with turn signal indicator.
- Adjustable truck seat with seat belt.

Computer and Control Systems

The host computer system provided by Kitmeer/TI is a high performance PC built from off-the-shelf components. It incorporates the latest PC technology and will be compatible with future hardware advances designed to include existing software. The choice of the PC platform assures the client ease of maintenance and minimum cost for repairs and parts.

Kitmeer/TI's PCs use a common operating system, either Microsoft Windows 2000™or Windows XP. The main simulator PC uses a dedicated computer engine for vehicle dynamics and visual display. The OpCon PC and simulator PC communicate over a high-speed Ethernet link.

Visual Subsystem

The visual system is comprised of the image generator (IG), and monitors. The visual system description is as follows:

Table 2. Visual System Description

	Feature	***Description***
1.	Number of Channels	3 channel (16 x 9 aspect ratio monitors)[1]
2.	Eye Distance to Screen	32 to 40 inches (adjustable depending on seat position)[2]
3.	Horizontal Field of View (FOV)	180° at 34" eyepoint, slew able to 270°[3]
4.	Vertical FOV	37° (adjustable)
5.	Scene Edge Matching	3 side by side monitors
6.	Rear View Mirrors	Driver's side, center and right side insets

Image Generators (IG)

The IG is the computer that creates the real-time interactive image the driver sees out of the window. Ship Analytics, Inc. reserves the right to substitute the IG described herein with one of equal or better performance at no additional cost to the Client.

Table 3. Image Generator Capabilities

[1] The use of 16:9 aspect ratio monitors ensures its future compatibility with advances in commercial/consumer electronics that are driven by the new High Definition Television (HDTV) technology. This also allows the use of 3 monitors versus five monitors to present an adequate field of view. Ship Analytics, Inc. has been the leader in adopting this approach to display systems. Indications are that several competitors are following suit.
[2] The monitors are at a constant radius from the driver's eye-point, thereby mitigating eye fatigue issues associated with systems where the focal distance is variable.
[3] Variable fields of view can be adjusted electronically to provide variable fields of view (150 – 200 degrees) from the operator's console.

	Feature	Description
1.	Image Generator	PC based (Open GL format)[4]
2.	Update Rate	70 Hertz
3.	Refresh Rate	70 Hertz (flicker free)
4.	Resolution @ 70 Hz	1024 x 768 XGA
5.	Polygons @ 70 Hz	>6000 for the system
6.	Photo Texture	Yes
7.	Time of Day	Day, dusk, night
8.	Illumination	Headlights, taillights, directional and wig wag lights, EVO, Left and Right Alley lights and Overhead Takedown lights
9.	Weather Effects	Fog, haze, rain, snow, ice
10.	Transparency	Yes
11.	Color	32 bit
12.	Other Moving Vehicles/Objects	Over 60 with rotating wheels, a total of 127 objects available in addition to "own vehicle" per driving station[5]

Due to the extreme rate of price/performance improvement in the PC market, Ship Analytics, Inc. reserves the right to substitute equal or better components with no change in the proposed price.

Monitors

The Simulator is designed around off-the-shelf commercial gas-plasma monitors. These monitors provide a bright, sharp image at an economic price. The monitor configuration consists of three each, 43" diagonal wide-aspect ratio (16 x 9) monitors with an XGA-compatible resolution @ 70 Hz.

Audio and Vibration System

Sounds are computer generated from recordings of actual in-cab sounds. These audio signals are played back to the driver in real-time at the actual sound levels experienced in the real vehicle.

Internal vehicle audio source emulation includes:

- Engine audio source synthesis
- Tires and chassis digital audio replay

[4] Unlike our major competitors, Ship Analytics, Inc. has designed their visual subsystem in-house. The current architecture is structured to take advantage of the latest technological developments in either Open GL or Active X. In-house development allows us to respond quickly to our Clients' needs and to optimize our solutions for driving simulation and training.
[5] Advances in computer/graphics technology make this number a 'moving target.' Our modular design allows us to keep current with technological advances and improve on this current level of performance.

