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Advanced Distributed Simulation Technology



Advanced Field Artillery System (AFAS) / Future Armored Resupply Vehicle (FARV) Simulation Feasibility Analysis Study (FAS)



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Prepared for: STRICOM U.S. Army Simulation, Training and Instrumentation Command 12350 Research Parkway Orlando, FL 32826-3275

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APPENDIX C

SIMULATOR/SIMULATION PERFORMANCE REQUIREMENTS

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APPENDIX C

AFAS VEHICLE ATTRIBUTES

30. SIMULATOR/SIMULATION PERFORMANCE REQUIREMENTS.

30.1 AFAS Vehicle Characteristics.

30.1.1 Crew, Crew size: 3.

- The crew members must be able to be viewed directly by each other.
- The system must be able to be operated by two crew members for up to 4 hours.
- The system must be operable by 3 crewmen over a 48 hour scenario.
- Provision for crew rest (one person).
- Provision for ration heater, and storage for 2 -3 day supply of water.

30.1.2 Decision Aids. See paragraph 4.1.4 in basic report.

30.1.3 Auxiliary Power Requirements:

- Must be able to power all on-board systems for at least 6 hours. (Except NBC over pressure and main armament.)
- Must be able to start the main engine.
- External power receptacle to start engines, run diagnostics and run ammunition handling systems (download).

30.1.4 Vision Requirements:

- Provide the crew adequate vision capability for ground and air surveillance, 360 degree coverage, from ground level at 25 meters from the vehicle to infinity at 45° above the horizon.
- Provide the driver with a close-in capability. 180 degrees horizontal, from within 5 meters of the vehicle to 45 degrees above the horizon.
- Provide the driver sufficient rearward visibility to enable him to perform docking maneuvers.

- Provide the Chief of Section sufficient visibility to confirm the driver's maneuver decisions and to verify surveillance sightings.
- Provide the capability to identify people at 800 meters and identify vehicles at 1500 meters under day, night and reduced visibility conditions.

30.1.5 Mobility.

- Responsiveness. Be able to move 750 meters within 90 seconds after identifying a potential threat.
- Maximum on/off road- grade, in percent grade.
- Climbing or descending straight up the slope. 60% Grade. Wet and dry (hard) surface.
- Traversing the slope: 40% Grade. (90 Degrees to the fall line, on a dry hard surface.)

30.1.5.3 Minimum Required Speeds in kilometers per hour (Based on the criteria to be able to keep up with the maneuver forces; the mobility criteria same as an M-1A2 tank and M-2A2 or M-3A2 IFV.)

- On level hard surfaced roads:
- Sustained Forward Speed: 78 km/h (desired), 67 km/h (required).
- Minimum Forward Sustained Speed: 4 km/h
- In reverse: 20 km/h
- On Hills. At full combat weight the vehicle must be able to maintain forward downhill speeds of not less than uphill speeds on long primary road grades of up to 15% without overheating when operated at 40° C and 1800 meters elevation.
- On slopes of 2% to 60%, see the following table.
 - 02% 65.0 km/h 05% 47.4 km/h 10% 32.0 km/h 15% 23.7 km/h 20% 19.5 km/h 30% 13.5 km/h 40% 9.5 km/h 50% 8.3 km/h 60% 7.0 km/h
- Decelerate fully loaded vehicle at 5m/s².
- Accomplish 25 consecutive stops, at five minute intervals, from 80% max speed at a rate of 3.3 m/s² minimum deceleration.
- Service Brake will hold vehicle motionless on 60% slope (facing uphill or downhill).

- Parking Brake will hold the vehicle motionless on 60% slope.
- Minimum sustained cross country speeds: 48 (desired), 39 km/h. (required) 30.1.5.4 Braking.
- Braking and Steering will be possible without engine power.

30.1.5.4 Turning.

• Pivot steer (meters): 16.3 meter diameter "spot" circle. Note: This value was obtained by subtracting 1/2 of the chassis length (7925mm) from the total vehicle length including the gun tube (12,116mm), to get a radius equal to the distance from the center of the chassis to the end of the gun tube, then doubling the result and rounding up to the nearest whole meter, to compensate for the pendulum effect of the gun tube. See Figure 1 below.





• Lateral steer 16.64 meter diameter "doughnut" circle. See Figure 2 below.



Figure 30.1.5.2. Minimum Lateral Steer Turn

Above numbers contain an allowance for the pendulum effect of the gun tube, which extends beyond the end of the chassis.

• Minimum Required Radius of Turn No greater than 1.5 times the chassis length. See Figure 3 below. The vehicle must be able to accomplish a 0.7g (lateral) turns on a dry pavement as speeds of 20 to 100% of its maximum speed.



Figure 30.1.5.3 Minimum Required Lateral Steer Turn

30.1.5.5 Maximum tree knockdown and drive-over (diameter in meters). Trunk diameters of less than 5 centimeters (2 inches) generally do not hinder tracked vehicles. The practical upper limit for a medium tank is 15 to 20 centimeters in diameter (6 to 8 inches). Groups of trees with stem diameters less than six inches may be obstacles if they are close together. The average distance between trees (stem spacing) is 4.5 to 6 meters for both wheeled and tracked vehicles. This distance is greater than the width of standard military vehicles, but allowance is made for individual vehicle maneuver. (Ref. FM 5-36, page 6-3)

30.1.5.6 Maximum vertical step climb height (meters): 0.91 meters

30.1.5.7 Maximum trench/ditch crossing width (meters): 2.5 meters

30.1.5.8 Maximum fording depth (without floatation/snorkeling kit, in meters): 1.22 meters. Hard surfaced entrance and exit slopes of 40% shall be negotiable.

30.1.5.9 Maximum snorkeling depth with snorkeling kit (in meters): 2.5 meters.

30.1.5.10 Maximum stream velocity when fording/floating/snorkeling: Not available.

Note: The vehicle is not designed to swim/float. At a maximum snorkeling depth of 2.5 meters, the vehicle displaces approximately 34.7 metric tons. If the average coefficient of friction for wet rock is the same as wet concrete, (0.25), then a side force greater than or equal to 472 kg/m^2 would cause the vehicle to begin to slide sideways and the driver may lose control of the vehicle.

30.1.5.11 Untrafficable Terrain. Average percentage of the terrain that would be untrafficable by the vehicle under the following conditions in the following geographical areas:

	Central Europe	Middle East
Dry	05.0%	05.0%
Wet	10.0%	05.0%
Snow	14.0%	10.0%

30.1.5.12 Vehicle cone index :

- Pass: 26.6 (in fine-grain soil).
- 50 Passes: 60.0 (estimate based on similar vehicle)
- Towing Capabilities Must tow another vehicle (AFAS or FARV) at least 15 km at a minimum speed of 20 km/h on a dry hard surface.

30.1.6 Fuel.

- Primary Fuel: JP-8.
- Alternate Fuel: MIL-F-5380
- Capacity: 1100 liters / 280 gallons.
- Consumption Rates. Idle, maximum 15kg/hr.

	Gallons/Hour	Liters/Hour	Miles/Gallon	Kilometers/Liter
Idle	2	7.5	N/A	N/A
Cross Country (Avg. Speed)	26.53 (32 km/h) (20 mph)	100	0.76	0.32
On Roads (Avg. Speed)	18.79 (65 km/h) (40 mph)	71	2.12	0.91

Based on FM 101-10-1/2, "Staff Officer's Field Manual Organizational, Technical and Logistical Planning Factors," Vols. 1 & 2. Fuel consumption rates for 60-ton vehicles were used. The fuel used to develop the tables in the FM was diesel fuel, which may have a different energy density content than the new fuel, JP-8. The ratio of consumption of JP-8 to Diesel Fuel will be roughly proportional to the ratio of the API numbers for JP-8 and Diesel Fuel. Average speeds are derived from above tables in lines 4 and 5.

30.1.6.5 Maximum Unrefueled Travel Distance:

- Minimum required unrefueled travel distance, using roads: 405 km (at 47km/h.)
- Approx. max. travel distance without refueling, cross country: 320 km

30.1.7 Physical Dimensions.

30.1.7.1 Vehicle length

- Chassis (Without Gun Tube): 7.925 meters, maximum.
- Total length (Includes Gun Tube): 12.116 meters, maximum.
- Vehicle width (meters): 3.37 meters, maximum.
- Vehicle Weight:
- Combat weight: 55 tons.
- Curb weight: 50 tons.

30.1.7.2 Vehicle wheel base (track foot print length in meters): Approximately 3.9 meters

30.1.7.3 Minimum Ground Clearance: 0.43 meters.

30.1.7.4 Vehicle height (meters): 2.883 meters, without Ancillary Equipment

30.1.7.5 Ancillary Equipment. The following items are either an integral part of the vehicle or routinely carried on all armored vehicles. These items are normally loaded or mounted on top of the vehicle, which when present or in use, will increase the apparent size of the vehicle.

ITEM	HEIGHT
Antenna (upright)	3.0 meters
Antenna (tied down)	1.3 meters
Antenna Mount	0.3 meter
Rolled camouflage net	0.6 meter
Camouflage pole bag	0.3 meter
Duffel bag	0.4 meter
50 cal machine gun mount	0.4 meter
50 cal machine gun, on mount	1.2 meters (tilted full up)
Crew hatch, open, unsecured	0.8 meter
Crew hatch, open, secured	0.3 meter
IFF device	1.0 meters
Pantel Ballistic shield	0.6 meters
Pioneer Tools	0.1 meter
Lifting eyes	0.2 meter

30.1.8 Engine Type: Diesel, 1500 HP.

30.1.9 Armament.

30.1.9.1 Main Gun. The Main Gun will be a 155mm Cannon

- Required Maximum Range: 30 km (unassisted projectile).
 40 km (rocket-assisted projectile).
- Desired Maximum Range: 40 km (unassisted projectile). 50 km (rocket-assisted projectile).
- Minimum Required Range: 6 kilometers (at 200 mils QE). Desired: 4 kilometers.
- Minimum Number of Rounds on board: 60, plus 2 Copperhead rounds.
- Maximum Rate of Fire: 10 -12 Rounds per Minute for 3 -5 minutes. Desired: 16 Rounds per Minute for 5 minutes. Required: 10 Rounds per Minute for 3 Minutes.

Sustained Rate of Fire: 3-6 Rounds per minute. Desired: 6 Rounds per Minute for 10 minutes. Required: 3 Rounds per Minute for 10 minutes.

- Rounds per TOT: 4-8 Rounds on target, from 8 36 km, within 4 seconds.
- Maximum allowable slope/grade for firing: 17% (10 degrees to the fall line).
- Gun Elevation Limits: -3 Degrees from AFAS longitudinal center line to +75 degrees above the center line.
- Maximum time to fire
 - •• Emplaced, 15-20 seconds. 20 seconds.
 - •• On the Move, 30-45 seconds. 45 seconds.
 - •• After being re supplied, 90 seconds, maximum.
 - •• From a warm section status: 45 seconds. 9.
- Accuracy of Fires:

Range	Bias	Precision CEP
Min. to 15 km	55m	40m
16 to 25km	80m	75m
26 to 35 km	140m	120m
36 to max	215m	200m

• Weapon Capabilities: Fully functional within 15 minutes after startup; when OAT is -46°F

30.1.9.2 Safety Devices.

- Previously Rammed Round Check Device. Device to ensure that any previously rammed round is detected before another round is rammed.
- Bore Clear Check Device. Device to ensure that the bore is clear of obstructions, primarily previously fired rounds which may have become stuck in the tube.
- Round Fall-Back Check Device. Device to ensure that the round is firmly engaged in the lands and has not fallen back onto the propellant.

30.1.9.3 Upload and Download Criteria. After both vehicles are within 8 meters of each other, their resupply ports facing each other and within 10° of being on the same horizontal plane, the AFAS must be able to:

- Automatic Up-load
 - Accept 60 complete rounds in less than 12 minutes.
 - •• Accept fuel at the rate of 132 190 liters per minute.
 - •• Control the loading process.
 - •• Automatically download 60 complete rounds to the FARV in 20 minutes.
 - •• Manual Up-load.
 - •• Up-load Ammunition at one round per minute from flatracks.
 - •• Up-load 60 rounds in 45 minutes from FARV.
 - •• Up-load liquid propellant without special material handling equipment.
 - •• Download Liquid Propellant:
 - •• 20 minutes into the FARV.
 - •• 30 minutes into containers (barrels).

30.1.10 Self Defense Armament.

30.1.10.1 Maximum Effective Range: (Depends on Weapon Type.)

20 mm. Approx. 2,000 meters. 25 mm. Approx. 2,500 meters. 30 mm. Approx. 3,000 meters Minimum Range: N/A.

30.1.10.2 Rate of Fire: TBD

30.1.10.3 Ammunition Capacity: TBD

30.1.11 Communications:

30.1.11.1 Crew Internal. Voice Intercom System.

30.1.11.2 Crew External.

- Remote voice intercom with range of 15 meters.
- Connection to AFAS/other FARV intercom system when docked.

30.1.11.3 Tactical Communications. Two SINGARS radios.

Advanced Field Artillery Tactical Data System (AFATDS) Interface.

• Army Tactical Command and Control System (ATCCS).

30.2 FARV System Characteristics.

30.2.1 Crew Size 3 People. Reduced Manning: Must be able to be operated by two people for four hours.

30.2.2 Decision Aids. These types of decision aids are specified for the system:

GUI with Digital Map. POS/NAV IFF Embedded Training. BIT/BITE

30.2.3 Auxiliary Power Systems:

30.2.3.1 Provide power for 6 hours for on-board computer systems, communication systems, Pos/Nav Systems, and survivability systems.

30.2.3.2 Provide enough power to start the FARV's engine.

30.2.3.3 Possess capability to accept/provide external power to download ammunition, run diagnostics and start the engine.

30.2.4 Vision Requirements:

30.2.4.1 Driver:

30.2.4.1.1 90° Left and Right of vehicle centerline, and 0 to 45° in the vertical, and all of that area included in the sector from 5 meters from the vehicle, out.

- Sufficient rearward vision to allow positioning and docking with the AFAS.
- Sufficient rearward vision to allow the backing of the trailer.
- Chief of Section:
- Capability to monitor the driver's maneuver decisions.
- Capability to monitor/verify surveillance sightings.

30.2.4.3 Crew Vision. (everyone)

- Capability to view 360 degrees within 25 meters of the vehicle and upward to +45° above the horizontal plane of the vehicle.
- Capability to recognize humans out to 800 meters and identify vehicles at 1500 meters.

30.2.5 Mobility. Mobility should be the same as the AFAS, except the FARV will not have the problems associated with the cannon tube's pendulum effect. The following list summarizes the mobility requirements. The FARV mobility may be hindered when pulling a trailer.

Road Speed.	67-78 km/hr sustained.
Cross-Country Speed.	39-48 km/hr.
Lateral Slope.	40% .
Ascend/Descend.	60%/60%.
Gap Crossing.	2.5 - 2.7 meters.
Fording.	122 - 150 cm.
Reverse Speed.	20 -25 km/hr.
Vertical Wall.	91 - 107 cm.
Cruising Range.	405 to 450 km at 47 km/hr on a dry hard surfaced road.
Stopping.	Max speed to full stop at 5 m/s^2 .

- Pivot Turn Radius. N/A. (Same as AFAS, unless pulling a trailer.)
- Trailer Requirements. The FARV bust be equipped to tow and Backup a Trailer.
- Tow another AFAS or FARV at 20 km/h for 15 km.
- Maximum Towing Capacity. 50 tons.

30.2.6 Response Times:

- Cold Start. 15 minutes after application of power the FARV will be fully mission capable.
- Warm Start. 45 seconds after notification.

30.2.7 Physical Dimensions.

- Length: 7.925 meters.
- Width: 3.37 meters.
- Weight. Curb. 50 tons. Combat. 55 tons.
- Wheel Base. (track foot print length in meters): Approximately 3.9 meters
- Minimum Ground Clearance: 0.43 meters.
- Vehicle Height 2.88 meters.
- Ancillary Equipment. The following items are either an integral part of the vehicle or routinely carried on all armored vehicles. These items are normally loaded or mounted on top

of the vehicle, which when present or in use, will increase the apparent size of the vehicle.

ITEM	HEIGHT
Antenna (upright)	3.0 meters
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Camouflage pole bag	0.3 meter
Duffel bag	0.4 meter
50 cal machine gun mount	0.4 meter
50 cal machine gun, on mount	1.2 meters (tilted full up)
Crew hatch, open, unsecured	0.8 meter
Crew hatch, open, secured	0.3 meter
IFF device	1.0 meters
Pioneer Tools	0.1 meter
Lifting eyes	0.2 meter

30.2.8 Engine Type: Diesel, 1500 HP.

30.2.9 Fuel.

- Primary Fuel: JP-8.
- Alternate Fuel: MIL-F-5380
- Capacity: 1100 liters / 280 gallons.
- Consumption Rates. Idle, maximum 15kg/hr.

	Gallons/Hour	Liters/Hour	Miles/Gallon	Kilometers/Liter
Idle	2	7.5	N/A	N/A
Cross Country (Avg. Speed)	26.53 (32 km/h) (20 mph)	100	0.76	0.32
On Roads (Avg. Speed)	18.79 (65 km/h) (40 mph)	71	2.12	0.91

Based on FM 101-10-1/2, "Staff Officer's Field Manual Organizational, Technical and Logistical Planning Factors," Vols. 1 & 2. Fuel consumption rates for 60-ton vehicles were used. The fuel used to develop the tables in the FM was diesel fuel, which may have a different energy density content than the new fuel, JP-8. The ratio of consumption of JP-8 to Diesel Fuel will be roughly proportional to the ratio of the API numbers for JP-8 and Diesel Fuel. Average speeds are derived from above tables in lines 4 and 5.

- Maximum Unrefueled Travel Distance:
 - •• Minimum required unrefueled travel distance, using roads: 405 km (at 47km/h.)
 - Approx. max. travel distance without refueling, cross country: 320 km

30.2.10 Storage and Transfer Capabilities.

30.2.10.1 Fuel Transfer Rates:

Self. N/A.

To another vehicle. 132 - 190 liters/min.

Resupply Distances. 2-12 km from reload point to AFAS and back again.

30.2.10.2 LP Storage. 75% Full Charge for 130 - 200 rounds.

30.2.10.3 Ammunition Storage Capability.

- Conventional 130 200
- Copperhead 2

30.2.10.4 Ammunition Transfer System. Must handle all current and planned ammunition types, except copperhead and rounds over one meter long. Will be controlled from the receiving vehicle after docking.

- Manual Loading Criteria: Ground to FARV. 130 rounds within 65 minutes.
- Automatic FARV to AFAS Transfer. 60 rounds within 12 Minutes.
- Automatic AFAS to FARV Transfer. 60 rounds in 30 minutes.
- Automatic Unloading Criteria: FARV to FARV. 130 rounds within 20 minutes.
- Automatic Unloading Criteria: FARV to Ground. 130 rounds within 30 minutes.
- Manual Unloading Criteria: FARV to Ground. 130 rounds in 90 minutes.
- Angle between Vehicles: 10 degrees maximum resultant angle.
- Distance between Vehicles: 8 meters maximum.
- Download from AFAS: 60 rounds in 30 minutes.

30.2.10.5 Fuel Transfer System:

- Transfer fuel at a rate of 132 190 liters per minute.
- Disconnect within 10 seconds without spillage.

• Capable of disconnecting and moving 750 meters within 90 seconds of threat detection. (Without dropping any ammunition or spilling fluids.)

30.2.11 Self Defense Armament.

Maximum Effective Range: (Depends on Weapon Type.)

20 mm. Approx. 2,000 meters. 25 mm. Approx. 2,500 meters. 30 mm. Approx. 3,000 meters Minimum Range: N/A.

- Rate of Fire: TBD
- Ammunition Capacity: TBD

30.2.12 Communications:

- Crew Internal. Voice Intercom System.
- Crew External.
- Remote voice intercom with range of 15 meters.
- Connection to AFAS/other FARV intercom system when docked.
- Two SINGARS radios.
- Tactical Communications.
- Advanced Field Artillery Tactical Data System (AFATDS) Interface.
- Army Tactical Command and Control System (ATCCS).

30.3 AFAS/FARV Task Matrixes. The tasks that the simulations must represent or support were derived from the "Advanced Field Artillery System (AFAS) Task List (Draft)" by CAE-Link Corporation, for U.S. Army Research Institute's Ft Sill Unit, July 31, 1992.

30.3.1 Concept. The AFAS-FARV-FAAPS simulators/models will consist of an integrated system of model devices. The devices that are candidates for simulation will be defined in generic terms and assigned fidelity values. I attempted to relate the fidelity values to those found in the proposed IEEE draft standard, "Fidelity Description Requirements for Distributed Interactive Simulation", prepared by the Institute for Simulation and Training for STRICOMM-DMSO, 22 March, 1993, but was unable to do so because the fidelity for vehicle representations and device level objects have not been defined.

30.3.1.1 Fidelity. Devices in the simulator will have to have varying degrees of fidelity, depending on the way that the crew interacts with them. Devices that the crew must manipulate or interact with should have the highest possible fidelity. Devices that only provide information to the crew could have lower levels

of fidelity, while devices that only maintain the illusion of reality could have less. For simplicity, I have defined devices into three categories of fidelity: high, medium and low. See the following paragraphs for examples of each.

- High. Functions like the real vehicle/device. Is a full scale model. Allows the user full interaction with all aspects of the device. User inputs get realistic and reasonable responses from the device. Simulation provides realistic tactile, auditory, and visual feedback to the user. For example, a circuit breaker panel, that is within sight of the crew, and is actually wired into the simulator so that the crew can pull and reset individual circuit breakers to disable or enable other real or simulated devices in the simulator, is high fidelity.
- Medium. Visually, it looks like the real vehicle/device, may even be a full scale model. It allows the user to touch and manipulate controls. User input gets no response from the simulator. Using the previously mentioned circuit breaker panel as an example, if the panel was not wired to any devices and pulling and resetting the circuit breakers had no effect on devices on the simulator, but had to be included for realism, that would be medium fidelity.
- Low. Visually, it may barely resemble the real object. Controls do not work and cannot be manipulated. The device may consist of graphical depictions only. Indicator panels/lights do not work. Using the circuit breaker panel for an example again, a low fidelity circuit breaker panel would be a single solid molded representation of the panel, or a life size picture of the panel placed in its intended location in the simulator.

30.3.2 Devices to Be Modeled.

30.3.2.1 Annunciators. Devices that provide visual or auditory indications to the crew that something requires additional/immediate attention. A red light and/or a beeper is an example of an annunciator.

30.3.2.2 Decision Aids. Decision Aids (DA) consist of: (1) a set of rules, implemented in hardware or software; (2) a graphical user interface (GUI) to present the choices to the user and receive user commands; (3) an information base that provides data for the rules to act on; and (4) a computer to control the GUI, update and maintain the information base and execute the rules.

30.3.2.3 Switches. Switches may be either software or hardware devices. They are used to change the state of a device.

30.3.2.4 Sensors. Sensors may be either hardware or software devices that are used to determine the state of a device or process.

30.3.2.5 Controls. Crew activated mechanical devices used to move devices or control dynamic processes.

30.3.2.6 GUI. Graphical User Interface. Computer-like display screen. May be illuminated icons or buttons, flat panel or CRT, or some other device that can display pictures.

30.3.2.7 GUI/Control. GUI with some sort of associated control or input device. Could be keyboard, mouse, joystick or touch screen.

30.3.2.8 GUI Screen. GUI/Text based menu screen. Allows the display and selection of items from menus or lists. Allows moving/dynamic displays.

30.3.2.9 Intercom. System that allows the crew to hear other crew members conversations/commands within the vehicle, or within close proximity to the vehicle.

30.3.2.10 Intercom/Mike. System that allows internal and external communications between crew members and other persons who are located far away from the vehicle.

30.3.3 Crew Tasks. With fewer crew members, less specialization will be allowed. Each crew member will be able to do some, if not all of the other crew member's task, depending on the current situation. The crew tasks must be passed back and forth, started and stopped in a coordinated manner. Decision aids and rapidly reconfigurable crew station displays and controls will make task shifting and task sharing easier.

30.3.3.1 Task Shifting. For instance, all self defense tasks are not assigned to the same person or crew position at all times. When the vehicle is moving, primary responsibility for self defense systems monitoring lies with the gunner, and all other crew members monitor the system to some degree. The CoS will monitor the system more than the driver. When the vehicle is stopped and is conducting fire missions, then the primary responsibility for self defense systems monitoring lies with the driver. and the other crew members then monitor the system, but the gunner would monitor the system less than the CoS. In the transition phases, when the driver is preparing to move, and the gunner is securing the gun for movement, the chief of section will have to momentarily assume primary responsibility for monitoring the self defense systems. Either the gunner or the chief of section will have primary responsibility for monitoring the self defense systems whenever the driver is performing maintenance outside the vehicle.

30.3.3.2 Task Matrices. The possible combat related situations are addressed in the matrices are:

- (1) Resting or accomplishing maintenance.
- (2) Transitioning from one state to another (Preparing to move).
- (3) Tactical Movement (between areas of operations)
- (4) Survivability Movement (between firing sites).
- (5) Firing operations.
- (6) Resupply operations.

30.3.4 Crew Responsibilities and Crew Station Requirements.

30.3.4.1 Driver. The driver is primarily responsible for driving the vehicle when the vehicle is moving. He monitors the self defense sensors and mans the self defense weapon(s) when the vehicle is stationary. He monitors system start-up and system initialization as it pertains to his duties and crew position. He is also responsible for monitoring the status of all of the automotive systems, and performing maintenance on those systems whenever required.

- Driver Station. Fidelity Required: High. The driver must feel like he is actually driving a vehicle and controlling any self defense systems. As a minimum, the simulator should provide visual, tactile, and auditory fidelity.
- Physical Fidelity. High. The driver should have access to and be able to operate all of the controls that he is responsible for. This includes defensive armament and sensor readouts. The driver is also responsible for PMCS and maintenance on the vehicle. He may require high fidelity external features on the simulator for combat battle damage assessment and repair tasks.
- Decision Aid Fidelity. High. Actual software decision aids can be used to drive the simulations.
- Visual Fidelity. High. The driver must think that he can see enough to drive the vehicle and avoid obstacles. Some of his vision capability will be provided by television cameras, and some by direct view through glass. The television views should be very high fidelity while some of the through glass capability could be of a lower quality.

30.3.4.2 Chief of Section (CoS). The CoS is responsible for the actions of the crew and the safe and efficient operation of the vehicle in the accomplishment of the mission. He reports arriving and departing specific locations. He navigates between locations and monitors the driver's performance while the vehicle is moving. He monitors the actions of the gunner when the vehicle is stationary and in a firing position. He monitors system start-up and system initialization as it pertains to his duties and crew position. He plans routes and selects positions. He establishes the defense plans. He assigns responsibilities and tasks, monitors their

accomplishment, and provides continuity when task responsibilities are passed from one crew station to another.

- Chief of Section Station. Fidelity Required: High. The CoS must feel like he is actually commanding a vehicle and controlling any of the self defense systems, resupply, planning, firing, etc. systems. As a minimum, the simulator should provide visual, tactile, and auditory fidelity.
- **Physical Fidelity.** High. The CoS should have access to and be able to operate all of the controls that he is responsible for. This includes defensive armament and sensor readouts.
- Decision Aid Fidelity. High. Actual software decision aids can be used to drive the simulations.
- Visual Fidelity. High. The CoS must think that he can see enough to drive the vehicle and avoid obstacles. He must be able to see enough to help direct the driver and ensure that the driver is safe. Some of his vision capability will be provided by television cameras, and some by direct view through glass. The television views should be very high fidelity while some of the through glass capability could be of a lower quality.

30.3.4.3 The Gunner. The gunner is responsible for monitoring and executing firing operations. When the vehicle is moving, he is responsible for monitoring and operating the self defense equipment. He monitors system start-up and system initialization, as it pertains to his duties and crew position. He is also responsible for monitoring the status of all of the armament systems, and performing maintenance on those systems whenever required.

- Gunner Station. Fidelity Required: High. The Gunner must feel like he is actually controlling the firing process. He must also be able to control the vehicle and any of the self defense systems, resupply, planning, firing, etc. systems. As a minimum, the simulator should provide visual, tactile, and auditory fidelity.
- Physical Fidelity. High. The Gunner should have access to and be able to operate all of the controls that he is responsible for. This includes defensive armament and sensor readouts. The Gunner should have access to a gun compartment, equipped with copperhead rounds and loading equipment, for accomplishing all of his primary combat tasks.
- Decision Aid Fidelity. High. Actual software decision aids can be used to drive the simulations.

• Visual Fidelity. High. The Gunner must think that he can see enough outside the vehicle to drive and avoid obstacles. He must be able to see enough to help direct the driver during positioning for resupply. He must be able to "see" the loading and firing mechanism working in the turret from his station. Some of his vision capability will be provided by television cameras, and some by direct view through glass. The television views should be very high fidelity while some of the through glass capability could be of a lower quality.

30.3.4.4 The Handler. In the FARV the Handler is responsible for monitoring and executing resupply operations. When the vehicle is moving, he is responsible for monitoring and operating the self defense equipment. He monitors system start-up and system initialization, as it pertains to his duties and crew position. He is also responsible for monitoring the status of all of the resupply conveyor and robotic systems, and performing maintenance on those systems whenever required.

- Handler Station. Fidelity Required: High. The Handler must feel like he is actually controlling the resupplying (FARV up-load) process. He must also be able to control the vehicle and any of the self defense systems, resupply, planning, firing, etc. systems. As a minimum, the simulator should provide visual, tactile, and auditory fidelity.
- **Physical Fidelity.** High. The Handler should have access to and be able to operate all of the controls that he is responsible for. This includes defensive armament and sensor readouts. The Handler should have access to a supply compartment (equipped with copperhead rounds) and materials transfer equipment for accomplishing all of his primary combat tasks.
- Decision Aid Fidelity. High. Actual software decision aids can be used to drive the simulations.
- Visual Fidelity. High. The Handler must think that he can see enough outside the vehicle to drive and avoid obstacles. He must be able to see enough to help direct the driver during positioning for resupply. He must be able to "see" the materials handling mechanism working in the ammunition compartment from his station. Some of his vision capability will be provided by television cameras, and some by direct view through glass. The television views should be very high fidelity while some of the through glass capability could be of a lower quality.

30.3.5 Component Fidelity. When individual hardware and software components of the FARV, FAS and FAAPS are called out, I have listed them in a

matrix and assigned fidelity values to them. The criteria used was based on the degree that the crew members interacted directly with the components.

30.3.5.1 Hardware Components. If the hardware component would not be directly viewed or touched by any crew member, it was assigned a low fidelity rating. If the component was likely to be viewed but not touched, then it was given a medium fidelity rating If the component is likely to be both viewed and touched by the crew members, it was assigned a high fidelity rating.

30.3.5.2 Software Components. If a software component fed data directly to the crew stations then it was assigned a high fidelity rating. If the component feeds data to a device that is used by the crew, it is assigned a medium fidelity rating. If the device does not directly or indirectly feed data to the crew station, it is assigned a low fidelity rating.

30.3.5.3 Matrices. The data is summarized in the following tables.

17. 13. 1

afas I	Primary Responsibility							
14565	Resting	Startup	Resupplying	Moving	Firing	Interface Device	Fidelity	Enabling Devke
PREPARE NOR OPERATIONS							<u> </u>	
SYSTEM ATTALIZATION					,	•		
Selve Invidence Declar	Up Crewman	N/N	4/8	V/V	V/V	CUN/Control	11tch	ACI Mus. UPI 3
Selects Pre-operational Checks Aid IDA!	Up Crewman	N/N	1	V/V	N/N	GUI/Control		CPU and DA
Monitors Pre-consisten Checks (DA)	Up Crewman	N/N	1/N	N/N	N/N	GUI Screen	ligh	Sensors/Sumulation
Activates Master Power	N/A	Driver/CoS	1/2	N/N	N/N	Control	i ligh	Switch
Activates Starting Sequence	N/N	Driver/CoS	V/N	V/V	N/N	CUI/Control	High	CPU and DA
Monitors Engine Warning Indicators	N/N	Driver/Cos	4/2	N/N	N/A	GUI Screen	i ligh	Sensors/Sumulation
Activates Power to Crew Stations	N/N	Driver/CuS	V.V.A	N/N	N/N	Control	li ligh	Switch
Monitors Self Tests	N/N	All T	4/7	N/A	N/A	CUII Serven	l ligh	C PU and DA
Selects Crew Configuration Selection Displays [DA]	Up Crewman	VII I		N/A	N/N	GUI Screen	lingh	CPU and DA
Science Crew Configuration and Task Allocations [DA]	Up Crewman	Cos	V/7	N/N	V/N	CUI/Control	ligh	CPU and DA
Selects Crew Interfaces in order to assign positions (DA)	Up Crewman	CoS		N/A	N/A	CUI/Control	liigh	CPU and DA
Monitors Power up and Crew Ready Indication	N/A		1/1	N/N	N/N	CUI Screen	litigh	Sensing
Receives Crew Ready Alert	N/A	Cos	1/1	N/A	N/N	Annunciator	High	Sensors and DA
Determines Providion Location and Orientation	Up Crewman	CoS/AII	<>>	N/A	V/N	GUI Screen	High	Sensurs
Vertifies Position and Orientation	Up Crewman	CoS/All	V/7	V/N	V/V	CUI Screen	High	CPU and DA
Scherts System Pre-operational Checks Aid [DA]	Up Crewman	CoS/All	V/V	N/A	V/V	GUI Screen	High	Switch
Science System Default Mode Display (DA)	Up Crewman	Cos/All	<	V/N	V/V	CUI Screen	High	Switch
Observes System Modes	Up Crewman	CoS/All	</th <th>N/N</th> <th>N/N</th> <th>GUI Screen</th> <th>High</th> <th>Sensions</th>	N/N	N/N	GUI Screen	High	Sensions
Receives Operations Order	Up Crewman	CoS/Gunner	K / X	N/A	N/N	GUI Screen	i tigh	Radus
Evers Data from Operations Order	Up Crewman	CoS/Curner	7</th <th>V/V</th> <th>V/V</th> <th>GUI Screen</th> <th>ligh</th> <th>CPU) and DA</th>	V/V	V/V	GUI Screen	ligh	CPU) and DA
Selects Operations Order Diaplay	Up Crewman	CoS/Gunner	4/7	V/V	V/N	GUI Screen	1 ligh	CPU and DA
Oberves Operations Order	N/A	CoS/Gunner	<	N/N	V/V	GUI Screen	High	CI'll and DA
Informs Crew of Operations Order and Tasks	N/A	CoS/Cunner	<>>	V/V	N/N	GUI Screen	1 ich	CPU and DA
Receives OPORD Displays	N/N	CuS/All		V/V	N/N	GUI Screen	ltigh	Ratio and DA
Receives Section Chief Guidance	N/N	CuS/Gunner	1</th <th>N/N</th> <th>N/N</th> <th>GUI Screen</th> <th>High</th> <th>Rathy</th>	N/N	N/N	GUI Screen	High	Rathy
Determines Operational Mode Changes [DA]	N/N	SoS	< >>	V/V	V/V	GUI Screen	High	CPU and DA
Selects Operational Mode [DA]	Up Crewman	8		N/A	N/N	CUI Screen	High	CPU and DA
Selects Status Display	Up Crewman	A I	<u> </u>	N/N	V/N	GUI Screen	High	Switch
Monitors Statuts of System Readiness Report	Up Crewman	Cos	×/>	V/V	V/V	GUI Screen	High	CPU and UA
Determines if Maintenance is Required [DA]	Up Crewman		V/N	V/N	V/N	GUI Screen	High	Services and DA
PERFORM COMMUNICATIONS SETUP					1			
Selects Communications Setup Display	Up Crewman	S	×/>	۲ ×	V/V	GUI/Control	High	C'PU and DA
Determines Communications Configuration [DA]	Up Crewman	Cos	V/V	V/V	</th <th>CUI/Control</th> <th>ligh</th> <th>CPU and DA</th>	CUI/Control	ligh	CPU and DA
Establishes and Updates Communications Detablish	Up Crewman	80	× /7	V/V	V/N	GUI/Control	ten i	CPU and DA
See Radia	Lip Crewman	CuS/All	2/2	V/V	V/N	Control	1 ligh	Raths
Selects Message Setup Aid [DA]	Up Crewman	g		N/N	<th>CUI/Control</th> <th>l ligh</th> <th>CPU and DA</th>	CUI/Control	l ligh	CPU and DA
Sets Internal Message Procedures [DA]	Lip Crewman	Cos	<	V/V	V/V	GUI/Control	High	CPU and DA
Establishes Internal Message Priority [DA]	(Ip Crewman	Cos	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	N/A	< N	GUI/Control	High	CTU and DA
Monitors Dignal Command Check	Up Crewman	CoS/All	4/7	N/N	N/N	Annunciator	l ligh	Rada

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Contraction and

	Provide Recording							
TAGG	Retine	Startup	Resumptione	Movine	Finne	Interface Device	Fidulity	Enabling Decision
		9.5		01				c
Ealites Net	Up Crewman	9	V/V		V/N	Control	High	Kadio
PERFORM INFORMATION MANAGEMENT								; 1
Selects information Management Display	Up Crewman	CuS	500	CuS	CuS	GUI/Control	l fagh	CTU And DA
Determines Data Required to Perform Mission [DA]	Up Crewman	8	80	Cos Cos	S	CUI/Control		CPU and DA
Monitors File Contents for Completeness	Up Crewman	Cos Cos	8	192	3	CUI/Control		CPU and DA
Remines incomplete or Missing Piles	Up Crewman	80	Cos	CoS	CuS	GUI/Control	High	CPU and DA
Selects Deta Diaplay for Review	Up Crewman	900	C66	Cos Cos	Cos	GUI/Control	High	CPU and DA
Identifies Obsolete Data (DA)	Cos	C 6	Cos	Cus	S	GUI/Control	Hich	CPU and DA
Reviews Data Files	Ci6	Č (S	Cus	CuS	Cus	C.U.I./Control	lich	CTU and DA
Deters Oudsted Data	CuS	Suc	CuS	CuS	Cios	GUI/Control	ligh	All and DA
Requests Current Data	CoS	Cos	Cris	ູຮູ	Cos	GUI/Control	i tigh	Radio
Monitors Updates	Up Crewman	Cos	Cos	CuŠ	Cos	GU1/Control	High	Cru and DA
PERFORM PLANNING AND COORDINATE OFERATIONS				:	۱ ۱		н :	-
Selects Operational Displays [DA]	N/N	CuS	CuS	(iuš	cus	GUI/Control	Hugh	VCI pur ILL.)
Reviews Mission	N/N	90	Cos Cos	SuS	<u>Co</u>	GUI Screen	High	CPU and DA
Determines Activities to Support Mission [DA]	N/A	Cos	Cos	Cus	1S S	GUI Screen		CPU and DA
Determines Resources Repeted for Each Activity [DA]	N/A	Cos	CuS	CuS	CoS	GUI Screen	ligh	CPU and DA
Determines Mission/Task Priorities [DA]	N/A	C S S	Cos	CuS	CuS	GUI Screen	High	CPU and DA
Determines Schedwing Requirements with Scheduling Aid [DA]	N/N	80	CoS	Cuố	CoS	GUI Streen	ligh	CPU and DA
Determines Restraints (DA)	N/A	Cris	S	CuS	CuS	CUI Screen	High	CPU and DA
Plans Coordination of Activities [DA] 2.	N/N	CoS	Cos	CuS CuS	Cos	CUI Screen	ligh	CPU and DA
CONDUCTS TERRAIN ANALYSIS		, , ,	 ! !	1			N.	
Reveves METT-T Data	Up Crewman	VII	CuS	CuS	CuS	GUI/Control	l tugh	Ratur
Sefects Operational Overlay of Terrain Graphics	Up Crewman	All A	S	CuS	Cuố	GUI/Control		CPU and UA
Observes Terrain Prestures	Up Crewman	VII	8	CuS	S	GUI Screen	High	Seriours
Identifies Terain that with Support Operations	Up Crewman	N.	Cos	Cos	Suc	GUI Screen	High	CPU and DA
Monitors Digital Data Display	Up Crewman	NI	Cis	Sic	Sig	GUI Screen	ltigh	CPU and DA
KSOF					;			
PERFORM SECURITY SWEEP		- 1 - 1						
Activates Vehicle Display Screen	Up Crewman	CoS/Driver	Dnver	< \Z	Driver	GUI/Cuntrol	l ligh	CPU and DA
Selects NAV System Route Display	Up Crewman	Co6/Driver	Driver	2</th <th>Driver</th> <th>GUI/Control</th> <th></th> <th>CPU and DA</th>	Driver	GUI/Control		CPU and DA
Selects Area Sweep Aid [DA]	Up Crewman	CoS/Driver	CoS/Driver	V/V	CoS/Driver	GUI/Control	High	CPU and DA
Analyzes Digital Ternain Display	Up Crewman	CoS/Driver	CoS/Driver	V/V	CuS/Driver	GUI/Control	i ligh	CTU and DA
Selects / Indicates Sweep Route [DA]	Up Crewman	CoS/Driver	Driver	< \ Z	Driver	CUP/Control	High	CPU and DA
Determines These [DA]	Up Crewman	CoS/Driver	CoS/Driver	N/N	Driver/CuS	CUI/Control	High	CPU and DA
Selects Early Warning System Display [VIDS]	Up Crewman	IIV	CoS/Driver	N/N	Driver/CoS	Control	te l	Switch
Activates Early Warning System	Up Crewman	Co5/Driver	CoS/Driver	2</th <th>Driver/CaS</th> <th>Cuntrol</th> <th>High</th> <th>Switch</th>	Driver/CaS	Cuntrol	High	Switch
Vertifies Early Warning System Activition	Up Crewman	IV	CoS/Driver	N/N	Driver/CoS	CUI/Control	High	Serves
Selects Sensor Display [VIDS]	Up Crewman	AB	CoS/Driver	V/V	Driver/CoS	Control	High	Switch
Activates Sensor Suite	Up Crewman	CoS/Driver	CoS/Driver	V/N	Driver/CoS	Control	High	Switch
Verifies Sensor(s) Activation	(Up Crewman	CuS/Driver	CoS/Driver	V/V	Driver/CuS	GUI Screen	l tigh	C PU ANI IDA

AFAS	rinnary Kesponsibul	Å.			· · ·			
SIST	Keang	drumes	Kesuppiying	MOVING	FILLING	Intertace Lievice	Fidelity	Enabling Device
Observes Display	Up Crewman	Co5/Driver	Co6/Driver		Driver/CuS	GUI Screen	High	CPU and DA
Observes unite Visual Surveillance Device	Up Crewman	CoS/Driver	Driver	Gunwer/CuS	Driver	CUI Screen	High	Video/Sensw
Identifies Elements in Area (DA)	Up Crewman	CoS/Driver	Driver	Gunner/CoS	Driver	GUI Screen	High	Viden/Sensor
	Up Crewman	Cos	Driver	Gunner/CoS	Driver	GUI Screen	High	Video/Sensor
MONITOR SENSOR ALARMS							2	•
Selects Alarms and Alerts [DA]	Up Crewman	All	Driver/CoS	Gunner/CuS	Driver/CoS	Control	l ligh	Switch
Monitors Early Warning System Display [VIDS]	Up Crewman	Driver/CoS	Driver/CoS	Gunner/CoS	Driver/CaS	GUI Screen	E H	Serisors
Monitors Sensor Suite Warning Display (VIDS)	Up Crewman	Driver/CoS	Driver/CoS	Gunner/CoS	Driver/CoS	GUI Screen	lich	Sensurs
Monitors Audio Visual Display (HRTV)	Ith Crewman	Driver/CoS	Driver/CoS	Gumer/CoS	Driver/CuS	Cill Screen	1 light	Video/Senser
Monitors Area Denial Proximity Warning (DA)	Up Crewman	AI	Driver/CuS	Gummer/Cos	Driver/CuS	GUI Screen	1 heh	CPU and DA
Selects Wide Field of View for Surveillance Device	e Up Crewman	Driver/CuS	Driver/CoS	Cunier/Cos	Driver/CoS	GUI Screen	High	Video/Sensor
RESPOND TO SENSOR ALARM						· • • • • • • • • • • • • •		•
Monitors Warning Systems [VIDS]	Up Ĉrewman	VI	Driver/CoS	Gunner/CoS	Driver/CuS	GUI/Control	1 ligh	Serimics
- Ventics Attack [DA]	Driver/CoS	Driver/CuS	Driver/CoS	Gunner/CoS	Driver/CoS	GUI/Control		Sensurs
Monitors Activation of Countermeasures	Driver/Cas	Driver/CoS	Driver/CoS	Gunner/Cos	Driver/Cas	GUI/Control	i i i	Sensurs
Monitors Activation of Signature Suppression Syst	tem CoS/Driver	CoS/Driver	Driver/CuS	Gunner/CuS	Driver/CuS	GUI Screen	l ligh	CPU and DA
Monitors Activation of Active RADAR Mode	CoS/Driver	CoS/Driver	Driver/CoS	Gunner/Cos	Driver/CoS	GUI Surren	Hgh Hgh	CPU and DA
Monitors IFF Display [DA]	Cos/Driver	Cos/Driver	Cos/Driver	CoS/Gunner	Cos/Driver	GUI Screen	1	CPU and DA
Locates System Designated Target	N/N	Dnvn/Cos	Driver/Cos	CuS/Gunner	Driver/CoS	GUI Screen	High	Video/Sensor
(Dooses Target Override (if desired)	N/N	Driver/CoS	Driver/CuS	CuS/Gunner	Driver/Cas	GUI Screen	High H	Viden/Sensur
Selects Alternate Target (if desired)	N/N	CoS/Driver	Driver/CuS	CuS/Cunner	Driver/CuS	Control	18h	Video/Sensor
Selects Narrow Field of View for Surveillance Devi	N/A	CoS/Driver	Driver/CoS	CuS/Gunner	Driver/CuS	Control	Han	Viden/Sensur
Monitors LASER Range Finder	V/N	CoS/Driver	Driver/CoS	CuS/Gunner	Driver/CuS	GUI Screen	High	Sensor
Identifies New Target (If desired)	N/A	Driver/CoS	Driver/CoS	CuS/Gunner	Driver/CoS	GUI/Control	te la	Viden/Senser
Monitors/Selects Armament for Defense	N/N	Co5/Driver	Driver/Ca6	CuS/Gunner	Driver/Cas	GUI Screen	High	CPU and DA
Reads Evasive Action Advisory System Display [C	DAI N/A	CoS/Driver	Driver/CuS	CoS/Gunner	Driver/CoS	GUI Screen	1 tigh	CPU and DA
Determines Use of Tactical Mobility [DA]	N/A	CoS/Driver	Driver/CoS	Co5/Gunner	Driver/CoS	GUI Screen	High	CPU and DA
selects posmon				1			e ;	•
Selects Site Selection Aid [DA]	(CuS	Ces	CuS	Cirs	CuS	GUI Screen	High	CPU and DA
Observes Graphic Terrain Information	Cros	8	S	Sol	ß	CUI Screen		Cru and DA
Ventiles NAV/POS Information [DA]	Ci6	8	S	Cus	Cos	GUI Screen	50	CPU and DA
Locates Other Elements in Area [DA]	CuS	Cre	ŝ	CuS	So	GUI Screen	ligh	CrU and DA
Selects Firing Position [DA]	Cr6	So	S	CuS	CuS	CUI Screen	ţ	CTYL AND DA
Locates FARV Position	Cros	8	Cos	CuS	CuS	GUI Screen	tr.	CPU. DA and Kalin
PERFORMS SITE IMPROVEMENT							4	,
Determanes Site Improvement Requirements [DA]	Driver/Gumer	N/N	2</th <th>7 Z</th> <th><!--2</th--><th>GHI Saran</th><th>11.54</th><th>C I'll and I'A</th></th>	7 Z	2</th <th>GHI Saran</th> <th>11.54</th> <th>C I'll and I'A</th>	GHI Saran	11.54	C I'll and I'A
Directs Site Improvement	CoS/Cunner	N/N	8	< \ N	Cris	GUI Screen	12	(PU) and DA
ESTABLISH SECURITY/DEPENSIVE PLAN					1		1	
Selects Integrated Defense Display (VIDS)	CuS/Driver	Co5/Gunner	CoS/Driver	CuS/Cunner	CuS/Driver	CUI Screen	Hugh	CTU and DA
Observes Integrated Defense Display (VIDS)	CoS/Driver	Co5/Cunner	Cos/Driver	CoS/Gunner	CoS/Driver	CUI Screen	4811	CINI and DA
Described Server Renairements (DA)	CoS/Driver	Co6/Gunner	Cos/Driver	CuS/Gunner	CaS/Driver	CUI Some	i liet	CIVI and DA

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ALAC		Primary Reconcidition			-			-	
2001		Backing	Come		Luine	Electore .	Interface Device	Fidality	Eashing Course
		Sincu			9				
	Activates Sensor Suite	CoS/Driver	COS/Cunner	COS/Driver	CoS/Gunner	CoS/Daver	Control	High	Switch
	Determines Countermeasure Requirements [DA]	CoS/Driver	CoS/Gunner	CoS/Driver	CuS/Gunner	CaS/Driver	CUI Screen	lligh	CPU and DA
	i a chu stee C a mhortrostantea	CuS/Driver	CoS/Gumeric	oS/Driver	CuS/Canner	CaS/Driver	Control	liteh	Swith B
	Determine Constant Constant Publication IDA	Cres/Drues	Creveners	S. Delver	Cue / Cumper	CoS/Detwar	CIII Server	i tet	CPU AND A
								¢	
	Activates Signature Suppression System	Cos/Univer		S/LTWER	Lannun / 201	10/17/Net	Control	1.1.61	DWIND
	Determines Early Warning System Requirements [DA]	CoS/Driver	CoS/Gunner	CoS/Driver	CoS/Gunner	CoS/Driver	GUI Screen	l ligh	CPU and DA
! 	Activates Early Warning System	CoS/Driver	CoS/Gunner	CoS/Driver	CoS/Gunner	CoS/Driver	Control	High	Switch
5	TABLEH COMPANICATIONS							4	1 · · · #
	Selects Measure Servio Aid (DA)	CuS/Gunner	CuS/Gunner	CuS/Driver	Cus/Ciunner	CuS/Driver	GUI Screen	1444	Vel Pur (J.J.)
	Enter Subscripter Table Information	CoS/Gumer	Co6/Gunner	o6/Driver	Cuố/Cunner	CaS/Driver	GUI/Control	lieh	CPU and DA
	Entern Authentication Table	Co5/Gumer	Co5/Gumer	os/Driver	CoS/Gunner	CoS/Driver	GUI/Control	High	CPU and DA
1	Selects Communications Configuration (DA)	CoS/Gumer	CoS/Gunner	CoS/Driver	CoS/Gunner	CoS/Driver	GUI Screen	Hich	CPU and DA
1	Communicates with External Stations	CoS/Gunner	Cos/Gunner	oS/Driver	CoS/Gunner	CoS/Driver	CUI/Control	lich	Radio
1	Receives Automatic FARV Location Update	CoS/Gumer	Cos/Cunner	oS/Driver	CoS/Cunner	CoS/Driver	GUI/Control	lieh.	Radio
!	Versifies Automatic Communications with POC/BOC	CoS/Gumer	Cris/Gunner(CoS/Driver	CoS/Cunner	CoS/Driver	GUI/Control	High	Radio
1	Communicates with Crew	CuS/Gunner	CoS/Cunner	oS/Driver	CoS/Gunner	CuS/Driver	Control	ligh	Intercom / Radio
)	Vertifies Subsystem Warning and Alert Configuration (DA)	CoS/Gumer	Co6/Cunner	oS/Driver	CuS/Cunner	CuS/Driver	GUI Streen	lith	CPU and DA
1	Monitors/Transmits Shradon Remort	CoS/Gumer	CoS/Gunner	uS/Driver	CuS/Cunner	CoS/Driver	GUI/Control	lieh	Ratio
1	Manime () E Wamman () Al	Cris/Curner				CoS/Detwee	Cill Serven		
								0	
		· · · · · · · · · · · · · · · · · · ·							
E									
	MONHOR MOVEMENT CRIEVE WARNIngs [UA]	Up Crewinan		(is/intiter		JANUO/SU			
	Receives Movement Order	Up Crewinan	Co5/Gunner	COS/DAVer		CoS/DHVer	GUI/Control	5	Radio .
	Activates Vehicle Power-up Sequence	Driver/CoS	Driver/CoS	Driver/CoS	< 2	Driver/CoS	Control	High H	Switch
	Monitors Afterstart Checks	All	All All	-	< >Z	78	GUI Screen	l tigh	CPU and UA
:	Inspects for Loose Equipment	VII	All		N/N	-	GUI/Control	ligh	Video/Sensor
	Activates Movement Sequence	Driver	Dirver	Diver	× × ×	Dinver	Control	High	Switch
	Monitors Ammunition Security Locks Status	Gumer	Cunner	Cunner	N/N	Gunner	GUI/Control	High	Viden/Same
1	Monitors Remote Travel Lock Position Status	Curner	Curner	Currer	N/N	Cunner	GUI/Control	litigh	Viden/Sensur
;	Monitors Secondary Armament Status	Up-crewman	Curner	Driver	Gunner	Driver	GUI/Control	ligh	Video/Sensor
1	Monitors Doors and Hatches Closure Status	AB/CoS	All/CoS	AB/CoS	N/>	All/CuS	GU1/Control	tigh t	Viden/Sensur
	Activates NAV System Route Display [DA]	Up-crewman	CoS/Driver	CoS/Detwer	CuS/Driver	CoS/Driver	GUI/Control	light	CPU and DA
-	Determines Threat [DA]	Up-crewman	Cunner/Cas	Driver/CoS	Cunner/Cos	Driver/Cos	GUI/Control	High	CPU and DA
i 	Selects Early Warming System Display [VIDS]	Up-crewman	Gumer/CoSI	Driver/Ca6	Gunner/CuS	Driver/CoS	GUI/Control	H&H	CPU and DA
: 	Activates Early Warning Systems	Up-crewman	Cunner/CoS	Driver/CoS	Cunner/CoS	Driver/CuS	Control	High	Switch
•	Vertices Early Warning Systems Activation	Upcrewman	Cunner/CoS	DHVer/CoS	Gunner/Cos	Driver/Cas	CUI/Control	l ligh	Serister
	Selects Sensor Display (MDS)	(Ip-crewman	Cunner/CoS	Driver/Ca6	Gummer/CoS	Driver/Cos	GUI/Control	lingh	CPU and DA
	Activates Sensor Suite	Upcrewman	Cumer/CuS	Driver/CoS	Cunner/CoS	Driver/CuS	Control	ligh	Switch
	Verifies Sensor(s) Activation	Up-crewman	Cumer/CoS	Driver/CuS	Gummer/CuS	Driver/CuS	GUI/Cuntral	i tich	Seriisur
	Observes Display	Upcrewman	Cunner/CoS	Driver/Co5	Gunner/Cas	Driver/CuS	Cili/Control	in the second se	CPU AIM DA
	Monitors for System Checks Warnings [DA]	Upcrewman	Cunner/CoS	Dhver/Cas	Gunner/CuS	Driver/CuS	GUI/Control	1 tigh	(I'I) and DA

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	Descent Base of March							
	r minary wespendingung			: 				
	Keang	dimes	Kesuppiying	MOVING	Finng	Interface Levice	Fidelity	Enabling Device
MONITOR SENSOR ALARM								
Scherb Albern Mode and Alert Aid [DA]	Up-trewman	Cos	19	CuS	CuS	GUI/Control	Huch	Similar In
Monitors Early Warning System Display (VIDS)	(ip-crewman	Gunner/Cos	Driver/CuS	Gunner/CoS	Driver/CuS	GUI/Control	1 teh	CPU ANI UA
Monitors Senser Suite Warning Disolay (VIDS)	l lp-crewman	Gunner/Cos	Driver/Co6	Gummer/CoS	Driver/CoS	GUI/Control	lith	CPU and DA
Monitors Audio Visual Disolay	Up-crewman	Gunner/CoS	Driver/CoS	Gumer/CoS	Driver/CoS	GUI/Control	litieth	Video/Sensor
Monitors Area Denial Prostantiv Warning [DA]	Up-crewman	Gumer/Cas	Driver/Co5	Cunner/CoS	DHver/CoS	GUI/Control		CITU AND DA
Selects Wide Field of View for Surveillance Device	Un-crewman	Gunner / Cos	Driver/CoS	Cunner/Co5	Driver/Cu5	GUI/Control		Video/Sensor
RESTOND TO SENSOR ALARM							2	
Monitors Warning Systems [VILDS]	Up-crewman	CuS/Gunner	Driver/CuS	Gumwer/CuS	Driver/CuS	CLU/Control	1 ligh	CTU and DA
Verifies Anact [DA]	Up-crewithan	Co5/Gunner	Driver/CuS	Gunner/Cas	Driver/CuS	GUI Screen	1 High	DA and Video/Server
Monitors Activation of Countermeasures	Upcrewman	Cos/Gunner	Driver/CuS	Gumer/Cus	Driver/CuS	GUI/Control	lich	CPU and DA
Monitors Activation of Signature Suppression System	Up-crewman	CoS/Gunner	Driver/Co5	Gunner/Cas	Driver/CoS	GUI/Control		CPU and DA
Monitors Activation of Active RADAR Mode	Up-crewman	CoS/Gunner	Driver/CoS	Gunner/CnS	Driver/Co5	GUI/Control	ligh	Sensor
Monitors (FF Display (DA)	Up-crewman	CoS/Gunner	Driver/CuS	Gunner/CoS	Driver/CuS	GUI/Control		Sensor
Locates System Designated Target	N/N	CoS/Gunner	Driver/Cos	Cunner/Cos	Driver/CoS	CUI/Control	High	Video/Scitorie
Chooses Target Override (If destred)	N/A	CoS/Gunner	Driver/CuS	Gunter/CoS	Driver/CoS	GUI/Control	High	Viden/Sensor
Selects Alternate Tarret (if desired)	N/N	Cos/Gunner	Driver/CoS	Gunner/Cos	Driver/CuS	GUI/Control	i tich	Video/Sensor
Selects Namow Field of View for Surveillance Device	N/N	CoS/Gunner	Driver/CoS	Gumer/Cos	Driver/Cos	GUI/Control	High	Video/Sensur
Monitors LASER Range Prider	N/N	CuS/Gunner	Driver/CoS	Gummer/CuS	Driver/CoS	GUI/Control	l tigh	Sensors/Simulation
Identifies New Target	N/A	Co6/Gunner	Driver/CoS	Cunner/CoS	Driver/Cas	CUI Screen	Hich	Video/Sensor
Reads Evasive Action Advisory System Display [DA]	Up-crewman	CoS/Cunner	Driver/Cn5	Gunner/Cos	Driver/CoS	GUI/Contrus	High	CPU and DA
Determines Use of Tactical Mobility [DA]	CoS/Driver	V/N	Cos	Cits	Cos	GUI/Control	High	CPU and DA
MONTOR ROUTE INDICATOR				•		•		
Monitors Driver Route Indicator	N/N	N/N	N/N	Driver/CuS	N/N	GUI Screen	l ligh	Video and Seriese
Monitors Graphic Terrain Indicator	N/A	N/N	N/N	CoS/Driver	N/N	GUI Screen		Video and Sensor
Monitors Visual Displays	N/N	N/N	N/N	CuS/Driver	N/N	GUI Screen	High	Video and Sensor
Monitors Obstacles Warnings (DA)	N/N	V/N	N/N	CuS/Driver	N/N	GUI Screen	ingh	DA and Video/Series
DRIVE				•	<i>د</i>	1	4	
Communicates Movement Order to Crew	N/A	N/N	< N	Cu5	×/2	Intercom/Mike	High	Intercom/Radio
Activates Driver Route Indicator	N/A	V/N	N/N	Driver/CuS	V/N	Control	10 H	Switch
Selects Driver Display	N/A	N/A	V/N	Driver/CoS	V/N	Control	5	Switch
Activates Vision Devices/FLIR	N/N	N/N	N/N	Driver/CoS	N/N	Control	5	Victory/Sensor
Observes Terrain using Vision Devices	N/A	N/N	V/N	Driver/CoS	N/N	GUI Schen	10 I	Video/Sensor
Moves Vehicle	N/A	V/V	V/V	Driver	V/N	Control	1 figh	Semulator/Mudel
Communicates Movement	N/A	N/N	N/N	Driver/Lis	V/N	Intercom / Mike	Medium	Rachur/Somulation
Adjusts Speed	N/A	N/N	N/N	Driver	N/N	Control	High	Simulator / Akudet
Succes Vehicle	N/A	N/N	N/N	Driver	N/N	Control	The second	Simulatur / Mudel
Stops Vehicle	N/A	N/N	N/N	Driver	N/N	Contrul	l ligh	Sumulator / Marky
Monitors Integrated Defense System (VIDS)	N/A	N/N	NIN	Gunner/CuS	N/N	GUI Screen	i lingti	DA Jul Summy
Monttors Vehiche Warning Menaugra	N/A	N/N	N/N	Driver/Cits	N/N	GUI Screen	1 ligh	DA and Sensary
NAVIGATE ROUTE				•	<u>Gent</u>	•	:	

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AFAS		Primary Responsibility							
TASIC TASIC		Resting	Startup	Resupplying	Moving	Firing	Interface Device	Fidelity	Enabling Devate
-	Cutton Tentral Maria Planuine Aid (DA)	N/A	NIA	N/N	1	N/N	Control	Hish	
					3 !!		Dana J		
	Locates Current Postsion (DA)	V/N	N/N	N/N	Cits		CUI Screen	lingh	DA and Survey
	Identifies Destination	N/N	V/N	N/A	CuS/Driver	<td>GUI Screen</td> <td>High</td> <td>DA and Sensings</td>	GUI Screen	High	DA and Sensings
•	[Indicates/Selects Route [DA]	N/A	N/N	N/N	Cu6	V/N	GUI/Control	ligh	CPU ANI DA
	Verifies Route and Location	N/N	N/A	N/N	CuS/Driver	V/N	CUI/Control	litch	CPU and DA
	Monitors Craphic Terrain Disolay	N/A	NN	N/N	CuS/Driver	N/N	GUI/Control		CPU and DA
	Meriter Move Variation Alert (DA)	N/A	N/N	N/N	CoS/Driver	N/N	GUI/Control		Radio/DA
:			N/N			1	Cill/Control		
1								c	
	MOREOF MOVEMENT SHETY LICEDUCE INVI	V.N.						L'INGU	
	Enters/Receives MAPS Update Data	V/N	V/N	< N	ŝ	< X >	CUI/Control	fligh	Radin/C'HI and DA
8	NIDUCT COMMUNICATIONS								
	Selects Message Handling Configuration [DA]	N/N	N/N	2</th <th>CuS/Gunner</th> <th><!--2</th--><th>Control</th><th>High</th><th>Switch</th></th>	CuS/Gunner	2</th <th>Control</th> <th>High</th> <th>Switch</th>	Control	High	Switch
!	, and the second a second a second	N/A	N/A	N/N	CuS/Gunner	N/N	Annunciator		Radio/Semilation
	Martin Data Data	N/N	N/N	N/N		N N			Butto / Similation
	[[ANSING EXIMINAL COMPANY (2001)	V/2					INVERTIMENT ANAL	Medium	KACIO/SIMUSIAN
	Enters New External Nets	V/V	N/N	N/N	CoS/Gunner	2</th <th>Intercom/Mike</th> <th>Medium</th> <th>Radio/Simulation</th>	Intercom/Mike	Medium	Radio/Simulation
i 	Transmits Position Reports [DA]	N/A	V/N	V/N	CuS/Gunner	V/N	Intercom/Nike	Medium	Radio/Simulation
Z	COTINTE OBSTACLES			1		1		:	ł
	Science Desirch Identification Aid (DA)	IN/A	N/N	N/N	CoS/Driver	N/N	Cuntral	Hach	Switch
;		N/N	N/N	N / N	C.S.Dure		Cill/Control		CP(1 aut 1)A
	Determines Obstacte Restrictions (DA)	V/V	V/V	V/N	CuS/Driver	V/N	CUI/Control	E.	CPU and DA
	Selects Route to Breech or By-pass Obstacte [DA]	N/N	V/V	</td <td>CuS/Driver</td> <td>V/N</td> <td>GUI/Control</td> <td>High</td> <td>CPU and DA</td>	CuS/Driver	V/N	GUI/Control	High	CPU and DA
!	Directs Crossing or Detour	N/A	N/N	V/N	CuS/Driver	< \Z	Intercom/Mike	Medium	Interview / Radio
8	CUPY POSITION					!			• • •
	Selects Site Selection Aid [DA]	N/A	N/N	Cits	V/N	CuS	Control	High	Şwach
1	Observes Terrain Analysis using Graphic Display	N/A	N/N	80	N/N	9	GUI Screen	f	Sensors/Sumulation
	Locates Firing Position (DA)	N/A	V/N	Soc	N/N	19	GUI/Contrul	i i i	Vicken/Sensor
	Verifies Position with Emplacement Aid [DA]	N.A	N/N	CoS/Driver	N/A	CuS/Driver	GUI/Control	1	Viden/Sensur
	Positions Vehicle on Azimuth of Fire	N/A	N/N	Driver/Co5	N/N	Driver/CoS	CUI/Control	High	Viden/Sensus
!	Puthes Emplace Button	N/N	N/N	C66	N/A	Cos	Control	Hit	Switch
1	Monitors Remote Travel Lock Release	N/N	V/N	Cunkr	N/A	Gunner	GUI Screen	Medium	Vulen/Sensor
1	Verifies Azimuth of Fine[DA]	N/N	N/N	CoS/Gunner	V/V	CoS/Gunner	GUI Screen	Het	Sensors/Simulation
•	Activates Backup Azimuth Reference System (if required)	N/N	N/N	CoS/Cunner	N/N	CoS/Curner	Control	High	Switch
<u>.</u>	Identifies Distant Atming Point [DA]	N/N	N/N	CoS/Gunner	V/V	CoS/Cunner	GUI/Control	t t	Valar/Sturk
, 	Determines Site and Range to Crest with Laxer [DA]	N/N	N/N	Cunner/CoS	N/N	Gunner/CuS	GUI/Control	÷.	Viden/Sensur
	Creations / Vertices Target Priority	N/A	N/A	Gunner/CoS	V/V	Gunner/CaS	GUI Screen	ter.	CI'LI AND DA
	Montons System Checks	N/A	N/N	AII	N N	20	GUI Screen	liteh	CPU and DA
	Monitors Free Control Checks	N/A	N/N	Gunner/Cus	N/N	Gunner/CoS	GUI Screen		CPU and DA
-	Enters/Receives Fire Control System Undate	N/A	N/A	Cumer/CoS	N/N	Cumer/Cos	Cui Some		Radia CITI and DA
	Manians/Transmits System Status Report	N/N	N/N	Gunner/Co5	N N	Cumer/CoS	Intercom/Mike	Medium	Partico / Samulation
	Montered Provider Cafety Data from POC	N/N			N N				Dertin / Ciminsteria
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	Barrow Barrow Miles							
	Luman Mapunanuk					1		
1 <b>VSIC</b>	Kesny	Sarto	Resupplying	MUVING	Pirng	Interlace Device	HIDEIII	Enabling Devuc
Determines Criteria for Survivability Move [DA]	N/N	N/N	Cunner/Co5	V/V	Gunner/CuS	<b>GUI/Control</b>	High	CPU and DA
Survivability Move		) ; ; ; ;		:			<u>,</u>	•
PREPARE FOR MOVEMENT		 ;						
Monitors Movement Criteria Warnings [DA]	N/N	N/N	Gunner/CoS	V/V	Driver/CuS	GUI/Control	High	CPU and DA
[Determines Type of Move (Hasty, etc.) [DA]	N/N	N/N	Cos	N/N	Co6	GUI/Control	f.	CPU and DA
Receives/Gives Movement Order	N/N	N/N	Cos	N/N	56	Intercom/Milke	Medium	Radio/Simulatum
Activates Vehicle Power-up Sequence (if required)	N/A	N/N	Driver/CuS	N/N	Driver/CoS	Control	High	Switch
Montons After start Checks	N/A	N/A	N	N/N	All	<b>GUI Screen</b>	High	DA and Summer
Inspects for Locae Equipment	N/A	N/N	VI .	N/N	Ň	GUI Screen	lich	Vidici/Sensor
Activates Movement Sequence	N/A	N/N	CirS/Driver	N/N	Ca5/Driver	Control	l hch	Switch
Monitors Ammunition Security Locks Status	N/A	N/N	Gunner/CoS	N/N	Gunner/Cos	GUI Screen	i lich	Vulen/Sausar
Monitors Remote Travel Lock Position Status	N/A	N/A	Gunner/Cos	N/N	Gummer/Cos	<b>GUI Screen</b>	t	Viden/Sensur
Monitors Secondary Armament Status	N/N	N/N	Cunner/Cos	N/N	Gunner/Cits	<b>GUI Screen</b>		Video/Sensor
Monitors Doors and Hatches Closure Status	N/N	N/A	All	V/V	All	GUI Screen		Video/Sensor
Activates NAV System Route Display (DA)	N/A	N/N	CoS/Cunner	N/N	Co5/Driver	Control	-	Switch
Obervis Display	N/N	N/N	CoS/Gunner	N/N	CuS/Driver	GUI Screen	High	DA and Sensors
Monitors for System Checks Warnings	N/A	N/A	CuS/Driver	N/N	CoS/Driver	GUI Screen	lich	DA and Sensors
MONTOR SENSOR ALARM		!				•••••	×	•
Selects Alarms and Alerts [DA]	N/N	, IIV	CuS/Driver	N/A	CuS/Driver	Control	Hugh	Switch
Montton Early Warning System Display [VIDS]	N/A	NB -	CoS/Driver	N/N	CoS/Driver	<b>GUI Screen</b>	f	DA and Sensure
Monitors Sensor Suite Warning Display (VIDS)	N/N	M	CoS/Driver	N/N	Cu5/Driver	GUI Screen	Har I	DA and Sensors
Monton Audio Visual Display (HRTV)	N/A	<b>MI</b>	CuS/Driver	N/N	CuS/Driver	<b>GUI Screen</b>	i ligh	Viden/Seman
Monitors Area Denial Provintity Warming (DA)	N/N	NI N	CuS/Driver	V/V	CuS/Driver	GUI Screen	Fligh	DA and Summers
Science Wide Field of View for Surveillance Device	N/N	Gunner	CoS/Driver	N/N	CoS/Driver	Control	i ligh	Switch
RESTOND TO SENSOR ALARM				•			Ň	•
Monitors Warring Systems (VIDS)	N/N	Gunner/Cos	CuS/Driver	N/A	CuS/Driver	GUI Screen	111211	DA and Sumars
Verties Aust (DA)	N/N	Gumer/Co5	Co6/Driver	N/N	CoS/Driver	GUI Screen	Le la	DA and Sensins
Monitory Activation of Countermeatures	N/A	Currer/CoS	CoS/Driver	N/N	CoS/Driver	GUI Screen	f	DA and Sensing
Monitors Activation of Signature Suppression System	N/N	Gunner/CoS	Co6/Driver	N/N	Co6/Driver	<b>GUI Screen</b>		DA and Sensing
Monitors Activation of Active RADAR Mode	N/N	Gumer/Co5	CoS/Driver	N/N	Co5/Driver	CUI Screen	l ligh	DA and Sensing
Monitors IFF Display (DA)	V/N	Gunner/CoS	CoS/Driver	V/N	CoS/Driver	CUI Screen	High H	DA and Sensury
Locates System Designated Target	N/N	Curner/CoS	CoS/Driver	V/V	CoS/Driver	<b>GUI Smen</b>	i ligh	Viden/Sensor
(Chosen Tanger Overnde (il destred)	N/N	Gunner/Coo	CoS/Driver	V/N	CoS/Driver	Control	i ligh	Swittch
Selects Alternate Tanget (if desired)	N/A	Curner/CoS	CoS/Driver	V/V	CoS/Driver	CUI Screen	t	Vicken/Samar
Selects Namow Field of View for Surveillance Device	N/A	Gumm/CaS	CoS/Driver	V/V	CoS/Driver	Control		Switch
Montons LASER Range Finder	N/N	Gunner/CuS	CoS/Driver	N/N	CuS/Driver	GUI Serven		DA and Summer
Identifies New Target (if desired)	N/N	80	CoS/Driver	N/N	CuS	<b>GUI Screen</b>		Vadeo/Seman
Monitory/Selects Armanent for Defense	N/N	Gunner/Cus	Co5/Driver	V/N	CuS/Duver	CUI Screen		DA and Serieurs
Reads Evasive Action Advisory System Display [DA]	N/N	AN	CoS/Driver	N/N	All	<b>GUI Screen</b>	i ligh	DA and Sensors
Drummers Use of Tectical Mobility (DA)	N/A	Cos	CoS/Driver	N/A	Cas	<b>GUI Smen</b>	lingth	IDA and Sensors
MONTOR ROUTE INDICATOR					!		r -	

ALAS -		I'mmary stepponeround			•				
TASKS		Resting	Startup	Resupplying	Muving	Jung	Interface Device	Fidelity	Enabling Device
	Monitors Driver Route Indicator	N/N	Co5/Driver	N/N	CoS/Driver	< \ \ \ \	GUI Screen	High	DA and Sensors
			345		and and			4011	
			3,		DALLT /ON				
-	Monitors Visual Displays	V/V	Cos Cos	< <u>&gt;</u>	CuS/Driver	2</th <th>CAUI SUTERIA</th> <th>High</th> <th>Value/Saman</th>	CAUI SUTERIA	High	Value/Saman
	Maniture Obstacles Warmings	N/A	S.		CuS/Driver	× >>	Cilli Screen	lich	DA and Sensors
			;	1		1		Bi	
	Communication Movement Order to Crew	N/A	N/N	N/N	CuS	N/N	Intercom / Mike	Huch	Interventy/Radio
Ť	Arthrees Driver Route Indicator	N/A	N/N	N/N	Driver/CuS	N/N	Control	Hel	Switch
		N	N/N		1900, and				
	ACTIVEMES VISION LEVICES/ FLIK						CUMURN		A HIM / MARKA
-	Observes Terrain using Vision Devices	N/N	<b>V/N</b>	V/V	Driver/CuS	<>>	GUI Screen	ligh Hgh	Viden/Sensur
	Mones Vehicle	N/A	V/N	V/N	Driver	× >>	Control	High	Sumulator/Mudel
	Communicates Movement	N/A	N/N	N/N	Driver/CuS	2/N	Intercom / Make	Medium	Radio/Simulation
	Adues Socied	N/A	N/N	N/N	Driver	V/N	Control	High	Semulator / Nockel
	Reen Vehicle	N/N	N/N	N/N	Driver	V.N	Control	f	Simulator / Minkel
	These Variations	N/N	N/N		Delver	217	Control		Similar / Mudul
1	Ionia I usede second hae dave second								
	Monitors Vehicle Warning Messages	N/A	V/N		Driver/CoS		CUI Screen	t the	DA and Sensurs
YN	rigate Route								
	Selects Survival Newe Route Selection Aid [DA]	N/N	= V/V	2</td <td></td> <td>4/7</td> <td>Cuntral .</td> <td>High</td> <td>build</td>		4/7	Cuntral .	High	build
1	Locates Current Position (DA)	N/N	N/N	× / >	Cos	2/2	GUI Streen	-	DA and Selisors
;	Vendes Desination	N/A	N/N	<. N	CuS/Driver		CUI Screen	f	DA and Sensors
1	adram (Seine Roue (DA)	N/A	N/N	N/N	CuS		CUI/Control	lich.	CPU and DA
		N/A	N/A		CuS/Daver	212	GUI/Control	to t	CPU and DA
1	VALUES FORK and LOLDANS	N/N			L'S/Priver			4	THI MAL DA
- <u>-</u>				!				c	
_	Monitors Move Variation Alter [UA]				LINNEL OUT				Kaulo/UA
	Determines Movement Plan Changes (DA)	N/N	V N	N/N	S S	<t< th=""><th>GUI/Control</th><th>Ę.</th><th>CINI and DA</th></t<>	GUI/Control	Ę.	CINI and DA
	Monitors Movement Safety Procedures [DA]	N/A	N/A	</th <th>21</th> <th><!--2</th--><th><b>GUI/Control</b></th><th>HCH</th><th>CPU and DA</th></th>	21	2</th <th><b>GUI/Control</b></th> <th>HCH</th> <th>CPU and DA</th>	<b>GUI/Control</b>	HCH	CPU and DA
	Enters/Receives MAPS Update Data	N/A	N/N	V/V	3	< \ Z	CUI/Control	ter T	Radio/CI'U and DA
NO I	DUCT COMMINICATIONS			1	r				
Ľ	Selects Mesuage Handling Configuration (DA)	N/A	N/N	N/N	CuS/Gunner	2</th <th>Control</th> <th>l ligh</th> <th>Swarth</th>	Control	l ligh	Swarth
	Monitors Radio	N/N	N/N	< N	CoS/Gunner	V/V	Amministur	1	Radio/Simulation
	Monitors Digital Display	N/N	N/N	N/N	CoS/Gunner	</th <th>GUI Screen</th> <th>E</th> <th>Radio/Simulation</th>	GUI Screen	E	Radio/Simulation
	Transmis External Communications	N/A	N/N	N/N	Cu5/Gunner	N/N	Intercom/Make	Medium	Radin/Simulation
	Eners New Exernal Nets	N/N	N/N	N/N	CuS/Gunner	2/2	Intercom/Mike	Medium	Radio/Simulation
	Transmits Position Reports (DA)	N/À	N/N	N/N	CuS/Cunner	V/V	Intercom/Mike	Medium	Radio/Semulation
NEC	OTIATE OBSTACLES			•	1	1		;	
121	telects Obstacts Identification And IDA!	N/A	N/N	1</th <th>Gus/Dawer</th> <th></th> <th>Cuntral</th> <th>1 tuch</th> <th>Divition In the second s</th>	Gus/Dawer		Cuntral	1 tuch	Divition In the second s
	denutions Obstactes [DA]	N/N	N/N	N/N	CoS/Driver	4/4	CUI/Cimini	1	CPU and UA
	<b>Determines Obtacle Restrictions [DA]</b>	N/A	N/N	N/N	CuS/Driver	<.>	GUI/Control	÷	CI'll and DA
	Selects Route to Breach of Dy-Date Objucte (DA)	N/A	N/N	N/N	CuS/Driver	1	GUI/Control		TTU and DA
	Directs Crossing or Detour	N/N	N/N	N/N	US/Driver	<>>	Internation/Milke	Mehun	Intervente (Rada)
					Contraction of the local division of the loc		a state of the sta		and the second s

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AFAS		Primary Responsibility							
TASIC		Resting	Surtup	Resupplying	Moving	Fing	Interface Device	Fudehity	Enabling Device
0 0 0	UPY POSITION								
	dens See Selection Aid IDA1						Control	l ligh	Swach
	A a a a a a a a a a a a a a a a a a a a	N/A	N/N	50	N/N	CuS	CUI Screen	f	Serving / Standaland
						19	Cill /Commu		Virti Virtus
<u>-</u>	SCHES FINDS FUNDER INA			3		3			
2	(erifies Posisiun with Emplacement Aid [DA]	N/N	N/A	CuS/Dhvar	< N	Cirs/IDnver	CUI/Control		Valen/Sensar
	buttons Vehicle on Azimuth of Pre	N/N	V/N	Driver/CoS	N/>	Driver/Co6	GUI/Control	É.	Video/Sensor
	Vates Estates futros	N/N	N/N	SS.	N/N	C S S	Control	to the	Switch
	Aniver Denote Trivel I art Dates	N/A	N/N	Gunner	N/N	Gunner	<b>CUI Screen</b>	Medium	Vales/Value
	terdar Asteriate of Fice (DA)	N/N	V/V	CoS/Gunner	N/N	CuS/Gunume	(31 N Surren	High	オーション あたい 人のかいたい
1	(Attent Pertur Azimuth Reference Souters (if reasterd)		N/N	CoS/Gumer	N/N	CoS/Gumer	Control	Hith I	Switch .
	Antifact Print (DA)	N/N	N/N	Co6/Gunner	N/N	CoS/Gumer	<b>CUI/Control</b>	1	Valker/Shish
	There are and Press in Creat with Later (DA)	N/N	N/N	Gunner/Co5	N/N	Gunner/CoS	GUI/Control	t i	Victori / Senaur
	Version //edita Tract Prints	N/N	N/N	Gunner/CuS	N/A	Gunner/Cos	GUI Screen	t t	Chù mà ĐÃ
	frains Some Checks	N/N	N/N	All	N/N	All	GUI Screen	5	CPU and DA
1	Aminon Pine Control Checks	N/N	N/N	Gunner/Cas	N/N	Gunner/CuS	GUI Screen	ta I	CPU and DA
1	inters/Receives Pre Control System Update	N/N	V/N	Cunner/CoS	N/N	Cunner/CuB	<b>GUI Screen</b>	49	Radio, CPU and DA
	Verition (Treewits Southen Status Percet	N/N	N/N	Cunner/Co5	N/N	Gunner/Cris	Intercom/Mike	Medium	Radiu/Sumulation
	Anniany/Transmits Selety Data from POC	N/A	N/N	Gunner/CoS	N/N	Gunner/CoS	Intercom/Mike	Medium	Radio/Simulation
	A state of the Second Miles Mane (DA)	N/A	N/N	Gunner/CuS	N/N	Gunner/CuS	GUI/Control	High	CPU and DA
					1		•	¥.	
			N/A		N/N	Cus	Cuntral	Linch	Switch
				CoS/Denver		CoS/Dover	CUI Server		DA and Sensers
<u>. (</u>								1	Viden / more
	Positions Vehicle on Azimuth of Fire	V/N							
	heles Englace Button	×/2		8	2	<u>8</u> ]			
	Veniors Remote Travel Lock Release	V/V	N/N	Cunner/CuS	2</td <td>Cunner/CuS</td> <td>CUI Screen</td> <td>5</td> <td>Value/Stick</td>	Cunner/CuS	CUI Screen	5	Value/Stick
	Verties Azimuth of Fire [DA	N/N	V/V	Gunner/CoS	2</td <td>Gunner/Cog</td> <td>GUI Smeen</td> <td>5</td> <td>DA and Sensors</td>	Gunner/Cog	GUI Smeen	5	DA and Sensors
	Monitors System Checks	N/A	V/V	Gunner/CuS	×/>	Cunner/CoS	GUI Screen	5	DA and Sensers
	Monitors Fire Control Orects	N/A	V/V	Gunner/CoS	N/N	Gummer/CuS	<b>GUI Screen</b>		DA and Sensurs
DELIVER	( NDRECT ANE								
NON	<b>JTOR COMMAND FIRE NET</b>								
	Determines Mexage Nandling Configuration [DA]	N/A	Co5/Gunner	Cas/Gunner	CuS/Gunner	CoS/Gunner	GUI/Control	K.	CI'U ANN UA
	Venios Radio	N/A	CoS/Gumer	CoS/Gumer	CoS/Gunner	CoS/Current	Intercom/Mike	Medium	Rediu/Simulatum
	Vortices Distal Display	N/N	CoS/Cunner	CoS/Cunner	CuS/Cunner	CoS/Gumer	GUI Screen		CTU and DA
	Lactives Fire Menton/Corrections	N/A	CoS/Gumer	Co6/Cunner	CuS/Cunner	CoS/Cunner	Annunciator	fa I	Radiu/Simulatum
EXEC	UTE FILE ONDERS								
	Leceives Fire Mission	N/A	CuS/Cunner	CoS/Gunner	CuS/Gunner	CuS/Cumer	Annunciative	19.11	Rather/Sumulation
	Observes Fire Mission Display	NIA	Co6/Gume	CoS/Gumer	CuS/Gummer	CoS/Gumme	GUI Screen	Į.	CPU and DA
<u>,                                    </u>	Channes Fire Massion Priority	N/N	Co8/Gunner	CoS/Gunner	Cu5/Gumer	CriS/Gunner	CUI Screen		CPUI and DA
• <b>•</b>	Determines to Accept/Retect Fire Mission [DA]	N/A	Co6/Cunner	CoS/Cunner	CuS/Cunner	CirS/Cunner	<b>CUI Screen</b>	High H	CPU and DA
	Indomina Circuit of Price Mission	N/A	Co6/Cunner	CuS/Cunner	CuS/Gummer	CirS/Cunner	Intercom/Make	Medium	Kadut/Simulatana
<u></u>	Observes Fire Mission Data	N/A	CoS/Cunner	Cr6/Cumm	CuS/Gummer	CuS/Cumer	<b>GUI Screen</b>	1 ligh	CPU and DA

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AFAS I	Primary Resourcibility	-						
9160C	Benjar	Control of	Denmahuna	Muine	Eleine	and and and and	Eventury	Carbina Dance
	Since	- Annual -	Andreas			האבווקרב היבארב		ESTADAINING TRANC
Enters Data into the Fire Control System (if required)	V/V	Co5/Gunner	CoS/Gunner	CoS/Gunner	CoS/Gunner	<b>CUI Screen</b>	Hor H	Radio, CITU and D.A.
EXECUTE LINETED TACTICAL FUE DRECTION								•
Determines Capability to Support [DA]	N/N	CoS/Gunner	CoS/Gunner	CuS/Gunner	Cu6/Gunner	<b>GUI Screen</b>	High	CPU AIM DA
Schern Fue Planature Ald [DA]	NIA	CoS/Cume	CoS/Cumme	CoS/Gunner	CoS/Cumer	Control	f	Switch S
Determines/Monitors Fuze Selection [DA]	V/N		Coo/Cunner	Coo/Cunner	Lanuno/001			CI'U and DA
Determines/Manitors Number of Rounds to Fire [DA]	V/N	CoS/Gunner	CoS/Gumer	CoS/Gunner	CoS/Gunner	GUI/Control	High	CPU and DA
Science Howkness to Fare	N/A	Ca6	Co6	CuŠ	S	GUI/Control	Hich	Cit and DA
		1	1	÷.			6	-
There are a set of the	N/N	Gunne/Cas	Gummer /Cush	< N N	Cambred /Cash	1.1.11./C \unitrad	11 4	Values/SeriesF
Vinde Curren Barde en Ene (DA)	N/N							CPI and DA
							O	
Activates Fields Sequence	V/N	V/N	2</th <th></th> <th>Cunner/Cos</th> <th>Control</th> <th></th> <th>SWIKH</th>		Cunner/Cos	Control		SWIKH
Pushes Crease Pire Interrupt (if required)	V/N	V/V	2</th <th><!--2</th--><th>Gummer/CoS</th><th><b>GUI/Control</b></th><th>l ligh</th><th>CPU and DA</th></th>	2</th <th>Gummer/CoS</th> <th><b>GUI/Control</b></th> <th>l ligh</th> <th>CPU and DA</th>	Gummer/CoS	<b>GUI/Control</b>	l ligh	CPU and DA
Manion Alterine Checks	N/N	V/N	N/N	N/N	Gummer/CuS	GUB/Control	Ş	CPU and DA
Verties Ammunition Update	N/N	N/N	N/N	Gunwer/CuS	Gunner/CuS	<b>GUI/Control</b>		CPU and DA
MONITOR SAFE FIRE CONDITIONS			1	1	•	• • • • • •	×.	•
Manhars / Verifies Fire Control System Data Inout	N/N	N/A	Cunner/CuS	× \Z	Cunier/CuS	<b>GUI/Control</b>	1 toch	CPU and DA
Verten Distant and Definin (DA)	N/A	NVA	Cunner/CuS	N/N	Gumer/CoS	GUN/Control	Heh	CPU and DA
MORNERS SIGN IN CASH WATTING	V/N	<t< th=""><th></th><th></th><th></th><th></th><th></th><th></th></t<>						
Monitors Friendly Forces Location Warnings	V/V	N/N	Cunner/CnS		Cunner/CaS	GUI/Control		CPU and DA
Monitors No Fire Control Messures Warrings	V/V	N/N	Gunner/CoS	< N	Gunner/CaS	<b>GUI Screen</b>		CPU and DA
Monitors Tube Thermal Warning System	V/N	V/N	V/V	< N	Gunner/CoS	<b>GUI Screen</b>	High H	DA and Sensurs
Monitors Unobstructed Bore Serieor Warning	N/N	V/N	V/N	N/N	Gunner/CuSi	<b>GUI Screen</b>	i tigh	DA and Sensors
MONTOR SAFE FIRE CONDITIONS (Continued)				•	1 1 1			-
Manitors propellant Sensor Warrings	N/N	N/N	N/N	N/A	Gunner/Cush	GUI Screen	l tuch	DA and Sensors
Mericas Raes of Pre-	N/N	N/N	N/N	N/N	Gunner/Cos	CUI Screen	High	DA and Sensors
Pathes Cases Fore Internuct (if required)	N/N	N/N	N/N	N/N	Cunner/CoS	Control		Switch
PERFORM MISFIRE PROCEDURES			1		<b>†</b>	• • • • •	; 	-
Moniturs for Missine Warning	N/N	N/N	2</th <th>N/A</th> <th>Gunner/CuSi</th> <th><b>GUI Sureen</b></th> <th>l luch</th> <th>EDA and Sensors</th>	N/A	Gunner/CuSi	<b>GUI Sureen</b>	l luch	EDA and Sensors
Verfies Mistine [DA]	N/A	N/N	N/N	N/N	Gunner/CoS	GUI Screen		DA and Sensors
Determiners Cause of Mistire (DA)	N/N	V/N	N/N	N/N	Cunner/CoS	GUI Screen	f	DA and Sensurs
Determine Corrective Action (DA)	N/A	N/N	N/N	N/N	Gunner/CoS	GUI Screen	i liet	DA and Sensors
Davis Arits	N/N	N/A	N/N		Cannor / Cor	Ci il /Control		M I and MY
OBTAIN AND REPORT BATTLE DAMAGE ASSESSMENT			1		1		e	
Montors Projectile Tractime System Display	N/N	N/N	N/N	N/A	Gunner/CuS	GUI Screen	Hich	DA and Smarth
Monitors Fire Control Net	N/N	N/N	N/N	N/N	Cunner/CoS	CUI Screen	ſ	Radio. CPU and D.A
Determines BDA from Target Acoustitum Source	N/A	N/N	N/N	N N	Gunner/CoS	Intercom / Milke	Medium	Radio/Simulature
December to Terminus Minuton	N/A	N/N	N/N	N/N	Cumer/CoS	CU1/Control	Hat	CPI and DA
Vertice Advances	N/A	NIA	N N			a hit was a second		
							a for the set	Control Services and the service of
							Weinen	

	Commentation of the second							
	Linearendere Areurus			-	1			
SXYL	Kesting	divers	Kesuppiying	MUVING	Firing	Intertace Device	Fidelity	Enabling Device
MONTOR AUTOLOADER OPERATIONS								
MOMMON SANCHON OF LIGHTING	V/N			2</th <th>SU/Jours</th> <th></th> <th></th> <th>A STRACK</th>	SU/Jours			A STRACK
Monitors Selection of Liquid Propeliant Charge	V/N	N/N	2</th <th>&lt; \ Z</th> <th>Cummer/CoS</th> <th>GUI/Control</th> <th>Hit</th> <th>Video/Sensur</th>	< \ Z	Cummer/CoS	GUI/Control	Hit	Video/Sensur
Meators Puse/These Interaction Sensor Warning	N/N	N/N	N/N	N/A	Gumer/CoS	GU1/Control		Video/Sensor
- Nin-ins A. Marker Turne Come Winnings	N/N	N/N		N/N	Same /	Citt Come		OA and Concern
							•	
Selects Autobader Overhöle (if required)	V/V	N/N	V/V	2</th <th>Cunner/Cas</th> <th>Control</th> <th></th> <th>Switch</th>	Cunner/Cas	Control		Switch
PLAN POR REARM								
Munitors Inventory Alarm [DA]	N/N	CoS/Gunner	Co5/Gunner	CuS/Gunner	CuS/Gunner	GUI/Control	Hugh	CTU and DA
Editation American Residence IDA	N/N	CoS/Gumer	CoS/Gunner	CoS/Gunner	Co6/Gumer	GUI/Control	Ţ	CPU and DA
	N	100/0/90	Several Second		Cue, Current		1	
Rectives Automatic PARV Location Update	V/N	CoS/Cunner	CoS/Gunner	CuS/Cunner	CoS/Gunner	Intercom/Mike	Medium	Radio/Simulation
Communicates with FARV	V/V	CoS/Gunner(	CoS/Gunner	CuS/Gunner	CuS/Gunner	Intercom/Mike	Medium	Radio/Semulation
PLAN FOR MOVEMENT				•		-		
Science Route Planning Aid IDAI	N/N	Suc Suc	ci5	Cusi Cusi	Cits	Cuntrol	i tuch	Switch
Observes Tenrain Analysis unlaw Granhie Disolav	N/A	C6		Cuố	<u>Čoš</u>	CUI Screen	1	Video/Server
			12		19			
			8	2.2	9			
Determines Survival Move Criteria (DA)	V/N	8	9	S.C.S.	20	GUI/Control	lish i	CP11 and DA
Locates Positions [DA]	V/N	So	S	CuS	C.G	GUI/Control	High	CPU and DA
Indicates/Selects Route IDAI	N/N	80	18	Su Su Su Su Su Su Su Su Su Su Su Su Su S	CuS	GUI/Control	Í	CPU and DA
Descrive Period Pilon IDA	NA	Cos	19	Çuğ	Čoš Š	Clui / Control	1	City Land DA
	N N		14	2	90			Chiland DA
		3	3	31	}		8	
UPDATE MET/MUZZLE VELOCITY DATA						1		
Receives MET Data	Up-crewman	CuS/Gunner(	CuS/Cunner	CuS/Gunner	CuS/Gunner	GUI Seren	ł łych	Radin, CI'YI and DA
Monitors input of MET Data into the Fire Control System	Upgewaren	CoS/Gummer	Co6/Cummer	CoS/Gumer	CoS/Gunner	GUI/Control	f	CPU and DA
Verifies Muezte Velocity Update Data	Up-crewman	CoS/Cunner(	CoS/Cunner	CuS/Gunner	CoS/Cummer	GUI/Control	f	Chi and DA
Monitors Input of MV Data into the Fire Control System	Up-dewman	CoS/Cunner	CoS/Gunner	CoS/Gunner	CoS/Gunner	GUI/Control	itet.	CPU and DA
INITIALIZE FIRE DIRECTION COMPUTER						* *		
Activates Pres Control System	N/N	Gunner/CuSi	Gunner/CoS	Gumer/CoS	Gunner/CuSi	Cuntrul	I tach	Surfacts
Moniton System Cherks	NN	Gunner/CoS	Cumer/CoS	Gunner/CoS	Gumer/Co5	GUI/Control	1	CPU and DA
Receives Operational Data	N/A	Gumer/CoS(	Juner/Cob	Cunner/CoS	Gumer/CoS	GUI Some	t	Radial CTU and DA
Scherk Mrde	N/A	Cumer/CoS(	Cumer/CuS	Gunter/CuS	Gunner/CoS	GUI/Control		CMI and DA
View On State Date	N/A	Current Case	S		province of	Cliv, Control		
CORRATE AND VEREY POR/NAV SYSTEM							•	
It when Correct Produce (DA)	N/A	N/N		<b>A</b> 1	CuS/Cummer	GLI S mun	l tuch	IA and warm
								VIOCO/ SEPARA
Aligne Graphics	V/N	N/N		< <u>x</u>	CoS/Gumen	Control	5	Switch
Receives GPS Automatic Update	N/N	N/A		V/N	CoS/Gumer	<b>GUI Screen</b>	te i	Series a
Vertites GPS Automatic Update	N/N	N/N	× / >	N/N	Cu5/Cunner	<b>GUI Screen</b>	l herh	DA and Services
OPERATE MANUAL LOADING OF CPHD					;	1		
Selects CPHD Projectale	N/N	N/N	1/1	V/N	Gunner	Nawe - Manual	Mushum	Properties