External audio source emulation includes:

- Wind vs. speed (and vehicle aerodynamic model)
- Miscellaneous environmental sounds (sirens, traffic etc.)
- 3-Dimensional sound directionality (i.e., passing automobiles, trucks…)

Vibration includes:

- Tactile transducer under seat to partially simulate road vibration
- Steering wheel feel providing natural tactile stimuli (bandwidth > 20 Hz, amplitude correlation with tire/roadway interaction and engine operation, and fully synchronous and complementary with audio signals)

The audio software includes the following:

- Engine sound is specific to each scenario vehicle
- Horn sound is specific to 12 scenario vehicle classes
- Siren sound is specific to 3 scenario vehicle classes
- Other sounds can be associated with the position of any scenario vehicle
- Own cab engine sound is specific to the VDD model
- “Static” sounds with fixed spatial position are available
- "Dynamic" sounds that can be associated with any scenario object are available
- Software design improvements for greater reliability and maintainability

Vehicle Dynamics Model

Kitmeer/TI’s vehicle dynamics models have the sophistication to represent real vehicle behavior for the vehicle being driven (OwnCab). Each tire/wheel/suspension point, steering wheel, engine/drive train, and chassis is modeled.

Kitmeer/TI provides vehicle dynamics models that are modular and adjustable representations of the actual vehicle’s subsystems. The tire patch model provides interaction with the road surface to simulate actual skids, tire envelopment over objects, and road hazards. The accurate tire-road model interaction with dynamic forces allow a full spectrum of tire reactions which provides a driver the ability to feel a variety of forces/sensations through the steering wheel as the wheels hit, roll-into, or roll-over a specific object.

The tire patch model characterizes SAE standard functions, including:

- Normal force vs. vertical displacement vs. tire pressure
- Lateral-slip vs. slip-angle vs. normal force
- Longitudinal force vs. rolling slip vs. normal force
- Composite vector limits on total reaction force vs. normal force

Automobile and tire manufacturers have supplied the high fidelity tire force model data. Kitmeer/TI's tire models are measured at multiple points per tire footprint.

OwnCab Models

The standard trucking package for the Simulator III includes 51 tractor/trailer combinations and10 removable trailers.

The Simulator III offers several simulated engine/transmission/trailer combinations. Engine types included are Cummins, Caterpillar and Detroit. Transmissions include 9,10 and 13 speeds. The Simulator III also has the ability to be driven with an automatic transmission.

Scenario Models

Models provided to appear in scenario as other vehicles and objects:

1. Variety of cars
1. Variety of trucks, small and large
2. Emergency vehicles, including operational wigwag lights
3. Pedestrians
4. Road Barriers
5. Bicycles
6. Motorcycles
7. Animals
8. Traffic Signals

Road Surface Model

Kitmeer/TI's road surface models are 3-Dimensional and include curbs, gutters, soft edges, variations in surface texture and content (asphalt, cement, gravel, sand, dirt, ice, snow, pot holes, and assorted hazards). In addition to 3-D road surface models, Kitmeer/TI samples the critical interface between tire and road at a rate of around 960 Hz[6]. This is essential to capture accurate vehicle position, road feel, and vehicle control.

Kitmeer/TI's road surface proprietary 3-Dimensional Road Surface Model (superior to competitors' polygon-based road surfaces) interacts with the vehicle's dynamics and tire models. The road that the simulator drives upon represents the features and character of a real road. As no road in the real world

[6] At 60 miles per hour a vehicle travels 88 feet per second. At 960 Hz, our distance between tire/road samples is 1 inch. For comparison, if a simulator sampled its tire to road surface at 60 Hz, the distance between tire/road samples is 1.5 feet. Sampling at the lower frequency does not provide high fidelity modeling of vehicle control.

is flat, unique Kitmeer/TI technology accurately simulates uneven and crowned road surfaces for a more realistic experience.

The road is a B-spline, high-resolution surface model with curb, gutter, and super elevation for banking around curves. Some road surfaces are designed to the U.S. Standards for Highways or The American Association State Highway Traffic Office.

VS III Standard Trucking Package

The Standard Trucking Package for the Simulator IIIincludes 51 tractor/trailer combinations that can be driven as OwnCab, 10 drop/hook trailers and 25 training scenarios. Each scenario was developed within a specific visual driving environment, including but not limited to rural, freeway, city/residential, mountain pass, and warehouse environments.

The standard trucking package is designed to enhance the skills of experienced drivers and to train entry-level drivers.