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VEVE		Primary Responsibility			-	-			
		Retine	Startuo	<b>Tesupolvine</b>	Movine	Finne	Interface Device	Fidelity	Enabling DATE
2				5 . L	CI				
	Mowes CPHD to Transfer Device	N/N	N/N	<		Cunner	None - Manual	Medium	attracting
-		N/A		1/1	N/N	Gunner	Vorre - Manual	Meduim	Fuze
							famely - and	<b>Mand</b> ianan	Personal Inter-
	Sets Weaping/ Prequency Switch Setting								
1	Moves CPHD to Intalke Conveyor	N/N	< \ \ \		</th <th>Curner</th> <th>Kine - Manual</th> <th>Medium</th> <th>CIMVEYOF Tray</th>	Curner	Kine - Manual	Medium	CIMVEYOF Tray
;	Activative Sections	N/N	N/N	×/>	N/N	Cunner	None - Manual	High	Controls
-	Muthan I Andrew Constants	N/A	N/N	V/V	N/N	900	CUI Screen	Medium	Video/Sensor
<b>,</b>	MATE /VEBEY GRE G BENET COMENNATION MEASURES				!	:   			1 ··· -
51			1000 1000 1000 1000 1000 1000 1000 100	ac / Cumar	Cus / Cunned	Cos/Cameral	nterrom / Mike	Medium	Radio/Sumalation
;									the distribution of the di
	Enters/Receives Bankefield Management Update Data	V/N							Management (management
	Enters/Receives Pier Control System Update Data	N/N	Coo/Cunner	06/Gunner	CuS/Gummer	CoS/Cunner	GUI/Control	L SA	Radio/Simulation
	Vertifies System Data Update	N/A	CoS/Gunner	CoS/Gunner	CoS/Gunner	CoS/Gunner	GUI Screen		DA and Sensions
DELN	<b>TER DIRECT FIRE WIG PREMARY</b> ARMAMENT								
	ONITOR SENSOR ALARM			]		···.			
<u> </u>	Science Alarma and Alarts (DA)	Up Crewman	Cos/Gunneric	CoS/Driver	CuS/Gunner	CuS/Driver	Cuntrul	High	Switch
_	Attended in the Contract of th	In Crewnon	CoS/Cunner(	o6/Driver	CoS/Gunner	CoS/Driver	<b>CUI Screen</b>		DA and Sensors
				Sec. Prime	Cost Change	Cos/Deluse	CI I Server	lich.	DA and Senerce
	Monitors Sensor Suite Wanning Depity (VIUS)	UP LITWING							
	Monitors Audio Viewal Display	Up Crewman	CoS/Gunner(	us/Driver	CuS/Gunner	Cas/Driver	CUI Screen		DA and Sensing
1	Selects Wide Field of View for Surveillance Device	Up Crewman	CuS/Gunner(	CoS/Driver	CuS/Gunner	CoS/Driver	Control	l likh	Switch
	SEAND TH SENSOR ALARM								
<u> </u>		It in Crewman	Cus/Canner	as/Driver	CoS/Gummer	CuS/Driver 10	Chil Screen	l heb	DA and Sensors
	lontal scoredo Sausa aconstal								Vidan (concer
	Verifies Attack [DA]	UP LIEWINAN							
	Monitors Activation of Countermeasures	Up Crewman	CoS/Gunner	Cos/Driver	Cus/Gunner	Cos/Univer	CUI SCREEM		DA and Senses
ł	Monitors Activation of Stenature Suppression System	Up Crewman	CoS/Gunner	oS/Driver	CuS/Gunner	CoS/Driver	<b>CUI Screen</b>	High	DA and Sensors
1	Limiter Activities of Active RADAR Mode	Up Crewman	CoS/Cunner(	CoS/Driver	CoS/Gunner	CoS/Driver	CUI Screen	1 tigh	DA and Sensions
2	MARTINE ARE / SMC ACE TA ACETS						<b>GUI Screen</b>	i ich	DA and Sensins
:		Illa Crauman/Con	icus/Cumrie	CuS/Driver	CuS/tanaard	CuS/Driver	Control		Switch
:					Cos/Cummer	CoS/Dawer	CIII Serven		DA and Service
									Video / Control
	Selects Nartow Field of View for Surveillance Levice							0	
	Locans System Designated Targets	Up Crewinan/Cob							
	Monitors LASER Range Finder	Up Crewman/CoS	CoS/Gunner	CoS/Driver	Cos/Cunner	CoS/Driver	CUI Screen		DA and Smsors
!	Scans Commander's Panoramic Sight	Up Crewman/CoS	CoS/Gunner	CoS/Driver	CuS/Gunner	CoS/Driver	CUI Screen		Video/Sensor
1	Monitors Encagement Criteria Warnings [DA]	Up Crewman/CoS	CoS/Gunner	CoS/Driver	CoS/Cunner	CoS/Driver	GUI Screen	ta H	DA and Sensors
, 	Choses Tartet Overide	Up Crewman/CoS	CoS/Gunner	99	CuS/Gunner	9	Control	to I	Switch
<u>.</u>	Selects Alternate Tarret	Up Crewman/CoS	Co5/Cunner	8	CuS/Cunner	20	Control	High	Switch
	Scherts Namow Field of View for Surveillance Device	Up Crewman/CoS	CoS/Cunner	8	CuS/Gunner	Cos	Control	te i	Switch
	Monthes New Tarret	Lip Crewman/Cos	CoS/Gunner	50	CuS/Gunner	S	<b>CUI/Cintrol</b>	1 ligh	Vulei/Sense
		(Ip Crewman/Co6	CoS/Gunner	50	CuS/Cumer	C.15	Intercom/Mike	Meduum	Radin/Simulation
	Terte Terre with Dart Fire Stohl	Up Crewman/CoS	CoS/Gunner	CoS/Gunner	N/N	CuS/Gunner	<b>GUI/Control</b>	Huch	Vickes/Service
, ,		11hn Crewman / CoS	Cu5/Cunner	Co5/Cunner	N/N	CuS/Gumer	Control	l tiet	Switch
		it in Crevman/Cris	Cu6/Cunner	Co5/Cunner	V/N	CuS/Gumen	GUI/Control	1 toch	Value/Second
		In Crewman /Cres	Creek Current		< N	C-S/Cunner	CUI/Control	1 heh	Value/Sensor
		I'V CIEVWARD COL						-	

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AFAS		Primary Responsibility				-			
TASKS		Resting	Startup	Resupplying	Moving	Firing	Interface Device	Fidehity	Enabling Device
	Monstors Automatic Target Tracking	Up Crewman/CuS	CoS/Cunner	CoS/Gunner	N/N	CoS/Cunner	<b>GUI/Control</b>	Figh	Viden/Sunsur
•	Mentions Maneuverine Tartet Predictor	tip Crewman/CoS	CoS/Gunner	CoS/Gunner	N/A	CirS/Gunner	<b>GUI/Control</b>	liteh	Video/Sensor
	Purber Ere Butter (4 manual)	Cov/Cunner	Cus/Cunited	Circle Contract	N N	CuS/Cunner	Contrad	1 tich	Sector 4
VSV	ESS DAMACE							¢.	
	Overne with Viscal Dovern	N/N	CuS/Guone	CuS/Gunner	N N	CuS/Canner	C.I.II./Control	1 tach	Value / Concer
								c	
	Annual State I State of State								
	Dritemines Target Damage	V/V	CoS/Gunner	CoS/Gunner	V/V	CoS/Gunner	GUI/Control	High	Video/Sensor
 	Determines Target Threat	N/N	CoS/Cunner	CoS/Cunner	N/N	CoS/Gunner	GUI/Control	High	Viden/Sensur
	Determines Priority to Refire	N/A	CoS/Gunner	CoS/Gunner	N/N	CuS/Cunner	GUI Screen	ligh	DA and Synows
E	NSMIT STREP		•	•					
<u> </u>	Every STIREP	N/N	CuS	CuS	N/N	Cis	Intercon/Mike	Neduum	Radio/Sumdation
	Transis SITEP	N/A	80	80	N/N	So So	Control/Mike	Medium	Radio/Simulation
	Receives Acknowledge of SITREP	N/N	Cos	8	N/N	i Sol	Intercom/Mike	Medium	Radio/Simulation
RE	ALM PRIMARY ARMAMENT				•				
	Selects Projectile	N/A	N/N	CoS/Gunner	N/N	CoS/Gunner	CU1/Control	1 tigh	Robota >/ Sumulation
	Selects Charge	N/A	N/N	CoS/Gunner	N/N	CoS/Gunner	GUI/Control		Rubutics/Simulation
	Sets Automatic Fuze Setter	N/N	N/N	CoS/Gunner	N/N	CoS/Cunner	<b>CUI/Control</b>		Rubutics/Simulation
 +	Activates Loading Sequence for Main Armament	N/A	V/N	CoS/Gunner	<th>CoS/Cunner</th> <th>Control</th> <th>li likh</th> <th>Switch</th>	CoS/Cunner	Control	li likh	Switch
1	Activation I cardine Securence for Secondary Armament	N/A	N/N	CoS/Gunner	N/N	CoS/Gunner	Cuntrol	i tich	Switch
-	Meeting for the Mark Mark	N/A	N/N	CoS/Gumer	V.N	CuS/Cunner/	CI II Serven	lich.	DA and Suiver
			:					6	
2	NITOR AUTOLOADER OPERATIONS		:						
	Monitors Selection of Projectile	N/A	K/Z	CuS/Cunner	2</th <th>CuS/Gunner</th> <th>CUI Steen</th> <th>  ligh</th> <th>Vicker/Sensor</th>	CuS/Gunner	CUI Steen	ligh	Vicker/Sensor
	Monitors Selection of Liquid Propellant Charge	N/A	N/N	CoS/Gunner	< Z	CoS/Gunner	<b>CUI Screen</b>	High	Video/Sensor
	Monitors Fuze/Time Interrogation Sensor Warning	N/A	V/V	CoS/Gunner	V/V	CoS/Gunner	<b>GUI Screen</b>	l tigh	Video/Sensur
•	Monitors Autoluader "Event" Sensor Warnings	N/A	V/V	CoS/Gunner	V/V	CuS/Gunner	<b>GUI Screen</b>	High	Video/Sensor
۱ 	Selects Autoloader Overside (if required)	N/A	N/N	CoS/Gunner	X/X	CuS/Cunner	GUI/Control	l tigh	CPU and DA
DELIVE	R DIRECT FIRE with SECONDARY ARMAMENT		     						
19a	NITOR SENSOR ALARM								
	Selects Alarmo and Alerts [DA]	Up Crewman	CoS/Gunner	CoS/Driver	CuS/Gunner	CuS/Driver	Control	i fugh	Swikih
	Monitors Early Warning System Display (VIDS)	Up Crewman	CoS/Cunner	CoS/Driver	CoS/Gunner	CoS/Driver	<b>GUI Screen</b>		Video/Sensor
	Monitors Sensor Suite Warning Display (VIDS)	Up Crewman	CoS/Gunner	CoS/Driver	Co5/Cunner	Cos/Driver	GUI Screen	BH	Cru and DA
•	Monitors Audio Visual Display	Up Crewman	CoS/Gunner	CoS/Driver	CoS/Gunner	Co6/Driver	GUI Screen	HSH.	Video/Sensor
۱ 	Selects Wide Reid of Verw for Surveillance Device	Up Crewman	CoS/Gunner	CoS/Driver	CoS/Gunner	CoS/Driver	Control	ta l	Switch
RE	ROND TO SENSOR ALARM								
<u> </u>	Monitors Warning Systems [VIDS]	Up Crewman	CoS/Gunner	CoS/Driver	Co5/Gunner	CuS/Driver	GUI Screen	i tugh	AU MIL UT
	Verfies Attack [DA]	Up Crewman	Co6/Gunner	CoS/Driver	CoS/Gunner	CoS/Driver	CUI Smen		Viden/Sensor
	Monitors Activation of Countermeasures	Up Crewman	Co6/Gunner	CoS/Driver	CoS/Cunner	CoS/Driver	<b>GUI Screen</b>	Heh	CPU and DA
•	Monitors Activation of Signature Suppression System	Up Crewman	CoS/Gunner	CoS/Driver	CuS/Gunner	CuS/Driver	GUI Screen	1 lich	Victor / Server
1	Manitors Activation of Active RADAR Mode	(Ib Crewman	Co5/Gunner	CoS/Driver	CuS/Gunner	CuS/Driver	CUI Screen	l lieh	CPU And DA
7	DRITTZE/IFF/ENCAGE TARGETS		1					5	
	Activates IFF System	Up Crewman/CuS	Cus/Gunner	CuS/Driver	T-MINIL 1/SU 3	CuS/Driver	( matrol	li huch	too the the

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1					-					~
		Frimary Responsibulity			:					_
		Kesting		Kesuppiying	MOVINE		Interface Device	Fidelity	Enabling Device	
-	Admittes Targets using IFF System (DA)	Up Crewman/CoS	CoS/Gunner	CoS/Driver	CoS/Gunner	CoS/Driver	GUI Screen	High	CPU and DA	_
•	Selects Narrow Petid of View for Surveillance Device	Up Crewman/CoS	CoS/Gunner	CoS/Driver	CoS/Gunner	CoS/Driver	Control	High	Switch	
•	Lockes System Designated Tarrets	Up Crewman/CoS	CoS/Gunner	CoS/Driver	CuS/Gunner	CuS/Driver	<b>CUI/Control</b>	High	Viden/Sensor	
-	Menters LASER Pares Pader	Up Crewman/CoS	CoS/Gunner	CoS/Driver	CoS/Gunner	CoS/Driver	GUI Some	ł	CPU and DA	
-	Scan Connader's Provant Seth	Up Crewman/CoS	CoS/Gumer	CoS/Driver	CoS/Gunner	CoS/Driver	Control	lich	Video/Server	-
		I la Crewman / Cos		C.A. Deluse		Cos / Delver			DA and Concern	-
	Channel Travel Quarters	lip Crewman/CoS	CoS/Gumer	500	CoS/Gumer		Control	ţ	Switch	
-	Chen About Trees			e e e e e e e e e e e e e e e e e e e			Control		Cultrh.	-
	Science Marrow Field of View for Surveillance Device	lin Creaman/CoS	Cos/Cume		CuS/Cunner		Control		Switch	
+		and the second s		:			CHI/Control		Vulnut/Funct	
1		Lip Crewman/CoS	CoS/Gumer	S	CuS/Gunner		Intercom / Mike	Medium	Radiu/Simulaturi	
+	Tracks Target with Direct Fire Sich	Up Crewman/CoS	Co6/Gunner	CoS/Gunner	CoS/Gunner	CoS/Gunner	GUI/Control	H	Video/Sensor	_
!	Artivates Automatic Brine Security	Up Crewman / CoS	CoS/Gumer	CoS/Cunner	CoS/Gumer	CoS/Gumen	Control	le h	Switch	
-	Monitors / Activates Londone Sequence	Up Crewman/Co5	CoS/Cunner	CoS/Gunner	CuS/Gunner	CuS/Gunner	GUI/Control		Viden/Same	-
	Markets Authorder	Up Crewman/CoS	CoS/Cunner	CoS/Gumer	CoS/Gunner	CoS/Cumer	Cili Screen	lie h	Video/Sensor	
÷	Montere Automatic Tarent Trachine	I lo Crewman / CoS	Cos/Gunner	CnS/Gunner	Cos/Gumer	CoS/Gumer	Cili Serven		Virtani/Sumuv	-
+										_
1										
:	(Pusition (M. Branutal)	COS/CUMPER	Los/cumer				Contrea	ugui	DWIKI	_
<	SSESS DAMAGE									
ļ	Observes with Visual Devices	CuS/Gunner	CoS/Gunner	CoS/Gunner	CuS/Gunner	CuS/Driver	GUI/Control	lingh	Vulen/Sensur	
<b> </b>	Monitors Automatic Target Screening	CoS/Gumer	CoS/Gunner	CoS/Gunner	CoS/Gunner	CoS/Driver	<b>CUI Screen</b>	f		
-	Determines Target Damage	CoS/Gumer	CoS/Gunner	CoS/Gunner	CoS/Gunner	CoS/Driver	GUI/Control	f	Victory/Sensor	
+	December Tares Threat	CoS/Gunner	CoS/Gunner	CoS/Gunner	CuS/Gunner	CoS/Driver	CUI/Control	High	CPU and DA	-
	Commen Printe In Paine	CoS/Gumer	CoS/Cunner	CoS/Gunner	CoS/Gunner	CoS/Driver	CU1/Control	Hich	CPU and DA	_
F								ð		_
=			3				111 (C. 111-	4		
!			3	8						
	Transmis STREP	V/N	8	8	S.	8	GUI/Control	4811	Radio/Simulation	
	Receives Actnowledge of SITREP	N/N	ŝ	50	CoS	50	GUI/Control	High	Radiu/Simulatiun	
Z	EARM PRIMARY/SECONDARY ARMAMENT	1		!	r	1			•	
<u> </u>	Activates Loading Sequence for Secondary Armament	N/A	CuS/Gunner	CuS/Driver	CuS/Gunner	CoS/Gunner	Control	high .	ówata h	
; 	Monitors Inventory Alarm [DA]	N/N	CoS/Cunner	CoS/Driver	CoS/Gumer	CoS/Driver	GUI/Control	High	CPU and DA	
1	ONTOR AUTOUOADER OPERATIONS				• • •				•	
1	Monttons Selection of Projectile	N/A	CoS/Cunner	Cos/Driver	CuS/Gummer	CuS/Dnver	GUI Screen	Huch	Vulen/Semar	-
	Montions Autobader "Even" Sensor Warnings	N/N	CoS/Gunner	CoS/Driver	CoS/Gunner	CoS/Driver	GUI Somen	1	Video/Sensor	-
*	Selects Autoloader Override (if required)	N/A	CoS/Gunner	Cos/Driver	Cos/Gunner	Cos/Driver	Control	High High	Switch	
N.	OUCT FIRING IN AN NEC ENVIRONMENT				; ;		•	 X		
F	TEPARE FOR OPERATIONS IN AN NBC ENVIRONMENT	n Mar analasanan Arron Mar 1								
<b>!</b>	Determines MOPP Level Uniform Requirements [DA]	Cus	Cos	Sec.	CuS	CuS	CUI/Control	High	CITU and DA	
	Identifies Difficult Mission Essential MOPP 4 tasks [DA]	Ca6	8	19	S.C.	19	CUI/Control	H	CPU and DA	
	Plane MOPP 4 Rest Schedules (DA)	Cas	Ca6	S	CuS	Sec.	CUI/Control		CPU and DA	-
	Identities Contraction Automatic Marking (DA)	S.J.	S.			 	C111/Control	4		-
			22	3	2					

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Add Correction

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		<u> </u>	Decodering	Manna	Cinne	Interface Device	Fidality	Enabline Device
SNC/	Sincul			ð	<b>D</b>			
Science NBC Alarma and Sensors [DA]	500	8	8	8	8	Congo	wither a	SWILLI
American American American	Cus	80	<u>S</u>	CuS CuS	So So So So So So So So So So So So So S	CUI/Control	High	Serve
A BE V CERTIAL MANY INC BENTER AS PROVIDED				•	:		i	
VILL SECTOR SWINGEN ENVERNMENTS IN WARMEN			·····	ر. ار او		CH1/Control	L darde	Att the tite's
Identifies Special Handling Procedures (DA)	3	8	8				0	
Performs Special Handling Procedures	60 0	CoS	8	3	8	CUI/Control		
Activated Londing Securators						Control	High	Switch
Mexiana Social Mandline Princetures	lcus	CuS	Cos	CuS	CuS	<b>CUI/Control</b>	l ligh	Sensur
					i , 			
			-					
Present Comparison Configuration (DA)	Up Crewman/CoS	, So	Suc	CuS	Ś	GUI/Control	t tugh	CPU and DA
Director Mercen Condension (DA	Ub Crewman/Co5	80	500	Cus	19	GUI/Control		CPU and DA
	I in Crewman/CoS	80	Cos	Cos	190	Intercom/GUI	Medium	Radio/Simulation
Towners where and because the manufactures	In Crewman/CoS	Ces	Cos	CuS	CuS	Intercom/GUI	Medium	Radio/Simulation
Transition and Bardian Distra Transmissions	Up Crewman/CoS	180	Cos	COS	Cos	CUI/Control	Medium	Radiv/Simulation
	Itin Crewman/CoS	<u>C</u>	CuS	<u>Č</u> iš	Cus Cus	Control	High	Switch
These Tares Madias Privadures	Up Crewman/CoS	S	CuS	Cuŝ	Cus	Intercom/Alike	Medium	Radio/Sumulation
		;		•	!			1
			CuS .	ŚIJ	CuS	CU11/Control	High	CPU and DA
		4	2	2.2		Cili/Control	lieh	CPU and DA
Insuats CONSEC Keys	B	3	3	3	31			
OPERATE INTERCOM				:	:		-	C
Selects Headset/Loudspeaker Mode	Up Crewman/CoS			All		Control		<b>DWINCI</b>
heads Headset to External Intercom Jack	Up Crewman/CoS	All	70	28	NI	Control	High	Switch
Activates FARV / AFAS-C Hockup Intercom	Up Crewman/CoS	V/V	CoS/Gunner	V/V	CoS/Driver	Control	ligh	Switch
Transis Mesan	Up Crewman/Cos	V/N	CoS/Cunner	V/V	CuS/Driver	GUI/Cuntrol	Medium	Radin/Simulatum
MANTANCEO				ł				
Provins (FOI Indue from NCS	Up Crewman/CoS	Cos	Cus	CiuS	CuS	CUI/Ci trul	Medium	Radio/Sumulation
Lientifier (BO) Previdents	Up Crewman/CoS	Cos	S	Soo	SoS	GUI/Control	5 I	CPU and DA
RECOCNIZE ECM/EMPLOY ECCM				,   	l			
[Determines ECM Interference [DA]	Up Crewman/CoS	AU	<b>NII</b>	AII	<b>AII</b>	GUI/Control	High	CI'll and DA
Continues Operations	Up Crewman/Cos	All	71	11	<b>N</b>	CUI/Control	Hill H	CPU and DA
Scients ECCM Menu	Up Crewman/Cos	AII	AB	NV		Control	High	Switch
Selects Radio Januaries Mode	Up Crewman/CoS	Cos	Co6	So	8	Control	High	Switch
Directs Anth-Jammine Procedures (DA)	Up Crewman/CoS	CoS	Cuố	SUS	ŝ	GUI/Control	High	CPU and DA
Selects Alternate Frequency Scan	Up Crewman/CoS	<b>9</b> 00	S	Cirs	ŝ	Control	High	Switch
Transmiss BCM Report	Up Crewman/CoS	AU	AU	All	V	<b>CUI/Control</b>	Medium	Radio/Simulatum
COLLECT AND DISTRIBUTE INTELLIGENCE					•			
SENSE AND CATHER INFORMATION								
Selects Intelligence Cathering Ald [DA]	Up Crewman/CoS	CoS	Cos	Cus	S	Control	1 tug'u	Switch
Monitors Integrated Defense System (VIDS)	Up Crewman/CoS	VI	VI	N.	M	GUI/Cuntrul	t inter	CPU and DA
Cherves Nich Resolution TV	Up Crewman/CoS	Cos/Gunn	Driver/CoS	Gumer/Cu	S Driver/CoS	GUI Screen	High	Video/Sensor
Monitors FLIR Display	Up Crewman/CoS	CoS/Gunn	Driver/CoS	Cunner/Co	SDriver/CoS	GUI Screen	High	Video/Sensur

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AFAS	-	Primary Responsibility	-						
TASIC		Resting	Startup	Resupplying	Moving	Firing	Interface Device	Fidelity	Enabling Device
.	Chronie with WO Denne Vision Davise		Cre/Cumor	Diver / Car	Cumme/Cus	Diver C.		Hish	Valey/Superv
								0	
	Observes with Night Vision Devices	[Up Crewman/CoS	CoS/Cunner	Driver/CoS	Gunner/Co6	Driver/CaS	<b>GUI Screen</b>	High	Video/Sensor
	Instants Sions of Ensary Activity	It D Crewman/CoS	Cus/Cunner	Driver/CoS	Cummer/CuS	Datver/CoS	Cill Screen	i liet.	Video/Series
								•	
, 	Receives Execting Inclugence Leorington	up Litwinan/Los				Į		Medium	Kaulu
2	OCESS INFORMATION								
	Selects Receives and Processes intelligence Aid [DA]	Up Crewman/CoS	Sus	Cos	CuS	CuS	Control	High	Switch
-	Monters External Intelligence Information [DA]	Up Crewman/CoS	80	Cos	S	Cos	<b>GUI Screen</b>	Her	CPU and DA
	Romen Local Inselfamence Information	Un Crewman/CoS	CG6	Cos	CoS	Ces	GUI/Control	High	CPU and DA
-								D	
1			- - - - -						A THE ALL AND A
-		UP LIEWMAN/LUS	30						
	Operves Battlefield Information Display	UP CRWMAN/COS	8	8	8	2	CUI SCREED	L.S.L	Cru and DA
<b>BE</b>	PORT INFORMATION								
	Directs Target Hand-off	N/N	Cos	CuS	Cuš	CuS	GUI/Control	High	Radin, CPU and DA
i	Transis Intillence Reports	Up Crewman/CoS	80	8	CoS	<u>Co</u>	<b>GUI/Control</b>	High	Radio, CPU and DA
	Transie SPOT Report	Up Crewman/CoS	80	Cos	CuS	Co S	GUI/Control	Hieh	Radio, CPU and DA
-	Transite Crater Analycic Renard	N/A	CaS	SoS	CuS	CuS	<b>GUI/Control</b>	Hich	Radio CPU and DA
	NEEDAE PLANING				1			6	
ľ			•	•					
5						2.1	المعامين	4	4-11-11-
1	אנגעים החבנו גווג גושנהשל השלאל העיל לעיל			3 3				e	
1	Determines Threat (DA)	COS/LUTIVET	Cos/curver	9	8	8	CUI/Control		
	Selects Digital Map Display	CuS/Driver	Cos/Gunner	S	CuS	So	Control	High	Swikrh
 	Determines Likely Energy Avenues of Approach (DA)	CoS/Driver	V/V	S	CuS	CuS	CUI/Control	High	CPU and DA
	Determines Fields of Fire (DA)	CoS/Driver	V/N	S	CuS	CuS	GUI/Control	High	CPU and DA
1	Selects Direct Fire Positions (DA)	CoS/Driver	V/V	S	CuS	Soc	<b>CUI/Control</b>	ligh	CPU and DA
!	Selects Range Card Data (DA)	CoS/Driver	V/N	S	CuS	CoS	GUI/Control	1 tigh	CPU and DA
	Selects Decision Points for Coordination [DA]	CoS/Driver	N/N	S	CuS	Cos	<b>GUI/Control</b>	l ligh	CPUT and DA
:	Plans Early Warning Requirements [DA]	CoS/Driver	V/N	Cee	Cuŝ	CoS	<b>CUI/Control</b>	High	CPU and DA
ő	WELOP INDRECT FIRE PLAN					:			• • • •
<u> </u>	Selects Unit Defense Indirect Fire Planning Display	CuS/Gumer	N/N	Cree	CuS	CuS	Control	Hugh	Switch
<u></u>	Selects Preplanning Defensive Indirect Pre Aud [DA]	Cos/Gunner	N/N	190	SoS	S	Control	Ha I	Switch
	Plans Execution of Final Protective Fires (DA)	CoS/Gunner	V/N	18	Cos	CoS	<b>CUI/Control</b>	High	CPU and DA
1	Plans for 'On Call' Missions (DA)	Co5/Gunner	N/N	Cos	CuS	CoS	GUI/Control	High	CPU and DA
	Plans for Execution of CPHED [DA]	CoS/Gunner	N/N	18	Cuš	CoS	<b>GUI/Control</b>	Hich	CPU and DA
	Plans for SEAD (DA)	CoS/Gunner	V/N	SS	CuS	Cos	<b>GUI/Control</b>	Hich	CPU and DA
- <b></b>	Plans Stand-off Ramer Fires for Ground Targets [DA]	CuS/Gumer	N/N	i So	Cus	Cits Si	<b>GUI/Contrul</b>	High	CI'll and DA
۱ ـــــــــــ	Plans Indirect Cover Fire for Evacuation (DA)	CoS/Gunner	V/N	ß	Coš	Cus	<b>CUI/Control</b>	High	CPU and DA
! 	Selects Alternate Howitzer Positions (DA)	CoS/Gunner	N/N	CuS	Cos	Cus	GUI/Control	lingh	CPU and DA
	Venilles Coordination of Fire Control Measures	CoS/Gunner	N/N	So	CuS	ĈuŜ	<b>GUI/Control</b>	High	CPU and DA
ă	EVELOP POSITION FORTIFICATION/CONCEALMENT PLAN	and the function of the same same same same and	! :	]	•	;	•		•
	Plans use of Existing Terrain [DA]	CuS	Cus	CuS	Cus	CuS	<b>GUI/Control</b>	t tugh	VII mur I.I.I.)
-	Determines ForthCattorn Assets [DA]	Caš	SS	Cos	CuS	Cris	<b>GUI/Control</b>	it to the	CPU and DA

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FAS		Primary Responsibility						_	
NSV VSV	S	Resting	Startup	Resupplying	Moving	Firing	Interface Device	Fidelity	Enabling Device
į.				2	X	19			
-			3	3		3			
	Selects Indirect Fire Positions to be Fortified (DA)	S.	2	38	CoS	ŝ	GUI/Control	ligh	CPU and DA
	Selects Direct Fure Positions to be Fortified [DA]	Cris	C iS	CuS	CirS	Cus	GUI/Control	1 ligh	CPU and DA
	Determines Concelment Requirements (DA)	Cros	90	Cuố	CoS	CuS	<b>GUI/Control</b>	litieh	CPU and DA
	Selects Protition Consistent unlik Requirements (DA)	Cos	Cos	Cos	CoS	Cuộ Cuộ	GUI/Control		CPU and DA
			3	30	14	14	CIII/Control		CPU
 		319			319	1			
	Plans External Position Movement Koutes [UA]	8	8	8	3	8	CUI/Control	181	CI'U MINI DA
ā	EVELOP POSITION EVACUATION PLAN								
1	Selects Evacuation Route Aid (DA)	CuS	CuS	CuS	CuS	(inS	( murul	Hugh	շտուհի
•	Ciente Fuzzation Dienlav	Cos	S.	Cos	CuS	CoS	<b>GUN/Control</b>	liteh	CPU and UA
,			14	14	2		Cill/Contend		CPI 1 and DA
						, u			
			3	5		5.0			
	Plans Excape Routes (DA)	8	8	8	25	3	GUI/Control	1 tigh	CPU and DA
 	Selects Hide Positions (DA)	Cos	ŝ	Cros Cros	So	ŝ	<b>GUI/Control</b>	High	CPUI and DA
۵	EVELOP POSITION SUPPRESSION PLAN				•			i	
<u> </u>	Selects Minimize Signature Aid (DA)	CuS	ິ້	CuS	Cus	CuS	Control	Huch	Switch
-	Clerk Summation Summa Dierlau	Cos	190	Cos	CuS	CoS	Control		Switch
		yw)	5		S.J	12	CIII/Control	lich.	
		3	3.0	3.0		2.0			
	Reviews/Receives Unit Suppression Criteria (DA)	Cos	8	S	Sis	S. S.	CUI/Control	Itigh	CPU and DA
, 	Plans for use of Acoustic Suppression Suite [DA]	Cos	g	So	Cus	So	GUI/Control	High	CPU and DA
:	Plans for use of Radar Suppression Suite (DA)	Cos	S	Cos	Črõ		GUI/Control	ligh	CPU and DA
!	Plans for use of Visual Suppression Suite (DA)	CuS	CuS	Ciré	Cus	Cus	GUI/Control	High	CPU and DA
-	Plane for use of Infrared Summation Suite IDA	Cos	So	ČiŠ	ĆuS	Ŝ	GUI/Control	High	CPU and DA
-	Diverties of Manufactor Commission Cuite (DA1	Los Cost	19		Suc.	20	CHI/Control	Hich	CPU and DA
:								0	
	Frank for use of Uppedia Augmentation Sure (UA)		; ;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;	Bi		81			
ā	EVELOP FIRST AID PLAN		1						
	Plans Crewman Evacuation [DA]	CuS	CuS	CoS	C.S.	CuS	GUI/Control	1 high	CPU and DA
, 	Determines Medical Assistance Locations	S S	So	8	CoS	g	GUI/Control		CPU and DA
Δ	EVELOP SANITATION PLAN				1				1
Ļ	Plans Re supply of Field Sanitation Items [DA]	CuS	Cos	CuS	CuS	CuS .	GUI/Control	11 High	CPU and DA
<u> </u>	Plans Unit Water Supphy Tests [DA]	Cos	Cos	Cos	Cos	18	<b>GUI/Control</b>	fi I	CPU and DA
	Plans Location of Latrines and Urtnals [DA]	Cos	C 66	50	ČnS	18	<b>GUI/Control</b>		CIVI and DA
-	Plans use of Shower Points [DA]	Cos	80	8	Ŝ	Sos	<b>GUI/Control</b>	Hich.	CPU and DA
•••••	Plans for Sanitation and Discard of Refuse (DA)	Cos	80	Cos	CuS	Cos	<b>GUI/Control</b>		CPU and DA
3	ERFORM CONDES IT ANNING		-					L.	
1	Shere Tade Scheduline Ald (DA)	CuS	CuS	CuS .	CuS	CuS	Cuntral	Hach	Such la
	Plans Seco Schedule IDA!	CoS	50	9	CuS	CoS	GUI/Cuntral		CPU and DA
	Plans Crew Rotation Schedule [DA]	Cos	18	8	ČuŠ	S.C.	GUI/Control	1 heh	CPU and DA
	Plane for Cald Section Operations (DA)	Cris	Cos	Ĉ.S	ČuS	Cu5	GUI/Cantrol	Hish	AC but (PC)
	Proceedings of the DAT		5	2			C.B./Contrad		
-EX	DEFENSE OFERATIONS	-			2				

	Brinner, Brencerethilter							
	a minery responsed any						Ei dabian.	Contract Contract
	Amcau	2 dented	Bunkiddnen	A HANN	Lung		Linemy	
OPERATE VEHICLE INTEGRATED DEFENSE SYSTEM								
Activates Sereor Suite	CuS	Cus	8	CuS	SuS	Control	High	Switch
Determines Countermeasures Requirement [DA]	C6	C C C C	S	Sol	So	GUI/Control		CPU and DA
Selects Mode for Conternationts	Cos	Cos	18	Sug	CoS	CUI/Control	High	CPU and DA
Activates Early Warning System	Cos	Cos	198	Cos Cos	C (S	Control		Switch
Monitors for Warnings	AU AU			All A	All	<b>GUI/Control</b>		<b>ČPU and DA</b>
CONSTRUCT FORTHICATION/CREW SERVED WEAPONS POSITION	\$						, ,	
Fortifies Howitzer Indirect Parties Postcons	N/A	N/N	N/N	N/N	N/N	Manual Task	Nikk	
Fourther Howsteer Direct Future Positions	N/A	N/N		N/N	N/N	Manual Task	N X	
Forthes Crew Served Weston Positions	N/A	N/A	1/1	< \ Z	N/N	Manual Task	Nine	
Forther Designated Equipment	N/N	N/N	N.N.	< 7	N/N	Manual Task	None	
Fortifies Designated Alternate and Supplemental Positions	N/A	N/A		2/2	N/N	Manual Task	None	
EMPLOY SIGNATURE SYSTEM			* ;	•		*	ι	
Determines Signature Minimization Requirements [DA]	Cus	Cas Cas	Sn	CuS	Umver/CaS	CUH/Control	1 lugh	CPU and DA
Activates Acoustic Suppression Suite	Cos	CoS	19	CoS	Driver/CoS	Control	1	Swikh
Activates Radar Suppression Suite	Cos	5	18	Sus	Driver/CoS	Control	E	Switch
Activates Visual Suppression Suite	Cos	C SS	8	Cos	Driver/CuS	Control	Han I	Switch
Activates Infrared Suppression Sutte	Cos	5	S.	CuS	Driver/CuS	Control	l itch	Switch
Activates Magnetic Suppression Suite	Cas	Cos	ins in	SuS	Driver/CoS	Control	ingh i	Switch
Activates Optical Augmentation Suite	Cos	80	Ş	SS.	Driver/CoS	Control	1	Switch
ESTABLEH LOCAL DEPENSE		   		1		•	N	
Activates Visual Area Defense Monitor	CuS/Driver	Cus [0	uS/Driver		Driver/CuS	Cuntrol	lifth	Switch
Determines Primary Area of Responsibility [DA]	CoS/Driver	S	oS/Driver	<>	Driver/CoS	CUI/Contrast	48H	CPU and DA
Communicates Crew Responsibility assignment [DA]	CoS/Driver	C Q	oS/Driver	<>>	Driver/CoS	<b>GUI/Control</b>	High	CPU and DA
Montions Early Warning System	Co6/Driver	Cos	oS/Driver	V/A	Driver/CoS	CUI/Control	f.	CPU and DA
Monitors Visual Area Defense Monitor	CoS/Driver	500	oS/Driver	<>>	Driver/Cas	CU1/Control	High	CPU and DA
OPERATE IFF SYSTEMS								ŧ
Activates IFF: System	CuS	3	3	202	S.C.	Control	High	Switch
Monitors (FF Display	8	80	8	9	8	CUI/Control	5	CPU and DA
Selects Mode	26	8	-8	CuS	<b>છ</b> .	Control	t.	Switch
Identifies Target Friend or Foe	Ce	8	8	<b>2</b>	S	CUI/Control	ligh	Victory/Section
Informs Curner/Secondary Armament Operator	CoS/Driver	Co6/Driver	oS/Driver	CuS/Driver	CuS/Driver	Intercom/Mike	Medium	Radio/Simulation
OPERATE ARMAMENT SYSTEMS	-							
Scans with Visual Sight	Up Crewman/CoS	CuS/Cunner C	oS/Driver	<'	CuS/Driver	CUI/Control	High	Vulco/Sensor
Monitors Commander's Module Fire Control System	Up Crewman/Cos	CoS/Gummer	oS/Driver	<	CoS/Driver	GUI Screen	F	DA and Sensors
Selects Armament to Fire	Up Crewman/CoS	Co5/Gumer(	dS/Driver	<	CoS/Driver	Control	101	Switch
Determines Range to Tanget with Laser	Up Crewman/CoS	CoS/Gummer	oS/Driver	<th>CoS/Driver</th> <th><b>GUI Screen</b></th> <th>1</th> <th>DA and Service</th>	CoS/Driver	<b>GUI Screen</b>	1	DA and Service
Determines Main Cun Designation	Up Crewman/CoS	CoS/Gunner	05/Driver	< \ Z	CoS/Driver	<b>GUI Scriten</b>	f	DA and Sensors
Vertifies Altignment with Visual Display	Up Crewman/CoS	CoS/Cunner C	os/Driver	V/V	CuS/Driver	GUI Screen	i tych	Viden/Seman
Tracks Target with Direct Pire Sight	Up Crewman/CoS	CoS/Gumer	0S/Driver	< 2	Cris/Driver	GUI Screen	the second	Vulen/Sensor
Activates Main Armament Loading Sequence	Up Crewman/CoS	CoS/Gumer	a6/Driver	N/N	CuS/Driver	Control	i ligh	Swarth

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		Press Resources							
			6.410 1	Passwoldne	Movine	Fields	Interface Device	Firtulativ	Enabline Device
					ð				
	Munitors Autoloader	Up Crewman/CoS	COS/Cunnel	COS/UTIVET					Alloco/ Scheme
•	Prints Pre Preton	Up Crewman/CoS	Co5/Gume	CoS/Driver	< \Z	CoS/DHVer	Control	L.	Switch
	Permiser Secondary Amament Destimation	Up Crewman/CoS	CoS/Cunner	Co5/Driver	V/V	CoS/Driver	<b>GUI/Control</b>	tet I	CPU and DA
-	10-14- Alexandrik Viend Dieday	Up Crewman/CoS	CoS/Gunner	Co5/Driver	N/N	CoS/Driver	<b>CUI/Control</b>	High	Vkten/Sensor
	Total Total Consider Amameni Sicht	Itin Crewman/CoS	CoS/Gunner	CoS/Driver	N/N	CoS/Driver	GUI/Control	i i i	Video/Sensor
;			100 C	and yes	N/N	Cas, Driver	Control	Fich	Switch
1	Preses Fire Button on Joysbox							0	
	Monitors / Activates Reload Sequence	Up Crewman/Cos	Coo/Cunner						ANICA: / CANA
	MPLOY NBC SELF DEFENSE SYSTEM (SENSORS)								
<u> </u>	Selects Theest Evaluation Aid [DA]	AB	A.V	AN	NR	21	Control	10%0	Switch
	Schem NBC Depertion and Warning System Display	Xii	MM	N	AII	All	Contrul	te te	Switch
;	Provident And Information (DA)		AII	MI	Ä	Nii Nii	<b>GUI/Control</b>		Radio/Semulation
;	Activative Individual / Collective Protection System	Au	VII	VI	NN NY	VI	Control	High	Switch
1	CLIMA NINC SAMA [DA]	Zi	AII	Ali	Aŭ	Ali	Control	High	Switch
	Activate NRC Description and Warning System		All	NI VI		NH NY	Control	High	Switch
2		Management and the second s			:				
1	CLAR BAN AM Kit		AIL .	AIL	All	АН	Manual Task	1144	
+				NN NN	AIL	Ni	Manual Task	No.1	
+			NI I	VII.	NN NN	Ň	GUI/Control	High	CI'll and DA
;							Citt/Control	litet	CPUI and DA
	Determines Evacuation Requirements (UA)							¢	
1	Moves Cestuality in order to evacuate	VI					Manual Iask		
NDCE	DEPENSIVE OPERATIONS					,			
S	ENSE/MONITOR FOR NBC THREAT		   						
ļ_	[Deerwines Threat [DA]	Cos	Cos	Cos	Sic	S	<b>GUI/Control</b>		CPU and DA
)	Mentioner Automatic Chemical Acent Alarm (DA	<b>N</b>	AN	AN A	All	2	<b>GUI/Control</b>	Í	CPU, DA and Senser
; 1	Monitors Badic Meter Alers (DA)	AN	<b>NN</b>	AN AN	AN AN	AN A	GUI/Control	High	CPU, DA and Senser
	Monitors Distancial Annue Depetor Alarm (DA)	All	VII	VI	AN	AN AN	GUI/Control	High	CPU, DA and Server
-	Monitors Padio for NBC Alert	AB	M	71	<b>All</b>	N	GUI/Cuntrol	High	CPU, DA and Radin
-	D/REMORT NIC ATT ACK/AGENTS								
,	Verifies Alarm Warning (DA)	CuS	CoS	CuS	CiS	Cito Cito	GUI/Contrus	High	CPU, DA and Selve
!	Determines briefal Identification from Detector	Cos	80	80	ŝ	8	GUI/Control	f.	CPU, DA and Radm
	Activates Sample Transfer System	Cos	CoS	CoS	S	8	Control		Switch
	Activates Sampling Device	Cué	စ္ပိ	90 20	ŝ	S S	Control		Switch
	Manihors/Transatts NBC Report	Cas	Cos	80	CuS	C do	<b>GUI/Control</b>	te l	CPU, DA and Rath
0	PERATE ONBOARD NBC PROTECTION SYSTEM					!			
<u>.</u>	Activises Enertency Containment Controls	Au	1	AU	AR AR	VII	Cuntral	1 hyb	Switch
+-	Activates NBC Over pressure (Main) System	Ai	Ail Ail	VI	1¥	VI	Control	f	Switch
	Meeting Reduce System	All	N	N	N.	NI VI	GUI/Control	High	CPU, DA and Shine
<u>.</u>	Activities MORP Conditions (DAI	VIII VIII VIII VIII VIII VIII VIII VII	AI	<u>An</u>	NI VI	<u> </u>	GUI/Control	i i i i i	C'TH, DA and Server
, 	Draw Variated Excelents		AB	AN	NI VI	NI I	Manual Task	Medium	•
	Minime FARV Armea Pont Indicator		AN	AN T	All		CUI/Cuntrel	High	Value Schew
	DECONTAMINATE SYSTEM AS REQUIRED								