The Simulator III simulator system provides multiple terrain environments that include: suburban, suburban2, freeway, rural, and an off road visual driving environment.

The following list details the databases included in the Simulator III

Database	Description	Road Miles
Suburban/city	Suburban city driving. Includes multiple lane roads with operational traffic lights, stop signs, speed and caution signs, street signs, gas station, large parking lot, police station, neighborhoods, malls, civic centers, crosswalks, residential, commercial properties, and open areas.	10
Suburban2	Same as Suburban but includes an extended canyon area to the north terminating at a railroad station. Features new residential area with large homes, narrow bridge and railroad crossing at steep angle to road. Small warehouse with loading dock, connected to large parking area. Used for backing exercises.	13.8
Freeway	Divided Freeway includes mountain area, runaway ramps, on/off ramps and rest area. (Road Miles based on both directions – approx. 23 miles one direction. Plus side roads and ramps.)	46
Freeway w/ Snow	Same as freeway but in a snow environment.	46
Rural	Two lane rural driving. Includes narrow 2-lane roads, winding lanes, small roadside villages, farms, hilly roads hiding oncoming traffic, blind	31.5

	intersections, and branching "Y" type roads, with appropriate signage.	

Operator's Console

Kitmeer/TI provides a user friendly Windows™-Based Operator/Instructor's Station (OpCon). The instructor's computer skill level need only be sufficient to operate a word processor or similar type of program. A Microsoft Windows™ format Graphical User Interface (GUI) on the instructor's computer screen provides an easy, non-intimidating instructional flow to start the simulator, choose scenarios, change scenario conditions, change own cab vehicle, and interact with the driver "on the fly".

The GUI in the OpCon includes multiple display areas and icon control buttons. A single GUI screen provides all the functions required for one instructor to control all the training and simulator control functions for up to 4 linked simulators. The operator uses an ordinary mouse and keyboard to select and activate the GUI functions. The operator can control and manipulate individual vehicles in the driving scenario while the scenario is running. From the OpCon, for example, a car can be made to stop or pull out in front of the driver when the instructor commands it to happen.

OpCon allows the operator to select the vehicle type and dynamics to be driven by the student, called OwnCab. For example, a Tractor with a 53-foot trailer can be selected then driven by one student while another student drives a Tractor with a 48-foot trailer. Each simulated vehicle's feel and performance will approximate that vehicle's size, weight, turning radius, tire and suspension characteristics, etc.

The trainee's drive can be recorded and played back. This is a great training tool that can help the driver see his proximity to other vehicles or objects during the replay. When a trainee hits an object, the scenario can continue or stop depending on how the instructor sets up the scenario at the OpCon.

Scenario Vehicle Control Features

The instructor can control the scenario vehicles within a scenario from the OpCon. The behavior of the scenario vehicles that can be controlled include vehicle:

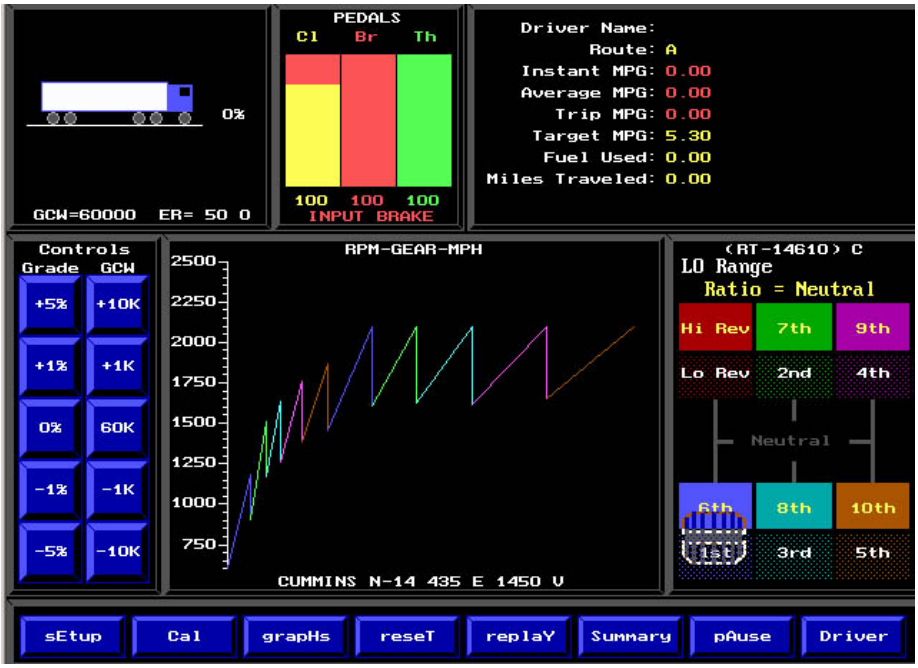
- Speed
- Lane position
- Parking position
- Forward/reverse direction
- Obedience to rules of road (stop or yield, etc)
- Driver drunkenness (DUI characteristics, 5 levels of BAC up to BAC.10), and
- Aggressiveness