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AFAS		Primary Responsibility							
1XXX	50	Resting	Startup	Resupplying	Moving	Firing	Interface Device	Fidelity	Enabling Device
-	Clerk Demonstrice Deriver Aid Display (DA)	Cons.	Cr6	<u>Sec</u>	S.C.	3	Control	Hoh	Switch
			1	1			CUL/Control		Chil Transferred
			<u>B</u> :	<u>B</u> :	B	<u>B</u> :		rugu	
	Activates Automatic Decontamination System	CuS	S S S	Sus	Cirs	CuS Su J	Control	l ligh	Switch
	Monitors Automatic Chemical Arent Alarm			, vľ	AN	All All	<b>GUI/Control</b>	Hich	CPU, DA and Server
1	Drae Principae Case	Ali	NI NI		Υ.	ĂŬ	Manual Task	lich	•
1			94.2	1		1			
	DATCE MEMUAI DECONTARTIVIDON (DA)	ß	8	B	B	9			CIU, UA ANU WAYER
Ζ	ERFORM CONOPS PLANNING				:				
<u> </u>	Selects Task Scheduling Aid (DA)	CuS	CuS	Cos	CuS	CoS	Control	Hugh	Switch
	Plans Steep Schedule [DA]	Cob	80	8	500	500	CUI/Control	E F	CPU AND DA
	Plane Crew Reviews Schedule IDA1	( as	Cos	Sec.	<u>č</u> uš	Cus	CUI/Control	lich	CPU and DA
1	Plane for Cutto Constitute (DA)	(ref	90	i Suj	CoS	Sus Sus	GII/Control		CPU and DA
، 	Plane Maintaine Chadida (DA)		Cost of the second seco	J.		الع	CIII/Control	Hich	CPU Pare 10A
								C	
	PERATE ELECTRONIC TECHNICAL MANUALS			;					
!	Selects Automatic Logbook Display (DA)	Driver/Ca6	N/N	Driver/CuS	V/N	N/A	Control	l ligh	Switch
	Selects Preventive Maintenance Aid (DA)	Driver/CoS	N/N	Driver/CoS	N/N	N/N	Control	High	Electronic Manuals
:	Selects PMCS Checklists (DA)	Driver/Ca6	N/N	Driver/CoS	N/N	N/N	Control	High	Switch
	Identifies Scheduled Maintenance Recurrements [DA]	Driver/Co6	N/N	Driver/CuS	N/N	N/N	GUI/Control	High	CPU and DA
	Deermines Status of Maintenance Subsystems (DA)	Driver/CoS	N/N	Driver/CuS	N/N	N/N	GUI/Control	lieh	CPU, DA and Series
;	Selects Unerheduled Maintenance Aid (DA)	Driver/Co6	NN	Driver/CoS	N/N	N/N	Control		Switch
1	Identifies Corrective Maintenance Procedures (DA)	Driver/Co6	N/N	Driver/CoS	N/N	N/N	CUI/Control	likh	CPU and DA
1	Enters Maintenance Record Undates (DA)	Driver/Ca6	N/N	Driver/CuS	V/V	N</td <td>GUI/Control</td> <td>lieh</td> <td>(PU and DA</td>	GUI/Control	lieh	(PU and DA
<u>'</u>	ONDUCT PACS AND MAINTENANCE.							Di	4 5 <b>4</b> 5 <b>5 5</b>
<u>-</u>	Directs PMCS on Turnet Assembly IDA1	Driver/CoS	N/N	N/N	</th <th>N/N</th> <th>GUI/Control</th> <th>Hich</th> <th>CPU and DA</th>	N/N	GUI/Control	Hich	CPU and DA
Ļ	Inspects Turret Subasemblies	Driver/Co6	N/N	N/N	N/A	N/N	CUI/Control	E I	Electronic Manuals
	Removes / Replaces LRUs (DA)	Driver/Ca6	N/N	N/N	N/N	N/N	Manual Task	Medium	Electronic Nanuals
1	Directs PMCS on Crew Stations [DA]	Driver/Ca6	N/N	N/N	N/A	N/A	GUI/Control	High	CPU and DA
!	Troubleshoots Crew Subtons (BITE)	Driver/Ca6	N/N	Driver/CoS	Driver/CuS	Driver/Cos	<b>GUI/Control</b>		Electronic Manual-
: 	Removes/Replaces LRUs [DA]	Driver/Ca6	N/N	N/N	N/N	N/N	Manual Task	Medium	Electronic Manuals
!	Tests Crew Stations (BITE)	Driver/CoS	VII	VII.	<b>VII</b>	All.	CUI/Control	High	Electronic Manuals
; ;	Directs PMCS on Sumage Racks and Boxes [DA]	Driver	N/N	V/V	V/N	N/N	GUI/Control	E.	CPU and DA
	Removes/Replaces LRUs [DA]	Driver	N/N	N/N	V/N	N/N	Manual Task	Medium	Electronic Manuals
	Directs PMCS on Suspension Assembly (DA)	Driver	N/N	N/N	N/N	N/N	GUI/Control	Hingh	CPU and DA
	Adjust Supprison (DA)	Driver	N/N	N/N	N/N	N/N	Manual Task	Medium	Electronic Manuals
!	Renoves/Replaces LRUs [DA]	Driver	N/N	V/V	N/N	N/A	Manual Task	Medium	Electronic Manuals
	Directs PMCS on Track Assembly [DA]	Driver	N/N	N/N	N/N	N/N	GUI/Cuntrul	High	CPU and DA
• • • •	Removes/Replaces Track Blocks [DA]	Driver	N/N	N/N	V/N	N/N	Manual Task	Medium	Electronic Manuals
	Removes/Replaces Sprocket [DA]	Driver	N/N	N/N	V/N	N/N	Manual Task	Medium	Electronic Manuals
·	Directs PMCS on Power pack [DA]	Driver	N/N	N/N	N/N	N/N	CUI/Cuntria	ligh	CPU and DA
	Troubleshoots Power pack (BITE)	Driver/Ca6		Driver/CuS	Driver/CaS	Driver/CuS	CU1/Control	High	Electronic Manade
	Removes/Replaces LRUs [DA]	Driver	N/A	N/N	N/N	N/N	Manual Task	Medium	Ehrsteinik Manuals

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		Franking Acapanian	1	0					
	و و . موجود چند چند و واهنده بروزوان د <u>و مو</u> قع دارد. و وروان مربور والای و والای و موالا میشود میشود میشود. میشود و ب	LINCAN		Bunkiddnew	MUNIN	Anna -		LIDENCA	Endbing Levice
	Adjusts Components [DA]	Driver	X/N	V/V	V/N	N/N	Manual Task	Medium	Electronic Manuals
	Tens Power part (BTE)	Driver/CaS		Driver/CuS	Driver/CuS	Driver/CoS	<b>GUI/Control</b>	High	Electronic Mamads
	Directs PMCS on Final Drives [DA]	Driver	V/V	N/N	N/N	N/N	GUI/Control	High	C PUL and DA
	Removes/Replaces LRUs [DA]	Driver	N/N	N/N	N/N	N/N	Manual Task	Medium	Electronic Manuals
t 1	Directs PMCS on Fuel System [DA]	Driver	N/N	N/N	N/A	N/N	<b>GUI/Control</b>	High	CPU and DA
:	Troublishoots Fuel System (BITE)	Driver/Ca6	-	Driver/CoS	Driver/CuS	Driver/CoS	GUI/Control	High	Electronic Manuals
i	Removes/Replaces LRUs [DA]	Driver	N/N	N/N	N/N	N/N	Manual Task	Medium	Electronic Manuals
!	Inspects Components [DA]	Driver	N/N	N/N	N/A	N/A	Manual Task	Medium	Electronic Manuals
:	Adjusts Components [DA]	Driver	N/N	N/N	N/A	N/A	Manual Task	Medium	Electronic Manuals
 	Texts Fuel System (DiTE)	Driver/Ca6		Driver/CuS	Driver/CaS	Driver/CuS	CU1/Control	Hugh	Electronic Manuals
1	Directs PMCS on Cooling System [DA]	Driver	N/N	N/N	N/N	N/N	GUI/Control	Har I	CPU and DA
	Troubleshoots Cooling System [BITE]	Driver/Ca6		Driver/CaS	Driver/CuS	Driver/Cos	GUI/Control	5	Electronic Manuals
-	Removes/Replaces LN'Js [DA]	Driver	N/N	N/N	N/N	N/N	Manual Task	Medium	Electronic Manuals
L	Tests Cooling System (BITE)	Driver/CoS		Driver/CoS	Driver/CoS	Driver/CuS	GUI/Cuntrol	High	Electronic Manuals
1	Directs PMCS on Air Induction System [DA]	Driver	N/N	N/N	N/N	N/N	<b>GUI/Control</b>	tigh .	CPU and DA
	Troubleshoots Air Induction System (BITE)	Driver/CoS		Driver/CuS	Driver/CuS	Driver/CuS	<b>GUI/Control</b>	High	Electronic Manuals
 	Removes/Replaces LRUs [DA]	Driver	N/N	N/N	N/N	V/V	Manual Task	Medium	Electriniic Manuals
-	Inspects Components [DA]	Driver	V/N	V/N	V/N	V/N	Manual Task	Medium	Electronic Manuals
	Adjusts Components (DA)	Driver	V/V	V/N	N/N	N</th <th>Manual Task</th> <th>Medium</th> <th>Electronic Manuals</th>	Manual Task	Medium	Electronic Manuals
<u> </u>	Tests Air Induction System [BITE]	Driver/CoS		Driver/CuS	Dnver/CoS	Driver/CuS	CUI/Control	High	Electronic Manuals
 ,	Directs PMCS on Exhaust System [DA]	Driver	V/V	V/N	N/N	N/N	GUI/Control	t an	CPU and DA
;	Troubleshoots Exhaust System [BITE]	Driver/CaS		Driver/CuS	Driver/CuS	Driver/CuS	GUI/Control	High	Electronic Manuals
	Removes/Replaces LRUs [DA]	Driver	N/N	N/N	2</th <th>V/V</th> <th>Manual Task</th> <th>Medium</th> <th>Electronic Manuals</th>	V/V	Manual Task	Medium	Electronic Manuals
;	Tests Euhaust System [BUTE]	Driver/CoS		Dnver/CuS	Driver/CoS	Driver/CuS	<b>GUI/Control</b>	Hegh	Electronic Manuals
	Directs PMCS on Auxiliary Systems (DA)	Driver	N/N	N/N	2</th <th>N/N</th> <th>GUI/Control</th> <th>tight</th> <th>CPU and DA</th>	N/N	GUI/Control	tight	CPU and DA
	Troubleshoots Auxiliary Systems (BITE)	Driver/CaS		Driver/CuS	Driver/CuS	Driver/CuS	CUI/Control	ligh	Electronic Manuals
	Removes/Replaces LRUs [DA]	Driver	N/A	N/N	×/×	N/N	Manual Task	Medium	Electronic Manuals
	Tests Auxiliary Systems [BITE]	Driver/CoS	·	Driver/CuS	Driver/CoS	Dnver/CoS	GUI/Cuntrol	to I	Electronic Manuals
	Directs PMCS on Hydraulic Power System (DA)	Driver	V/V	N/N	V/V	N/N	GUI/Control	181	CPU and DA
	Troubleshoots Hydrautic Power System [BITE]	Driver/Co6		Driver/CuS	Driver/CuS	Dnver/CoS	GUI/Control	tight i	Electronic Manuals
	Removes/Replaces LRUs [DA]	Driver	N/A	V/V	V/V	V/N	Manual Task	Medium	Electronic Manuals
	Tests Hydraudic Power System (BITE)	Driver/CaS		Driver/CuS	Driver/CoS	Driver/CuS	<b>GUI/Control</b>	High	<b>Electronic Manuals</b>
	Directs PMCS on Potable Water Unit	Driver	N/N	N/N	V/N	V/V	GUI/Control	ter T	CPU and DA
	Removes/Replaces LRUs [DA]	Driver	N/N	V/V	V/N	V/N	Manual Task	Medium	Electronic Manuals
	Inspect LRUs (DA)	Driver	N/A	V/N	V/N	V/V	Manual Task	Medium	Electronic Manuals
	Directs PMCS on Embedded Training Device [DA]	Driver	N/N	N/N	V/N	2</th <th><b>CUI/Control</b></th> <th>High</th> <th>CPU and DA</th>	<b>CUI/Control</b>	High	CPU and DA
	Troubleshoots Embedded Training Device (BITE)	Driver/Ca6	V/V	Driver/CuS	Drver/CuS	Driver/CaS	GUI/Contrul	l tigh	Electronic Manuals
	Removes/Replaces LRUs [DA]	Driver	V/V	N/N	N/N	N/N	Manual Task	Medium	Electronic Manuals
	Tests Embedded Transing Device (biTE)	Driver/CaS	V/V	Dnver/CuS	Driver/CuS	Driver/CuS	CUI/Cuntrol	High	Electronic Manuals
	Directs PMCS on Survivability System [DA]	Driver	N/N	2</th <th>N/N</th> <th>V/N</th> <th>GUI/Control</th> <th>114</th> <th>C I'll and DA</th>	N/N	V/N	GUI/Control	114	C I'll and DA
	Troubleshoots Survivability System [BITE]	Driver/CuS	N/A	Driver/CuS	Driver/CuS	Driver/CuS	CUI/Control	i tigh	Eky trenk: Manudy

AFAS		Primary Remonsthillity							
TASIC		Resting	Startup	Resupplying	Moving	Firing	Interface Device	Fidelity	Enabling Device
-	Berner (Bellinal		N/A	NI/A	N/A	N/N	Manual Task	No. of Lot of Lo	
	Directs PMCS on Portable Handheld Extinguishers	Driver	N/N	V/V	N/N	< Z	CUI/Control	LY.L	CPU and DA
	Directs PMCS on Crew Compartment Extinguishing System (DA)	Driver	V/N	V/N	N/N	V/N	<b>GUI/Control</b>	High	CPU and DA
1	Troubleshoots Crew Compartment Estinguishing System (BITE)	Driver/CoS	N/N	Driver/CoS	Dnver/CoS	Driver/CoS	Manual Task	Medium	Electronic Manuals
:	Removes/Replaces LRUs [DA]	Driver	N/N	N/N	N/N	N/N	Manual Task	Medium	Electronic Manuals
1	Inspect LRUs (DA)	Driver	N/N	N/N	N/N	N/N	Manual Task	Medium	Electronic Manuals
	Tests Crew Compartment Extinguishing System (BITE)	Driver	N/N	N/N	N/N	V/N	<b>GUI/Control</b>	High	Electronic Manuals
	Directs PMCS on Weapon Compartment Extinguishing System (DA	Driver	N/N	N/N	N/N	N/N	GUI/Control	Het	AU bre UTD
!	Troubleshoots Weapons Compartment Extinguishing System (BITE)	Driver/CoS	N/N	Driver/CoS	Dnver/CoS	Driver/CuS	<b>GUI/Control</b>	1 figh	Electronic Manuals
	Removes/Replaces LRUs (DA)	Driver	N/N	N/N	N/A	N/A	Manual Task	Medium	Electronic Manuals
	Insper LRUs [DA]	Driver	N/N	N/N	N/A	N/N	Manual Task	Medium	Electronic Manuals
	Tests Weapons Compartment Extinguishing System (BITE)	Driver/Ca6	N/N	Driver/CuS	Driver/CoS	Driver/CoS	<b>GUI/Control</b>	High	Electronic Manuals
<u> </u>	Directs PMCS on Engine Compartment Extinguishing System [DA]	Driver	N/N	N/N	N/N	N/N	GUI/Control	High	CPU and DA
]	Troubleshoots Engine Compartment Extinguishing System (BITE)	Driver/CaS	N/N	Driver/CuS	Driver/CoS	Driver/CuS	GUI/Control	High	Electronic Manuals
<u> </u>	Removes/Replaces LRUS (DA)	Driver	N/N	N/N	N/N	N/N	Manual Task	Medium	Electronic Manuals
L	Impect LRUs (DA)	Driver	N/N	N/N	V/N	N/N	Manual Task	Medium	Electronic Manuals
	Tens Engine Compartment Extinguishing System [BITE]	Driver/CaS	N/N	Driver/CuS	Driver/CuS	Driver/CoS	GUI/Control	Hgh	Electronic Manuals
-	Directs PMCS on Fire Suppression Alarm System [DA]	Driver	N/N	N/N	N/N	N/N	<b>GUI/Control</b>		CPU and DA
	Troubleshoots Pirt Suppression Alarm System (BITE)	Driver/CoS	N/N	Driver/CoS	Driver/CuS	Driver/CoS	GUI/Control	High .	Electronic Manuals
	Removes/Replaces LRUs [DA]	Driver	N/N	N/N	V/N	N/A	Manual Task	Medium	Electronic Manuals
-	Impect LRUs (DA)	Driver	N/N	N/N	N/N	N/N	Manual Task	Medium	Electronic Manuals
	Tens Fur Suppression Alarm System (BITE)	Driver/Ca6	N/N	Driver/CuS	Driver/CuS	Driver/CuS	CU1/Cuntrol	High	Electronic Manuals
	REORM PLACS AND MAINTENANCE ON CCE EQUIPMENT.							1	
	Directs PMCS on Intercommunication System [DA]	Driver	N/N	N/N	N/A	N/N	GUI/Control	High	CPU and DA
1	Trouble shoots Intercommunication System (BITE)	Driver/CuS	N/N	Driver/CoS	Driver/CuS	Driver/CuS	<b>GUI/Control</b>	5	Electronic Manuals
	Removes/Replaces Intercommunication System LRUs [DA]	Driver	V/N	N/N	N/N	N/N	Manual Task	Medium	Electronic Manuals
1	Tests Intercontinue/atton System (BITE)	Driver/Ca6	N/N	Driver/CuS	Dinver/Lus	Driver/CoS	GUI/Control	High	Electronic Manuals
}	Directs PMCS on SINCGARS Radio (DA)	Driver	<b>V/V</b>	V/V	V/V	V/V	<b>GUI/Control</b>	5	CPU and DA
	[Troubleshoots SINCGARS [BITE]	Driver/CaS	N/N	Driver/CuS	Driver/CuS	Driver/CuS	GUI/Control	5	Electronic Manuals
	Removes/Replaces LRUs [DA]	Driver	N/N	N/N	2</th <th>N/N</th> <th>Manual Task</th> <th>Medium</th> <th>Electriwic Manuals</th>	N/N	Manual Task	Medium	Electriwic Manuals
	Adjusts Components [DA]	Driver	N/N	V/V	V/V	V/N	Manual Task	Medium	Electronic Manuals
	Tens SINCCANS (BITE)	Driver/CoS	N/N	Driver/CaS	Driver/CuS	Driver/CoS	CU1/Cuntrol	High	Electronic Manuals
<u> </u>	Directs PMCS on Electrical System (DA)	Driver	N/N	N/N	N/N	N/N	GUI/Control		CPU and UA
	Troubleshoots Electrical System (BITE)	Driver/Co6	V/N	Driver/CoS	Driver/CuS	Driver/CaS	GUI/Control	ten I	Electronic Manuals
 	Removes/Replaces LRUs [DA]	Driver	N/N	N/N	N/N	N/N	Manual Task	Medium	Electronic Manuals
 ,	Tests Electrical System [BiTE]	Driver/Co6	N/N	Dover/CuS	Driver/CuS	Driver/CuS	CUI/Control	Hith	Electronic Manuals
!	Directs PMCS un Navigation Equipment (DA)	Driver	N/N	N/N	N/N	N/N	CUI/Control		CPU and DA
1	Troubleshoots Navigation Equipment (BITE)	Driver/Co5	N/N	Driver/CuS	Dirver/CuS	Driver/Cas	GUI/Control	tin the	Electronic Manuals
1	Removes/Replaces LRUs [DA]	Driver	V/N	N/N	V/N	N/N	Manual Task	Meduum	Electronic Manuals
	Tests Navigation Equipment (BITE)	Driver/Ca6	N/N	Driver/CuS	Driver/CuS	Driver/CuS	GUI/Cuntrol	High	Electronic Manuals
	Directs PMCS on Mission Critical Computer [DA]	Driver	N/A	N/N	V/N	N/A	GUI/Control	ligh	ACI how (PT)

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AFAS		Primary Responsional							
<b>SAZAT</b>	2	Reding	Stanto	Resupplying	Moving	Finng	Interface Levice	HOGHIN	ELADERS LAVICE
		Dever CuS	N/A	Driver/CoS	Driver/CuS	Driver/Co5	CUI/Control	Hish	Electronic Manuals
	Removes/Replaces LRUs [DA]	Driver	V/V	V/N			Manual lask	Medium	
	Team Minution Critical Computer (B(TE)	Driver/CoS	V/N	Driver/CoS	Driver/CuS	Driver/CaS	GUI/Control	High	Electronic Manuals
in the second									• • • •
	REATS BERTHOND TROUMENT MANIALS				•		1		
2			NIN	N/N		N/A	Control	Hich	Switch
	Serves Automatic Lapood Lapoing ILMA								
	Selects Prevenlative Maintenance Aid [DA]	Cumer	V/V	< XX			CONUC		
	Selects PMCS Checklists [DA]	Gunner	N/N	N/N		Z/Z	Control	ligh H	Switch
-	Manifes Schulded Mananance Requirements (DA)	Gunner	N/N	N/N	×/N	< 2	<b>GUI/Control</b>	High	DA and Elec Manual-
1	Description Solid of American Subsequent (DA)	Gumer	N/N	N/N	N/N	N/N	GUI/Control	High	DA and Elec Manuals
1	City In the Auto Managers Ald IDA!	Gumer	N/N	N/N	N/N	N/N	Control	High	Switch
	Manufact Construe Mainmanne Procedures (DA)	Gumer	N/N	N/N	N/N	N/N	CUI/Control	High	DA and Elec. Manuals
<u> </u>	Enter Muthaman Ramed (Indused (DA)	Gumer	N/N	N/A	N/N	N/N	GUI/Control	High	DA and Elec. Manuals
12	MONICE PACE AND MARTENANCE				1	1			• · · • • • • • • •
<u>i</u>	Darie MCC. an C. to Tube Assembly (DA)	Gumer	N/N	N/N	N/N	N/N	GUI/Control	High	CPU and DA
<u> </u>	Renew / Renew 1 2 (b) (DA)	Gumer	NN	N/N	N/N	N/N	Manual Task	Medium	Electronic Manuals
+	Insen Community DA1	Curner	N/N	N/N	N/N	N/N	CUI/Control	HT	DA and Elec. Manual-
+	Diante PACS on Canons Conline Assembly (DA)	Curner	N/N	N/A		N/N	<b>GUI/Control</b>	ta la	CPU and DA
	Trubbelow Contract Assembly (2012)	Gunner/Co5	N/A	Gunner/Cos	Gunner/CoS	Gunner/CuS	GUI/Control	Ha H	DA and Elec. Namuel-
		Gumer	N/A	N/N	N/N	N/N	Manual Task	Medium	Electronic Manuals
1		Gumer	NN	N/N	N/N	N/N	Manual Task	Medium	Electronic Manuals
÷		Gunner/Ca6	N/N	Cunner/CuS	Gunner/Cus	Gunner/Cos	GUI/Control	Hgh	Electronic Manuals
1	Press Barry and Accelerate Accembrate DA	Gumer	N/N	N/N	N/N	N/N	GUI/Control	÷.	CPU and DA
i		Gunner	N/N	N/N	N/N	N/N	Manual Task	Medium	Electronic Manuals
+		Gumer	N/N	N/N	N/N	N/N	Manual Task	Medium	Electronic Manuals
	Dance PACS on Canon Accerdity Sensors (DA)	Gumer	N/A	N/N	N/N	N/N	GUI/Control	High	CPU and DA
<b> </b>	Treaded hoots Cannon Assembly Sensors (NTE)	Gumer/Ca6		Gunner/CoS	Gunner/CoS	Cunner/CoS	<b>CUI/Control</b>	1	Electronic Manuals
1	Removes / Redson 1.8 (bA)	Gunner	N/N	N/N	N/N	N/N	Manual Task	Medium	Electronic Manuals
	Indexs (201)	Curner	N/N	N/N	N/N	V/N	Manual Task	Medium	Electronic Manuals
+	Tess Careon Assembly Sanon (BITE)	Gunner/Ca6	N/N	Gunner/CoS	Gunner/CoS	Gunner/CoS	GUI/Control	High	Electronic Manuals
1	Derry PMCS on Recoil/Counterrooil Assembly (DA)	Currer	N/N	V/N	N/N	N/N	<b>GUI/Control</b>	Hart I	CPU and DA
,	Troublehoot Subeseenblues (PTB)	Gunner/CaS	N/N	Cunner/Cir5	Gunner/CuS	Gunner/CoS	GUI/Control	Į.	Electronic Manuals
•	Removes/Revises LRUs (DA)	Gumer	N/N	N/N	V/N	N/N	Manual Task	Medium	Electronic Manuals
	Tests Recoll/Converticol Assembly (MTE)	Gunner/Co6	N/N	Cunner/CuS	Gunwer/Cos	Gunner/CoS	CUI/Control	Hugh	Electrumic Manuals
1	Directs PMCS on Gun Mount Cooking Assembly [DA]	Curner	V/V	V/V	V/N	V/V	GUI/Control	ł tigh	CMI and DA
1	Renover/Reviews Likits (DA)	Gumer	N/N	V/N	V/N	V/V	Manual Task	Medium	Electronic Manuals
	lessers Submerbles (DA)	Gunner	N/A	N/N	V/N	2</th <th>Manual Task</th> <th>Medium</th> <th>Electronic Manuals</th>	Manual Task	Medium	Electronic Manuals
1	Directs PMCS on Gun Mount Sensors IDAI	Gumer	N/N	N/N	N/A	V/V	CUI/Control	High	CPU and DA
÷	Troublehoote Cue Mount Senson (BITE)	Gunner/Cos		Gunner/CoS	Gunner/CuS	Gunner/CoS	CUI/Control		Electronic Manuals
<u>.</u>	Removes / Realises LRUs (DA)	Gunner	N/N	N/N	N/N	N/N	Manual Task	Medium	Electronic Manuals
+		Currer	N/A	N/N	N/N	N/N	Manual Task	Medium	Electrowic Manuals

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AFAS		Franky Mapuneny						C: Autor	Cashing Damas
TASK	5	Keting	douns	Bunkadmean	Moving			λ	
-	Tess Cun Mount Serions (BITE)	Gunner/CoS	V/V	Gunner/CoS	Cunner/CuS	Gunner/CoS	GUI/Control	5	Electronic Manuals
	Dence PACS on Triviel Lock Assembly (DA)	Gunner	V/N	V/N	1</th <th>N/N</th> <th><b>GUI/Control</b></th> <th>t</th> <th>CPU and DA</th>	N/N	<b>GUI/Control</b>	t	CPU and DA
	Truckeshook Travel Lock Assembly (BUTE)	Cunner/CoS	V/N	Gunner/CuS	Gunner/CuS	Gumer/CuS	GUI/Control	l ligh	Electronic Manuals
	Barren / Periscen   R (b (DA)	Guner	N/N	N/N	N/N	N/N	Manual Task	Medium	Electronic Manuals
;	hences Schemerbles (DA)	Gunner	N/N	N/N	V/N	N/N	Manual Task	Medium	Electronic Manuals
	Town Trough A complete (RTE)	Gunner/Ca6	N/N	Gunner/CoS	Gunner/CoS	Gunner/CoS	<b>GUI/Control</b>	High	<b>Electronic Manuals</b>
;	Diserve PMCS on Projectile Surgers and Handline System (DA)	Gumer	N/N	N/N	N/N	N/A	<b>GUI/Control</b>	fa 1	CPU and DA
,	Trusticities Projectie Service and Handline System (B/TE)	Gumer/Ca5	N/N	Gunner/Cos	Gunner/CoS	Cunner/CoS	<b>GUI/Control</b>	10	Electronic Manuals
+	Persona / Restant LRUs (DA)	Gumer	N/N	N/N	N/N	N/N	Manual Task	Medium	Electronic Manuals
-	Increase Composition (DA)	Gumer	N/N	N/N	V/N	V/N	Manual Task	Medium	Electronic Manuals
	Tens Projectie Secrete and Handline System (MTE)	Cunner/Ca6	N/N	Gunner/CuS	Gunner/CuS	Gunner/CuS	GUI/Cuntrol	Heth	Electronic Manuals
1	Dreets PMCS on Autoloader Servors (DA)	Guner	N/N	N/A	N/A	N/A	<b>GUI/Control</b>	ţ,	CPU and DA
<u></u>	Troubletoos Autobades Senson (MTE)	Gunner/Ca6	N/N	Cunner/CoS	Gunner/CoS	Gunner/CuS	<b>GUI/Control</b>	ł.	Electronic Manuals
1	Removes/Reviews LRUA (DA)	Gumer	N/N	N/N	V/N	V/V	Manual Task	Medium	Electronic Manuals
1	Inners Little IDA!	Curner	N/N	N/N	V/N	V/N	Manuel Task	Medium	Electronic Manuals
+	True Autories Sensors (2)/TE)	Gunner/Ca6	N/N	Gunner/CuS	Gumer/CuS	Gunner/CuS	GUI/Control	H ² H	Electronic Manuals
	Dente PMCS on Provident Sprace and Handling System (DA)	Gumer	N/N	N/N	V/V	V/V	GUI/Control		CPU and DA
1	Troubleshoots Procedant Storage and Handling System (MTE)	Gunner/Ca6	N/N	Gunner/CuS	Guniwr/CuS	Gunner/CuS	GUI/Control	ţ	Electronic Manuals
+	Removes/Replaces LRUs (DA)	Gumer	V/N	N/N	V/V	V/V	Manual Task	Medium	Electronic Manuals
<u>_</u>	Insurts Companys (DAI	Gumer	V/N	V/N	V/V	N/N	Manual Task	Medium	Electronic Manuals
	Tean Proceduat Sprage and Handburg System [BITE]	Cunner/Ca6	N/N	Gunner/CuS	Gunner/CuS	Gunner/CuS	<b>GUI/Cuntrol</b>	Her	Electronic Manuals
+	Deers PMCs on Propertient Sensors (DA)	Gumer	N/N	N/N	V/V	V/V	GUI/Control	5	CPU and DA
+	Tradictions Provedant Sensors (8/7E)	Cunner/Ca6	N/N	Gunner/CuS	Gunner/CuS	Cunner/CoS	<b>GUI/Control</b>	te l	Electronic Manuals
+	Removes / Reviews LRUs (DA)	Guner	N/N	N/N	N/N	N/N	Manual Task	Medium	Electronic Manuals
1	Imment LRIA IDAI	Gumer	V/N	N/N	N/N	V/N	Manual Task	Medium	Electronic Manuals
1	Texa Provellant Sensors (BLTE)	Cunner/CaS	N/N	Gunner/CuS	Gunr r/CuS	Cunner/CuS	<b>GUI/Cuntrol</b>	High	Electronic Manuals
	Diarts PMCS on Fire Control Society (DA)	Gunner	N/N	N/N	N/N	V/V	GUI/Control	5	CPU and DA
+	Truckieshoots Fire Control System (9178)	Cunner/Co5	N/N	Gunner/CoS	Gunner/Cos	Gunner/CoS	<b>GUI/Control</b>	10	Electronic Manuels
	Removes/Replaces LRUs (DA)	Gumer	N/N	V/N	V/V	N/N	Manual Task	Medium	Electronic Manuals
+	Tests Fire Control System (BITE)	Gunner/CaS	V/V	Gunner/CoS	Cunner/Cos	Gunner/CoS	CU1/Control	f.	Electronic Manuals
	Directs PMCS on Pire Control Sights (DA)	Gunter	V/V	N/N	N/N	N/N	<b>GUI/Control</b>	É.	CPU and DA
<u> </u>	Removes/Replaces LRUA [DA]	Gunner	N/N	V/N	2</th <th>V/V</th> <th>Manual Task</th> <th>Medium</th> <th>Electronic Manuals</th>	V/V	Manual Task	Medium	Electronic Manuals
	Dreats PMCS on Night Vision Viewer [DA]	Gunner	V/V	V/V	V/V	N/N	GUI/Control	fa H	CPU and DA
•	Directs Self-Test	Gunner	N/N	V/N	< \Z	2</th <th>GUI/Control</th> <th>f.</th> <th>CPU and DA</th>	GUI/Control	f.	CPU and DA
<u>ــــ</u>	Directs PMCS on Secondary Armament (DA)	Gumer	V/V	N/N	V/V	N/N	<b>GUI/Control</b>	ligh	CPU and DA
<u> </u>	Troubleshoots Secondary Armament (BITE)	Gunner/CoS	V/V	Cunner/CoS	Gunner/Cut	Cunner/CoS	GUI/Control	ţ	Electronic Manuals
+	Removes/Replaces LRUs [DA]	Gunner	V/V	N/N	V/V	V/V	Manual Task	Medium	Electronic Manuals
	Adjuste Components [DA]	Gumer	N/N	V/N	N/N	V/N	Manual Task	Medium	Electronic Manuals
+	Tests Secondary Armament (BITE)	Gunner/Co6	N/A	Gunner/CuS	Gunner/Cut	Gunner/CuS	GUI/Cuntrol	High	Electronic Manuals
	Directs PMCS on Smoke Granade Launcher (DA)	Gunner	N/N	V/V	V/V	V/V	GUI/Control		CPU and DA
		Cume	N/N	N/N	N/N	NIN	GUI/Control		Electronic Manuals

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A/AS	Pundenodes ( Yenning						•	
14905	Resting	Startup	Resupplying	Moving	Fining	Interface Device	Fidelity	Enabling Device
Removes/Replaces LRUs [DA]	Curner	N/N	N/N	V/N	N/N	Manual Task	Medium	Electronic Manuals
Insura Concerna (DAI	Gunner	V/N	N/A	N/N	N/N	Manual Task	Medium	Electronic Manuals
Text Sante Crande Lawrine (MTE)	Cunner/CoS	N/N	Gunner/CuS	Cumur/Cos	Gunner/Circ	Cill/Custor	Hut	Flat tranic Manuals
Control Date of the local (DA)						Cilit /Comtered		C. Pt 1 August 11.A
							e	
			C/N					
Directs PMCS on Fire Control Sensors (DA)	Gunner	V/N	V/V	V/N	N/N	GUI/Control		CPU and DA
Troubleshoot Fire Control Sensors (BTTE)	Gurner/Co5	<b>X/X</b>	Gunner/CoS	Gunner/Co5	Gunner/CoS	<b>GUI/Control</b>	High I	Electronic Manuals
Removes/Replaces LRUs (DA)	Gumer	N/N	N/N	N/N	N/N	Manual Task	Medium	Electronic Manuals
Indexs LPUs (DA)	Gumer	N/N	N/N	N/N	N/N	Manual Task	Medium	Electronic Manuals
Texe Pre Concol Sensors (Drift)	Gunner/Cas	N/N	Gunner/CoS	Gunner/Cu5	Gunner/Cub	GUI/Control	Heh	Electronic Manuals
Directo PACS on Gun Pointing Systems (DA)	Guner	N/N	N/N	N/A	N/N	<b>GUI/Control</b>	f	Electronic Manuals
Troublehook Fire Control Sensors (MTE)	Cunner/CoS	N/N	Gunner/CoS	Cunner/Cu5	Gunner/Cos	CUI/Control		Electronic Manuals
Removes / Reviews LRUb (DA)	Gumer	N/N	N/N	N/N	N/N	Manual Task	Medium	Electronic Manuals
heneves LRUA (DA)	Gumer	N/N	N/N	V/N	N/N	Manual Task	Medium	Electronic Manuals
Teth Pre Control Sensors (PUTE)	Curner/CoS	N/N	Gunner/CuS	Gunner/CuS	Gunner/Cus	<b>CUI/Control</b>	Hich	Electronic Manuals
NBC MANTENANCE)							Þi	•
IOPERATE ELECTRONIC TECHNICAL MANUALS		 ; T-	1		,			
Selects Automatic Larbook Display [DA]	Driver/Co6	N/N	N/N	V/N	V/N	Cuntrul	I ligh	Switch
Selects Prevenentive Maintenance Aid IDA	Driver/Co6	N/N	N/N	N/N	N/N	Control	HE	Switch
Selects PMCS Creditiss (DA)	Driver/Co6	N/N	N/N	N/N	N/N	Control		Switch
Menthes Scheduled Mustemence Requirements (DA)	Driver/CoS	N/A	N/N	N/N	NIN	<b>GUI/Control</b>	i ieh	CPU and DA
Describes States of NBC Subscription (DA)	Driver/Ca6	N/A	N/N	N/N	N/N	GUI/Control		CPU and DA
Science I Inscheduled Maintenance Ald [DA]	Driver/Ca6	N/N	N/N	N N	N/N	Control	) ish	Switch
Resident manadered managements Providente (DA)	Driver/Co6	N/N		N N		CIII / Cuntrus	à	
Fater Managers Percel Indust (DA)	Driver/CoS	N/N	N/N	N/N	N/N	CUI/Control		CMI and DA
COMPLET PLES AND MANTENANCE							6	
Directs PACS on MOPP Evolutions	Driver/Co5	N/N	N/A	N/A	NIA	GUI/Control	Huch	CPU and DA
Directs PMCS on NBC Senters (DA)	Driver/Co5	V/N	N/N	N/N	N/N	CUI/Control	Í	CPU and DA
Troubleshoop NBC Sensors (BITE)	Driver/Ca6	N/N	Driver/Co6	Driver/CoS	Dnver/CoS	GUI/Control	Í	Electronic Manuals
Removes/Replaces LRUb [DA]	Driver/Co5	N/N	N/N	N/N	N/N	Manual Task	Medium	Electronic Manuals
Prepects LRUs (DA)	Driver/Ca6	V/V	N/N	N/N	N/N	Manual Task	Medium	Electronic Manuals
Tests NBC Senson (B/TE)	Driver/Co6	N/N	Driver/CoS	Driver/CoS	Driver/CoS	CUI/Control	High	Electronic Manuals
Directs PMCS on NBC Overpressure System [DA]	Driver/Co6	N/N	N/N	N/N	N/N	CUI/Control		Electronic Manuals
Troubleshoots NBC Overpressure System (BITE)	Driver/Co6	N/N	Driver/CoS	Driver/CuS	Driver/Co5	GUI/Control	E	Electronic Manuals
Removes/Replaces LRUs (DA)	Driver/Co6	N/N	N/N	N/N	N/N	Manual Task	Medium	Electronic Manuals
Inspects LRUs	Driver/CoS	N/N	N/N	N/A	N/N	Manual Task	Medium	Electronic Manuals
Terts NBC Overpressure System [BITE]	Driver/Co6	N/N	Driver/CuS	Driver/CuS	Driver/CuS	<b>GUI/Control</b>	High	Electronic Manuals
Directs PACS on NBC Self Dukines System (DA)	Driver/Ca5	N/N	N/N	N/A	N/N	GUI/Contrus	High	CPU and DA
Directs Self Tests	Driver/CoS	N/N	N/A	N/N	N/N	<b>GUI/Contrul</b>	l lich	CPU and DA
Directs PMCS on NBC Backup System [DA]	Driver/CoS	N/N	N/N	N/N	NN	<b>GUI/Control</b>	1 ligh	CPU and DA
Troubleshoots NBC Backup System (DITE)	Driver/Co6	N/N	Driver/Co6	Driver/CuS	Driver/Cos	GUI/Control	Hich	Eketnesk Manuals

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AEAe		Primary Pennshilliny						-	
		Retine	Startup	Reupplying	Moving	Fing	Interface Device	Fidelity	Enabling Device
					N/N	NVA	Manual Task	Medium	Electronic Manuals
	Removes/Replaces LRUs (DA)	Dirver/ COD				9.09			
~	Tests NBC Beckup System (BTE)	Driver/Cd5	N/N	Dewer/Los		B)/IMM			
•	Diserts PMCS on Decontractivation System (DA)	Driver/CoS	X/X	V/N	N/N	<>>	GUI/Control	f	
i 	Truthe hours Demonstration Section (B/TE)	Driver/Ca5	N/N	Driver/CuS	Driver/CuS	Dmver/CaS	CUI/Control	te i	Ekernenk: Manuals
		Driver/Cr6	N/N	N/N	NN	N/N	Manual Task	Medium	Electronic Manuals
							Manual Tark		Flattenic Manuals
	Inapects LRUs (DA)	Driver/LCD	~~~						
	Tests Decontamination System (B(TE)	Driver/CaS	N/A	Driver/CaS	Dnver/CoS	Dinver/CoS	CUI/Control		Electronic Manuals
<b>GNO</b>	UCT RESURPLY OF BATTONS								
	CURICIE / REPORT LEVILLS OF ONBOARD CLASS LILL V STOCKS								
2	Reiters Automatic Investory Souther (DA)	Cus	N/N	80	City	C.S.	CUI/Control	Hayh	VII MA (1.1
1		Ces	N/N	19	19	19	GUI/Control	1	CTU and DA
	Monther Automatic Requires Monitors Inventory Warrings [DA]	Cob	N/N	C66	S	8	GUI/Control	1	CPU and DA
1	Evine PM Three (DA)	Coo	N/N	18	So	S	GUI/Control	Í	CPU and DA
╀		Ces	N/N	80	Cos	8	GUI/Control	į	CPU and DA
+	Number Consult Lettered Reports	C6	N/N	Co6	Cos	199	GUI Screen	1	Radio, CTU and UA
	AN ACCORDANATE RESURTLY CONTAINONS								
1	Seints Research Coordination Ald IDA1	Cos	N/N	CuS	CuS	Cos	Cuntrul	litich	Switch
+	Revives Automatic BARV Location Undate	Cos	N/N	19	SS	8	GUI Screen	Į.	Radius CI'U anni DA
	Citers Research Brush Plansing AM (DA)	Cos	N/N	18	Cos	8	Control	ter 1	Switch
+	Linuten Johns Route of Manager (DA)	C6	N/N	Cos	Cos	l S S	CUI/Control	f	CPU and DA
+	Cried Proves Prin [DA]	C66	N/N	Cos	Cus	8	GUI/Control	F	CPU and DA
+	letter Density Print The Window (DA)	Ce6	N/N	Cos	Cr6	Cos Cos	GUI/Control	f.	CPU and DA
1	ALL LIVE A LIVE ALL CLARK PANAR [DA]	90	N/A	C 66	CuS CuS	Cos Cos	GUI Screen	Medium	Video/Series
1		Cos	N/N	90	Ĉuŝ	Cost 190	GUI/Control	High	Radin/Simulatum
-						: 		1	
4		N	N/N	Čis, – Čis,	CuS	CuS	<b>GUI/Control</b>	Medum	Vicken/Summer
-		N/A	V/N	S	S S	Cos	Control	Í	Switch
	Devices EABV is order to past with ABAS	N/N	N/N	Cos	Cos	Cas	<b>GUI/Control</b>	Medium	Video/Sensur
1	I tutter funder binder Winder	N/N	N/A	200	Cue	Cas	GUI Somen	f.	DA and Sensors
+	Manhor Automate Transfer Senans	N/N	N/N	Cos	C.nS	Cas	CUI Screen	Í	DA and Sensins
T	DCATE/NA VECATE TO REALFYLY FOINT								
	Schrets Crachie Terrain Display	N/N	N/N	CoS	CuS	CuS	Control	l ingh	Swah
1	It water Comme Presiden (DA)	N/N	N/N	56	Cos	Soc	GUI Somen	Í	DA and Sensity
	Meether Rescolv Poter IDAI	N/N	N/A	8	50	Co5	GUI Somen	5	DA and Sensors
	Durther Selects Route (DA)	N/N	N/N	Cos	Cub	80	CUI Screen		DA and Sensors
-	Meeting Combin Disaley	N/A	N/N	Cos	S	80	<b>GUI Screen</b>	Ę.	DA and Sensors
+	Marine Warness Varian Alm (DA)	N/A	N/N	80	Si Si Si	8	<b>GUI Screen</b>	itteh	DA and Sensing
	Deach Measured to Research Point	N/N	N/N	80	Ĉuŝ	80	GUI/Control	l hgh	CPU and DA
<u> </u>	DAME DAD CLASS IN V STOCKS				ł				
1		N/A	N/N	Driver	N/N	V/V	GUI/Country	Nutium	Vuhai/Sharak
	Amus Surve for monitoring if Regimed	N/N	N/N	Gunner	NIA	N/N	<b>GUI/Control</b>	Fligh	DA. CPU and Ridness