Simulator VS I Mode

The Simulator III can be operated in the Simulator I mode with a Big Screen Format with all of the features of our popular Simulator to teach:

- Entry Level Shifting Skills
- Advanced Progressive Shifting Techniques

- Fuel Management
- Driving trucks with different engines, transmissions, axle ratios, and tire sizes.



Main Screen in the Simulator I Mode

VS I Vehicle Dynamics
The Simulator I offers an extensive array of simulated engines, transmissions, axle ratios, and tire sizes. Users can choose from more than:

- 240 engine types
- 140 transmissions
- 33 axle ratios
- 300 tire sizes

Engine types include the most popular types:

- Cummins
- Caterpillar
- Detroit Diesel
- Volvo
- Ford
- Mack
- Navistar

Transmissions include:

- 9 speeds
- 10 speeds
- 13 speeds
- 15 speeds
- 18 speeds
- Non-synchronized

An engine torque-RPM table is provided for each vehicle combination to demonstrate progressive shifting techniques.

VS I Vehicle Characteristics and Driving Conditions
The load carried by the vehicle can be varied from 35,000 to 200,000 lbs GVW. In addition, the grade of the road driven can be adjusted for uphill and downhill environments.

VS I Driver Information Screen

The information presented on the screen in front of the driver is pictured above. This screen provides the driver with useful learning cues including:

- RPM shift point curve
- Fuel Mileage
- Shifting pattern for selected transmission
- Vehicle load and road grade
- % Clutch, brake, and accelerator pedal application
- Clutch brake applied

VS I Driver Performance Report

A printable summary report is available as part of the Simulator I. Some of the information reported includes:

- Shifting history from gear to gear.
- Speed at start and finish of the shift
- RPM at the start and finish of the shift
- Sync error
- Time to complete the shift
- Clutch brake application
- Distance in feet between shifts
- Total distance traveled
- Fuel used
- Trip miles per gallon
- Average shift time

VS III Optional Package Descriptions

Trucking-Bus Vehicle Package

The Trucking-Bus vehicle package contains 4 vehicles:

- Motor coach bus
- Transit bus
- School bus
- Shuttle bus

These vehicles can be driven as the OwnCab in the standard trucking scenarios installed on the Simulator III.

Trucking-Municipal Vehicle Package

The Trucking-Municipal vehicle package contains 8 vehicles:

- Dump truck – 6 wheel
- Dump truck – 10 wheel
- Garbage Truck – 10 wheel
- Fire Truck – Red
- Fire Truck – Yellow

- SWAT Command Vehicle
- SWAT, Step Van, Automatic
- SWAT Support Vehicle

These vehicles can be driven as the OwnCab in the standard trucking scenarios installed on the Simulator III.

Trucking-Delivery Vehicle Package

The Trucking-Delivery vehicle package contains 14 vehicles:

- Moving Truck
- Step van 5 speed Manual
- Step Van automatic
- Tractor with Single pup trailer, Automatic
- Tractor with Double trailer, Automatic
- Tractor with Triple trailer Automatic
- Tractor with Single pup trailer, CM390 – 7 Speed
- Tractor with Double trailer, CM390 – 7 Speed
- Tractor with Triple trailer, CM390 – 7 Speed
- Tractor with Single pup trailer, CM390 – 9 Speed
- Tractor with Double trailer, CM390 – 9 Speed
- Tractor with Triple trailer, CM390 – 9 Speed
- Tractor with Double trailer, DT430 – 9 Speed
- Tractor only, Automatic

These vehicles can be driven as the OwnCab in the standard trucking scenarios installed on the Simulator III.