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	Announder Alennus	1						2
	Kesung	dimens	Burkiddensaul	Moving	a sur	INNETTACE LIEVICE	redelity	Enabling Levice
Activates Automated Handling System in AFAS	N/N	V/V	Cunner	V/V	V/V	Control	fair I	Switch
Moves Stocks in order to download	N/N	N/N	Gunner	N/N	N/N	<b>GUI/Control</b>	1	DA, CI'll and Rithina .
Montions Automatic Inventory Control System [DA]	N/A	N/N	<u>C66</u>	CuS	CuS	<b>CUI/Control</b>	itigh	CPLi and DA
Eners Updates tato Inventory Control System	N/A	N/N	8	Soc	Cos	GUI Screen	H	Radio, CI'U and DA
CONDUCT RECOVERY OPERATIONS								
COORDINATE FOR HET/MAR EVACUATION/RECOVERY				1	; ; ;	•	•	
Informs Command Element	Driver/CoS	N/N	Driver/Co5	Driver/CoS	Driver/CoS	<b>Gul Screen</b>	High	Radiu, CPU and DA
Communicates with Majanenance Element	Driver/CoS	N/N	Driver/CoS	Detver/CoS	Driver/CoS	<b>GUI Screen</b>	E	Radio. CPU and DA
Determines Recovery Point (DA)	Driver/Ca6	N/N	Driver/CoS	Driver/CoS	Driver/CoS	GUI/Control		CPU and DA
Determines Everation Method [DA]	Driver/CoS	N/N	Driver/CoS	Driver/CuS	Driver/Cris	<b>CUI/Control</b>		CPU and DA
Determines Vehicle Configuration [DA]	Driver/CoS	N/N	Driver/CoS	Driver/CoS	Driver/CoS	GUI/Control		CI'U and DA
Poetsions Vehicle	Driver/Co6	N/A	Driver/Co5	Driver/CoS	Driver/Cos	GUI/Control	Medium	Video/Sensor
CONDUCT SELFRECOVERY								*
Selects Maintenance Recovery Guide [DA]	Driver/CoS	N/N	Driver/CuS	Driver/CuS	Driver/CuS	Cuntrol	High	Switch
Selects Troubleshooting Sequence (DA)	Driver/Ca6	N/N	Driver/CoS	Driver/CoS	Driver/CoS	Control		Switch
Determines Problem [DA]	Driver/Co5	V/N	Driver/Co5	Driver/CoS	Driver/CoS	<b>GUI/Control</b>	te i	DA and Elec. Manuals
Adjusts and Repair Cause of Problem (Temporary) [DA]	Driver/Ca6	V/N	Driver/CoS	Driver/CoS	Driver/CoS	GUI/Control	High	DA and Elec. Manuals
Directs Movement to Maintenence Area	Driver/Ca6	V/N	Driver/CaS	Driver/CoS	Driver/Cris	<b>GUI/Control</b>	liteh	CPU and DA
CONDUCT AFAS/FARV-A RECOVERY							4	
Determinets Recovery Point [DA]	Driver/CoS	N/N	Driver/CoS	Driver/CuS	Driver/CuS	<b>GUI/Control</b>	i figh	CPU and DA
Activates Load Transfer	Driver/Co5	V/N	Driver/CoS	Driver/Ca6	Driver/CoS	Control	få I	Switch
Moves Load for Transfer	Driver/Co5	N/N	Driver/CoS	Driver/CoS	Driver/Cos	Manual Task	Pow	
Installs Towing Equipment	Driver/CoS	N/N	Driver/CoS	Driver/CoS	Driver/CaS	Manual Task	LOW	
Prettions Vehicle	Driver/CoS	N/N	Driver/CoS	Driver/CoS	Driver/CoS	CUI/Cuntrol	Medium	Video/Sensor
Directs Movement to Maintenance Area	Driver/Co6	N/N	Driver/CoS	Driver/CoS	Driver/CoS	GUI/Control	High	CPU and DA
COMMA/POS NAV DECRADED/UNUSUAL OPERATIONS								
OPERATE AFAS IN PAIRS (1 AFAS FIRE CONTROL)								
Selects Degraded Operations Aid [DA]	N/A	V/V	ß	CoS	CuS	Control	High	Switch
Directs Palend Howtczer Concept	N/A	N/A	80	So	g	GUI Screen	Í	Radio, CPU and DA
Installs Wire (si Appropriate)	N/N	V/N	Driver	V/V	Daver	Manual Task	Low	
Directo Deta Base Buchange	N/N	V/V	ဗ္လ	Cos	Cos	GUI Smen	High	Radio, CPU and DA
Travenie fire Mission	N/N	V/N	Cos	Cos	S	GUI Screen	19 1	Radio, CPU and DA
Determines Pine Command Connections for Second Howitzer	N/A	V/V	Cunner/CoS	Gunner/CoS	Cunner/CoS	CUI/Control	1	CPU and DA
Transmits Fire Commends to Second Howitzer	N/A	N/N	Curner/CoS	Gunner/CoS	Gunner/CoS	<b>CUI Somen</b>		Radio, CTU and DA
Determines Corrections	N/A	V/N	Gunner/CoS	Gunner/CoS	Gunner/CoS	GUI Screen	High	DA and Sensors
OPERATE AFAS IN PAIRS (1 AFAS W/COMMO DEAD ON VOICE)								
Determines Digital Message Configuration (DA)	N/A	N/N	Cos	CuS	CuS	GUI/Cuntrol	h tugh	CI'U and DA
Directs Paired Howitzer Concept	N/A	N/A	80	Cos	90	GUI/Control	1 E	CPU and DA
(heads Wire (if Possible)	N/N	V/N	Driver	V/N	Driver	Manual Task	Low	
Receives First Misaion	V/V	N/N	Cunner/CoS	Gunner/Cos	Cunner/Cos	GUI Screen	li tingh	Radin, C'TU and DA
Transfer Division Other Manufase	N/N	NIA	Cummer / Cub	Cumer/Con	Cunner/Col		1	Party Collection

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		Primary Responsibility						i	-
NASK I	2	Resting	Startup	Reupplying	Moving	Firing	Interface Device	Fidelity	Evabling Device
-	Transmiss Flat Mission	N/N	V/N	Cunner/Co6	Gunner/CuS	Cumer/CoS	<b>GUI Screen</b>	High	Radio, CI'U and DA
•	Vertiles Actrowledgment	N/N	N/N	Cunner/CoS	Gunner/CoS	Gunner/Co5	GUI Screen	High	Radio, CPU and DA
1	AP READING WITH DECRADED NAV SYSTEM								•
<u> </u>	Selects Busic Route Planner Ald [DA]	Cos	N/N	SoS	CuS	CuS	Cuntrol	High	Switch
<u> </u>	Selects NAV System in Degraded Mode Display	Cos	N/N	19	S	S	Control		Switch
	Determines Usable Features of NAV System [DA]	Co6	N/N	COS	Cos	CoS	<b>GUI/Control</b>	if.	CPU and DA
-	Activates Deckup Azimuth System	Cos	N/N	SoS	CoS	CoS	Control	Heh	Switch
	Locates Current Position	Co6	N/N	80	S	CoS	<b>GUI Screen</b>	High	DA and Sensors
┼	Verifies Position (DA)	C 66	N/N	8	CoS	Cos	GUI Screen	lich	UA and Sensurs
+	Montors Display	Cos	N/N	8	CuS	Cas	<b>GUI/Control</b>	High	CPU and DA
:	Determines Route (DA)	Co6	N/N	SS	CoS	CoS	<b>GUI/Control</b>	High	CPU and DA
<u>1</u> 2	LAP READENC WITH INOPERATIVE NAV SYSTEM				1				1,
<u> </u>	I Acates Current Position	Cus	Cas	Cos	CuS	CuS	GUI Screen	High	(DA and Sensors
Ļ	Activates Backup Azimuth System	Cos	80	8	Soc	C BS	Control	Heh	Switch
	Overse Map	C6	Cos	.90	CoS	Cos	GUI/Control	High	CPU and DA
	Verifies Map Location with Visual References	Cos	Cos	Ser	CoS	CoS	GUI/Control	High	Video/Sensor
+-	Demines Route	Cos	Cos	8	Cos	Cos	<b>GUI/Control</b>	High	CPU and DA
Deci	ADED OFERATIONS			1					2
0	PERATE WITH OVER PRESSURE SYSTEM INOPERATIVE					;	_		
	Selects NBC Warning Display (DA)	Cos	Cos	S	CuS	So	Control	High	Switch
-	Determines MOPP Uniform Criteria (DA)	Cos	50	8	100	50	<b>GUI Screen</b>	15	DA and Sensors
ļ	Monitors NBC Detection and Warning System	Cos	50	8	Cos	Cos	GUI Screen	10	DA and Sensors
   	Monttons Entry/Exit/Sealing System Warnings	8	80	8	Cos	Cos	<b>GUI Screen</b>	High H	DA and Sensors
	Dow Vereilated Face phones	C66	900	90	Cos	Cos	Manual Task	Medium	• • •
•	Done Protective Gear	Cos	S	18	SoS	Cos	Manual Task	Medium	
<u>.</u> 0	PERATS W/NBC SENSOR SYSTEM INOPERATIVE								
1_	Selects NBC Warning Display (DA)	Cus	Cos	CoS	CuS	CuS	Control	i ligh	Switch
<u></u>	Determines Service Degradation [DA]	Co6	80	90	50	Cos	GUI Screen	15. I	DA and Sensurs
;	Communicates with Adjacent Howitzens for Alerts	Cob	C S	9	1	Cos	GUI Screen	if.	Radio, CPU and DA
	Communicates with POC for Alerts	Cos	S	8	CoS	Cos	<b>GUI Scneen</b>	i tigh	Radio, CPU and DA
!	Communicates with FARV for Alerts	Co	80	8	CuS	Cos	CUI Somen	HEH.	Radio, CPU and DA
1	Description MOPP Uniform Criteria (DA)	66	S	90	SU	CoS	<b>CUI/Control</b>	Hat	CPU and DA
! 	Determines Masking Procedures and Criteria (DA)	8	g	8	CuS	Cos	GUI/Control		CPU and DA
0	PERATE WITH SINCLE CREWMAN			 	r	1			
L.,	Schects Single Crewman Operations Display (DA)	AI	NI I	5	<b>A</b> #	AII	Control	h lugh	Switch
ļ	Directs Functions to Selected Crew Section [DA]	N	All	2	All I	AI	GUI/Control	Ş	CPU and DA
1	Determine Priority Warnings (DA)	AII		2	All I	Ăİİ	GUI Screen	Í	DA and Sensurs
	Sciences Mission Function	All	All		ĂÜ	All	Control	ta j	Switch
<u> </u>	Activates Mission Function	Ail	All	Se la compañía de la comp	Aü	All T	Control	ligh	Switch
	Muritors for Mission Warrings	AI	All I		All T	NI I	<b>GUI Screen</b>	ligh	DA and Sensors
<u> </u>	Interiment for Priority Warnings	AN	All I		Ail Ail	AN	Cili Some	Heh.	DA and Smears

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<b>\$</b>	Invertace Device	
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Enabling [	f	CPU and [	CPU and I	Sensurs	Switch	CPU and I	Sensions	Switch	CPU and I	CI'U and I	CPU and [	CI'U and [	Sensurs	Sensors un	Senaurs	CI'U and [	Switch	Switch	Sensurs	Radio	CI'U and [	CPU and [	CI'U and I	CI'U and [	Radio and	Radio	CI'U and I	Cirù and I	Switch	CPU and (	Servins an
Fidelity	:	Hich	10 I	15 E	High Figh	High	High	High	10		i de li	Het	få H	High	High	5	fo H	High	High	High	High	High	Her H	High H	5	High	High	Her	16	18H	Hart H

~		Primary Responsibility			*				
5		Resting	Startup	Resupplying	Moving	Firing	Interface Device	Fidelity	Enabling Devi
ARE	FOR OPERATIONS								
SIS	TEM INITIALIZATION				• ! !			:	: • •
	Selects Initialization Display	Up Crewman	N/A	V/V	N/N	N/N	CUI/Control	High	CPU and DA
Ì	Selects Pre-operational Checks Aid [DA]	Up Crewman	N/N	V/V	N/N	N/N	<b>GUI/Control</b>	51	CPU and DA
	Monitors Pre-operation Checks [DA]	Up Crewman	N/N	V/V	N/N	N/N	CUI Screen	E.H	Sensurs
	Activates Manter Power	N/N	Driver/CaS	4/2	N/N	N/N	Control	High	Switch
	Activates Starting Sequence	N/N	Driver/Co6	V/V	N/N	N/N	GUI/Control	High	CPU and DA
	Monitors Engine Warning Indicators	N/N	Driver/Cos	N/N	V/N	N/N	GUI Screen	He H	Sensors
	Activates Power to Crew Stations	N/N	Driver/Co5	V/N	N/N	N/N	Control	Her	Switch
	Monitors Self Tests	N/N	<b>All</b>		N/N	N/N	<b>CUI Screen</b>		CPU and DA
	Selects Crew Configuration Selection Displays [DA]	Up Crewman		V/V	N/N	N/N	GUI Screen		CI'U and DA
	Selects Crew Configuration and Tests Allocations (DA)	Up Crewman	Cos	4/2	N/N	N/N	CUI/Control		CPU and DA
	Selects Crew Interfaces in order to assign positions [DA]	Up Crewman	Cos	V/V	N/N	V/N	GUI/Control	High	CI'U and DA
	Monitors Power up and Crew Ready Indication	N/N	NN I	4/1	N/N	V/N	CUI Screen	19 H	Sensors
	Receives Crew Ready Alert	N/N	C B C	V/V	N/N	N/N	Annunciator	Ha H	Sensors and D
	Determines Position Location and Orientation	Up Crewman	CoS/All 1	V/V	N/N	V/V	CUI Screen	High	Senarce
	Vertifies Position and Orientation	Up Crewman	CoS/All	V/V	N/N		CUI Screen	Har	CI'U and DA
1	Selects System Pre-operational Checks Aid (DA)	Up Crewman	Cos/All		N/N	N/N	CUI Screen	High	Switch
	Science System Default Mode Display [DA]	Up Crewman	CoS/AII	V/V	N/N	×/2	CUI Screen	Hat	Switch
	Observes System Modes	Up Crewman	CoS/All	V/V	V/V	2/2	GUI Screen	High	Sensurs
	Receives Operations Order	Up Crewman	CoS/Handler	V/N		N/N	GUI Screen	High	Radio
	Enters Data from Operations Order	Ur Crewman	Co6/Handler	V/V	N/N	N/N	CUI Screen	H	CPU and DA
	Selects Operations Order Display	Up Crewman	CoS/Handler	N/N	N/N	N/N	GUI Screen	High	CPU and DA
	Observes Operations Order	N/N	CoS/Handler	V/N	N/N	N/N	GUI Screen	Hor H	Ci'U and DA
	Informs Crew of Operations Order and Tasks	N/N	CoS/Handler	N/N	N/N	N/N	GUI Screen	High	Ci'U and DA
	Receives OPORD Displays	N/N	CoS/All	N/N	N/N	N/N	CUI Screen	High	Radio and DA
	Receives Section Chief Guidance	N/N	CoS/Handler	V/N	N/N	N/N	CUI Screen	High	Radio
	Determines Operational Mode Changes [DA]	N/N	200	2/2	N/N	N/N	CUI Screen	High	CI'U and DA
	Selects Operational Mode [DA]	Up Crewman	66	V/N	N/N	V/N	GUI Screen	15H	Cirù and DA
	Selects Status Display	Up Crewman	All I	<>	N/N	< N	CUI Screen	16H	Switch
•	Moniturs Status of System Readiness Repurt	Up Crewman	80	<>>	V/V	< X	CUI Screen	He H	CPU and DA
	Determines if Maintenance is Required [DA]	Up Crewman	IIV	2</td <td><!--</td--><td>V/N</td><td>GUI Screen</td><td>High</td><td>Servers and D</td></td>	</td <td>V/N</td> <td>GUI Screen</td> <td>High</td> <td>Servers and D</td>	V/N	GUI Screen	High	Servers and D
PER	FORM COMMUNICATIONS SETUP								
	Selects Communications Setup Display	Up Crewman	Cos	<b>X/X</b>	V/V	N/>	GUI/Control	High	CPU and DA
	Determines Communications Configuration [DA]	Up Crewman	S	<b>V/N</b>	V/V	N/N	GUI/Control	High	CPU and DA
ſ	Establishes and Updates Communications Detabase	Up Crewman	Co6	V/V	N/N	V/V	<b>GUI/Control</b>	Har H	CPU and DA
	Sets Radics	Up Crewman	CoS/All	X / Y	N/N	N/N	Control	High	Radio
	Selects Message Setup Aid (DA)	Up Crewman	C66	N/>	V/V	V/V	CUI/Control		CPU and DA
	Sets Internal Message Procedurts [DA]	Up Crewman	Co6	N/N	V/V	N/N	GUI/Control	19H	CPU and DA
	Establishes Internal Message Priority [DA]	Up Crewman	Cos	N/N	V/V	×/×	CUI/Control	Her	CI'U and DA
	Monitors Digital Command Check	Up Crewman	CoS/All	X/X	N/N	V/V	Annunciator	High	Radio
	Enters Net	Up Crewman	S S	N/N	N/N		Control	<b>1</b> 0	Radio
E	FORM INFORMATION MANAGEMENT	a second s			1				
	Selects Information Management Display	Up Crewman	S S	Cub	5 2 2 2	S	GUI/Control	Har	CI'U and DA
	Determines Data Required to Perform Mission [DA]	Up Crewman	C.05	90	80	90	CUI/Control	High	CI'll and DA

NOLLYZTIVUM MELISIS REPARE FOR OPERATIONS

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	0 i	4 - 0	Kesing	Samp	Resupplying	Moving	LING	Interface Device	Pidelity	Enabling Device
		Monitors File Contents for Completeness	Up Crewman	ŝ	ŝ	Soc	Sos	GUI/Control	High	CI'U and DA
		Itemiaes Incomplete or Missing Files	Up Crewman	SS	So	CuS	Sec.	CUI/Control	Hich	CPU and DA
	ŗ	Colorde Data Disadau (se Baviau		22	19		-   4		1	THI MAN
	1					) - ( ) - (			bi	
į		Identifies Obsolete Units [UA]	8	9	9	ا : 9	9	CUI/Control	SI	CI'U and DA
		Reviews Data Files	Co6	<b>9</b> 9	ŝ	Cos	S	<b>CUI/Control</b>	High	CPU and DA
		Deletes Outdated Data	Cos	CoS	Soc	505	CoG	GUI/Control	High	CPU and DA
		Requests Current Data	Cos	Co6	Cub	So	Cos	CUI/Control	E	Kadio
1		Manitor Undates	Un Crewman	CoS	Cos	Ces Ces	Cos	GUI/Control	H	Pilland DA
1		Mail Brand Mr. Am Connist to Octo Lines		33						
ł		KORM FLANNENG AND COURDENATE OFERATIONS								
		Selects Operational Displays [DA]	V/N	2	3	2)	9	GUI/Control	1941	ACI Inte UT.
		Reviews Mission	N/N	ŝ	30	Co5	500	<b>CUI Screen</b>	40 H	CI'U and DA
1 	: •	Determines Activities to Support Mission (DA)	N/N	80	90	50	80	GUISmen	15 I	CI'U and DA
ļ		Determine Record Revealed for Each Activity (DA)	N/N	ريو	-	50	y C			
1				3	19	1 } 4	319		<b>N</b>	
Ī			S/2	3	3	8	9		5	
		[Determines Scheduling Requirements with Scheduling Aid [DA]	V/N	င္လ	CuS	8	8	CUI Screen	få H	CI'U and DA
		Determines Restraints (DA)	V/V	Soc	ŝ	Co5	S S	CUI Screen	10H	CI'U and DA
!		Plans Coordination of Activities [DA]	N/N	C S S	Sico	CuS	C of	CUI Screen	Her	CI'U and DA
	S	VDUCTS TERRADN ANALYSIS					i	;		
;		Review NETT. This	la Creman	1 AH	5.6	Cu6	50	CHI/Control	Huh	2. des
ļ									0	
ļ		Selects Operational Overlay of Lertain Graphics	UP CRWIMAN	AH T	8	8	8	CUI/CONTRO	5	
		Observes Terrain Features	Up Crewman	All	S	8	S	GUI Screen	10	North Market
		Identifies Terain that will Support Operations	Up Crewman	VI	8	ŝ	ŝ	CUI Screen	5	CPU and DA
ļ		Monitors Digital Data Display	Up Crewman	AU AU	Cas	.9) .0	Ces	CUI Screen	High	Ciru and DA
Ş						• • • •	•			
2	000	to by certipity cureed					:			
						, ,				
;		Activates Vehicle Display Screen	Up Crewman	Co5/Driver	Driver	V/N	Driver	GUI/Control	High	CI'U and DA
		Selects NAV System Route Display	Up Crewman	CoS/Driver	Driver	2</td <td>Driver</td> <td>GUI/Control</td> <td>10 I</td> <td>CPU and DA</td>	Driver	GUI/Control	10 I	CPU and DA
	1	Selects Area Sweep Aid [DA]	Up Crewman	CoS/Driver	Co6/Driver	N/N	Co6/Driver	GUI/Control	15H	CI'U and DA
1		Analyzes Dicital Terrain Display	Up Crewman	CoS/Driver	Co6/Driver	N/N	Co6/Driver	<b>CUI/Control</b>	Hel	CI'U and DA
!		Selects / Indicates Sweep Route (DA)	Up Crewman	Co6/Driver	Driver	N/N	Driver	GUI/Control	f	City and DA
ļ		Determiner Threat (DA)	Un Crewman	CoS/Driver	Cos/Driver	N/N	Driver/CuS	CUI/Control		I'll and DA
1		Celerte Early Warmine Switten Danlaw [VIDS]	Ilo Crevenan	All	Co6/Dever	N/N	20/ minut	Control	N f	
	1	Ariveter Farly Warning Sortem	lln Greenan	Cr6/Druge	CoS/Detwor		Puer Cas	Combool of the second		
							30,114			
1								Curl - control	5	CORLA
;		Selects Sensor Uniplicy (VIUS)	UP CRWMAN		Cos/Univer	2</td <td>Univer/Cos</td> <td>Control</td> <td>5</td> <td>switch</td>	Univer/Cos	Control	5	switch
_		Activates Sensor Suite	Up Crewman	CoS/Driver	Cos/Driver	2</td <td>Driver/Ca5</td> <td>Control</td> <td>Her</td> <td>switch</td>	Driver/Ca5	Control	Her	switch
		Verifies Sensor(s) Activation	Up Crewman	Co5/Driver	CoS/Driver	V/N	Driver/CuS	CUI Somen	19 H	CPU and DA
		Observes Display	Up Crewman	Co6/Driver	Co6/Driver	V/N	Driver/CuS	CUI Seren	f	CU and DA
	-	Observes using Visual Surveillance Device	Up Crewman	CoS/Driver	Driver	Handler/CuS	Driver	CUI Serren	6 H	Viden/Sensor
_	1	Identifies Elements in Area [DA]	IUp Crewman	Co6/Driver	Driver	Handler/CoS	Driver	CUI Serven	5	Video/Sensur
		Identifies Daniel Elements (DA)	Up Crewman	Ce6	Delver	Handler/Co5	Driver	GUI Semm	Het.	Video/Server
ì	<b>Q</b>	NITOR SENSOR A LARMS SUITE					:		2	
		icture Alarma and Abore [DA]	Ils Crumin	<b></b>	Druwer /CuS	Handler / CuS	Devue /CuS	Cunterd	Hub	Lund, h
	-	Admitten Fach Warning Surtem Display (VIDS)	In Commo	Diver/Cos	Dever /Cos	Mandher/Con	Prest of the second second sec			
	; 									
		[Monitors Sensor Suite Warning Lispury [VILO]	Up Crewman	DJ/mm/	BYING	Mandier/CG0	BU/INA		E E	

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FAR			Primary Resonation							
No.	9		Retine	Startup	Remonivine	Mavine	Finne	Interface Device	Fidelin	Enabline Device
	T		0							
		Monutors Audio Visual Utapiay (ITK I Y)	UP LITWINAN		Unver/Los	Handler/Cus	CHVAT/CO		5	Video/Schert
		[Monitors Ares Denial Proximity Warning [DA]	Up Crewman	٦I	Driver/CoS	Handler/CoS	Driver/CoS	CUI Screen	High	CI'll and DA
	,	Selects Wide Field of View for Surveillance Device	Up Crewman	Dover/CuS	Driver/CoS	Handber/CuS	Driver/CuS	GUI Server	ter.	Victory
									Ċ	
	3	WINTER STATES		******	,				-	
		[Monitors Warning Systems [VID5]	Up Crewman	All	Driver/CoS	Handler/CuS	Driver/CuS	<b>GUI/Control</b>	Hukh	1.N.F.L.K.
		Verifies Attack (DA)	Driver/Co5	Driver/CuS	Driver/CoS	Handler/CoS	Driver/Ca5	GUI/Control	Hich	Server 3
,		Meniper Activation of Combernasonee	Driver/CoS	Driver/Con	Driver/CoS	Handler/CoS	Diver/Con	Cill/Control		
	!							5		
		Monitors Activation of Signature Suppression System	Coo/Driver	Co5/Univer	Driver/CaS	Handler/Co5	Driver/Co5	GUI Screen	fa I	CPU and DA
		Locates System Designated Target	N/N	Driver/Ca6	Driver/CoS	CoS/Handler	Driver/CoS	CUI Screen	12 H	Viden/Sensor
-	Γ	(Docues Tarnet Override (if desired)	N/A	Driver/CoS	Driver/CoS	Co5/Handler	Driver/Co5	CUI Smm	i i	Video/Sense
	Ī				4					
		Server Visconse   asket (it ocalized)						Control	6	Video/Sense
		Identifies New Target (if desired)	V/N	Driver/CoS	Driver/CoS	CoS/Handler	Driver/Co5	CUI/Control	5	Video/Sensor
		Monitors/Selects Armament for Defense	N/N	CoS/Driver	Driver/CoS	Co5/Handler	Driver/Ca6	CUI Screen	High	CI'U and DA
į		Reads Evasive Action Advisory System Display [DA]	N/N	CoS/Driver	Driver/CoS	Co5/Handler	Driver/Ca6	<b>CUI Screen</b>	1	CI'U and DA
Ţ	Γ	Determines Use of Tectical Mobility (DA)	N/N	Co5/Driver	Driver/CaS	CoS/Handler	Driver/Cris	CUI Scener		Chi and DA
	EI B	CTS POSITION							Ы	
T	[				, 10 20					
1			3	9	9	ĝ.	<u>.</u>			VC PUT O.I.
		Observes Graphic Terrain Information	500	506	80	ŝ	50	CUI Screen	Ton I	CPU and DA
ĺ		Verifies NAV/POS Information [DA]	Cos	Co6	S	ŝ	198	<b>GUI Screen</b>	Í	CI'U and DA
Ì	Γ	Communicates with Other Flements in Area	Cus	Cob	20	Ş.		Cliferen		THI MAL DA
Ì	Ţ						3			
1		Selects Hide/Overwatch Position [DA]	8	8	8	5	9	CUI Screen	f.	CI'U and DA
		Locates AFAS Position	Cos	80	Ci6	CuS	59	CUI Screen	to I	CPU, DA and Radio
	PERF	PORMS SITE IMPROVEMENT					i			
	ſ	Determines Ste fenorement Requirements (DA)	Driver / Handler	N/N	N/N	N/N	N/N	CUI Samo	1144	This and DA
1 ,	Ţ				4		,			
ļ			CUO/ FURNINE		9		<b>B</b>			
	ET.	ABLISH SECURITY/DEPENSIVE PLAN					;			
		Selacts Integrated Defense Display [VIDS]	CuS/Driver	CoS/Handler	CuS/Driver	CuS/Handler	Co5/Driver	CUI Screen	High	CI'U JIN DA
		Observes Integrated Defense Display [VIDS]	Cos/Driver	Co5/Handler	Co5/Driver	Cu5/Handler	Co6/Driver	CUI Screen	H	CI'U and DA
,		Determines Sensor Requirements [DA]	CoS/Driver	CoS/Handler	CoS/Driver	CoS/Handler	Co6/Driver	CUI Smen	f	CI'U and DA
		Activates Sensor Suite	CoS/Driver	CoS/Handler	Co6/Driver	CuS/Handler	Co5/Driver	Control	, te	Switch
	1	Determines Countermeasure Recourtements (DA)	Co5/Driver	Co5/Handler	CoS/Driver	Co5/Handler	Co5/Driver	GUI Seren	Í	CINI And DA
i			C.S.Diver	Cost Handler		C.S. Handler				-
	Ī	Demine Contra Connector System Boundary (DA)	Cos/Driver	CoS/Handler	Contraction of the second	Cos/Handler				
Ì	T									
1	ļ	ACTIVATES SIGNATIVE Suppression System	Loo/Univer	COS/Handler	Cob/Univer	Cos/Handler	Cos/Delver	Control	É.	Switch
		Determines Early Warning System Requirements [DA]	CoS/Driver	Co5/Handler	Co5/Driver	CoS/Handler	Co5/Driver	CUI Screen	Í.	CPU and DA
		Activates Early Warning System	CoS/Driver	CoS/Handler	Co6/Driver	CoS/Handler	CoS/Driver	Control	14	Switch
!	N S	VBLEH COMMUNICATIONS				1			h.	•
T		Science Mennage Serve Aid (DA)	CuS/Handler	CoS/Handler	CoS/Driver	CuS/Handler	CoS/Driver	CUI Screen	H	CPU and DA
ļ		Enters Subscriber Table Information	CoS/Handter	CoS/Handler	Ca6/Driver	Co6/Handler	Cos/Driver	CUI/Centrol	Í	CIMI and DA
-		Enter Automication Table	C.S.Handler	C-6/Handler	C-6/Driver	C.S/Handler	C.K/Delver	Cill/Cartral		No martine
1	 					C.S. Handler				
	,									
	1	Communicates with External Stations	CuS/Handler	CoS/Handler	Cos/Driver	Cu5/Handler	Cos/Driver	CUI/Contrat	1	(indivi-
1		Receives Automatic AFAS Location Update	CuS/Handler	Co6/Handler	CoS/Driver	Cris/Handler	CoS/Driver	GUI/Control	1ª I	Radiu
í		Vertifies Automatic Communications with POC/BOC	Co6/Handler	CoS/Handler	Cos/Driver	CnS/Handler	Co5/Driver	CUI/Control	11 H	tadin.
		Communicates with Crew	CoS/Handler	Co5/Handler	CoS/Driver	Cu6/Handler	CuS/Driver	Control	t H	intercoun/Radio

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	Primary Responsibility							
	Resting	Startup	Resupplying	Moving	Firing	Interface Device	Fidelity	Enabling Device
Verifies Subsystem Warning and Alert Configuration [DA]	CoS/Handler	Co5/Handler	Co6/Driver	CoS/Handler	CoS/Driver	CUI Senten	f I	CPU and DA
Monitors / Transmits Situation Report	CoS/Handler	CoS/Handler	Cob/Driver	Co6/Handlet	Cos/Driver	GUI/Control	T	Radio
Monitors CCE Warnings (DA)	CoS/Handler	CoS/Handler	CoS/Driver	CoS/Handler	CoS/Driver	CUI Screen	HI	CPU and DA
ventert							2	
ARE FOR MOVEMENT						,	<b>.</b>	
Monitors Movement Criteria Warnings [DA]	Up Crewman	CoS/Handler	CoS/Driver	V/N	Cu6/Driver	CUI Screen	High	CI'U and DA
Receives Movement Order	Up Crewman	Co5/Handler	Co6/Driver	N/N	CoS/Driver	GUI/Control	E	Radio
Activates Vehicle Power-up Sequence	Driver/Ca8	Liver/CoS	Driver/CoS	N/N	Driver/Co5	Control	<b>F</b>	Switch
Monitors Afterstart Checks	All I	AII	<b>NI</b>	N/N	All	CUI Screen	Her	CPU and DA
Inspects for Locae Equipment		VII-		NN	Ϋ́Ϊ	GUI/Control		Viden/Seman
Activates Movement Sequence	Driver	Driver	Driver	<td>Driver</td> <td>Control</td> <td>Heh</td> <td>Switch</td>	Driver	Control	Heh	Switch
Monitors Amounition Security Locks Status	Handler	Handler	Handler	N/N	Handler	<b>GUI/Cuntrul</b>		Video/Senner
Monitors Secondary Armament Status	Up-crewman	Handler	Driver	Handler	Driver	GUI/Control	Hit	Videu/Sensor
Monitors Doors and Hatches Closure Status	All/Cos	All/Co5	All/CuS	N/N	All/CoS	CUI/Control	1 I	Video/Sensor
Activates NAV System Route Display [DA]	Up-crewman	Co5/Driver	CoS/Driver	Co5/Driver	CoS/Driver	CUI/Control	HH H	CI'U and DA
Determines Threat [DA]	Up-crewman	Handler/CoS	Driver/CoS	Handler/CoS	Driver/CoS	CUI/Control		CPU and DA
Selects Early Warning System Display (VIDS)	Up-crewman	Handler/CoS	Driver/CoS	Handler/CoS	Driver/CoS	<b>CUI/Control</b>	E E	CI'U and DA
Activates Barty Warning Systems	Up-crewman	Handler/CoS	Driver/CoS	Handler/CoS	Driver/CoS	Control	HH	Switch
Venifies Early Warning Systems Activation	Up-crewman	Handler/Co5	Driver/Co5	Handler/CoS	Driver/CaS	GUI/Control		Settacor
Selects Sensor Display   VIDS	Up-crewman	Handler/CuS	Driver/CoS	Handler/CoS	Driver/Co5	GUI/Control	Hich	CI'U and DA
Activates Sensor Suite	Up-crewman	Handler/Co5	Driver/CoS	Handler/CoS	Driver/CuS	Control	E	Switch
Verifies Sensor(s) Activation	Up-crewinan	Handler/CoS	Driver/Co5	Handler/CoS	Driver/CoS	GUI/Control		Sensor
Observes Diaplay	Up-crewman	Handler/CoS	Driver/CoS	Handler/CoS	Driver/CoS	GUI/Control	15 II	CI'U and DA
Monitors for System Checks Wanungs [DA]	Up-crewman	Handler/CoS	Driver/CuS	Handler/CoS	Driver/CoS	CUI/Control	1 I	CI'U and DA
ITOR SENSOR ALARM						• • • • • • • •		
Selects Alarm Mode and Alert Aid [DA]	Up-crewman	Ces	Cus	Cris	Cuố	<b>GUI/Control</b>	High	Switch
Monitors Early Warning System Display [VIDS]	Up-crewman	Handler/CoS	Driver/CoS	Handler/CoS	Driver/CuS	<b>GUI/Control</b>	Ĩ	CPU and DA
Monitors Sensor Suite Warning Display (VIDS)	Up-crewman	Handler/Co6	Driver/CoS	Handler/CoS	Driver/Co6	<b>GUI/Control</b>	15	CPU and DA
Monitors Audio Visual Deplay	Up-crewman	Handler/CoS	Driver/CoS	Handler/Co5	Driver/Ca6	GU1/Control	15	Video/Sensor
Monisors Area Denial Proximity Warning [DA]	Up-crewman	Handler/CoS	Driver/CaS	N/N	Driver/Ca6	<b>CUI/Control</b>	1	CI'U and DA
Selects Wide Field of View for Surveillance Device	Up-crewman	Handler/CoS	Driver/CoS	Handler/CuS	Driver/CoS	CUI/Control	fa T	Video/Sensor
OND TO SENSOR ALARM								
Monitors Warming Systems [VIDS]	Up-trewman	CoS/Handler	Driver/CoS	Handler/CuS	Driver/CuS	CUI/Control	High	CI'U and DA
Verifies Attack [DA]	Up-crewman	Co5/Handler	Driver/CoS	Handler/CoS	Driver/Co5	<b>GUI Senen</b>	11	DA and Viden/Sem
Monitors Activation of Countermeasures	Up-crewman	Co6/Handler	Driver/CoS	Handler/Co5	Driver/CoS	GUI/Control	1 I	CPU and DA
Monitors Activation of Signature Suppression System	Up-crewman	CoS/Handler	Driver/Co5	Handler/CoS	Driver/Co5	GUI/Control	Í	CTU and DA
Locates System Designated Tanget	N/N	Co5/Handler	Driver/Co5	Handler/Co6	Driver/CoS	<b>GUI/Control</b>	Í	Video/Sensor
Chooses Target Override (if desired)	N/N	CoS/Handler	Driver/Ca6	Handler/CoS	Driver/CoS	GUI/Control	Í	Video/Seneur
Selects Alternate Target (if desired)	N/A	Co6/Handler	Driver/Co5	Handler/CoS	Driver/Ca6	<b>GUI/Control</b>	f	Video/Sensor
Identifies New Target	N/N	Co5/Handler	Driver/Co6	Handler/CuS	Driver/Cu5	GUI Screen	if I	Viden/Setteur
Reads Everive Action Advisory System Display (DA)	Uperewman	Co5/Handler	Driver/CoS	Handler/CuS	Driver/CuS	GUI/Cuntrul	1	Ciru and DA
Determines Use of Tactical Mobility [DA]	CoS/Driver	N/N	Co6	CoS	Co6	<b>CUI/Control</b>	f	Ciru and DA
	an manual an an anna a' an an an an an an an an an an an an an			1				

Monitons Area Denial Proximity Science Wide Field of View for Su RESPOND TO SENSOR ALARM Monitors Audio Visual Display

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MONITOR SENSOR ALARM

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Video and Sensor Video and Sensor

fai fai

CUI Screen

<'< 2:2

Driver/CuS Co6/Driver

**V/N** 

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V/N

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Monitors Driver Route Indicator Monitors Graphic Terrain Indicator

MONITOR ROUTE INDICATOR

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MEPARE FOR MOVEMENT

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actical Movement

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No.		Entime webwebury	Sartun	Pressonal vino	Movine	Rinne	Interior Device	Fidaliny	Endding Duize
		0		9		<b>9</b>		1	
-	MONIONS VISUAI UNSplays	N/N	۲/۷	V/V	CO/UNVer	N/N	CUI STREN		Video and Sensor
•• :	Manitors Obstactes Warnings [DA]	N/N	N/N	V/V	CoS/Driver	N/N	GUI Screen	5) ±	DA and Video/Senwir
<u>-</u>	SVX					:			
	Communicates Movement Order to Crew	N/A	N/N	N/N	CuS	N/N	Control	High	Intercom/Radio
	Activates Driver Route Indicator	N/N	N/N	N/N	Driver/CaS	V/N	Control	High	Switch
	Selects Driver Display	V/N	N/A	N/N	Driver/CoS	N/N	Control	H B	Switch
-	Activates Vision Devices/FLJR	N/N	N/N	N/N	Driver/CoS	N/N	Control	HE	Video/Sensor
Ť	Otwerves Terrain using Vision Devices	N/N	N/A	N/N	Driver/CoS	N/N	<b>GUI Screen</b>	Het	Video/Sensor
<b>+</b>	Moves Vehicle	N/N	N/N	N/A	Driver	N/N	Control	E F	Simulativ / Mixdel
:	Communicates Movement	N/A	N/N	V/V	Driver/CuS	N/N	Control	Het I	Intercom/Radio
	Aduate Speed	N/N	N/N	N/N	Driver	N/N	Control	High	Simulative / Model
1	Seen Vehicle	N/Ā	N/N	V/N	Driver	N/N	Control	High	Simulator/Mudel
	Stops Vehicle	N/N	V/N	N/A	Driver	N/N	Control	High	Simulator/Model
1	Monitors Integrated Defense System [VIDS]	N/N	N/N	N/N	Handler/CoS	N/N	<b>CUI Screen</b>	HEH	DA and Sensurs
$\uparrow$	Monitors Vehicle Warning Messages	N/N	N/N	N/N	Driver/CoS	N/N	CUI Screen	High	DA and Sensors
f	IAVICATE ROUTE								
	Selects Tactical Move Route Planning Aid (DA)	N/N	N/N	N/N	CuS	N/N	Control	Hizh	Switch
1	Locates Current Position (DA)	N/A	N/N	N/N	190	N/N	<b>GUI Smen</b>	Hieh	DA and Sensing
1	Identifies Destination	N/N	N/N	N/N	CoS/Driver	N/N	GUI Screen		DA and Sensions
1	[indicates/Selects Route [DA]	N/N	N/N	N/N	Cue	N/N	GUI/Control	Her	CPU and DA
-	Verifies Route and Location	N/A	N/A	N/N	CoS/Driver	N/A	<b>CUI/Control</b>	EE	CPU and DA
<b></b>	Monitors Graphic Terrain Display	N/N	N/N	N/N	CoS/Driver	N/N	<b>GUI/Control</b>	Hith	CI'U and DA
-	Monitors Move Variation Alert [DA]	N/A	N/N	N/N	CuS/Driver	N/N	<b>GUI/Control</b>	Hith	Radio/DA
t	Determines Movement Plan Changes [DA]	N/N	V/N	N/N	Cas	N/N	GUI/Control	High	CPU and DA
İ	Manitors Movement Safety Procedures [DA]	N/N	V/N	N/N	VI	N/N	<b>GUI/Control</b>	High	CPU and DA
-	Enters/Receives MAPS Update Data	N/N	N/N	N/N	Cos	N/N	GUI/Control	High	Radiu/CI'U and DA
	CONDUCT COMMUNICATIONS								
	Selects Message Handling Configuration [DA]	N/N	V/V	N/N	CuS/Handler	N/N	Control	High	Switch
	Monitors Radio	N/N	V/V	V/N	CoS/Handler	N/N	Anunciator	10 H	Radio/Simulatives
-	Monitors Digital Display	N/N	V/V	N/N	CoS/Handler	N/N	GUI Screen	15	Radio/Simulation
	Transmits External Communications	N/N	N/N	N/N	CoS/Handler	N/N	Intercom/Mike	Medium	Radio/Simulation
	Enters New External Nets	V/V	N/A	N/N	CoS/Handler	N/N	Intercom/Milke	Medium	Radio/Simulation
   	Transmits Position Reports (DA)	V/V	N/A	N/N	CoS/Handler	N/N	Intercom/Mike	Medium	Radio/Simulation
-	<b><i>(ECOTIATE OBSTACLES</i></b>					;			
	Selects Obstack Identification Aid [DA]	N/A	N/N	V/N	CuS/Driver	N/N	Cuntrol	High	Switch
• • • •	Identifies Obstacles [DA]	N/N	V/V	N/N	CoS/Driver	N/N	<b>GUI/Control</b>	High	CI'U and DA
	Determines Obstacle Restrictions [DA]	V/V	N/A	N/A	CoS/Driver	N/N	CUI/Control	12 H	CI'U and DA
i	Selects Route to Breech or By-pass Obstacts (DA)	N/A	N/N	N/N	CoS/Driver	N/N	<b>CUI/Control</b>	High	CI'U and DA
	Directs Crossing or Defour	N/A	N/N	N/N	CuS/Driver	V/V	Intercom/Mike	Medium	Intercom/Raduo
Y	XCUPY POSITION								
	Selects Site Selection Aid [DA]	N/N	N/N	Cos	V/N	Cub	Control	High	Switch
	Observes Terrain Analysis using Graphic Display	N/A	V/V	9	N/N	Co6	CUI Screen	18H	Sensors/Semulation
	Locates Firing Position (DA)	N/N	N/A	Cos	V/N	S	<b>GUI/Control</b>	f	Video/Sensur
	Verifies Poution with Emplacement Aid [DA]	N/A	N/N	Co5/Driver	V/N	Cos/Driver	CUI/Control	High	Viden/Sensur
   	Manitors System Checks	N/A	V/N	AU	V/N	All	CUI Screen	Hit	CITU and DA

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FARV		Primary Responsibili	liy –						:
TASK		Resting	Startup	Resupplying	Moving	Fing	Interface Device	Fidelity	Enabling Device
	Monitors / Transmits System Status Report	NIN	N/A	Handler/CoS	N/N	Handler/CoS	Intercom/Mike	Medium	Radio/Simulation
÷						9.0,			
	Monitors/ Receives Salety Data from POC	2</td <td>V/N</td> <td>Handler/Co</td> <td></td> <td>Handler/Coo</td> <td>intercom/ Mike</td> <td>Medium</td> <td>water www.</td>	V/N	Handler/Co		Handler/Coo	intercom/ Mike	Medium	water www.
	Determines Criteria for Survivability Move [DA]	V/V	V/V	Handler/CoS	V/N	Handler/CoS	<b>CUI/Control</b>	High	CI'U and DA
Surviv									
ľ					•				
	<b>MURAKE FOR MOVEMENT</b>				1				
	[Monitors Movement Criteria Warnings [DA]	All	AN	Handler/CoS	V/V	Driver/CoS	<b>GUI/Control</b>	High	CI'U and DA
	Determines Type of Mone (Hasty, etc.) [DA]	Coo	N/N	30	N/N	900	<b>CUI/Control</b>	HH	CPU and DA
İ	Barriver / Cives Movement Order	Cas	NIA	CoS	N/N	Ceb	Intercom / Mike	Medium	Radio/Simulation
	WEARABLE LEVELE LOWER-UP SEGUENCE (IL LEGUIDE)								Unitar
	Monitors After-start Checks	VI	V/N	VI	V/Z		CUI Screen	10H	DA and Sensitia
	Inspects for Loose Equipment	N	N/N	N	N/N	Ali	GUI Screen	Hich	Viden/Sensor
		CoS/Deiver	N/N	Co5/Driver	N/N	Co6/Driver	Control	High	Switch
t	Musium Americian Constructor Cabie	Handler/Cre	N/A	Handler/CoS	NIA	Handler/CoS			Vitun/Cunce
+								51	
Ì		5/2							Annen/ Serana
	Monitors Doors and Hatches Closure Status	N/N	N/N	V	N/N	VI	CUI Screen	têt H	Video/Sensor
	Activates NAV System Route Display [DA]	V/N	N/N	Co5/Handler	V/V	Co6/Driver	Control	High H	Switch
1	Observes Disolay	N/A	N/N	CoS/Handler	N/N	Cos/Driver	GUI Screen	Hist	DA and Sensers
1	Monitors for Sector Charts Warmings	NIN	N/N	Cos/Driver	N/N	Cos/Dever			DA and Control
1					1				
-	MUNITUR SERVICE ALANM					(			
	Selects Alarms and Alerts [DA]	V/N	VI	Cu5/Driver	V/V	CuS/Driver	Control	High	Switch
	[Monitors Early Warning System Display [VIDS]	V/N	All	CoS/Driver	V/V	CoS/Driver	<b>GUI Screen</b>		DA and Sensions
	Monitors Sensor Suite Warning Diaplay (VIDS)	N/N	٩R	CoS/Driver	N/N	Co5/Driver	GUI Scnen	Hit	DA and Sensors
İ	Monitors Audio Visual Disolay (HRTV)	N/A	AII	CoS/Driver	N/N	CoS/Driver	GUI Screen	f	Video/Sensor
+	Monitor Ama David Provinity Warning (DA)	N/A	All .	CoS/Driver	N/N	Cris/Driver	CUI Smen	A T	DA and Smerry
1								b	
+						۱ بو بو		1	
	Monitors Warning Systems [VIL5]	V/V	Handler/Coo	Cub/Univer		Co/Chver		High	DA and Service
	Vertifies Attack [DA]	V/N	Handler/CoS	CoS/Driver	N/N	CoS/Driver	<b>GUI Screen</b>	fa H	DA and Smaurs
	Monitors Activation of Countermeasures	V/N	Handler/CoS	Co6/Driver	V/V	CoS/Driver	<b>GUI Screen</b>	H.H.	DA and Sensors
• •	Monitors Activation of Signature Suppression System	N/N	Handler/CoS	Co5/Driver	N/N	CoS/Driver	<b>CUI Screen</b>	EE	DA and Sensors
• •	Locates System Designated Target	N/N	Handler/CoS	CoS/Driver	N/N	CoS/Driver	CUI Screen	High	Video/Sensor
1	Chooses Target Override (II desired)	N/N	Handler/CoS	Co5/Driver	N/N	Cos/Driver	Control		Switch
	Selects Alternate Tarret (if desired)	N/A	Handler/CoS	Cu6/Driver	N/N	Cu6/Driver	CUI Screen		Viden/Sensor
	dentifies New Tarset (if desired)	N/A	90	Co6/Driver	N/N	19	<b>CUI Screen</b>	Hel	Video/Senant
-	Reads Evasive Action Advinory System Display (DA)	N/N	NN.	CoS/Driver	N/N	AN I	CUI Screen		DA and Sensors
;	Determines Use of Tactical Mobility IDAI	N/A	90 C	Co6/Driver	N/N	Cos	CUI Screen		DA and Smarth
	MONTOR ROUTE INDICATOR			:					
1	Monitors Driver Route Indicator	N/A	CuS/Driver	N/N	Cu6/Driver	N/N	CUI Screen	High	DA and Sensitia
<b>!</b>	Monitors Crashie Terrain Indicates	N/A	Cos	N/N	Co5/Driver	N/A	GUI Some	Í	DA and Semon
;	Mariton Visual Disulars	N/N	Cos	N/N	Cos/Driver	N/N	CUI Screen	H	Viden/Service
1			2						
1			8						
1									1
	Communicates Movement Croer to Lirew	8	9 	8	8	9	Intercom / Mike	¢.	Intercom/Kadix
	Activates Driver Route Indicator	Driver/Cob	Driver/Cop	Driver/Cab	Driver/CuS	Driver/Cu5	Control	f.	Switch
	Selects Driver Display	Driver/Co5	Driver/Co5	Driver/Cos	Driver/Cos	Driver/Co5	Control	Í	Switch
	Artivatan Vision Devices / FLIR	Driver/CoS	Driver/CoS	Driver/Ca6	Driver/Cu6	Driver/Co5	Contract Contract	Hish	Viden/Conce

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and the second

2		Primary Responsibility							
2		Renting	Startup	Reupplying	Moving	Firing	Interface Device	Fidelity	Enabling Device
¦ 	Cherves Terrain usine Vision Devices	N/A	N/N	N/A	Driver/CuS	N/N	GUI Screen	Hish	Video/Sensur
	Moves Vehicle	V/V	V/V	V/N	Univer	V/N	Control		Staulator/Model
	Communicates Movement	V/V	V/V	N/N	Driver/CuS	N/N	Intercom/Mike	Medium	Radio/Simulation
!	Adiusts Second	NN	N/N	N/N	Driver	N/N	Control	Hich	Simulator / Model
-		N/N	N/A	N	Detere	NIN	Centred	i inter	Simulative / Minded
								0	
-	Stops Vehicle	V/N	۷/۷	V/N	Criver	2/2	Control		NINCIAL / WALCE!
	Manitors Integrated Defense System [VID6]	V/N	2</td <td>N/N</td> <td>Handler/CoS</td> <td>N/N</td> <td>CUI Screen</td> <td>High</td> <td>DA and Sensions</td>	N/N	Handler/CoS	N/N	CUI Screen	High	DA and Sensions
 	Monitors Vehicle Warring Manages	N/N	N/N	N/N	Driver/CoS	N/N	CUI Screen	f	DA and Servins
ž	MCATE ROUTE								
Ļ	Selects Survival Move Route Selection Aid (DA)	N/N	N/N	N/A	Cu6	N/N	Control	Hich	Switch
	I write Current Burition (DA)	N/N	N/N	N/N	Cost Cost	NIN	CUI Server	I	DA and Service
+									
			C/N	V/N		C/2			
	Indicates/Selects Route [DA]	V/N	N/N	V/N	ŝ	N/N	<b>CUI/Control</b>		CPU and DA
	Vertiles Route and Location	V/V	N/A	N/N	Co6/Driver	N/N	CUI/Control	f	CPU and DA
	Monitors Crashie Terrain Diselay	N/N	N/A	N/N	CoS/Driver	NVA	GUI/Control	H	Ciru and DA
1	Marian Mass Vaisian Abril (DA)	N/N	N/N	N/N	CoS/Driver	NN	GUI/Control	I	Radin/DA
			N/N					1	CHI - LIVA
					; ; ;			þ	
	MONION MOVERNIC SARRY / TOORGUM (UA)	V/N	C Z						
	Enters/Receives MAPS Update Data	V/N	N/N	V/N	S S S	V/V	CUI/Control	High	Radio/CI'U and U
ĝ	VDUCT COMMUNICATIONS								
	Selects Menager Handling Configuration (DA)	N/N	N/N	V/V	CuS/Handler	N/N	Cuntrol	High	Switch
	Monitors Radio	N/N	N/N	N/N	CoS/Handler	N/A	Annunciator	to 1	Radio/Simulation
!	Mandae Design Display	N/N	N/N	N/N	CuS/Handler	N/N	CUI Semen	Hel	Radio/Simulation
1	Trumin Estima Commissions	N/A	N/A	N/N	CoS/Handler	NIN	Intercom / Mile	Madium	Radio/Semulation
	Free New Streed New	N/N	N/N	N/N	Cris/Handler	N/N	Internet Mike	Medium	Padio/Camilation
1									
Z	ZOTIATE OBSTACLES					1			
	Selects Obstacle Identification Aid [DA]	V/V	V/V	V/V	CuS/Driver	N/>	Control	High	Switch
	Mentifies Obstactes [DA]	N/N	V/N	V/N	Co6/Driver	N/N	<b>CUI/Control</b>	Ter.	CPU and DA
	Determines Obstacle Restrictions [DA]	N/N	N/N	N/N	Co6/Driver	N/N	<b>CUI/Control</b>	1 E	CPU and DA
	Selects Route to Breach or By-ease Obtacle (DA)	N/N	V/N	N/N	CoS/Driver	N/N	CUI/Control	FI	CirU and DA
	Prests Consider or Dather	N/A	N/N	NIA	CoS/Driver	N/N	Intercom / Mike	Medium	Intercon / Radies
12									
3	School School And IDA!						Control	Hich	Switch
	Onever Terrain Andreis wine Crashic Disolay	N/N	N/A	Ces	N/N	Cub	CUI Smen	Í	Services / Semulativ
		NIA	N/N	3		3			Vid Icent
1									
			~ ~ ~						
	Positions Vehicle	V/V	V/V	Driver/Co5	2</td <td>Driver/Ca5</td> <td>CUI/Control</td> <td>10 H</td> <td>Viden/Sensor</td>	Driver/Ca5	CUI/Control	10 H	Viden/Sensor
	Monitors System Chacks	V/V	2</td <td>AH</td> <td><!--2</td--><td>All All</td><td>CUI Screen</td><td>10 I</td><td>CI'U and DA</td></td>	AH	2</td <td>All All</td> <td>CUI Screen</td> <td>10 I</td> <td>CI'U and DA</td>	All All	CUI Screen	10 I	CI'U and DA
 	Monitors/Transmits System Scatus Report	N/N	V/V	Handler/CuS	V/V	Handler/CuS	Intercom/Mike	Medium	Walalumi2/when
1	Determines Criteria for Survivability Move [DA]	N/N	N/N	Handler/CoS	N/N	Handler/CoS	CUI/Control	High	CITU and DA
E	I COMPANICATIONS SYSTEMS								•
5	RATE SINCCAKS			• •					••••
L	Determines Communications Cunhamation [DA]	Up Crewman/CoS	Cue	Cu6	Cuố C	Cub	<b>CUI/Control</b>	Huch	CITLAND UA
,	Determined Measure Selves Confinemention (DA	Un Crewman/Ca6	<b>Ce6</b>	190		19	CUI/Control		City and DA
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	9		Resting	Startup	Resupplying	Moving	Fine	Interface Device	Fidelity	Endine Device
		Manison Vaire and Debal Communications		80	990	246	Cas Cas	Internet (CIII	New York	P. A. / Vince Jakes
				3		3	3			
		Transie and Receives Voice Transmissions	Up Crewman/CoS	50	39	90	8	Intercom/GUI	Medium	Radio/Simulation
		Transits and Bertium Diettal Transitations	I In Creaman / Cafe	80	8	80	80	CU1/Control	Medium	Radius/Signalation
							· ·			
	G	IXATE CONSEC BOUPMENT								
		Monitors COMSRC System	Cue	80	Sec	Cus	<u>Cus</u>	GUI/Cuntrul	High	CI'U and UA
		Preside CONSISC Krms	66	3	3	90	<b>C66</b>	GUI/Control	f	CPU and DA
<u>     </u>										
1		STRUE (TRIGERI/ LOUGEPENDT MODE	UP LITENTIAL/UD	2	AU			CONTRO		
1		Installs Meedent to Externed Intercom Jack	Up Crewman/Ca5	AB	Alt	VI	AR	Control	ter H	Switch
_		Activates FARV/AFASC Heatup Intercon	Up Crewman/Cod	N/N	Co5/Handler	N/N	Co6/Driver	Control		Switch
í	Ĩ									
i										
1	2									:
		Receives CBOI Update from NCS	Up Crewman/CoS	8	500	C.6	3	<b>CUI/Control</b>	Medium	Kadio/Sumulation
		Identifies CBOI Providents	Up Crewman/CoS	30	Sec	80	30	<b>CUI/Control</b>	HH	CI'U and DA
ļ	<b>REC</b>	DCNZE ECM/EMPLOY BCCM				:				
								CIII/Control	Hith	
ļ	ļ								2	
		Continuum Operations	Up CRWEAN/COD	2	Au Au		2	GUI/Control	5	
		Selects BCCM Menu	Up Crewman/CoS	<b>VI</b>	28		RV.	Control	fi	Switch
		State Radio Jammine Mode	Up Crewman/CoS	Cob	90	80	<b>C</b> 66	Control		Switch
		Divite Anti-Jamesian Providence (DA)		56	190	190	5	CII/Control		CPI and DA
	Ţ									
		Seets Alternate Frequency Scan	UP LIEWINAN/LOS	8	ß	8	8	Control	5	
		Transmits BCM Report	Up Crewman/CoS	AB	AH	<b>NI</b>	All	<b>GUI/Cuntrol</b>	Medium	Radio/Simulation
0	Lea	TAND DISTRIBUTE INTELLICENCE								
	NO.	SE AND CATHER INFORMATION				•	•		!	•
		Kitan hallingan Colorise Aid (DA)		Les les				Contrust	Î	Curiterh
	-			}						
		Monitors Integrated Detense Systems [VILIS]	UP CRWINIA/COS	2	Z	22	V	<b>GUI/Control</b>	<u>E</u>	
		Cheerves High Resolution TV	Up Crewman/CoS	CoS/Handler	Driver/CoS	Handler/CoS	Driver/CoS	GUI Screen	Í	Video/Senace
!		Monitors FLJR Display	Up Crewman/CoS	Co6/Handler	Driver/Cob	Handler/CoS	Driver/Cos	<b>GUI Sereen</b>	Í	Videu/Senace
:		Observes with 360 Denne Vision Device	Up Crewman/CoS	CoS/Handler	Driver/CoS	Handler/CoS	Driver/Cos	CUI Screen	I	Video/Senace
1		Omme with Nickt Vision Division	ille Crewman/Ca6	CoS/Handler	Driver/CoS	Handler/CoS	Driver/CoS	GUISSIN	1	Video/Service
i	1			Ca6/Handler	Thinse / Colo	Handler /C.S.			ľ	
	ļ								-	
 				2						
	2	X LES INFORMATION					1			
		Selects Receives and Processes Intelligence Aid (DA)	Up Crewman/CoS	Co6	<b>2</b> 8	505	So	Control	49 H	Switch
:		Monitors External intelligence Information (DA)	Up Crewman/Cab	99	89	80	56	CUI Some	Í	CTU and DA
,		Enters Local Intelligence Information	Up Crewman/CoS	99 U	Sec	500	90	GUI/Control	Í	Cru mi DA
!	VNV	ALYZE INFORMATION								
}	Ļ	Monitors intelligence Updates	Up Crewman/Co5	Cos	Ca6	C 6	Cris	CUI Screen	Heh	CI'U and DA
1 !		Cherves Berthefield Information Display	Up Crewman/Ca8	9	3	190	18	CU Sum	1	CPU and DA
, ,	REP	ORT INTO MATTON					-			
1		Directs Target Hand-off	N/A	Cas	icus	Cus	Cue	CUI/Cuntrul	Hinh	Madin, CIU and DA
1	 	I reactly letellerve feours	Up Crewman/CoS	83	80	190	100	GUI/Cantrol	1	PANA CTU MADA
1		Transis 201 Leact	Uto Crewman/Ca5	5	50	Sec.	5	CUN/Control	1	ALL CHI PAIN
;	Ļ	Trements Crater Analysis Broat	N/A	Ce l	9	8	19	CUI/Control	1	Public Children DA
125	1001	FINGE MANNANC							À	

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A	DS	5T/	<b>W</b>	D	U	TR	-94-	V	V	0	03	3	1	8
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2	2		Primary Kasponashing							
	2		Senery	Anume	Backiddman	BUNADIN	Suur -			
	â	VELOP DEFENSIVE FIRE PLAN								
		Selects Defendive Fire Planning Display [DA]	Ca5/Driver	CoS/Handler	90	9 <u>0</u>	8	Control	High H	Switch
		Determines Threat (DA)	CoS/Driver	Cos/Handler	8	80	8	<b>CUI/Control</b>		CPU and DA
:	-	CLAA Nain Man Malau		Car/Handler	<u>yy</u>	195	25	Cantral		
1						3 3	3			
	~	[Determines Likely Energy Avenues of Approach (DA)	Co5/Driver	N/A	565	9	8	GUI/Control	High	CPU and DA
		[Determines Pields of Fire [DA]	Co5/Driver	V/N	Co6	ŝ	80	GUI/Control	1	CPU and DA
!	Ļ	Selects Direct Fire Presidons (DA)	CoS/Driver	N/A	CoS	500	Co6	<b>GUI/Control</b>	f	PU and DA
1	Ļ	Christ Pares Card Data DA!	CoS/Driver	NIA	Cas	Case Case	8	CIII/Control		All and DA
	1				1		17			
	i				B	<u>B</u> .	8		5	VA BUT A.I.
		Plane Early Warning Requirements [DA]	CuS/Driver	2</th <th>99</th> <th>50</th> <th>99</th> <th>CUI/Control</th> <th></th> <th>ACI him UPC</th>	99	50	99	CUI/Control		ACI him UPC
	6	VELOP POSITION PORTIFICATION/CONCEALMENT PLAN		-	•	1		•		
	L	Plans use of Existing Terrain (DA)	Cee	C6	CoS	Cue	Cub	GUI/Control	Hich	CI'U and DA
	Ļ	Determines Fortification Assets (DA)	ICo6	9	Ce6	Ces	Ces	GUI/Control		City and DA
	1	Selects Equipment to be Rottind (DA)	Cos	Ces	Cob	Cas	Ces	CUI/Control	f	Ad bue Url
	1		er of the second s	950	C.es	5	3	CIII/Control		Ad have 111-
!	+			1		19	- 			
	_	SHACE FORDOR COMMENT WITH REQUIREMENTS [UA]	8	9	8	9	9	CUI/CONTROL		
		Plans Internal Position Movement Routes (DA)	Cc6	<b>2</b> 8	50	8	8	GUI/Control	f. I	CITU and DA
	_	[Plane External Position Movement Routes [DA]	Cos	99 00	CuS	ŝ	80	<b>CUI/Control</b>	High	CI'U and DA
}	G	VELOP POSITION EVACUATION PLAN					! <b> </b>		i i	· · · · · · · · · · · ·
	L	Selects Evacuation Route Aid (DA)	Cue	Co6	Cu6	Sus	Cub Cub	Cuntrol	Huch	Switch
	Ļ	Colorte Businshim Dimber	CoS	<b>B</b>	Ce6	190	Ces	CUITEMAN		PRI and DA
ļ	+	Primine Branchine Criteria (D.A.)	Cee	Cas	Cas	500	90	CUI/Control	Í	NI and DA
	$\downarrow$			4		19				
	4	[Tians Evacuation Koutes [UA]	ß	ß	B	B	<u>8</u>		6	
		Plane Eacape Routes (DA)	Cos	8	8	8	9	CUI/Control		CI'U and DA
1	-	Selects Hide Positions [DA]	8	Sec.	Co6	Suc	800	CUI/Control	f	Ad brie Urto
1	B	VELOP POSITION SUPPRESSION PLAN				: 1 <u>1</u>			,	1 · · · · · · · ·
i		Scherts Minimize Simeture Aid IDA1	- Icus	Ces	CuS	Cus	Ces.	Control	High	iwatch
	 +		4	4	4	4	2	1		
1	+	Anders unset to the same	8	3 3	3		3 3			
!			B	8	8	B	9			
		Reviews/Receives Unit Suppression Criteria [DA]	99 C	S S	8	80	8	CUI/Control	1	CI'll and DA
		[Flare for use of Acoustic Suppression Suite [DA]	Cos	99 20	SoS	9°0	99 99	CUI/Control	19	CI'U and DA
		Plans for use of Rader Suppression Suite (DA)	90	<b>9</b> 3	Soc	500	Co6	CUI/Control	Í	I'U and DA
	_	Plans for use of Visual Suppression Suite (DA)	Cos	99	Cos	56	56	CUI/Control	Í	CPU and DA
ļ	Ļ	Plane for use of Infrared Suppression Suite IDA	Cos	Cos	Cos	500	66	CUI/Control	F	O'U and DA
i I	Ļ	Plans for use of Magnetic Suppression Suite [DA]	Cos	Cob	CoS	SUC	Cos	CUI/Control	E E	CI'U and DA
	+-	Plane for use of Obtical Augmentation Suite IDAI	Cos	56	90	CoS	Ce6	GUI/Control	f	City and DA
i	6	VELOP PIEST AID PLAN							>	
i	1	Plane Crevenan Everytion (DA)	l cus	CoS	Cab	, Cus	Co6	<b>GUI/Control</b>	High	Ad har Ut
	1	Derminer Medical Assistance Locations	ICa6	99	19	50	19	CUI/Control	1	VO Pre (LI
1	2	VELOP CANETATION PLAN								
1	4	Press the second of Field Secritation (sems (DA)	- Cis	Co6	Cob	C.os	Cos	CUI/Control	Hith	This and DA
ł	4	Black it is when Campbell Table 10.1	90	4	30	14	813			
ł			8 4	<u>B</u> (		814	 9 2			
,		Plans Location of Latitudes and Uniteds [UA]	8	B	B;	8	<u>B</u> ][		5	
1	4	Plans use of Shower Points [UA]	8	9	9	8	8	CUI/Control	5	
		Plans for Sanitation and Discard of Refute [DA]	Sec.	500	ŝ	Sec.	<b>90</b> 0	CUI/Control		CIM and DA

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2	,		· Primers Pressenthilite			-			-	
	1			2112	Contra latine	Marine	Rivine .	Interior Print	E ALIN	En Mine Davie
2	2		Superv	Anune	2m /iddness				L'INTER L	
		ROOM CONOPS PLANNING			:					
i	Ļ	School Test School School Add (DA)	CuS	Ces	CoS	Cis	90	Control	Hich	Switch
					1		19			
	_	Frank Served use [UA.]	8)	9	ß	ß	B			
		Plans Crew Rotation Schedule [DA]	Cos	99 0	S	<b>8</b> 0	80	<b>CUI/Control</b>	Hit	CI'U and DA
1		Plans for Cold Section Operations (DA)		Cre	Ces	80	90 190	CUI/Control	Hist	CIM and DA
	1								•	
		Place Maintenance Schedule [DA]	Cos	COE	500	8	8	GUI/Control	H (B)	CI'U and DA
Z	D	FERSE OFERATIONS								
	5	REATE VEHICLE BUTECEATED DEFENSE SYSTEM							; ; ; ;	•
1	il.									
_	;	Activates Serence Swete	9	9	8	8	9	Control	5 Ī	Switch
-		Determines Countermeasures Requirement [DA]	500	80	8	8	80	<b>GUI/Control</b>	Į.	CPU and DA
i	;	Selects Mode for Compensations		8	90	19	19	CUI/Commi	f	Citi and DA
Ì	1			312						
	-	UNAL SHORE THE A SUBAL SHORE	3	8	8	<u>9</u>	3			UNIAC
	_	Muniters for Warnings	VII	AN		<b>VI</b>		GUI/Control	High	CPU and DA
i	C	PLOY SIGNATURE SYSTEM				1	: : : :			
;		Determines Signatures Minimization Requirements (DA)	Cas	Cos	CuS	CuS	Driver/CoS	GUI/Control	Hich	CPU and DA
					9	+4				
•			8	9	<b>9</b> [	<u>B</u> ]		CONTO		
	_	Activates Rader Suppression Suite	80	8	C 6	ŝ	Driver/CuS	Control	Talit.	Switch
		Activates Visual Suppression Suite	Cos	980	ŝ	80 0	Driver/Co6	Control	Hith	Switch
	L	Activates Infrand Summerics Suits	C.c.	99	80	Ş	Driver/CuS	Control	f	Switch
	1									
1		ACTIVENTIAL MARGINGS SUPPORTED SUBIR	ß	9	8	8	B)/JAAH			
		Activates Optical Augmentation Suits	Cos	8	S	ŝ	Driver/CoS	Control	tô H	Switch
	2	TAILISH LOCAL DEPARSE								•
ļ		TARWARD Viewal Area Defense Manilan		3	C.S./Driver	NVA	Driver/Cro	Control	Hich	Switch
	4									
		Determines Primary Area of Keeponsibility (DA)	CO5/Driver	9	Loo/Unver	۲/۷	Dinver/Cob	CUI/Control	5	
		Communicates Crew Responsibility assignment [DA]	Co5/Driver	90	CoS/Driver	<b>V/N</b>	Driver/CoS	<b>GUI/Control</b>	fa I	CPU and DA
!	L	Monitors Early Warning System	CoS/Driver	90	Co5/Driver	V/N	Driver/CoS	GUI/Control	H H	CI'U and DA
	Ļ	Maritana Visatad Areas Defense Maritare	Cres/Driver	<b>Y</b>	CoS/Driver	N/N	Driver/CuS	CIII/Control	I	CW and DA
	1	EDATE AMANENT EVENTEAR							2	
	5									
		Scans with Visual Sight	Up Crewman/Co5	Co5/Handler	CoS/Driver	V/N	Co5/Driver	GUI/Control	High	Video/Sensur
		Activates Pop-up Turret	Up Crewman/CoS	CoS/Handler	CoS/Driver	< <u>&gt;</u>	CoS/Driver	Manual Task	Medium	Video
1	 	Verifies Alignment with Visual Display	Up Crewman/CoS	CoS/Handler	Co5/Driver	V/N	CoS/Driver	<b>CUI/Control</b>	High	Video/Sensor
1	1	Tracts Tenset with Direct Fire Sight	Up Crewman/CoS	Co6/Handler	Cu5/Driver	N/N	Co6/Driver	CU1/Control		Video/Senaw
i	Ĺ	Preses Free Button on lowisids	Up Crewman/CoS	CoS/Handler	CoS/Driver	N/N	Cos/Driver	Control	H	Switch
1	1	Monitors / Activates Reland Servence	I la Crevenan / CoS	CoS/Handler	CoS/Driver	N/N	Ca5/Driver	CUI/Control	H	Viten/Conce
i i	1Z	IDI OV NAT GELE DEBENGE SVETELL (GENEOPS)							2	
1		Estate Themis Evolution And (DA)	A8	1		A11	<b>.</b>		H.	Curitch
1	1							511		
į	-	SPACE INST. LUNCTION AND WAINING SYSTEM LUSIPLAY					2	Condo		<b>DWIKD</b>
		Receives NBC Decision Aid Information [DA]	AII.	VII	AU		<b>VI</b>	<b>CUI/Control</b>	10 H	Radin/Simulatum
	-	Activates Individual/Collective Protection System	AU	Alt	78	<b>NI</b>	All	Control	f	Switch
;	<b>.</b>	Scleets NBC Sensor [DA]	NI NI	IV	<b>NI</b>	AH AH	<b>VII</b>	Control	High	Switch
i	!	Activates NBC Detection and Warning System	AN AN	<b>NI</b>	N	NI VI	VII VII	Control	f	Switch
;	NP.	PLY FIRST AID				<u> </u>				:
		Schots First Aid Kit		<b>NI</b>	VI	NII VII	<b>VI</b>	Manual Task	Huch	
1 1	-	Anoles Firt Ald		AB AB	M	IV		Manual Task	Mon	
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VAV.		Primary Masponetowity		8	N			and the second	
		6		6		2		2	
-	Untermines Evacuation Requirements [UA]		N	₹			CUI/Control	5	CI'U and UA
	Moree Casualty in order to evacuate	All	All	All		<b>VI</b>	Manual Task	MO	
<b>LINC DEF</b>	ENSIVE OPERATIONS								
K	SE/MONITOR POR NEC THREAT					:			
 ;	Determines Threat (DA)	Cos	Ca6	Cos	CuS	505	CUI/Cuntrol	High	CI'U and DA
	Monitors Automatic Chemical Agent Alarm [DA	A11	<b>N</b>		VII	21	CUI/Control	f	CI'U, DA and Server
1	Monitors Redix Meter Alarm (DA)	M	All	M		N	GUI/Control		CPU, DA and Sensor
+	Maniters Biolanicsi Asset Detector Alarm (DA)	MI	AB	V		V	GUI/Cantrol		CPU. DA and Sensor
			AB	<b>A</b> ¹⁰	VIII I	All			CHI DA sed Bud
							5157 200		
1				- - -		4		1.1	
		50		9		819			
	Determanes areas joenshicadon from Detector	8)	9	9	9	9	CUI/Control	5	CPU, DA and Kadio
	Activates Sample Transfer System	Co6	Co6	00 00	CoS	CoS	Control	10H	Switch
	Activates Sampling Device	CoS	Co6	Cos	80	90	Control	16 I	Switch
-	Monitors/Travenits NBC Report	Co6	Co6	500	Cus	19	GUI/Control	Į.	CPU, DA and Radio
No.	TATE ONDOARD NDC PROTECTION SYSTEM								
	LAdiview Researce Contribution Controls		M	All	AB 1	A0	Control	Hish	Switch :
+									
-	WARNARS LADE CARE DAMAGE (MARK) SAMERI		14	R					
	Monitors NPC Bectup System	VI	All				GUI/Control	Í.	CIU, DA and Senve
	Activates MOPP Conditions [DA]		AI	M		M	GUI/Control	Hel H	CI'U, DA and Sensor
	Dons Ventileted Facepieces	Alt	All	All A	AU VI	AN V	Manual Task	Medium	
	Monitors FARV Access Port Indicator	<b>AI</b>	AR	VI	<b>NI</b>	VI	GUI/Control	H H	Video/Senser
<b>D</b>	ONTAMINATE SYSTEM AS REQUIRED					; ; ;			
<b> </b>	Selects Decontamination Decision Aid Display [DA]	CuS	CuS	Suc	CuS	Cu6	Cuntrol	High	Switch
-	(Determines Contamination Status [DA)	Cos	Ca6	Cas	Cos	80	<b>GUI/Control</b>	f	CPU, DA and Sensor
	Activates Automatic Decontamination System	Cos	C66	80	50	Ces	Control	E I	Switch
	Monitors Automatic Chemical Agent Alarm	AN IN	N	IV	All	All	GUI/Control	f	CPU, DA and Senvir
<u> </u>	Dons Protective Gear	AI	<b>NI</b>	NN.	N.	All	Manual Task	1 H	
	Directs Manuel Decontamination [DA]	Cos	Co6	560	CoS	Co6	CUI/Control		CI'U, DA and Senser
PER	PORM CONDES FLANNING								
<u> </u>	Science Test Scheduling Aid [DA]	Co6	Cos	Cué	CuS	Cos	Control	High	Switch
	Plane Steep Schedule [DA]	Co6	Cab	C06	Cos	C66	<b>CUI/Control</b>	f	CPU and DA
	Plans Crew Rotation Schedule [DA]	66	Co6	<b>C66</b>	Cos Cos	80	CUI/Cantrol	Í	CPU and DA
	Plans for Cold Section Operations [DA]	Cos	SG	Cos	200	56	GUI/Control	1 I	CI'U and DA
	Plans Maintenance Schedule (DA)	50	56	80	Cos	80	GUI/Control	15	ci vi and DA
NUTONO	TIVE MAINTENANCE				•	!			•
6	TATE ELECTRONIC TECHNICAL MANUALS.				_	;	 :		
	Science Automatic Logbook Display (DA)	Driver/Ca6	N/N	Driver/CaS	V/N	N/N	Control	High	Switch
	Selects Preventive Maintenance Aid [DA]	Driver/Co6	V/N	Driver/Co6	V/N	V/N	Control	1 I	Electronic Manuah
 i	Selects PMCS Checklists [DA]	Driver/Co6	V/V	Driver/CaS	V/N	V/N	Control	1	Switch
	Identifies Schedeled Maintenance Requirements (DA)	Driver/CaS	N/N	Driver/CoS	V/V	V/N	CUI/Control	1	CPU and DA
	Determines Status of Maintenance Subsystems [DA]	Driver/Co6	V/V	Driver/Ca6	V/N	N/N	GUI/Control	1	CI'U, DA and Selisin
1	Selects Unacheduled Maintenance Aid [DA]	Driver/CaS	N/N	Driver/Co6	N/N	N/N	Control		Switch
-	Identifies Corrective Maintenance Procedures (DA)	Driver/Co8	N/N	Driver/CoS	N/N	N/N	CUI/Control	1	CI'U and DA
	Enters Maintenance Record Updates (DA)	Driver/CaS	N/N	Driver/CoS	N/N	N/N	CUI/Control		Citli and DA

FAR			Primary Responsibility							
SYL	8		Reating	Startup	Resupplying	Moving	Firing	Interface Device	Fidelity	Enabling Device
[	S	DUCT PACS AND MAINTENANCE.								
ļ		Directs PMCS on Pop-up Turret Assembly [DA]	Driver/CoS	V/V	N/N	N/N	N/N	<b>CUI/Control</b>	High	CI'U and DA
		Inspects Turret Subsmemblics	Driver/Co5	N/A	V/N	V/N	N/A	<b>GUI/Control</b>	f	Electronic Manuals
1	1	Removes/Replaces LRUs [DA]	Driver/Co5	N/N	V/N	N/N	N/N	Manual Task	Medium	Electronic Manuals
Í		Directs PMCS on Crew Stabors [DA]	Driver/Ca6	N/N	N/N	N/N	N/A	CUI/Cuntrol	High	CPU and DA
		Troubleshoots Crew Stations [BITE]	Driver/CoS	N/N	Driver/CaS	Driver/CoS	Driver/CoS	<b>GUI/Control</b>	High	Electronic Manuals
		Removes/Replaces LRUs [DA]	Driver/Co5	N/N	V/V	N/N	N/A	Manual Task	Medium	Electronic Manuals
ļ		Texts Crew Stations (B(TE)	Driver/CoS	A11	VI	All	<u>All</u>	<b>GUI/Control</b>	High	Electronic Manuals
		Directs PMCS on Stowage Racks and Boxes [DA]	Driver	N/N	V/V	N/N	N/N	<b>GUI/Control</b>	High	CPU and DA
1		Removes/Replaces LRUs (DA)	Driver	N/N	N/N	N/N	N/N	Manual Task	Medium	Electronic Manuals
ļ		Directs PMCS on Supervision Assembly (DA)	Driver	N/N	N/N	N/N	N/N	CUI/Control	Hind	CI'U and DA
Î		Adivets Supervision (DA)	Driver	N/N	V/N	N/N	N/N	Manuel Task	Medium	Electronic Manuals
		Removes/Replaces LRUs [DA]	Driver	N/N	V/N	N/N	N/N	Manual Task	Medium	<b>Electronic Manuals</b>
		Directs PMCS on Track Assembly [DA]	Driver	N/N	N/N	V/N	N/N	<b>CUI/Control</b>	High	CPU and DA
		Removes/Replaces Track Blocks [DA]	Driver	N/N	N/N	N/N	N/N	Manual Task	Medium	Electronic Manuals
		Removes / Replaces Sprocket [DA]	Driver	N/A	N/N	N/N	N/N	Manual Task	Medium	<b>Electronic Manuals</b>
		Directs PMCS on Power pack [DA]	Driver	N/N	V/N	N/N	N/N	<b>CUI/Control</b>	Hith	CPU and DA
ļ		Troubleshoots Power pack [BITE]	Driver/CaS		Driver/CoS	Driver/CoS	Driver/CaS	GUI/Control	1 E	Electronic Manuals
		Removes/Replaces LRUs [DA]	Driver	N/N	V/N	N/N	N/N	Manual Task	Medium	Electronic Manuals
1		Adjusts Components [DA]	Driver	N/N	N/A	N/N	N/A	Manual Task	Medium	Electronic Manuals
ļ		Texts Power pack (BUTE)	Driver/Ca6		Driver/CuS	Driver/CuS	Driver/CuS	CUI/Control	High	Electronic Manuals
ł		Directs PMCS on Final Drives [DA]	Driver	N/N	V/V	N/N	N/N	GUI/Control	15 T	CPU and DA
1		Removes/Replaces LRUs [DA]	Driver	N/N	N/A	N/A	N/N	Manual Task	Medium	Electronic Manuals
		Directs PMCS on Fuel System [DA]	Driver	V/N	V/N	N/N	N/A	GUI/Control	High	CPU and DA
		Troubleshoots Fuel System [BITE]	Driver/Co6		Driver/Co5	Driver/CoS	Driver/CoS	GUI/Control	High	<b>Electronic Manuals</b>
		Removes/Replaces LRUs [DA]	Driver	N/N	N/N	V/V	N/N	Manual Task	Medium	<b>Electronic Manuals</b>
	L	Impects Components [DA]	Driver	N/N	N/N	N/N	N/N	Manual Task	Medium	Electronic Manuals
!		Adjuste Components (DA)	Driver	N/N	N/N	V/N	V/N	Manual Task	Medium	<b>Electronic Manuals</b>
1		Tests Fuel System [BITE]	Driver/Ca6		Driver/CoS	Driver/CuS	Driver/CoS	CUI/Control	High	<b>Electronic Manuals</b>
!		Directs PMCS on Cooling System (DA)	Driver	V/V	N/N	N/N	N/N	CUI/Control	High	CPU and DA
1		Treubleshoots Cooling System [BITE]	Driver/CoS		Driver/CoS	Driver/CoS	Driver/CaS	<b>GUI/Control</b>	High	Electronic Manuals
]		Removes/Replaces LRUs [DA]	Driver	N/N	V/V	N/N	N/A	Manual Task	Medium	Electronic Manuals
ļ		Tests Cooling System [BITE]	Driver/CoS		Driver/CoS	Driver/CoS	Driver/CoS	<b>CUI/Control</b>	High	<b>Electronic Manuals</b>
		Directs PMCS on Air Induction System [DA]	Driver	N/A	V/N	N/N	N/A	CUI/Control	High	CPU and DA
		Troubleshoots Air Induction System (BITE)	Driver/CaS		Driver/CoS	Driver/CoS	Driver/CuS	<b>CUI/Control</b>	fa Í	Electronic Manuals
		Removes/Replaces LRUs [DA]	Driver	V/N	N/N	N/N	N/N	Manual Task	Medium	Electronic Manuals
]		inspects Companents (DA)	Driver	N/N	V/N	N/N	N/N	Manual Task	Medium	<b>Electronic Manuals</b>
		Adjusts Components [DA]	Driver	N/N	N/N	N/N	N/N	Manual Task	Medium	Electronic Manuals
	Ľ	Tests Air Induction System (BITE)	Driver/Ca6		Driver/CoS	Driver/CoS	Driver/Co6	CU1/Control	High	Electronic Manuals
		Directs PMCS on Exhaust System [DA]	Driver	N/N	N/A	N/N	V/N	GUI/Control	High H	CPU and DA
		Troubleshoods Exhaust System (BITE)	Driver/CoS		Driver/CoS	Driver/CuS	Driver/CuS	CUI/Control	T I	Electronic Manuals
, - <b>1</b> ,		Removes/Replaces LRUs [DA]	Driver	V/N	V/V	V/N	N/N	Manual Task	Medium	Electronic Manuals
]		Teeb Exhuust System (BITE)	Driver/CoS		Driver/CoS	Driver/CaS	Driver/CoS	CUI/Control	High	Electronic Manuals
	Ľ	Directs PMCS on Auxiliary Systems [DA]	Driver	N/N	V/V	N/N	N/N	<b>GUI/Control</b>	He H	CI'U and DA
		Troubleshoots Auxiliary Systems (BITE)	Driver/CoS		Driver/CoS	Driver/Ciss	Driver/Cos	GUI/Control		Electronic Manuals

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NSX T	ิท		Resting responsions	Startup	Resupplying	Moving	Firine	Interface Device	Fidelity	Enabline Device
		Bearing (Bealanse   R. M. DA)	Driver	N/N	N/A	N/A	N/N	Manual Task	Medium	Electronic Manuals
i		Texts Auritient Southing (BITE)	Driver/CoS		Driver/CoS	Driver/CoS	Driver/CoS	CUI/Control	Hit	Electronic Manuals
	1	Darte PACS on Hudraulte Preses Section (DA)	Driver	N/N	N/A	N/N	N/N	Cill/Control		CPU AND DA
Ì		Tradit have the device Druce Control Diffe	Diver/Ca6		Driver/Cos	Drive / C.S.	Driver/CoS	Cill/Control	•f	Floring Manuals
Ι		Persona / Benjama   21 / (DA)	Driver	N/N	N/N	N/N	N/N	Manual Task	Medium	Electronic Manuals
		Tath Hudradie Proce Sector (RTE)	Driver/Ca6		Driver/CoS	Driver/CoS	Driver/CoS	C111/Control	Hich	Electronic Manuals
Γ		Directo PMCS on Potable Water Linit	Driver	NIA	V/N	N/N	N/N	CU1/Control	Hish	CPU and DA
Ι	ł	Renove/Reviews LRUs (DA)	Driver	N/N	N/N	N/N	N/N	Manual Task	Medium	Electronic Manuals
		Inspect LRUs (DA)	Driver	N/N	N/N	N/N	N/A	Manual Task	Medium	Electronic Manuals
4		Directo PMCS on Embedded Training Device [DA]	Driver	N/A	N/N	N/N	N/N	CUI/Control	High	CPU and DA
	1	Troubleshoots Embedded Training Device (BITE)	Driver/Co6	V/N	Driver/CuS	Driver/CuS	Driver/CuS	GUI/Control	High	Ehrtrauk Manuals
1	4	Removes/Replaces LRUs [DA]	Driver	N/N	N/N	N/N	N/N	Manual Task	Medium	Electronic Manuals
ļ	Ĺ	Tests Embedded Training Device (BITE)	Driver/CaS	N/N	Driver/CoS	Driver/CuS	Driver/CoS	GUI/Control	High	Electronic Manuals
		Directs PACS on Survivability System [DA]	Driver	N/A	N/N	N/N	N/N	GUI/Control	High	CPU and DA
		Troubleshoots Survivability System (BITE)	Driver/CoS	N/N	Driver/Ca5	Driver/CoS	Driver/CoS	<b>GUI/Control</b>	15 I	Electronic Manuals
i		Removes/Replaces LRUb (DA)	Driver	N/N	N/N	N/N	N/N	Manual Task	Medium	Electronic Manuals
í		Directs PMCS on Portable Handheld Extinguishers	Driver	N/A	N/A	N/N	N/N	CUI/Control	High	CPU and DA
1		Directs PMCS on Crew Compartment Extinguishing System [DA]	Driver	N/N	N/N	V/N	N/N	<b>CUI/Control</b>	Fight H	CPU and DA
		Troubleshoots Crew Compartment Extinguishing System [BITE]	Driver/Ca6	N/N	Driver/CoS	Driver/CuS	Driver/CoS	Manual Task	Medium	Electronic Manuals
		Removes/Replaces LRUs [DA]	Driver	N/N	N/N	V/V	N/N	Manual Task	Medium	Electronic Manuals
		Inspect LRUs (DA)	Driver	N/A	N/A	V/N	N/A	Manual Task	Medium	Electronic Manuals
		[Texts Crew Compartment Extinguishing System [BITE]	Driver	V/N	N/N	V/N	N/N	<b>GUI/Control</b>	High	Electronic Manuals
		Directs PMCS on Weepon Compartment Extinguishing System [DA]	Driver	N/N	N/N	N/N	N/N	CUI/Control	High	CPU and DA
	L	Troubleshoots Weapons Compartment Extinguishing System (BITE)	Driver/Ca6	V/N	Driver/CoS	Driver/CuS	Driver/CoS	GUI/Control	16 H	Electronic Manuals
ĺ		Removes/Replaces LRUs [DA]	Driver	V/N	N/A	N/N	N/N	Manual Task	Medium	Electronic Manuels
		Inspect LRUs (DA)	Driver	N/N	N/A	N/N	N/N	Manuel Tesk	Medium	Electronic Manuals
		Tests Wespons Compartment Extinguishing System (BITE)	Driver/CoS	N/A	Driver/CoS	Driver/CoS	Driver/CoS	GUI/Control	High	Electronic Manuals
		Directs PMCS on Engine Compartment Extinguishing System [DA]	Driver	N/A	N/A	V/V	N/A	GUI/Control	High	CPU and DA
	L	Troubleshoots Engine Compartment Extinguishing System (BiTE)	Driver/CoS	V/N	Driver/CaS	Driver/CoS	Driver/CoS	CUI/Control	150 H	Electronic Manuals
		Removes/Replaces LRUs (DA)	Driver	V/N	N/A	V/N	N/N	Manual Task	Medium	Electronic Manuals
I		Inspect LRUs [DA]	Driver	N/N	V/N	V/V	N/A	Manual Task	Medium	Electronic Manuals
İ		Tests Engine Compartment Extinguishing System [BITE]	Driver/Ca6	N/N	Driver/CoS	Driver/CuS	Driver/CoS	CUI/Control	High	Electronic Manuals
l		Directs PMCS on Fire Suppression Alarm System [DA]	Driver	N/N	N/A	V/N	N/N	CUI/Control	15 I	CI'U and DA
!		Troubleshoots Fire Suppression Alarm System (BITE)	Driver/Ca6	N/N	Driver/CaS	Driver/CuS	Driver/CuS	<b>CUI/Control</b>	fø H	Electronic Manuals
		Removes/Replaces LRUs [DA]	Driver	N/N	N/N	V/N	N/N	Manual Task	Medium	Electronic Manuals
		bespect LRUs [DA]	Driver	N/A	N/N	N/N	N/N	Manual Task	Medium	Electronic Manuals
		Tests Fire Suppression Alarm System (BITE)	Driver/CoS	N/A	Driver/CoS	Driver/CuS	Driver/CoS	GUI/Control	Har	Electronic Manuals
	E.	FORM PACS AND MAINTENANCE ON CCE EQUIPMENT.								
		Directs PMCS on Intercommunication System [DA]	Driver	N/A	V/N	V/V	N/N	GUI/Control	High	CI'U and DA
		Troubleshoots Intercommunication System [BITE]	Driver/CaS	V/V	Driver/Co5	Driver/CuS	Driver/CoS	<b>GUI/Control</b>	if.	Electronic Manuals
ļ		Removes/Replaces Intercommunication System LRUs (DA)	Driver	V/N	V/N	V/V	N/N	Manual Task	Medium	Electronic Manuals
		Tests Intercommunication System [BITE]	Driver/CoS	N/N	Driver/CoS	Driver/CoS	Driver/CoS	CU1/Control	High	Electronic Manuals
I		Directs PMCS on SINCCARS Radio [DA]	Driver	N/N	N/N	N/N	N/N	CUI/Control	f.H	CPU and DA
	L	Troubleshoots SINCCARS (BITE)	Driver/Ca6	N/A	Driver/CoS	Driver/CuS	Driver/CoS	CUI/Control	E I	Electronic Manuals
		Removes/Replaces LRUs [DA]	Driver	N/N	N/N	N/N	N/N	Manual Task	Medium	Electronic Manuals

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		Retine	Cartero Cartero	Reunnlying	Movine	Firing	Interface Device	Fidelin	Enabling Device
		8			0				
	Adjusts Components [UA]	Driver	V/N	۷/۷	V/2	V/N	Manual Jask	Medium	Electronic Manuals
	Texts SINCCARS (BITE)	Driver/Ca6	V/N	Driver/CoS	Driver/CoS	Driver/CoS	GUI/Control	High	Electronic Manuala
	Directs PMCS on Electrical System (DA)	Driver	N/N	N/N	N/N	N/N	<b>CUI/Control</b>	1 H	CPU and DA
1	Trushahoot Blactrical Souton (B/TE)	Driver/CoS	N/A	Driver/CoS	Driver/CoS	Driver/CoS	GUI/Control	Heh	Electronic Manuals
Ţ							1		
	REPORT / REPLACE LAUS [UA]	LINVE	V/V	V/N	2/2	2/2	Manual 1 ask	Window	CIECTIVAN MADUAR
	Texts Electrical System [BITE]	Driver/Co5	N/N	Driver/CoS	Driver/CoS	Driver/CoS	<b>GUI/Control</b>	High	Electronic Manuels
ĺ	Directs PMCS on Navigation Equipment [DA]	Driver	V/N	N/N	N/N	V/V	<b>GUI/Control</b>	High	CPU and DA
1	Troubleshoots Navigation Equipment (BITE)	Driver/Co6	N/A	Driver/CoS	Driver/CoS	Driver/CoS	<b>GUI/Control</b>	High	Electronic Manuals
İ	Removes / Reviewes LRUs (DA)	Driver	N/A	N/A	N/N	N/N	Manual Task	Medium	Electronic Manuals
:	Tark Minister Enterney (RITE)	Dever/Cos	N/N	Driver/CoS	Driver/Cos	Driver/Cos	CI II / Control	Hich	Flactmonic Manuals
Ţ									
	Directs PMCS on Mission Computer [DA]	Driver	V/N	V/V	N/N	V/V	CUI/Control	5	CI'U and DA
	Troubleshoots Mission Critical Computer (BITE)	Driver/CoS	N/N	Driver/CoS	Driver/CuS	Driver/CoS	GUI/Control	High	Electronic Manuals
	Removes/Replaces LRUn [DA]	Driver	V/N	V/N	N/N	V/V	Manual Task	Medium	<b>Electronic Manuals</b>
	Tests Mission Critical Computer (BITE)	Driver/CoS	N/N	Driver/CuS	Driver/CuS	Driver/CuS	GUI/Control	High	Electronic Manuals
ARM	AMENT MARTENANCE								
	<b>OPERATE ELECTRONIC TECHNICAL MANUALS</b>								
T	Sciente Automatic I automite Discripte (DA)	Handler	N/N	N/A	N/N	N/N	Control	Hich	Switch
	Cibet Promisive Mainteners Aid IDAI	Handlee	N/N	N/N	N/N	N/N	Control	J.	Switch
								51	
1	SCREED THUCK CHROCHISED [U/V]		c /z						SWIICH
	Identifies Scheduled Maintenance Requirements [DA]	Handler	N/N	N/N	N/N	N/A	<b>GUI/Control</b>	E C	CPU and DA
	Determines Status of Armament Subsystems [DA]	Handler	V/V	N/A	V/V	N/N	GUI/Control	High	CPU and DA
	Selects Unacheduled Maintenance Aid (DA)	Handler	V/V	N/N	V/N	<b>V/V</b>	Control	High	Switch
	Identifies Corrective Maintenance Procedures [DA]	Handler	V/V	V/N	V/N	V/V	<b>GUI/Control</b>	Har	CPU and DA
Ī	Entern Maintenance Record Updates (DA)	Handler	N/N	N/A	N/N	N/A	<b>GUI/Control</b>	High	CPU and DA
-	CONDUCT PACS AND MAINTENANCE				•			k	
Ţ	North BACC - Briefly Control and Mardine Control (DA)	Handler	NVA	N/N	N/N	N_N	Ctill/Control	Hick	
1					Handler / Cas				
1	I TOUDRENOUS F TORATIE SUCRESS AND DEPORTE SYMMET SHIELD		V/N					1011	
	Removes/Replaces LRUs [DA]	Handler	V/V	V/N	V/N	V/V	Manual Task	Medium	Electronic Manuals
	Inspects Components [DA]	Handler	N/N	N/N	V/V	N/N	Manual Task	Medium	Electronic Manuals
	Tests Projectile Storage and Handling System (BITE)	Handler/CoS	N/N	Handler/CoS	Handler/CoS	Handler/CuS	<b>GUI/Control</b>	High	<b>Electronic Manuals</b>
1	Directs PMCS on Propellant Storage and Handling System [DA]	Handler	V/N	V/V	V/N	N/A	<b>CUI/Control</b>	18H	CI'U and DA
1	[Troubleshoots Propellant Storage and 4 and fing System [BITE]	Handler/Co6	N/A	Handler/CoS	Handler/CuS	Handler/CoS	GUI/Control	150 T	Electronic Manuals
	Removes/Repiaces LRUs [DA]	Handler	V/N	N/A	V/V	N/A	Manual Task	Medium	Electronic Manuals
	Impects Components [DA]	Handler	N/N	V/V	V/N	N/N	Manual Task	Medium	Electronic Manuals
Ì	Tests Propeliant Storage and Handling System (BITE)	Handler/CoS	N/N	Handler/CoS	Handler/CoS	Handler/CoS	<b>CUI/Control</b>	High	Electronic Manuals
1	Directs PMCS on Night Vision Viewer [DA]	liandler	N/N	N/A	N/N	N/N	GUI/Control	f	CI'U and DA
Γ	Directs Self-Test	Handler	N/N	N/N	N/N	N/A	GUI/Control	Hah	CI'U and DA
	Directs PMCS on Armament System [DA]	Handler	N/N	N/N	N/N	N/N	GUI/Control	f	CI'U and DA
i	Troubleshoots Armament System [BITE]	Handler/CoS	N/N	Handler/CoS	Handler/CoS	Handler/CoS	<b>GUI/Cuntrol</b>	15 E	Electronic Manuals
1	Removes/Replaces LRUs [DA]	Handler	N/N	N/A	N/N	N/N	Manual Task	Medium	Electronic Manuals
	Adjusts Components [DA]	Handler	N/N	N/A	NIA	N/N	Manual Task	Medium	Electronic Manuals
ļ	[Tests Secondary Armament (BITE)	Handler/Co5	N/N	Handler/CoS	Handler/CuS	Handler/CoS	<b>CUI/Control</b>	High	Electronic Manuals
1	Directs PMCS on Smoke Grenade Launcher (DA)	Handler	N/N	N/N	N/N	N/N	CUI/Control		CPU and DA
1	Trubledwork Smoke Cremade Launcher	Handler	N/N	N/N	N/N	N/N	GUI/Control		Electronic Manuals
T	Parameric Parameric Paramerican Paramerican	Handler	N/N	V/N	N/N	N/N	Manual Task	Madium	Flactory Manuals
	funition manual (manual)		141	11/11					LINCLUMING PROFILEMENTS