Snowplow Scenario and Vehicle Package

The Snowplow Package for the Simulator III™ includes 8 training scenarios and 10-vehicle combinations. The scenarios include 2 introductory, 4 intermediate, and 2 advanced scenarios in either a snowy freeway or mountain-driving environment. The snow is visually cleared from the road by the snowplow allowing the driver to check his progress. Two separate drivers can drive the advanced scenarios at the same time in separate simulators for coordination and communications training between the lead- and following-driver.

Snowplow Scenario and Vehicles

The vehicle combinations included with the package are shown in the table below:

Automatic transmission:	**13-Speed manual transmission**:
Snowplow all blades up	Snowplow all blades up
Snowplow front blade angled right	Snowplow front blade angled right
Snowplow front blade angled left	Snowplow front blade angled left
Snowplow front and wing blades angled right	Snowplow front and wing blades angled right
Snowplow front and wing blades angled left	Snowplow front and wing blades angled left

Scenario Editor Software

The clients can create their own driving scenarios using Kitmeer/TI's Scenario Editor software. Scenarios and environments are designed to provide sufficient realism in replicating real world driving situations. Kitmeer/TI's Scenario Editor features include:

- The programming capability provides the user with the ability to command by scripting vehicle models to interact with and between vehicles, cause vehicle models to obey or disobey the rules of the road, and collide or avoid collisions with OwnCab or other vehicles.
- Logic statements, zones, and on the fly commands provide the trainer with the ability to program scenario vehicles to misbehave, stop-on-command, park right or left, act aggressively, pass, speed, ignore traffic control devices, and ignore siren such as lights and siren from a law enforcement unit during a traffic stop.
- Realistic driving situations progress from simple to complex to include
    - Freeway, rural, and city driving environments
    - Various weather conditions such as snow, rain, fog, wind

Four-Day Scenario Editor Training Seminar at Client's location

The Client may select to conduct the Product Training Seminar at their location for up to 4 trainees. The training covers use of the Scenario Editing Software and a review of the operation and maintenance of the simulators.

Custom Logo Graphics

Using logo artwork supplied by the client, one (1) vehicle from the vehicles supplied with the simulators is modified to include the logo of the Client. This customized vehicle is available on all simulators purchased by the Client. The artwork supplied by the client must meet the Kitmeer/TI's specifications.

Installation in Client-Supplied Trailer or Recreational Vehicle

Kitmeer/TI will install the simulator(s) into a client-supplied trailer or RV at a Kitmeer/TI's factory in Salt Lake City, Utah. Kitmeer/TI will provide suggestions for the client to obtain the most suitable trailer or RV. However, the specification, purchase, service and warranty of the trailer or RV are solely between the client and the trailer or RV manufacturer. Kitmeer/TI only warrants the simulator as outlined in Appendix B—Parts/Phone Support.

The installation package includes:

- Kitmeer/TI labor to install simulator into the trailer or RV,
- Five (5) Air Springs to cushion each simulator during travel
- Five (5) Air Spring Brackets to affix the air springs to each simulator base and trailer floor
- Computer cable extensions
- Testing the simulator after installation to insure proper operation.

The client is responsible for delivering the trailer or RV to Kitmeer/TI's Salt Lake City Factory prior to installation and transportation from the factory to the client's final destination following installation.

Driver Training Courses

Kitmeer/TI offers a variety of courses that combine instructor-led (ILT), computer-based (CBT), and simulation-based instructional methodologies to reinforce the learning objectives for each course. Each course package will contain an Instructor Guide, which provides a course "road map" for the instructor; a CBT program; and the appropriate course scenarios as recommended in an individual course syllabus.

Seven courses are available or being developed for tractor-trailer drivers. Each is designed to be taught in 2-1/2 to 3-hours. These are:

Circles of Influence

This course teaches drivers how to recognize and anticipate hazardous driving situations and how to cultivate a state of mind in which they can take the correct actions to deal with them. This course includes ♦ psychological, physical, and environmental factors that influence driver performance ♦ basic decision-driving skills ♦ driving strategies for difficult environments ♦ rules of the road ♦ collision-avoidance techniques.