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		0		9 m And means		9		LIDEUL	Enabling Levice
• •	Interest components (UA)	Handler	N/N	N/A	V/N	V/N	Manual Task	Medium	Electronic Manuals
	Tests Smoke Grenade Launcher (BITE)	Handler/Co5	N/N	Handler/CoS	Handler/CuS	Handler/CoS	CUI/Control	Hich	Electronic Manuals
	Directs PMCS on Sighting Devices [DA]	Handler	N/N	N/N	N/N	N/N	GUI/Control	Heh	CPU and DA
	Directs Self-Text	Handler	N/N	N/A	N N	N N	CIN/Cantrol	bi	
	Development of the Control of the Co							2	
ţ		Langer .					CUI/Control		CI'U and DA
	Troubleshoot Sighting Devices Sensors (BITE)	Handler/CoS	N/N	Handler/CoS	Handler/CuS	Handler/CoS	<b>GUI/Control</b>	Har H	Electronic Manuals
1	Removes/Replaces LRUs [DA]	Handler	N/N	N/N	N/N	N/N	Manual Task	Medium	Electronic Manuals
	Inspects LRUs (DA)	Handler	N/A	N/N	N/N	NN	Manual Task	Medium	Flactronic Manuale
1 UNIN	<u> </u>								
	DEPATE ELECTRONIC TECHNICAL MANILALS								_
							-		
	Selects Automatic Logbook Display (DA)	Driver/CoS	N/A	N/N	V/N	V/V	Cuntrul	Hugh	Switch
	Selects Preventative Maintenance Aid [DA]	Driver/CoS	N/N	N/N	N/N	N/N	Control	F	Switch
,	Selects PMCS Checklists [DA]	Driver/CaS	N/N	N/N	N/N	N/N	Control	La L	Switch
	Identifics Scheduled Maintenance Requirements [DA]	Driver/CoS	N/N	N/N	N/N	N/N	GUI/Control	Hich	CHI and DA
	Determines Status of NBC Subsystems (DA)	Driver/CoS	N/N	N/N	NIN	V/N	CI II / Contend		
-	Selects Unacheduled Maintenance Aid (DA)	Driver/CoS	N/N		N/N	N/N	Control		
+	[Manifest mention Mainhance Providums (DA)	Diver/Cre		· · · · · · · · · · · · · · · · · · ·					
1									
T			2/2	V/V		< Z	CUI/Control	Ho Ho	Ad bue U'ID
-	CONDUCT PMCS AND MAINTENANCE								
	Directs PMCS on MOPP Equipment	Driver/CaS	2</td <td>N/A</td> <td>V/N</td> <td>V/V</td> <td>GUI/Control</td> <td>High</td> <td>CPU and DA</td>	N/A	V/N	V/V	GUI/Control	High	CPU and DA
	Directs PMCS on NBC Sensors [DA]	Driver/Ca5	N/N	N/N	N/N	N/N	<b>GUI/Control</b>	E E	CPU and DA
	Troubleshoots NBC Sensors (BITE)	Driver/Co5	N/N	Driver/CoS	Driver/CoS	Driver/CoS	<b>CUI/Control</b>		Electronic Manuals
	Removes/Replaces LRUs [DA]	Driver/CoS	N/N	N/N	N/N	N/N	Manual Task	Medium	Flectronic Manuals
1-	Inspects LRUs [DA]	Driver/CoS	N/N	N/A	N/N	N/N	Manual Task	Medium	Pertrunic Manuals
	Tests NBC Sensors (BITE)	Driver/CoS	N/N	Driver/CoS	Driver/CuS	Driver/CoS	<b>GUI/Control</b>	Hich	Electronic Manuals
1	Directs PMCS on NBC Overpressure System [DA]	Driver/Co6	V/V	N/N	N/N	N/N	GUI/Control		Hectronic Manuals
;	Troubleshoots NBC Overoreaure System (BITE)	Driver/CoS	N/N	Driver/CuS	Driver/CoS	Driver/CoS	CIII/Control		Instronic Manuals
+-	Reenves/Replaces   21 a [DA!	Driver/Cos	N/N	N/N	N/N	N / N	Manual Tack		
+-		Dive/Ca6							
+							Matiual 1256	Medium	CIECTUMIC Manuals
+	I BE NOL OVERPRESURE JYSIEM [34 12]	Driver/Loo	2</th <th>Unver/Cos</th> <th>Unver/Cos</th> <th>Driver/Cu5</th> <th>GUI/Control</th> <th>5</th> <th>Electronic Manuals</th>	Unver/Cos	Unver/Cos	Driver/Cu5	GUI/Control	5	Electronic Manuals
-+	Directs PMCS on NBC Self Detense System [DA]	Driver/Co5	V/V	N/N	N/N	N/N	GUI/Control	High	CPU and DA
-	Directs Self-Tests	Driver/Co6	N/N	V/V	V/V	V/N	<b>CUI/Control</b>	Ho H	CPU and DA
	Directs PMCS on NBC Backup System [DA]	Driver/CoS	N/N	N/N	V/N	V/N	GUI/Control	H H	CI'U and DA
	Troubleshoots NBC Backup System (BITE)	Driver/CoS	V/N	Driver/Ca6	Driver/CoS	Driver/CoS	<b>GUI/Control</b>	15 H	Clectronic Manuals
	Removes/Replaces LRUs [DA]	Driver/Co6	N/N	N/N	N/N	N/N	Manual Task	Medium	Electronic Manuals
-	Tests NBC Backup System (BITE)	Driver/CaS	N/A	Driver/CuS	Driver/CuS	Driver/CuS	GUI/Control	Hich	Electronic Manuals
	Directs PMCS on Decontamination System [DA]	Driver/CoS	N/N	N/N	N/N	N/N	<b>GUI/Control</b>	H	I'U and DA
	Troubleshoots Decontamination System [BITE]	Driver/Co6	N/N	Driver/CoS	Driver/CoS	Driver/CoS	GUI/Control	H	Inclusion Manuals
-	Removes/Replaces LRUs [DA]	Driver/Ca6	N/N	N/N	N/N	N/N	Manual Task	Medium	lectronic Manuals
1	Inspects LRUs (DA)	Driver/CoS	N/N	N/N	N/N	N/N	Manual Task	Medium	Hertronic Manuals
i 1	Tests Decontamination System (BITE)	Driver/CoS	N/N	Driver/CuS	Driver/Cu6	Driver/CuS	CUI/Control	Hwh	Hectronic Manuals
S	AUCT RESUIPLY OPERATIONS							4	
	MONITOR/REPORT LEVELS OF ONBOARD CLASS I, III, V STOCKS								<u> </u>
	Selects Automatic Inventory System [DA]	CuS	N/N	S	Cits Cits	Cub	GUI/Control	High 1	VI PUP NI
	Monitors Stock Levels [A]	CoS	N/N	S	8	18	GUI/Control		Tru and DA

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		Printer Management	1	Percentine	Maulan		Linden Print	E. J. Lin.	Fachline Damage
2		Simesu		9 middmenu	9	<b>9</b>	חותנושר דיבאור	L'Includ	
-	Receives Automatic Requests (DA)	Cos	V/N	8	8	8	CUI Screen	5	Radio, CI'U and DA
	Monitors Inventory Warnings	Cos	2</td <td>So</td> <td>ŝ</td> <td>8</td> <td><b>GUI/Control</b></td> <td>High</td> <td>CPU and DA</td>	So	ŝ	8	<b>GUI/Control</b>	High	CPU and DA
	Estimates POL Usage (A)	Cos	N/N	50	Sug	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	<b>GUI/Control</b>	High	CPU and DA
-			N/N	3		14			AN AN ANA
				3   1	3	31			
	Monitors / I ransmits Logistical Reports	8	V/N	8	3	3	CCI Screen	High	Kadin, CI'U and DA
	PLAN/COORDINATE RESUPPLY OPERATIONS	-							
	Selects Resupply Coordination Aid (A)	CaS	N/N	CoS	CoS	Cos	Control	High	Switch
	Receives Automatic AFAS Location Update	CoS	N/A	Ce6	Sol	Ces	GUI Schen	Hit	Radio, CPU and DA
!	Cetterte Parisonaly Bratta Planning Aid (DA)	90	N/N	yr.j	ye U	Sec.	Contrad	L I	Cuith
				3		319		N	
1		<u>8</u>	2/2	3	8	9			
	Vretifics Resupply Point [DA]	Cos	V/N	8	S	8	CUI/Control	fait i	CI'U and DA
!	Receives Resupply Point Time Window [DA]	Cos	V/N	CoS	CoS	ဖွ	<b>GUI/Control</b>	High H	Radio/Simulation
1	Monitors Automatic Supply Request [DA]	Cos	V/V	Cos	Cos	50	<b>GUI/Control</b>	High	Radio/Simulation
	TRANSFER CLASS I, III, V STOCKS							×	
Ţ	Positione Vehicle	N/A	N/N	Cos	Cus	Cos	GUI/Control	Medium	Viden/Server
1	Cutort Daviantu Pardu Muda	N/N	N/N	90	300	12		1	C. 14-1
1				3	319	313		ð	
i	FOREDORS BOOTH TO PLATE WITH AFAS	2/2		8	8	8	כתו/רטטוניא	Medium	AIGeo/ SCINK
	Monitors Transfer Interface Warnings	N/N	N/N	Soc	ŝ	g	<b>CUI Screen</b>	High	DA and Sensors
	Monitors Automatic Transfer Sensors	N/N	V/N	Cos	CuS	ŝ	GUI Screen	High	DA and Sensors
	Monitors Automatic Inventory Control System	N/N	N/N	CoS	Cus	80			2 2. <del>1</del> 1. 1. 1. 1. 1. 1.
	I OCATE/NAVICATE TO PESI (PPI V POINT						; ; ;		
1	Cutert Crahir Turnin Dialau	N/N	N/N	رىد	Ľ,		Centred	Hub	Switch
Ī				3		319		Ы	
	Locates Current Position [UA]	V/Z	2</td <td>g</td> <td>8</td> <td>9</td> <td></td> <td>5</td> <td>DA and Xmuros</td>	g	8	9		5	DA and Xmuros
	Identifies Resupply Point [DA]	V/N	V/V	Sol	S	8	CUI Screen	fa I	DA and Sensors
	Describes/Selects Route [DA]	V/V	V/V	Soc	Soc	So	GUI Screen	High	DA and Sensors
	(Monitors Graphic Display (2023.3)	N/N	V/N	CoS	CoS	80	CUI Screen	Hah	DA and Sensors
1	Monitors Movement Variation Alert [DA]	N/N	N/N	CoS	Cos	Cos	CUI Screen	High	DA and Sensors
Ì	Directs Movement to Resupoly Point	N/A	N/N	S S	Suc	C66	GUI/Control	Hish	CINI and DA
1	DOWNLOAD CLASS III. V STOCKS		   		1			6	
1	Praitions Vehicles	N/A	N/N	Diver	N/N	N/N	CUI/Control	Medium	Video/Senar
	Moves Storks for repositioning if Required	N/A	N/N	Handler	V/N	N/N	GUI/Control	Hist	DA. CI'U and Kubuku
1	Activates Automated Handline System	N/N	V/V	Handler	N/N	N/N	Control	H	Switch
	Moves Stocks in order to download	N/N	N/N	Handler	N/N	N/N	CUI/Control	Her	DA. CI'U and Rubetus
	Manitors Automatic Inventory Control System [DA]	N/A	N/A	Cos	CoS	Cos	<b>GUI/Control</b>	E	CPU and DA
-	Enterrs Updates into Inventory Control System	N/N	V/V	Cos	Cos	80	CUI Seren	Í	Kadio, CI'U and DA
}	UPLOAD CLASS III, V STOCKS	and a survey of the second s		-				9	
1	Positions Vehicles	N/N	N/N	Driver	N/N	N/N	CUI/Control	Medium	Video/Senses
!	Moves Stocks for repositioning if Required	N/N	N/N	Handler	N/N	V/N	<b>CUI/Control</b>	Medium	Video/Sensur
!	Activates Automated Handling System	N/A	V/V	Handler	N/N	N/N	Cuntrol	Hich	Switch
;	Moves Stucks in order to download	N/N	N/N	Handler	V/V	V/N	CUL/Control	Meduin	Viden/Samer
i	Monitors Automatic Inventory Control System [DA]	N/N	N/N	Ca6	Cos	Cuố Cuố	CUI/Control	High	DA. CI'U and Keinete
	Enters Updates into Inventory Control System	N/A	N/N	193	CuS	500	GUI/Control	Hish	Ci'll and DA
	UPLOAD CLASS IN V STOCKS (MANUAL)				1			6	
1	Positions Vehicles	N/N	N/N	Driver	1</td <td>V/V</td> <td>GUI/Control</td> <td>Medium</td> <td>Viden/Series</td>	V/V	GUI/Control	Medium	Viden/Series
1	Move Gorks for monitioning if Regured	N/N	V/N	Handler	N/N	N/N	CUI/Control	H.H	DA CITL and Resources
_									

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TAEVE		Primary Kesponsubuity							
2		Simery	denue	Sunkiddmenv	BUINOW	Smint	ILINEILINKE LIEVIKE	LIGENIN	Enteoling Device
	Activates Lifting Crane	V/N	N/A	Handler	V/V	V/N	Control	1981	Switch
1	Directs Manual Upload	N/N	N/N	Handler	N/N	N/N	<b>CUI/Control</b>	1 E	DA, CI'U and Kebotics
	Manitors Automatic Inventory Control System [DA]	N/N	N/N	Cos	Cos	CoS	<b>CUI/Control</b>	Hit	CI'U and DA
	Enters Updates into Inventory Control System	N/A	N/N	Cos	Cos	Cos	<b>GUI Screen</b>	High	Radio, CI'U and DA
nano	CT RECOVERY OPERATIONS							1	
8	ORDENATE FOR HET/MEE EVACUATION/RECOVERY								
-	Informs Command Element	Driver/Co6	N/N	Driver/Ca6	Driver/CoS	Driver/CoS	CUI Screen	Hish	Kadio, CPU and DA
Ļ	Communicates with Maintenance Element	Driver/Co6	V/N	Driver/CoS	Driver/Co6	Driver/CoS	GUI Screen	T T	Radio. CPU and DA
-	Determines Recovery Point (DA)	Driver/Ca6	V/N	Driver/CoS	Driver/CoS	Driver/CoS	CUI/Control	Hieh	CPU and DA
-	Determines Everythen Method [DA]	Driver/CoS	N/N	Driver/CuS	Driver/Cr6	Driver/CuS	Ctil/Control	c f	Chil and DA
i	Determines Vehicle Configuration (DA)	Driver/Co5	N/N	Driver/CoS	Driver/Co5	Driver/CuS	CUI/Control	Hick	CI'U and DA
-	Protitions Vehicle	Driver/Co6	V/N	Driver/CoS	Driver/CoS	Driver/CoS	CUI/Control	Medium	Video/Sensor
8	NDUCT SELF RECOVERY								
-	Selects Maintenance Recovery Guide (DA)	Driver/Ca6	N/N	Driver/CuS	Driver/Cos-	Driver/CuS	Control	Hish	Switch
+	Selects Troubleshooting Sequence (DA)	Driver/CoS	N/N	Driver/CoS	Driver/Co5	Driver/Co5	Control	He H	Switch
+	Determines Problem [DA]	Driver/CoS	N/N	Driver/CoS	Driver/CoS	Driver/CoS	<b>GUI/Control</b>	H H	DA and Elec. Manuals
-	Adjusts and Repair Cause of Problem (Temporary) [DA]	Driver/Co5	N/N	Driver/CoS	Driver/CaS	Driver/Co6	GUI/Control	Heh	DA and Elec. Manuals
-	Deects Movement to Maintenance Area	Driver/Ca6	N/N	Driver/Co6	Driver/CoS	Driver/CoS	CUI/Control	Het	CPU and DA
8	NIDUCT AFAS/FARV-A RECOVERY								
	[Determines Recovery Point [DA]	Driver/CoS	V/N	Driver/CoS	Driver/Cos	Driver/CaS	GUI/Control	Hich	CPU and DA
	Activates Load Transfer	Driver/Co6	N/N	Driver/CoS	Driver/Co6	Driver/CoS	Control	Hish	Switch
	Moves Load for Transfer	Driver/CoS	N/N	Driver/Co5	Driver/Co6	Driver/CoS	Manual Task		
	Installs Towine Equipment	Driver/Ca5	N/N	Driver/CoS	Driver/CoS	Driver/CoS	Manual Task	2	i
+	Britter Utitle	Drive Con	N/N	Anive Contract		New York			Vitua / Carrier
+									
			2/21						
COMM	POS NAV DECKAUED/UNUSUAL OPERATIONS							;	
ž	IT REAUTING WITH DEGRADED NAV STOLEM						1	;	
	Selects Basic Route Planner Aid (DA)	Cos	V/N	S	CuS	CoS	Control	Hart I	Switch
	Sclects NAV System in Degraded Mode Display	Cos	V/N	Cos	80	8	Control	få I	Switch
	Determines Usable Features of NAV System [DA]	Cos	N/N	Co Co Co Co Co Co Co Co Co Co Co Co Co C	Soc	Soc	GUI/Control	fa I	CPU and DA
	Activates Backup Azimuth System	Ces Ces	N/N	g	200 C	565	Control	te I	Switch
	Locates Current Position	Cos	V/N	90 0	Cos	56	CUI Screen	fe H	DA and Sensors
	Verifies Position (DA)	Cos	V/N	S S	Se	Cos	<b>GUI Smen</b>	Hith	DA and Sensors
	Monitors Display	Cas	V/N	8	Cos	Cos	CUI/Control	4 H	<b>CIVIANIDA</b>
	Determines Route (DA)	Cos	N/N	80	Cos	Cos	CUI/Control	E E	CI'U and DA
X	<b>A READING WITH INOPERATIVE NAV SYSTEM</b>								
	Locates Current Position	Cos	Ca6	ŝ	Cus	CoS	CUI Screen	High	DA and Sensors
	Activates Backup Azimuth System	Cos	Cob	30	Cos	Cos	Control		Switch
	Orients Map	Cas	CoS	Cos	Cos	Cos	CUI/Control	fii	CPU and DA
	Vertites Map Location with Visual References	Cos	Cos	<b>C</b> 6	2 S	CoS	CUI/Control	H	Viden/Sensor
	Determines Route	Cos	Cos	Cos	Cos	Ca6	CUI/Control	1 I I I	CI'U AND DA
DECRAL	DED OPERATIONS				and the second of the second sec		-	*	****
ð	ERATE WITH OVER PRESSURE SYSTEM INOPERATIVE				1 		na mana na ina manana na sa mana na mana	•	
	Selects NBC Warning Display [DA]	Cos	CoS	30	Cos	Ca6	Contrul	High	Switch
:	Determines MOPP Uniform Criteria (DA)	Cos	90	Cos	Sol	C.65	CIII Sman	, t	DA and Smuth

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	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1

		Primery Resound bility							
			11110	Pressmanne	Munine	Fising	Interface Device	Fidelity	Enabline Drvice
SYLE SYLE	20 I	<b>S</b> max							
ſ	Manitone NBC Detection and Warning System	Cos	g	8	8	8			
i	Marine Law, Ruth Antine South Warring	Ces	S6 C66	Cos	80	S	CUI Screen	Į.	DA and Semans
		Cas	Co6	56	50	80	Manual Task	Medium	
ī	Dens Protection Case	CoS	Cos	Cos	Cos	8	Manual Task	Medium	
-	OPERATE W/NEC SENSOR SYSTEM INOPERATIVE								9 : 9 · ·
	Ic.L. A. M. Warring Diaslaw (DA)	8	8	Cos	CoS	Cos	Control	5 II	Switch
	Denning Serve Decredation (DA)	Cos	Cab	Cos	So	g	GUI Screen	1 H	DA and Senaura
	Communication with Adjacent Howitzers for Alerte	Cos	Co6	ŝ	3	80	GUI Screen	5 I	Radio, CFU and DA
	Communication with POC for Alerts	Cos	<u>Co6</u>	g	8	80	CUI Screen	5	Redio, CFU and UA
1	Communication with FARV for Alerts	CoS	CoS	8	9	8	CUI Screen	ŝ	Kadiro, CI'U and UA
1	Dependence MOTP Uniform Criteria (DA)	CoS	Co6	g	80	8	CUI/Control	5	CIU and DA
	Determines Masking Procedures and Criteria [DA]	Cos	Cos	90	80	8	GUI/Control		
	OPERATE WITH SINCLE CREWMAN					1		, e	
-	Selects Single Crevenen Operations Display (DA)	All	Al	<b>AI</b>		V	Control		
	Directs Punctions to Selected Crew Station (DA)	an l	VI	M	N	V	CUI/Control		
	Determine Priority Wernings [DA]	AN	A1		N N		CUI Screen	5	
	Setects Mission Function	<b>Ait</b>	7	<b>NI</b>	V		Control		
1	Activates Minetion Punction	IV!	78	All		N.	Control		
	Monitors for Minition Warmings	IV	<b>VI</b>	2			CUI Screen		
ļ	Monitors for Priority Warrings	Alt	Al	2	2	V			
								1	••••
}									

1

FAS SI	ubeys	tems.	Suggested
			Fidelity Level
			For Simulator
. Prima	ary An	mament.	
155n	nm Gu	un.	Low
1	Gun M	lount.	Low
	Canno	n Assembly	Medium
	Re	ogenerative Liquid Propellant Gun (RLPG).	Low
		I P Mount	Low
		Ignition System	low
		Propellant Storage and Handling System (PSHS)	low
		Provide I P to the Gun	Low
		Provide Lubricant to the Gun	Low I ow
		I oad/Dowoload Eluide	tow
		Store Eluide	
		Matar Shuide	LOW
			LUW
			LUW
			Low
	Gu	In Positioning System.	LOW
_{		Damper Oil Reservoirs.	LOW
		Hydraulic/Electric Power Unit.	Low
			Low
		Hoses.	Low
		Piping.	Low
		Sensors.	High
		Muzzle Reference Sensor (MRS)	High
		Azimuth.	High
		Elevation.	High
		Muzzle Velocity Management and Prediction.	High
		Projectile Tracking System	'High
	Gu	In Control System.	High
		Decision Aids.	High
		Power Supplies.	Low
		Communications Device. (RS 422)	Low
		Controller (Computer)	Low
		Control Hardware.	Low
		Pneumatic Power Supplies.	Low
		Hydraulic Power Supplies.	Low
		Breech Controller.	Low
		Hardware and Software.	High
		Breech Actuators.	High
-+	Ba	listic Computer and Fire Control.	High
		Environmental Sensors	Hich
.

AS Subsystems.	Suggested
	Ficielity Lovel
	For Simulator
Compensation Algorithms.	High
Projectile Tracking System.	High
Ammunition Handling System.	Medium
Ammunition Loading System.	Medium
Inventory Control System.	High
Ammunition Type.	High
Ammunition Lot Number.	High
Ammunition Fuze Information.	High
Ammunition Weight.	High
Ammunition Storage System.	Medium/Low
Ammunition Racks.	Medium/Low
Transfer/Lift Mechanism.	Medium/Low
Hydraulic and Electrical Controls.	Medium/Low
Ammunition Selection System.	Medium/Low
Ammunition Loading System.	High
Transfer/Lift Mechanism.	Medium/Low
Fuze Setting Mechanism.	Medium/Low
Upload.	Medium/Low
Storage.	Medium/Low
Handling/Selection.	Medium/Low
Transfer.	Medium/Low
Setting.	Medium/Low
Identification.	Medium/Low
Verification.	Medium/Low
Down Load.	Medium/Low
Ramming Mechanism.	High
Verify Projectile/Fuze Combination	High
Hydraulic and Electrical Controls.	High
Extracting Mechanism.	High
Peripheral Equipment.	Medium/Low
Liquid Propellant Handling System.	Low
Loading mechanism.	Low
Measuring mechanism.	Low
Handling System.	Low
Defensive Armament.	
Weapons.	High
Weapon Mounts.	High
Peripherals.	High
Command, Control and Communications.	
Fire Control System	High
Position Navigation and Azimuth System	High

<b>AFAS Sub</b>	syste	ms.				Suggested
						Fidelity Level
						For Simulator
	Enh	anced Posi	tion Location an	d Reporting Sys	tem (EPLARS).	High
	Glot	bal Position	ing System (GP	S) and Position	(POS/NAV)	High
Co	mmu	nications S	ystem.			High
	Inte	mal Commo	o Systems.			High
		Crew Static	on Intercom Sys	items.		High
		Very High S	Speed Bus.			High
		External Po	ort Interface.			High
		LAN Interfa	ice for:			High
		Digital	Audio.			High
		Digital	Video.			High
		Other [	Data.			High
	Data	a Storage.				High
		Digital Map	S.	Í		High
1		Mission Qu	eue (Up to 30 M	lissions.)		High
		Message F	ormats.			High
		Electronic M	Aanuals and Ch	ecklists.		High
		PMCS				High
		Operato	or Manuals.			High
		Maintai	ner Manuals.			High
		Diagno	stics.			High
		Progno	stics.			High
		Automa	ited Log Books	•		High
		Tactica	I Data.			High
		Logistic	al Data.		•	High
		Etc.				High
	Elec	ctrical Cooli	ng Equipment.			Low
	Exte	emal Comm	o Systems.			High
		Two CINGA	AS radios.			High
		Army Tactio	cal Command a	nd Control Syst	em (ATCCS)	High
		Advanced	Field Artillery Da	ata System (AF/	ATDS).	High
		??TACFIRE	.??			High
		Intercom C	onnection to FA	RV when docke	d.	High
De	cisior	n Aids.				High
	Nav	rigation.	L			High
	Pro	gnostics/Dia	agnostics.			High
	Deg	raded Mode	Operations			High
	Diag	gnosing/Per	forming/Deferring	and Repair (BD	AR).	High
	Fire	Mission Pla	nning and Man	agement.		High
		Moving Tar	get Prediction a	ind Aiming.		High
		Fire Suppo	rt Coordination I	Measures Check	ling	High
		Manageme	nt of Ammunitic	on Inventory.		High
	Mar	naging Surv	ivability (Resup	ply and Support	)	High
	Sen	sing Safety	Status.			High

St. Warth and

AFAS 8	Subsystems.	Suggested
		Fidelity Level
1		For Simulator
!	Override Automatic Functions if Unsafe Condition Exist	s. High
	Tracking and Sensing Threat and Risk Status.	High
1	Embedded Training.	High
1	CATT Compatible.	High
	FARV Compatible.	High
	Machine-Crew Interface.	High
	Interactive Display Units (IDUI)	High
	Power Module	High
	General Purpose Processor.	High
	Bus Interface Modules.	High
	Graphics Display Interface Module.	High
	General Purpose Interface Module.	High
	Remote Vehicle Control and Monitoring System.	High
	Fire Control.	High
	Systems Operation.	High
	Automated Reporting.	High
	Occupation Report.	High
	Position.	High
	Altitude.	High
	Azimuth of Fire.	High
	Mask Data.	High
	Non Mission Capable Report.	High
	Biological Agent Reporting.	High
4. Mot		
	Chassis/Huti	Low
		Medium
	Propulsion System.	Low
	Engine	Low
	Transmission or equivalent device.	Low
	Final Drive System or equivalent device	Low
	Auxiliary Automotive System.	Low
	Track and Suspension System	Low
	The fuel system.	Low
5. Sur	vivability.	
	Armor.	Low
	Secondary Armament.	High
	Sensors.	High
	Thermal.	High
	Optical.	High
	Long Range (acoustic, seismic, radar, etc.)	High
	Identification Friend or Foe (IFF).	High

AFAS Subsystems.			1	Suggested
				Fidelity Level
				For Simulator
Vehicle Integrated	<b>Defense System</b>	n (VIDS).		High
Acoustic Sens	ors.			High
Laser/Missile V	Varning System	or Sensors.		High
NBC Detection	Equipment.			High
Counter-Mine	Equipment.			High
Automatic Fire Ex	tinguishing Syste	em.		High
Nuclear Biological	and Chemical (N	IBC) system.		High
Auxiliary Power Sy	stem			Medium
Battery				Low
Aux. Powered	Generator.			Medium
Power General	tion and Manage	ment System.		High
Main Powe	r System			High
Auxiliary P	ower Systems			High
Battery Po	werpacks.			High
External P	ort Power Conne	ections.		High
Power Bus	Controllers.			High
Electrical L	.oads.			High
Maintenance Supp	ort.			High
Prognostics.				High
Diagnostics.				High
Electronic Repa	air Manuals.			High
Degraded Ope	rational Modes.			High
Auxillary Maintena	nce, Transport, a	and Recovery E	quipment.	Low
Cranes.				Low
Hoists.				Low
Pintels.				Low
Lifting Eyes.				Low
Tools.				Low
Gauges.				Low
Welding Appar	atus.			Low
Ramps.				Low
Other Devices		<u> </u>		Low
Battle Damage Ase	sessment and Re	epair Equipment	(BDAR).	Medium
			1	

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FA	AV	1			:	l				Suggested
		1	į					;		Level of Fidelity
	ł				1					For Simulator
	1	-			i					1
1.	Prin	hary	Res	upp	ity S	ubs	/stem.			
	Aut	oma	ted	Am	mur	nitior	Upload System	m.		Medium
	Aut	oma	ted	Am	mur	nitior	Download Sys	stem.		Medium
	Ma	nual	Up-	load	i Su	sterr	)			Low
	Ma	nual	Dov	NTI-k	oad	Sus	tem			Low
	Aut	oma	ted	Am	mun	itior	Storage and H	landling System	۱.	Medium
	Ref	uei	and	Def	uel :	Syst	em.			Medium
	Aut	oma	ted	Upk	bad	for C	class I, water, Cl	lass III and Class	s IX.	Medium
	1	1	ſ							
2.	Def	ensi	ve A	\ma	me	nt.				
		We	apor	18.						High
		We	apo	n Me	ount	S.				High
	ĺ	Per	iphe	rais	•					High
		İ								
3.	Con	nma	nd, (	Con	trol	and	Communication	5.		
		Fire	Co	ntro	l Sy	sten	n			High
		Pos	sition	1, N	avig	atio	n and Azimuth	System.		High
		Cor	nmu	Inici	atior	18 S	ystem.			High
			Am	ny T	actic	cal (	command and C	Control System (	ATCCS)	High
			Ап	ny A	dva	nce	Field Artillery	Data System.		High
			TAC	FIR	<u>E.</u>		<u></u>			High
	L	Dec	<b>disio</b>	<u>n Ai</u>	ds.					High
			Mis	sion	Ma	nag	ement.			High
				เกง	ento	ny A	lanagement.			High
		i •		Info	oma	tion	Processing.	F		High
				Ha	rdwa	Ire (	Control.			High
				Sel	f De	tens	<b>e.</b>			High
				Ris	<u>k As</u>	865	sment.			High
				Op	erati	ona	Support Report	ting.		High
			Em	bed	ded	Trai	ning.			High
				CA	Π	Com	patible.			High
				AF	AS (	Com	patible.			High
4.	Mot	pility	•			ļ				
		Che	1881	Hu	<b>H.</b>	L				Low
		Pro	pule	ion	Sys	tem.				Low
			Die	sei i	Engi	ne.				Low
			Adv	anc	ed I	inter	rated Propulsio	n System (AIPS	5)	Low
			Ele	ctric	: Drt	V86.				Low
			We	ight	-Effi	cien	t Tracks.		·····	Low
			Drh	/e-b	y-w	ire.	·			Medium
		Au	dilar	y A	utor	notiv	e System.			Low

FARV	Suggested
	Level of Fidelity
	For Simulator
Track and Suspension System	Low
The fuel system.	Low
5. Survivability.	
Armor.	Low
Secondary Armament.	High
Sensors.	High
Thermal.	High
Optical.	High
Long Range (acoustic, seismic, radar, etc.)	High
Identification Friend or Foe (IFF).	High
Vehicle Integrated Defense System (VIDS).	High
Acoustic Sensors (or equivalent).	High
Laser/Missile Warning System.	High
Automatic Fire Extinguisher.	High
Nuclear Biological and Chemical (NBC) system.	High
Auxiliary Power System.	Medium
Battery	Low
Aux. Powered Generator.	Medium
Maintenance Support Systems.	High
Electronic Repair Manuals.	High
Degraded Operational Modes.	High
Auxillary Maintenance, Transport, and Recovery Equipment.	. Low
Cranes.	Low
Hoists.	Low
Pintels.	Low
Lifting Eyes.	Low
Tools.	Low
Gauges.	Low
Welding Apparatus.	Low
Ramps.	Low
Other Devices.	Low
Battle Damage Assessment and Repair (BDAR).	Medium

# APPENDIX D

SOLDIER MACHINE INTERFACE DESIGN CRITERIA

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#### APPENDIX D

#### 40. SOLDIER MACHINE INTERFACE DESIGN CRITERIA.

40.1 Human Engineering Design Approach. This human engineering design approach is robust in that it addresses the objective AFAS/FARV requirements in space claim, capacity, and functionality. This approach is traceable to the results of analyses and MIL-STD-1472D criteria. It is a systems approach to AFAS/FARV soldier machine interface design into which decision aid technology, embedded training, and additional functionality can be integrated in a manner consistent with the rest of the interface.

To instill user confidence in this level of automation, automating safety and accuracy checks, rechecks, and interlocks is necessary. The interface should be designed so that potentially dangerous or incorrect options are not presented to the user. Automatic and manual overrides that may result in a dangerous condition should be explained to the user and require dual control action to execute.

Human engineering design, layout, and arrangement of each item of crew station equipment having an user interface should be designed to MIL-STD-1472D guidelines as supplemented by MIL-HDBK-759B. Human engineering task analysis (per MIL-H-46855B guidelines) optimizes the design according to system mission, functions, and target audience description. Design Criteria, and a resulting design approach is addressed in the Crew Station Description.

40.2 AFAS/FARV Simulator Crew Station Display/Control Design Criteria and Task Analysis. The following listing of tasks performed by or through the user interface screen displays for the AFAS/FARV Simulator is only representative of the type of screens that should be required for operation of the simulation system. In order to determine the exact numbers and requirements for screens an in-depth Functional Analysis should be performed.

#### RESTING

AFAS/FARV Driver:

- Selects Vehicle Power-up Display
- Selects Movement Display
- Select Preventative Maintenance Display
- Select PMCS Checklists
- Select Unscheduled Maintenance Display
- Select Electronic Technical Manuals
- Select Automatic Log Book

### AFAS Gunner/FARV Ammo Handler:

- Selects Weapons System Status Display
- Select Preventative Maintenance Display
- Select PMCS Checklists
- Select Unscheduled Maintenance Display
- Select Electronic Technical Manuals
- Select Automatic Log Book

## AFAS Chief of Section/FARV Vehicle Commander:

- Select Direct Fire Planning Display
- Select Digital Map Display
- Select Indirect Fire Planning Display
- Select Evacuation Display
- Select Suppression System Display
- Select Task Scheduling Display
- Select Inventory Management Display
- Select Resupply Display

#### AFAS/FARV Up Crewman

- Initialization Screen
- Pre-Operational Checks/Starting Procedures Screen
- Crew Position Selection Screen
- Position/Orientation Display Screen
- System Default Mode Screen
- Select Operational Display Screen
- Select Status Display
- Initialize Communication Procedures Screen
- Set Radios
- Select Message Setup
- Select Information Management Display Screen
- Select Data Display Screen
- Select Operational Overlay of Terrain Graphics
- Activate Vehicle Display Screen
- Select NAV System Route Display
- Select Area Sweep Aid
- Select Early Warning System Display
- Select Sensor Display
- Select Alarms and Alerts Display
- Select ECCM Display
- Select Intelligence Display
- Select NBC Detection and Warning System Display

#### STARTUP

#### AFAS/FARV Driver:

- Initialization Screen
- Crew Position Selection Screen
- Pre-Operational Checks/Starting Procedures Screen

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- Maintenance System Checks Screen
- System Default Mode Screen
- Position/Orientation Display Screen
- Select Sensor Display Screen
- Select Wide Field View for Surveillance Device Screen
- Select Self Defense Weapons Screen
- Select Security Display
- Select Alarms and Alerts Display

## AFAS Gunner/FARV Ammo Handler:

- Initialization Screen
- Crew Position Selection Screen
- Weapon System Pre-Operational Checks Screen
- Review Mission Queue Screen
- Review Ammo/LP Inventory Screen
- Select Alarms and Alerts Display
- Activate Self Defense Posture Screen
- Select Early Warning System Display
- Select Sensor Display

AFAS Chief of Section/FARV Vehicle Commander:

- Initialization Screen
- Crew Position Selection Screen
- Pre-Operational Checks/Starting Procedures Screen
- System Default Mode Screen
- Position/Orientation Display Screen
- Select Communication Setup Screen
- Set Radios
- Select Information Management Display Screen
- Select Data Display Screen
- Select Operational Display Screen
- Review Mission Queue Screen
- Review Ammo/Fuel/LP Inventory Screen
- Select Security Display
- Monitor Early Warning System Display Screen
- Monitor Sensor Suite Warning Display Screen

- Select Alarms and Alerts Display
- Selects Site Selection Display
- Activate Self Defense Posture Screen

#### RESUPPLY

AFAS/FARV Driver:

- Select Vehicle Security Display
- Select Early Warning System Display
- Select Sensor Display
- Select Alarms and Alerts Display
- Select Integrated Defense Display
- Select Preventative Maintenance Display

AFAS Gunner/FARV Ammo Handler:

Select Resupply Module Screen

AFAS Chief of Section/FARV Vehicle Commander:

- Select Information Management Display
- Select Data Display
- Select Digital Map Display
- Select Operational Display
- Select Early Warning System Display
- Select Sensor Display
- Select Alarms and Alerts Display
- Select Site Selection Display
- Select Integrated Defense Display
- Select Route Planning Display
- Select Intelligence Gathering Display
- Select Unit Defense Indirect Fire Planning Display (Except FARV)
- Select Suppression System Display
- Select Task Scheduling Display
- Select Preventative Maintenance Display

#### MOVING

#### AFAS/FARV Driver:

• Selects Drivers Display

#### AFAS Gunner/FARV Ammo Handler:

- Select Integrated Defense Display
- Select Early Warning System Display
- Select Sensor Display
- Selects Message Handling Display

AFAS Chief of Section/FARV Vehicle Commander:

- Select Information Management Display
- Select Data Display
- Select Digital Map Display
- Select Operational Display
- Select Site Selection Display
- Select Integrated Defense Display
- Select Early Warning System Display
- Select Sensor Display
- Selects Message Handling Display
- Select Route Planning Display
- Select Intelligence Gathering Display
- Select Unit Defense Indirect Fire Planning Display (Except FARV)
- Select Suppression System Display
- Select Task Scheduling Display

#### FIRING

#### AFAS/FARV Driver:

- Select Vehicle Security Display
- Select Early Warning System Display
- Select Sensor Display
- Select Alarms and Alerts Display
- Select Integrated Defense Display

#### AFAS Gunner/FARV Ammo Handler:

Select Weapons Systems Display

#### AFAS Chief of Section/FARV Vehicle Commander:

- Select Information Management Display
- Select Data Display
- Select Digital Map Display
- Select Operational Display
- Select Early Warning System Display

- Select Sensor Display
- Select Alarms and Alerts Display
- Select Site Selection Display
- Select Integrated Defense Display
- Select Route Planning Display
- Select Intelligence Gathering Display
- Select Direct Fire Planning Display (Except FARV)
- Select Unit Defense Indirect Fire Planning Display (Except FARV)
- Select Suppression System Display
- Select Task Scheduling Display

#### 40.3 Crew Station Description.

40.3.1 Console. The crew station console should consist of a highresolution, dual capability (data and NTSC video) color Cathode Ray Tube (CRT) as the primary display. This CRT should be equipped with a touch-sensitive overlay used for user control inputs and menu selections.

40.3.2 CRT. The CRT should be flanked by panels of fixed-function pushbuttons, some of them with Built-In indicators. The pushbuttons and indicators should designed so that the computer can activate the indicators to maintain consistency with the actual state/mode of the system. For objective AFAS safety reasons, the CHECK FIRING and the objective FARV, the EMERGENCY UNDOCK push-button is an exception to this approach.

40.3.3 Left Panel. The left panel should contain pushbuttons supporting the general operation of the interface (e.g., POWER, EXECUTE, MAIN MENU, etc.). This panel of pushbuttons should allow the user to turn the crew station on or off, navigate through the menu structure, and execute computer processing of decisions made on the CRT display.

40.3.4 Right Panel. The right panel should contain pushbuttons for controlling the states and modes of the system. This panel should allow the user to command the system and to configure hardware and software for discrete operational modes or override conditions (e.g., emplaced to shoot, ready to move, ready to rearm, check firing, and direct fire). The user controls the execution of fire missions and gives the system authority to fire from this panel. The user can also select a joystick mode to identify the specific configuration of subsystems to be manipulated under control of the joystick.

40.3.5 Joystick. The joystick should support multiple functions based on the mode the user selects. The user can control direction of vehicle travel, direct movement of the main gun, panoramic camera. secondary armament, laser, or cursor using the joystick. Other than control of the cursor, joystick control of subsystems would be simulated.

40.3.6 Keyboard. The detachable Keyboard provides a keyboard entry capability for drafting free text messages. It is to be used only when the use of the joystick and cursor are inappropriate.

40.3.7 Data Input Device. The data input device is a magnetic medium that provides a means to enter large amount of data as an option to digital message exchange.

#### 40.4 Anticipated Equipment List.

40.4.1 Workstation. The workstation/console design for <u>all</u> crew positions should be identical. Any deviation from this standard is noted.

40.4.1.1 Touch-sensitive interactive display screen provides an interface that displays information and provides controls specific to the task at hand.

**40.4.1.2** Fixed-function pushbuttons provide controls and displays that are always available to the user, independent of the interactive control/display interface status.

**40.4.1.3** Multi-function joystick provides a control suitable for tasks requiring aiming of a pointer or camera.

40.4.1.4 Crewmember headset provides an interface for crew-to-crew communications and simulated radio communications.

40.4.1.5 Detachable keyboard provides a keyboard data entry capability for drafting free text messages.

40.4.1.6 Data input device provides a means to enter large amounts of data as an option to digital message exchange.

40.4.1.7 Auxiliary control panel provides an interface to simulate master power and engine operation. (AFAS/FARV Driver position)

40.5 Level of Fidelity Configuration Requirements. Results of the initial AFAS task analysis has established baseline crew station design requirements that impact system configuration as well as crew station integration and layout. The following paragraphs summarize the human factors design influence on the AFAS/FARV simulator.

40.5.1 Crew Compartment. The crew should be consolidated in one compartment to provide improved performance through greater control by the chief of section/vehicle commander, crew psychology, crew sustainment, and cross training. Crew station arrangement for the AFAS/FARV must be responsive to the following design requirements and performance objectives. Each requirement is

rated HIGH, MEDIUM, or LOW as defined by the top level analysis completed for Task 2.

40.5.1.1 Any crewmember should be capable of leaving his/her seat/workstation to exit the simulator, without displacing other crewmembers from their workstations. The access to the crew compartment from outside the simulator must be designed for easy passage of the 5th percentile female through the 95th percentile Arctic-clothed male. This fidelity requirement is considered HIGH.

40.5.1.2 A hatch must be available to allow the crew to enter the AFAS/FARV weapons compartment without leaving the simulator. This fidelity requirement is considered LOW.

40.5.1.3 The crew should have unrestricted access to at least two separate means of egress. This fidelity requirement is considered HIGH.

40.5.1.4 The crew should be capable of leaving their seats and stretching for short periods without leaving the crew compartment. The crew should have adequate space for putting on and removing clothing without leaving the crew compartment. This fidelity requirement is considered HIGH.

40.5.1.5 The crew compartment should address the stowage of the crew's personal gear. This fidelity requirement is considered LOW.

**40.5.1.6** The crew station arrangement should address design for accessibility of components for maintenance. This fidelity requirement is considered LOW.