Shifting Techniques

Practicing good progressive-shifting technique saves transmissions and improves fuel economy. This course will focus on ♦ advanced gear-shifting skills ♦ shifting controls ♦ gear synchronization ♦ consequences of improper shifting ♦ shift patterns for nine-, ten-, and thirteen-speed road rangers

Fuel Management

Even small increases in fuel economy can result in substantial bottom-line results, and most drivers can boost their average fuel economy by using the proper techniques. This course includes ♦ maximizing MPG performance through vehicle maintenance and progressive shifting ♦ calculating fuel consumption ♦ controlling speed ♦ limiting idling times ♦ braking properly ♦ route planning.

Speed Management

Managing the speed of a tractor-trailer under a variety of conditions can be a complex task. This course includes ♦ speed limits and the law ♦ speed and stopping distance ♦ traction and road surface conditions ♦ curves and grades ♦ sight distance and visibility ♦ speed and traffic flow.

Space Management

Managing the space around a tractor-trailer is critical to accident prevention. This course includes ♦ the space cushion ♦ calculating following distance ♦ tailgating ♦ space ahead and behind ♦ managing space during left and right turns ♦ space above and below your rig ♦ crossing, entering, and merging into traffic ♦ right-of-way issues.

Adverse Driving Conditions

Because adverse driving conditions tend to be rare or unusual, many drivers are unprepared to deal with them cautiously and effectively when they do occur. This course covers ♦ driver preparedness ♦ adverse weather conditions ♦ operational hazards ♦ traction and road surfaces ♦ stopping distance and reaction time ♦ night driving ♦ urban driving ♦ remote-area and mountain driving ♦ extreme heat ♦ snow and ice conditions ♦ freeing stuck vehicles.

Emergency Maneuvers

Driver error in emergency situations accounts for about 1/3 of all motor vehicle accidents. This course will improve safe operating practices by developing skills in ♦ hazard perception ♦ evasive steering ♦ skids and recovery ♦ emergency braking ♦ brake failures and blown tires ♦ off-road recovery.

Delivery Methods

There are three options for delivery of the course materials to the students:

Stand-Alone Delivery: Separate computers, projectors, etc are provided in this option for the client to present the CBT and ILT materials independent of the simulator. This delivery method can be used either in a group or individual teaching method.

Group Simulator-Bundled Delivery: In this method, the computers and center screen of each simulator are used to present the CBT and ILT course materials. This delivery option is effective in a group teaching method.

Individual Simulator-Bundled Delivery: In this method, the simulator computers and SimCommander touch screen are used to present the CBT and ILT course materials. This delivery option is effective for an individual teaching method.

Technology Changes

The technology used in Kitmeer/TI's simulators is constantly being updated and improved. Kitmeer/TI reserves the right to update and upgrade any hardware or software described in this proposal, without notice to the customer, provided it delivers the same or a better level of service to the customer.

Budgetary Pricing

DRIVER TRAINING SIMULATOR

Item #	QTY	Item Description/Info	Unit Price C&F- USD	Extended Price C&F - USD
1.0	1	**Simulator III DRIVER TRAINING SIMULATOR(S) WITH OPERATING SOFTWARE INCLUDED** Includes Vehicle Dynamics for UAZ, URAL and many more	$340,000.00	$340,000.00
2.0	1	**1 YEAR WARRANTY PARTS AND PHONE SUPPORT**	$50,000.00	$50,000.00
3.0	1	**INSTALLATION ON-SITE BY KITMEER/TI TECHNICIAN**	$23,000.00	$23,000.00
4.0	7	**OPERATORS ONLY TRAINING ON-SITE**	$21,000.00	$147,000.00
Total Quotation			**C&F**	**$560,000.00**

DRIVER TRAINING SIMULATOR

RECOMENDED OPTIONAL ITEMS

Item #	QTY	Item Description/Info	Unit Price C&F- USD	Extended Price C&F - USD
1.0	1	**1 YEAR ADDITIONAL PARTS AND PHONE SUPPORT**	$50,000.00	$50,000.00
2.0	1	**SPARE PARTS**	$50,000.00	$50,000.00
1.0	1	**1 YEAR ADDITIONAL PARTS AND PHONE SUPPORT**	$50,000.00	$50,000.00
2.0	1	**SPARE PARTS**	$50,000.00	$50,000.00
Total Quotation			**C&F**	**$200,000.00**