40.5.1.7 Crew station arrangement should facilitate each crewman's access to commonly used equipment, facilities, and stowage compartments. This fidelity requirement is considered LOW.

40.5.1.8 Crew member crew stations and seats should be designed to allow reclining seating. All seats should have headrests to protect the crew from whiplash injuries. The seats should be configured with 3 point passenger restraints. This fidelity requirement is considered HIGH.

40.5.1.9 The crew must be able to sit erect to conduct continuous operations at a fire control console/mission operation. This fidelity requirement is considered HIGH.

**40.5.1.10** Crew stations should be designed to allow static elbow clearance for 95th percentile Arctic-clothed male. This fidelity requirement is considered HIGH.

40.5.1.11 The primary displays and external vision features should be presented to the user in the optimal vertical visual field. Because the display screen is also a control panel, the display must be located in the optimal position for control actuation. This fidelity requirement is considered HIGH.

40.5.1.12 The chief of section and driver need 360° visibility optimized for terrain analysis, navigation. This fidelity requirement is considered MEDIUM.

40.5.1.13 The chief of section should be able to observe the activities of each individual crewmember from his/her workstation. This fidelity requirement is considered HIGH.

40.6 The Information Input Types. Data should be presented in the logical sequence in which it naturally occurs (i.e., chronologically or alphabetically). Data of significant importance requiring immediate response or used more frequently should be presented at the top of the display.

Each unique display screen format and every field and column should be labeled with a meaningful title as to the purpose or contents of the display/field/column. The top of each display should also be reserved for status messages and instructional prompts relevant to the interface.

Groups of data should each contain a descriptive title, phrase, word, or similar label to designate its contents. Labels should be located above or to the left of the data they describe. Labels should de displayed to be easily recognizable to the user in all upper case letters.

Interfaces with more than one display page should be labeled to identify the currently displayed page. The content of displays should all be laid out is a consistent, standardized manner. Information should be displayed in plain concise text. Use of abbreviations and acronyms should only be used as a last resort.

40.6.1 Visual.

**40.6.1.1** Dedicated Simple Indicator--an indicator that is on or off and is always visible in either condition.

40.6.1.2 Text-written communications.

**40.6.1.3** Graphic–Icons, bar graphs, gauges, etc.

40.6.1.4 Video Camera-a view from a video camera.

40.6.1.5 Windows/Periscopes--direct view through passive vision devices.

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#### 40.6.2 Audible.

40.6.2.1 Tone/Alarm--a simple tone with a meaning gained through training and experience.

40.6.2.2 Synthesized Voice--a stored voice message played back to the user.

40.6.2.3 Voice--crew-to-crew or voice radio communications.

40.6.2.4 Tactile--Information via sense of touch/feel

#### 40.7 The User Response Control Types.

40.7.1 Momentary. This control type provides an on/off function, but does not lock in either position. (Unless the control type is held in the actuated position, it returns to normal.) This control type can be used for alternating action, where the function pushbuttons on or off each time the control is actuated, or momentary action, where the function is on only as long as the control is held in one position.

40.7.2 Discrete. This control type provides selection between any number of exclusive conditions where the control locks into the selected condition and that condition remains in effect until the control is changed to another condition by the user.

40.7.3 **Proportional.** This control type allows directional and proportional commands to be given to a controlled function.

40.8 AFAS/FARV Crew Station Control Selection. Table 1 in MIL-HDBK-759B, Human Factors Engineering Design for Army Material, a supplement to MIL-STD-1472D, was used to select control types for crew station console. Table 14 provides the results of application of this type control selection criteria.

40.9 I/O.

40.9.1 Data Display Format. Data input and output displays should use the same formats when appropriate. The data entry formats used by the system should match the formats of the source documents. Required data should be computer controlled. Only data required by the user's needs should be presented.

40.9.2 Display Coding. Flash coding should be used to prompt the user to push the push-button or select the touch screen option that is flashing. The flash rate should be between three and five flashes per second. Standard symbols, in accordance with FM 101-5-1, Operational Terms and Symbols, should be used for display of tactical information on the digitized map display. Other symbols and icons should be analogous of the object they represent. Color coding should be used

to indicate operational conditions, warnings, and hazards. Colors should be used in accordance with table II in MIL-STD-1472D. Brightness inversion or "reverse video" should be used to indicate selection of a touch screen option.

40.9.3 Tabular data. Tabular data should be arranged in increasing order from left to right and top to bottom. All subclassification should be titled. Data in lists should be arranged in a recognizable order (e.g., chronological or alphabetical). Tabular data that extends beyond one page should be scrollable line by line. Arabic numbers should be used to number tabular data when necessary. Entry of numerical data by the user should be right or left justified by the system as appropriate. The units of measure for data should be included as part of the column label.

Graphic Displays. The graphic interfaces (e.g., the digitized map) 40.9.4 should use a distinctive cursor (e.g., a crosshair) whose intersection can mark a position with precision. Designating a point should require two control actuation's: (1) positioning the cursor and (2) designating the position. An easy and convenient means should be used for saving and retrieving graphic displays. The user should be able to designate file names of his/her choice for the stored data. Where graphic data must be plotted in predefined formats, a template display should be provided for that format to aid data entry. When an user's attention must be directed to a portion of a graphic display showing critical or abnormal data, that feature should be highlighted with some distinctive means of data coding. The capability to precisely read graphic data in actual numeric values should be provided. Pictorial symbols (e.g., icons) should look like the object they represent. Bar graphs should be used to compare a single measure across a set of several entities. Adjacent bars should be spaced closely enough so that a direct visual comparison can be made without eye movement.

40.9.5 Menu Selection. Menu selection style interactive controls should be used to reduce the training burden and to negate the need for memorization of commands. Touch screen technology should be used for menu selection. Each menu should have a title and be logically segmented to allow several sequential selections among a few alternatives. The system should only present menu selections for actions that are currently available. The menus should be presented in consistent format throughout the system and should always be accessible. The user should be able to return to the previous menu level or to the top level menu using a single control actuation.

40.9.6 Form Filling. The system should use form filling interactive control when some flexibility of data to be entered is needed (e.g., entry of grid coordinates). The format and content of displayed forms should be perceptually related to that of paper forms if paper forms are used to guide data entry. Fields should be separated by spaces, lines, or other delineating cues. Required fields should be distinguished from optional fields. The system should prompt entry at the first logical data field and should automatically prompt entry at the next field after a valid entry has been

made at the first. The system should require the user to input any required entries omitted by the user. The user should be allowed to re-enter, change, or cancel any data item before taking a final enter action.

40.9.7 Graphic Interaction. Graphic aids should be used as a supplement to other types of interactive control. Where icons are used to represent control actions, verbal labels should be used to ensure that their intended meaning should be understood.

40.9.8 Feedback. The system should provide an indication to the user when processing necessitates a delay in user interaction with the system. The system should provide an indication to the user when a process is completed or aborted or when user input is required. The system should display the current states and modes of the system. When the user selects an object or inputs data, the system should indicate acknowledgment by highlighting the object. When the system rejects an user input, the system should provide an indication of the rejection and instructions for taking corrective action.

40.9.9 Prompts. Prompts should be displayed in a standard area of the screen. Prompts should be explicit and in language easily understood by the user. User acceptance of data should be accomplished using a single confirming action.

40.9.10 Defaults. Default data values should be used to reduce user workload. Default values should be displayed automatically upon initiation of a data entry transaction. The user should be able to change the value for that transaction without changing the default value defined in the system. The system should allow the user to accept the default data as a group without accepting each item individually.

40.9.11 Error Management. The system should provide an easy means to correct erroneous entries. The system should allow correction of data without requiring the user to re-enter correctly entered data. The system should detect incorrectly entered data after keying, but prior to entry into the system for processing (e.e., incorrect number of digits in grid coordinate). Erroneous data entry should be minimized by only presenting valid options for selection by the user. The system should require confirmation for entry of critical data. Error messages should be appropriate to the target audience, specific to the error at hand, and explicit in a way to recover from the error.

40.9.12 System Response Time. The system should respond to user commands/inputs in accordance with table XXIX in MIL-STD-1472D.

40.9.13 Message Transmission. The user should be able to transmit data using the same procedures used for general entry, display, and other processing of data. These procedures should be consistent among transactions and other information handling tasks. The system should use standard and predictable

message formats and provide the user with stored forms to aid In message preparation. The system should not require the user to enter data into message formats that the system is aware of for other purposes. The system should automatically address messages based on a default by message type or by user selection of the destination.

#### 40.10 Input/Output Configuration Requirements.

#### 40.10.1 Visual Configuration Requirements.

40.10.1.1 Data Display Format. Data input and output displays should use the same formats when appropriate. The data entry formats used by the system should match the formats of the source documents. Required data should be computer controlled. Only data required by the user's needs should be presented.

40.10.1.2 User Controls and Displays. Each user display should contain interface-specific guidance on legal entries and instruction for use of the interface and task completion. Each user display should designate the operational states and modes that are displayed in day or night conditions. The system should respond to contradictory or conflicting control actuation's based on an established priority and the availability of data/subsystems.

40.10.1.2.1 Automatic Emergency Override Displays. Generally, the computer should not override an user's display screen without the user acknowledging a high-priority alert. Upon actuation of a specialized push-button, the system should automatically change mode to that activity. The user's display screen should inform him of the mode change and automatically present an interface to support appropriate tasks.

4.10.1.2.2 Operational Mode Change Displays. Initial operation mode display screens should give the user the opportunity to conduct a deliberate or hasty transition. Deliberate transition allows the user the option to complete the task in progress before beginning to transition between modes. Hasty mode change allows subsystems to be properly stowed, but automatically bypasses resolution of conflicts in favor of transitioning to the next mode. The mode transition screens should walk the user throug't the resolution of current tasks that conflict with the need to reconfigure subsystems for a mode change. Upon satisfactory resolution, the user should be prompted, in a computer controlled sequence, to authorize the movement and stowage of equipment into configuration for the desired operational mode.

40.10.1.2.3 Computer-Initiated User Tasks. The automation of subsystem monitoring and information handling results in a need for the computer top prompt users to perform different tasks of various priorities. In general, the approach to achieve this should be for the computer to display an alert to the user that a certain activity needs to be advised. The prompt should include some

indication of the priority of the activity or, in some cases, the probable consequences of delaying the activity. This prompt should be brief and presented in such a way as to not interfere with the task in progress. The user should normally be given the option to complete what he/she is doing or pause his/her current activity. In the case of the chief of section, the user may have the option to delegate the task to one of the subordinate crewmembers. This interface should be achieved using the touch-screen.

40.10.1.2.4 Log-On/Log-Off Procedures. User identification must occur prior to selection of operational states and modes. Log-on prompts should be automatically displayed upon application of power to the crew station. Orderly shutdown of the system prior to removal of power should occur to prevent loss of data or damage to hardware.

40.10.1.2.5 Data Entry. The system should provide feedback to the user of the acceptance or rejection on data entry. When a delay in processing occurs, the system should provide the user with an indication of the delay and the reason for the delay. Entering data into the system for processing requires an explicit action. The system should not allow execution of data that is not complete or not a legal value. The method of entering data should remain consistent throughout the interface. Areas prescribed for data entry should be clearly defined on the display visually.

40.10.1.2.6 Cursors. The system should provide control of cursors thro on the use of a joystick. The cursors should each be visually unique to the tasks they support (e.g., map and site-to-crest) and not obscure other information on the display. When necessary for fine positioning accuracy, the cursor should appear as a crosshair. When appropriate to the interface, the cursor should remain centered in the display screen and the display image should be made to scroll beneath it. The joystick should have a unique push-button to designate cursor location. Cursor movement using the joystick should be proportional to the displacement of the joystick.

40.10.1.2.7 Keyboard. Use of a keyboard should be avoided where selection of prompted options is practical.

40.10.1.2.8 Fixed-Function Keys. Fixed-function keys should be used for all time-critical, error critical, and frequently used control inputs. The functions and placement of the fixed function keys should be consistent among the three crew stations. The functions controlled by the fixed function keys should always be available for actuation by any crewmember unless preempted by a crewmember with high priority of control actuation. Fixed function keys with related functions should be grouped together physically and placed in a distinctive location on the control panel and labeled at all times as to their function. These keys should be limited to one function each. Actuation of a fixed-function key should result in immediate feedback to the crewmember.

40.10.1.2.9 Joystick. A Joystick should be used to enter data requiring more precision than is possible using the touch-sensitive display screen. The joystick should also be used to control subsystems such as the external camera and laser. Fixed function keys should be provided to control the mode of the joystick.

40.10.1.2.10 Touch Screen. A touch screen should be used at each crew station to provide direct visual reference access and optimum direct control access. The touch screen display should have sufficient luminance transmission to be daylight readable, night vision device compatible. The touch screen should provide a positive indication of touch screen actuation. Dimensions and separation of responsive areas of the touch screen should be in accordance with figure 14 in MIL-STD-1472D. The force required for actuation of the touch screen selections should be in accordance with table X in MIL-STD-1472D.

#### 40.10.2 Audio Configuration Requirements.

40.10.2.1 Audio Displays. The audio signals used should be supplementary to the visual signals and should be used to direct the user's attention to the appropriate visual display. Some audio alerts should be one time for use in altering the user to an errant entry, while others should be intermittent for use in prompting an user response or warning the user of a hazard. Intermittent signals should be automatically terminated when no longer applicable or by user action. Audio signals should be used when:

- The information to be processed is short and simple and requires an immediate or time-based response.
- User inattention is anticipated.
- The criticality of transmission response makes supplementary or redundant transmission desirable.
- It is desirable to warn, alert, or cue the user to subsequent additional response.
- Custom or usage has created anticipation of an audio display.

40.11 Screen Design Approach. Screen design refers to how information is arranged and presented on a display screen. It is difficult to develop standard guidelines for screen design for command and control systems, primarily because of the differences in tasks being performed by the users. Screen design requirements can vary extensively, depending on the function being performed by the system. Some systems are actually information management systems that rely heavily on databases and do not require immediate user response to information displayed on their screens. On the other hand, real-time tactical display and control systems require the user to make immediate decisions and to input commands based on the

information presented on the display screen. Each system has different screen design requirements based on its primary function. The designer needs to understand the primary function of the system being developed to provide an effective screen design. An example of the complexity is shown in Figure 40.1. Example Screen Design.



Figure 40.1. Example Screen Design

Certain common, general principles of human factors engineering (HFE) design should be incorporated into the screen design, regardless of the system function.

The user's performance is improved by the following screen features: an orderly, clutter-free appearance; information present in expected locations plain, simple language; a simple way to move through the system; a clear indication of interrelationships. Displays should be formatted to group data items on the basis of some logical principle, considering trade-off's derived from task analysis.

Screen design should minimize pointer and eye movement requirements within the overall design. The goal to minimize eye and pointer movement must be considered within general task considerations, with logical trade-off's taken into account.

**40.11.1 Organization.** Organization of information should be guided by Gestalt principles of perception, such as rules of proximity and similarity. These are discussed in greater detail in the introduction.

40.11.2 Formats. Display formats should be designed to provide optimum transfer of information to the user by the use of information coding, density, grouping, and enumerating.

40.11.3 Presentation. Information should be presented simply and in a wellorganized manner for high information transfer.

40.12 Maps and Situation Displays. Graphical presentation of data is a critical feature of many emerging command and control applications. This section suggests possible means for presenting data in graphical formats. The applications discussed here include tactical graphics (overlays, symbology, and terrain representation) and pictographic representations (digitized maps, pictures, etc.).

40.12.1 Maps. Maps refer to projected representations of geographic data, usually on flat surface displays. Maps include both natural and man-made features and text and/or graphics and colors used to describe or code those features. Situation displays provide a means of relating changing conditions or events to geographic features represented on maps

40.12.1.1 Curvature. Be consistent in projecting the earth's curvature on flat surface maps when displaying large geographic areas.

40.12.1.2 Map Label Position. Position map labels consistently (e.g., beneath or within the feature). Where possible, label all significant features without cluttering the display.

40.12.1.3 Map Orientation. Use a consistent map orientation when more than one map should be displayed (e.g., north consistent for all maps).

40.12.1.4 Designating Map Areas. Consider using color, shading, texture patterns, or highlighting to define map areas of special interest. Shades (tones) of a single color are preferable to multiple colors when observers must make relative comparisons between or among areas. When using shades of color or texture patterns, the gradation of shades from dark to light should correspond to variation in the variable that is represented.

40.12.1.5 Situation Display Presentation. Provide a means of presenting situation displays as overlays on related map backgrounds.

40.12.1.6 Automated Tools. Provide automated tools for complex map analyses. The specific tools should be based upon the user's needs. For example, avenue of approach, line-of-sight, and trafficability are needed by some but not all users. The user requirements should be determined and appropriate tools provided.

40.12.1.7 Coverage Area and Resolution. As a minimum, maps must cover the areas of responsibility of the user at each organizational level and provide all essential details required to conduct operations. Map displays should be large enough to permit the simultaneous presentation and visual integration of information required by the user. Small electronic displays may be panned and

zoomed to increase map coverage. However, at present, such displays have significant visual limitations when compared to traditional, large-format, paper maps.

40.12.1.8 Map Feature Representation. All critical map features must be represented .

40.12.1.9 Reduction of Clutter. Provide a means for reducing clutter while preserving essential information.

40.12.1.10 Area of View on Maps. Maneuver commanders at each echelon should be able to view their own areas of operation, activities one echelon above and two echelons below, and activities of friendly adjacent (flanking) units. The activities of adjacent and deep enemy units that oppose displayed friendly forces should also be displayed.

40.12.1.11 Accuracy of Location. Connecting Symbols to Location. Symbols should be accurately placed on the map or connected to the desired location using arrows, lines, or other pointing devices.

40.12.1.12 Automatic Registration. Provide an automated means of registering graphic data with background map information at all display scales.

40.12.2 Standard Military Symbols. Use standard military symbols in accordance with doctrine when preparing maps and overlays. For example, use the current edition of FM 101-5-1. Operational Terms and Symbols.

40.12.2.1 Symbol Color Coding. Use standard military map color codes and provide a user-prompted key defining the color codes which are used.

40.12.2.2 Overlap of Symbols. Map symbols should not be allowed to overlap, particularly if this would obscure their identity. Where overlap is unavoidable, provide a means for moving background symbols to the foreground or otherwise revealing masked symbols.

40.12.2.3 Symbol Labeling. Essential labels (for example, unit identification) should be displayed with the symbol; otherwise, provide a means by which the user can display information related to selected symbols.

40.12.3 Terrain Representation. Digital terrain data available for some versions of electronic map (e-map) allow alternative methods of portraying terrain features. In addition to traditional topographic contour intervals, digital terrain data can present map backgrounds depicting road networks, drainage, vegetation, and soil type. Shading, coloring, or other visual cues can also be used to accentuate terrain features.

40.12.4 Location of Displayed Section. Where location information is frequently used, a constantly visible display of coordinates associated with the cursor should be displayed in user-selectable coordinate units that can also be conveniently changed. The continuous display of location should be augmented with the capability to fix (point on the map) a location to facilitate moving overlay displays.

40.12.5 Availability of Symbol/Map Feature Coordinates. Provide to the user a means of obtaining the exact map coordinates for a selected symbol or map feature by means of querying the symbol or feature. The recommended method of querying an item is to use a pointing device, such as a mouse or trackball cursor.

40.12.6 Larger Map Inset. When the entire map is not displayed, provide an inset that shows where the displayed portion is within the larger map.

40.12.7 Distance Determination. Provide an automated means for readily determining the distance between points.

40.12.8 Bearing Determination. Provide a means for readily determining the bearing between points.

40.13 Display Size. Because of the limited screen size of many displays, a method is needed to scan and change the scales of the maps. In addition, changes in the tactical situation require updates to various map overlays. The following guidelines should be considered when implementing dynamically changing maps.

40.13.1 Use of Panning. Permit the user to change the displayed area by moving a window over the map in any direction. Panning operations may be continuous (preferable) or discrete but should meet the user's requirements.

40.13.2 Position Indicator for Panning. During panning operations, provide an indicator of position in the overall display.

40.13.3 Return to Start Point. During panning operations, provide a means for rapidly returning to the starting point.

40.13.4 Use of Zooming. Provide a means for moving away from or toward the displayed area (zooming) to obtain a larger view or greater detail.

40.13.5 Variable Level of Detail. When zooming, symbols should be collapsed into fewer summary symbols to declutter.

40.13.6 Levels of Detail. Consider modifying the level of detail (number of symbols and features depicted) to match the degree of zooming used (i.e., more detail for close-up views and less for large-area perspectives).

40.13.7 Method of Zooming. Of the two methods of zooming (i.e., continuous and discrete), continuous is preferable. Whichever method is used must be satisfactory to the user.

40.13.8 Return to Default. Provide a means for quickly returning to the normal display size when zooming.

40.13.9 Expanded Sector Position Indication. It is recommended that an inset or window be provided that shows the maximum available map coverage. An example of map coverage would be a graphic square on the inset map that indicates the position of the map currently displayed. In the most useful form, this inset would be interactive and used to set parameters for calling up a screen map display.

40.14 Automatic Updating. Automatic updating, editing, and distributing map data are among the primary advantages offered by electronic displays. The following guidelines address considerations in implementing these capabilities.

40.14.1 Selecting Information for Update. As appropriate, allow the user to select categories of information that should be automatically updated.

40.14.2 Stable Reference Elements. Provide stable reference elements (e.g., terrain features, boundaries, etc.) when displays are automatically updated.

40.14.3 Identification of Updates. Provide a means for readily identifying updates or changes. Critical changes must be easily recognized and distinguishable from other changes to the display. For example, highlight the update until the user acknowledges it.

40.15 Display Sequencing. Display sequencing refers to two practices: 1) selectively presenting and removing displayed data, such as a series of overlays with different information. This can act as an aid for decluttering a display. 2) illustrating temporal changes in the information of historical data or simulation of future events.

40.15.1 Sequencing. Display sequencing may be used to reduce clutter (e.g., presenting map overlays in succession), to reproduce temporal changes in the display database (e.g., changes in the tactical situation), and to aid in visualizing simulated changes in the battlefield situation.

40.15.2 Rate of Sequencing Control. Where possible, allow the user to control the rate of sequencing.

40.15.3 Sequencing Pause or Suspend. Provide a capability to pause or suspend sequencing operations and provide an indicator of the status of sequencing operations.

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40.15.4 Forward and Reverse Sequencing. As appropriate, allow the user to present sequenced displays in forward or reverse order.

40.15.5 Return to a Specific Display in a Sequence. Provide a means for the user to return quickly to a selected display within a sequence of displays.

40.15.6 Use of Animation in Sequencing. Consider using animation as an aid to the pictorial display for complex objects.

**40.16** Grid Overlay. Provide a user-selectable grid overlay that is keyed to the coordinate system of the map. It should be easy for the user to turn the grid on and off. Coordinate keying of the overlays must be clearly specified and easily operated by the user.

40.17 Dynamic Map Legend. The map display should have an associated window giving relevant information in a continuous display. The information should include map scale, cursor location, graphic of map coverage, and status (i.e., working, computing, available, etc.).

40.17.1 Standard Symbol Library. Provide a library of standard symbols and a means of transferring and manipulating symbols.

40.17.2 Labeling Symbols. Provide an easy means of labeling symbols. Consider automated means of aiding the user in labeling and enforcing labeling conventions.

40.17.3 Building Symbols and Overlays. Provide automated tools to assist the user in constructing new symbols and graphics overlays.

40.17.4 Addition and Deletion. The user should be able to add or delete symbols, labels, or other features without destroying background information.

40.18 Area Expansion for Data Placement. Allow the user to expand an area of the display as required for accurate placement of critical data.

**40.19 Graphic Element Designation.** Provide a means for designating graphic elements for editing. Highlight selected items to provide a visual cue of forthcoming subsequent actions.

40.19.1 Repositioning Elements. Allow the user to reposition selected elements on the display.

40.19.2 Remove/Restore Elements. Allow the user to remove and restore selected elements.

**40.20 Selection from Existing Options.** Allow the user to select from displays of available options when making changes to display attributes, such as color, symbols, line types, textures, etc. Selection should be made by pointing rather than by naming the options.

**40.21** Attribute Identification. Provide an easy means for the user to identify attributes currently selected.

**40.21.1** Attribute Change. The user should be able to change the attributes of selected graphic elements.

40.22 Storage of Graphic Display. Provide an easy means for naming, storing, and retrieving graphics displays and elements. Also, provide a means for reviewing and selecting from stored graphics files.

40.23 Map as a Base Screen. When an application is map intensive, it is recommended that the map be used as the background or base screen, which should be the maximum display size possible to promote readability.

40.23.1 Map Readability. It is beneficial to ensure the readability of map features since the map is the focus of the user. The screen design should avoid displays that cover the map when possible, and windows should not obscure the map.

40.23.2 Map Cursors. Map cursors should use a crosshair design that has high contrast with the background. It is recommended that cursor size subtend 20 minutes of visual angle so the average user can easily locate it on the map.

**40.23.3 Graphic Overlays.** The preselection or filtering of graphic overlays is a recommended feature. The decluttering graphic displays (especially maps) should be assisted.

40.23.4 Filters. Labels and titles used for filters should be carefully reviewed to ensure items are understandable. The filters should be extended to map features, such as roads, cities, vegetation, topography, and political data. The intensity of the map should be controllable to allow fadeout of the map without losing all the map features.

40.23.5 Labeling of Graphic Overlays. It is understood that graphic overlays should overlap map features, but text information should not be obscured. The text should be offset with arrows to preserve map legibility.

40.23.6 Color Use with Graphic Overlays. Using color to identify symbols is encouraged. but redundant coding that does not use color should also be used. This caution is especially true for friend-enemy or danger-safe designations. Dots, dashes, shapes, and video effects are recommended. Care must be taken to avoid visual

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color illusions caused by color blending (i.e., adjacent red and blue lines are seen as one purple line).

# APPENDIX E

# BEHAVIORAL REPRESENTATION OF SAFOR ENTITIES

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#### APPENDIX E

#### AFAS, FARV and LRP SAFOR Behavior

#### 50. BEHAVIORAL REPRESENTATION OF SAFOR ENTITIES

#### 50.1 Introduction

This appendix describes behavioral representations required for SAFOR entities corresponding to the AFAS vehicle, the FARV vehicle, the Logistics Resupply Point (LRP), and certain other battlefield elements expected to be involved in exercises that evaluate design revisions and operational employment alternatives.

Although the information provided in this appendix is sufficiently generic to support creation of SAFOR entities by alternative methods, the descriptions are structured to facilitate use of the ModSAF technology for implementation. Behavioral descriptions for tasked units / subordinate units are hierarchically decomposed in terms of the MISSIONS, MISSION PHASES, and TASKS they may be assigned during a simulation exercise. An account of the basic physical model for each unit / sub-ordinate unit is also supplied (where applicable).

#### 50.2 AFAS SAFOR

The tasked subordinate unit described in this subsection is an AFAS vehicle.

The physical model for this unit is a 55 ton tracked vehicle equipped with a 155mm cannon, a variety of secondary armament, and a suite of passive sensors for self defense.

The following behavioral specifications presume that the AFAS vehicle is operating in its role as a subordinate unit responsible to a platoon leader.

#### 50.2.1 Missions (AFAS)

mission name: Move

description: AFAS will conduct two types of Moves on the battlefield: Tactical Move and Survivability Move. In either type of Move, Platoon Operations Center (POC) will receive and transmit to the AFAS movement guidance for the section, specifying such things as section timing guidance, tactical movement routes, start points, release points, refuel points, traffic control points, check points, rest points, refuel points, area of operations and other information pertinent to the conduct of the type move planned.

component phases. Tactical Move, Survivability Move
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#### mission name: Communications

description: AFAS will communicate with external elements using a combination of voice, digital and, as an alternative, wire communications. In order to establish and maintain communications, AFAS must consider electronic line of sight (LOS) in the selection of positions and move to accommodate LOS when necessary.

component phases: Digital Communications, Voice Communications, Wire Communications

### mission name: Survive

description: To survive, the AFAS must be prepared to meet the threat presented by enemy ground forces, counterfire, aircraft and nuclear, biological and chemical (NBC) assets. AFAS must determine the best of several options in dealing with any of these threats. These threats may be singular or multiple. AFAS will determine its most appropriate defensive posture, develop a defensive plan based on the threat information provided by its C3 elements, and react to threats identified by its onboard sensor suite. (Decision aids will assist the crew in planning and conducting survivability operations by providing recommendations for responses to counteract identified threats.) To survive, AFAS must create a self-defense plan and monitor / control its own signatures and activities based on the projected threat while monitoring / reacting to threat activity, ultimately choosing to remain in position and fight the threat, run from the threat or hide.

component phases: Develop Self-defense Plan, Monitor / Control AFAS Signatures and Activities, Monitor / React to Threat

#### mission name: Deliver Fires

description: The delivery of fires is the primary mission of the AFAS; all other missions are subordinate to and performed in support of this mission. To perform this mission, AFAS must establish and maintain a firing capability, determine firing data, coordinate / control firing data, conduct fire missions, control ammunition and manage / submit reports. AFAS must be capable of performing these functions for itself and one additional AFAS. The additional AFAS may be performing in a senior or subordinate role during paired howitzer operations or in a degraded mode of operation due to a subsystem failure. In order to perform its mission, AFAS relies on a digital link with C2 elements as a source of the data required. Commander's guidance, battlefield geometry, fire support coordination measures and meteorological updates are the primary external information that affects virtually every aspect of the delivery of fires. The AFAS will have the capability to link directly with an observer to engage specific targets as directed by C2 elements. AFAS can perform its mission while consolidated in a centralized mode of operation (where all howitzers are centrally located), while paired with another AFAS (in either a senior or subordinate role), while moving independently within the platoon's position area (in a decentralized mode of operation), or in a combination of these operational modes that best suites the tactical situation as determined by the commander.

component phases: Establish / Maintain Firing Capability, Attack Targets

## 50.2.2 Mission Phases (AFAS)

mission phase name: Tactical Move description: Move that is controlled by higher levels of command and control, such as battalion TOC; normal distances are 2 to 14 km. component tasks: Plan Route, Follow Route

mission phase name: Survivability Move

description: Move within the assigned platoon position area which is controlled either by the POC or the howitzer; this move is normally less than 2 km. component tasks: Plan Route, Follow Route

mission phase name: Digital Communications

description: Digital communications will represent the bulk of the communications with external sources. This method is considered to represent less likelihood of detection than voice and will be used to transmit and receive all information relative to AFAS databases. Additionally, a plain text message format will be included for the transfer of unformatted messages. component tasks: Use Correct Radio Procedures

mission phase name: Develop Self-defense Plan

description: AFAS will determine the best plan for defense of its current and future positions and routes. The plan will be made based on the information available to the AFAS from its C3 elements. This information includes expected enemy capabilities in air power, ground forces and equipment types, counterfire threat and NBC capability. Each of these plans will consider the terrain in which the AFAS is operating, based on a digital mapping system integral to the howitzer which displays battlefield geometry and boundaries and friendly / enemy unit information. The terrain analysis will provide tactical options based on the physical terrain features. component tasks: Develop Position Defense Plan, Develop Route Defense Plan

mission phase name: Monitor / Control AFAS Signatures and Activities

description: AFAS will determine the type of threat (air, ground, counterfire, NBC or a combination of these) that is most likely to be encountered, based on intelligence information provided by its C3 element. From this the AFAS will determine the type of signatures or activities most likely to cause the AFAS to be identified as a target by the enemy. For example, if the enemy has air superiority, the necessity to move less frequently is implied, thereby necessitating a reduction in movement activity and use of active sensors. The result would indicate the use of less frequent survivability moves using terrain that provided the most overhead concealment and sensors that were passive (versus active emitters). component tasks: Develop Sensor Plan, Develop Movement Plan

#### July 18,1994

mission phase name: Monitor / React to Threat

description: In the event that a threat presents itself to the system, AFAS must plan for and initiate an appropriate response. An appropriate response is based on the idea that a system has three options when confronted: run, hide, or fight. The plans developed in the previous two mission phases will have narrowed the options available and, in most cases, reaction to a threat will be no more than carrying out a previously- developed plan. However, each threat must be prioritized and dealt with as the situation dictates, thereby affecting the validity of any plan unless the circumstances are static.

component tasks: Determine Rationale to Run, Determine Rationale to Hide, Determine Rationale to Fight

#### mission phase name: Establish / Maintain Firing Capability

description: To establish a firing capability, AFAS must have (1) the ability to communicate, (2) necessary information within the ballistic computer databases, and (3) ammunition available. To maintain that capability, AFAS must maintain communications, update databases, control ammunition and manage / submit reports while ensuring the maintenance and sustaining actions are monitored and performed.

component tasks: Establish Communications, Initialize / Update Ballistic Computer Data, Control Ammunition, Manage / Submit Records and Reports, Maintain and Sustain

mission phase name: Attack Targets

description: The ability to attack targets is the execution phase (and the key phase) of the AFAS' Deliver Fires mission. During this mission phase, AFAS will coordinate and control fire missions, receiving, reviewing, accepting, rejecting and prioritizing them upon receipt. Once the mission is accepted, a priority is assigned, based on the other missions awaiting action. Firing data are then computed for the mission and the mission is either placed in the queue or fired, depending upon the prioritization process. The final task is initialization of the firing process by the crew.

component tasks: Determine Firing Data, Coordinate / Control Fire Missions, Conduct Fire Missions

### 50.2.3 Tasks (AFAS)

## task name: Plan Route

description: When executing a Tactical Move, AFAS will determine the best route from its current location to the start point (SP), and will plan its route from the release point (RP) to its first firing position (FP) within the new position area (PA). When executing a Survivability Move, AFAS will plan routes from its current position to the next planned position.

#### task name: Follow Route

description: When executing a Tactical Move, AFAS will follow the route provided either in convoy or incrementally, as designated by the POC, from the SP to the RP. When executing a Survivability Move, AFAS will follow planned route to next position.

#### task name: Develop Position Defense Plan

description: Position defense plans establish the intended method of defense prior to or upon occupation of a position, based on what is known of the enemy. The AFAS must take into account the intelligence information provided by C3 elements. This information includes air defense status based on the enemy air capabilities, enemy unit locations along with type of unit, and how the unit is equipped. NBC defensive posture is also provided. Based on this information, AFAS will determine an overall defense plan by combining the strategy applied in its sensor, weapon and movement plan, taking into account commander's guidance.

#### task name: Develop Route Defense Plan

description: Route defense plans are developed identically to the position defense plans with the exception that the location for the plan is continually changing. Some elements of the plan, such as the sensors, are affected by movement. This will limit the availability of certain data that can be used in position defense. For example, the AFAS will not be able to use a motion detection device while it is moving and acoustic sensors may not be able to filter out the noise of its own passage.

#### July 18,1994

#### task name: Develop Weapons Plan

description: Weapons plans are developed to maximize the benefits of the available weapons systems, based on the threat. Weapons plans will be developed based on available intelligence and linked to sensor input during the course of surveillance by the sensor suite when the AFAS is stationary in a position. Weapons plans for armament when the AFAS is enroute between positions will be based on the most likely threat. The secondary armament will be the primary means of defense against aircraft, light armor and dismounted infantry. If the ability exists to engage the threat using indirect fire with the main armament, this would be preferable to allowing the enemy within striking distance of its weaponry but would not be initiated until there is little doubt that the enemy will (or has) detected the AFAS.

#### task name: Develop Sensor Plan

description: The sensor plan will provide the AFAS with the ability to monitor its external environment. The plan is developed to provide AFAS with a warning that a threat is approaching prior to the threat having the ability to strike. The plan will take into account the enemy capabilities and equipment when selecting the most appropriate options for sensor deployment. Terrain will play a major part in determining which sensor is most capable of monitoring which sector within the avenues of approach available to the enemy. For example, a sensor which requires line of sight to detect the enemy would not be used in a sector that had limited line of sight.

## task name: Develop Movement Plan

description: The movement plan establishes a sequence of positions within the position area for the AFAS to use in the accomplishment of its mission. These movement plans expand on the position and route selection in that tactical considerations are applied based on the threat. For example, if the enemy counterfire capability is high, the AFAS would most likely move after each fire mission to another position outside the counterfire footprint.

#### task name: Determine Rationale to Run

description: Commander's guidance is the primary input to this task. It is not usually left up to the individual crews to determine if the mission is best supported by evasion. The primary mission of the AFAS is to provide fire support to the ground gaining arms. As such, if movement interrupts the accomplishment of the mission, in most cases the AFAS will report the threat and call for support in the event it is incapable of providing its own.

## task name: Determine Rationale to Hide

description: The rationale to hide is based on the mission. If AFAS is not firing missions at the time the threat is detected, the best approach may very well be to simply remain in place and not draw attention to itself or move to a position that provides concealment. Again, the key to this strategy is the effect of the decision to hide on mission accomplishment and the commander's guidance provided.

#### July 18,1994

#### task name: Determine Rationale to Fight

description: The rationale to fight is linked to the requirements for the AFAS to survive in order to continue its mission. AFAS is not, by design, a frontal assault type weapon. There is considerable improvement in the AFAS in terms of lethality in direct fire engagements using both the main and secondary armament. This function, however, is best left to armor and infantry. The decision to fight will normally be made after the ability to run and / or hide have been attempted and failed. Once AFAS has committed to fight, it must engage targets with its available firepower and countermeasures until the threat is destroyed or neutralized to the point that the indirect fire mission can be resumed.

#### task name: Establish Communications

description: AFAS requires the ability to communicate with C2 elements to engage the enemy with indirect fire. Communications with the platoon operations center (POC) provides the AFAS with digital information updates on commander's guidance / attack criteria, battlefield geometry, fire support coordination measures, and meteorological updates, as well as plain text digital message and voice communications. Observer information transmitted is essential in computing firing data and determining the method of engagement to neutralize or destroy the target. AFAS requires the ability to communicate directly with the observer for missions so directed by the POC. This requirement dictates the need to communicate out to a range of 25 km.

#### task name: Initialize / Update Ballistic Computer Data

description: Initialization of the ballistic computer is performed when turning the system on or as directed by C2 elements. C2 elements may use initialization as a means of standardizing databases prior to an engagement or to accomplish a specific tactical goal. Most, but not all, data elements are provided with a default in the absence of specified information. The operator may be required to input manually or to verify critical data elements.

#### task name: Control Ammunition

description: The ability to control ammunition is directly linked to the decision making process required for the acceptance or rejection of fire missions. AFAS must know what ammunition is on hand at any given moment, compare that ammunition to those missions already in the fire mission queue and determine if the remaining ammunition is sufficient to support incoming missions. AFAS must request resupply upon reaching critical stockage levels derived from commander's guidance.

#### July 18,1994

## task name: Manage / Submit Records and Reports

description: Managing and submitting reports is critical to the availability of the AFAS. C2 elements will rely upon--and base their operational and tactical decisions upon--the information available to them from AFAS' reports. Information such as location, operational status of subsystems, ammunition stock levels, fuel levels and crew status will impact these decisions significantly. Timeliness of fire support will be affected by the efficiency with which the AFAS can perform this task.

#### task name: Maintain and Sustain

description: AFAS must maintain its operational status in order to sustain the ability to deliver fires. The system will, through diagnostics and prognostics, evaluate internal systems for operational status and rely on embedded publications and preventive maintenance aides to assist in replacement or repair decisions. Sustainment aides will assist the crew in making decisions regarding all classes of supply available to the AFAS and managing critical stockage levels. Resupply decisions will be based on these stockage levels. AFAS will report changes in operational status to its C2 element. Requests for resupply will be sent to the POC for processing. The POC will process the requests, based on the tactical situation and availability of requested items. POC will base ammunition resupply on the amount of ammunition available both at the LRP and on board the FARV.

#### task name: Determine Firing Data

description: AFAS will determine firing data for itself and one additional AFAS. The POC will provide the AFAS with target and observer information as required. AFAS will compute firing data that accounts for internal, external and terminal ballistics to include round-to-round muzzle velocity corrections. Data will be derived which will fulfill the observers' request as modified by commander's guidance, attack criteria and the joint munitions effects manual (JMEM). A database will be maintained of all missions fired, along with the respective firing data and such perishable information as the meteorological update information corresponding to the period for which the missions were fired.

## July 18,1994

### task name: Coordinate / Control Fire Missions

description: AFAS will process fire missions upon receipt, deciding whether to accept or reject the mission and, if accepted, prioritize the mission. These decisions will be based on commander's guidance and the AFAS' current status. For example, if AFAS receives a fire mission which requires a time on target that conflicts with a mission currently in its queue, AFAS will reject the mission. The POC will receive the rejected mission along with the reason for rejection and forward the mission to another AFAS. In most instances, the POC will not send missions that conflict if all information regarding the AFAS' status is current. The POC may decide to resolve the conflict by eliminating the mission already in the queue. AFAS will be required to control and provide data to an additional AFAS that is assigned, either in a subordinate role or when the other AFAS is performing its mission with inoperative subsystems. The senior/subordinate relationship requires one howitzer, normally the senior section chief's, to receive the fire missions for itself and one additional howitzer. AFAS will control all aspects of fire mission coordination and control for both howitzers. When supporting a degraded howitzer, AFAS will provide the degraded howitzer with firing data and have the howitzer fire the number of rounds for its missions the degraded system can support. For example, an AFAS has an electrical malfunction that disables the computer system. A fully functional AFAS is directed by the POC to collocate with the degraded system and provide firing data to the system. The functional AFAS will provide the degraded howitzer with firing data and commands as well as managing its ammunition stockage.

#### task name: Conduct Fire Missions

description: AFAS will conduct fire missions as directed by its C2 elements and / or as computed by its on-board ballistic computer. Each mission will be conducted in accordance with the observer's request as modified by commander's guidance, attack criteria and the joint munitions effects manual (JMEM).

#### 50.3 FARV SAFOR

The tasked subordinate unit described in this subsection is a FARV vehicle.

The physical model for this unit is a 55 ton tracked vehicle equipped with automated loading mechanisms, a variety of secondary armament, and a suite of passive sensors for self defense.

The following behavioral specifications presume that the FARV vehicle is operating in its role as a subordinate unit responsible to a platoon leader.

July 18,1994

### 50.3.1 Missions (FARV)

#### mission name: Move

description: FARV will move extensively on the battlefield in the support of AFAS with all classes of supply. FARV will perform three types of movement: resupply, survivability and tactical. Resupply moves will require FARV to move from hide positions to the AFAS location or to the battery logistical resupply point (LRP) to resupply its stockage levels in support of AFAS' requirements. FARV will receive movement orders from the POC or, in a one-on-one relationship with AFAS, the AFAS to which it has been assigned. FARV will perform survivability moves as the situation and threat dictate. FARV will perform tactical moves between platoon position areas under POC control. Much like the AFAS, FARV will simply plan the route from its current location to the start point for the tactical move.

component phases: Resupply Move, Tactical Move, Survivability Move

#### mission name: Communicate

description: FARV will communicate with external elements using voice, digital and inter-vehicular communications. FARV must consider electronic line of sight and move to accommodate it when necessary.

component phases: Digital Communications, Voice Communications, Inter-Vehicular Communications

#### mission name: Survive

description: The survive mission for FARV is the same as that for AFAS, with two key exceptions. First, FARV does not possess the lethality afforded AFAS by its main gun. The emphasis placed on passive defense in the AFAS mission description still applies but is greater as a result. FARV has a significantly smaller signature when in the hide position than AFAS due to decreased amounts of radio traffic and lack of the main gun signature. Second, FARV will move more frequently than AFAS, especially during peak and surge operations, increasing its signature as well as its likelihood for detection.

component phases: Develop Self-defense Plan, Monitor / Control FARV Signatures and Activities, Monitor / React to Threat

#### mission name: Sustain

description: FARV has one primary purpose: provide AFAS with all classes of supply and provide limited recovery assistance to AFAS and other FARVs. FARV will perform this function by responding to resupply / recovery requests from the POC or the AFAS.

component phases: FARV Resupply, AFAS Resupply, Recovery

#### 50.3.2 Mission Phases (FARV)

#### mission phase name: Resupply Move

description: FARV will conduct resupply moves to two specific entities on the battlefield: the AFAS, of which there are four within the platoon, and the battery LRP. AFAS locations change frequently and the number and locations of AFASs the FARV supports will change according to the tactical situation. For example, the FARV may begin the day supporting only one AFAS and, based on the optempo, receive orders from the POC requiring FARV to support a pair of AFAS. The LRP location also changes, but less frequently and normally in conjunction with a tactical move to a different position area. FARV will, upon receipt of a resupply order from AFAS or an order from the POC to go to the LRP, plan a route from its current location to the destination. When resupplying AFAS, time of arrival should coincide with AFAS arrival so as to limit the amount of activity and time in the area, thereby reducing the likelihood of detection. Normally, the AFAS will use this resupply location to conduct fire missions following FARVs departure. From the resupply, FARV will move to a hide position pending receipt of its next resupply request.

component tasks: none

#### mission phase name: Tactical Move

description: Move that is controlled by higher levels of command and control, such as battalion TOC; normal distances are 2 to 14 km. FARV will perform tactical moves as directed by the POC in the same manner as the AFAS. component tasks: Plan Route, Follow Route

#### mission phase name: Survivability Move

description: Move within the assigned platoon position area which is controlled either by the POC or the howitzer; this move is normally less than 2 km. FARV will make survivability moves much the same as the AFAS and for mostly the same reasons. Survivability moves will normally be conducted from one hide position to another, based on having an increased likelihood of detection. For example, if FARV has frequent radio transmissions while in one hide position, the self- defense system will alert the crew to the increased likelihood of being acquired and recommend a move. FARV will then request authorization from its control element (an AFAS or the POC) and select a route to another hide position. component tasks: Plan Route, Follow Route

#### mission phase name: Digital Communications

description: Digital communications will represent the bulk of the communications with external sources. This method is considered to represent less likelihood of detection than voice and will be used to transmit and receive all information relative to AFAS / FARV databases. A plain text message format will be included for the transfer of unformatted messages.

component tasks: Use Correct Radio Procedures

mission phase name: Inter-Vehicular Communications

description: Inter-vehicular communications is the physical link for transferring digital database information and providing voice communications through the vehicle intercom systems between AFAS and FARV during resupply operations. FARV establishes the link when the vehicles are within docking range and disconnects the system upon completion. AFAS will control docking operations and data transfer through this link.

component tasks: none

## mission phase name: Develop Self-defense Plan

description: FARV will determine the best plan for defense of its current and future positions and routes. The plan will be made based on the information available to the FARV from its C3 elements. This information includes expected enemy capabilities in air power, ground forces and equipment types, counterfire threat and NBC capability. Each of these plans will consider the terrain in which the FARV is operating, based on a digital mapping system integral to the howitzer which displays battlefield geometry and boundaries and friendly / enemy unit information. The terrain analysis will provide tactical options based on the physical terrain features. component tasks: Develop Position Defense Plan, Develop Route Defense Plan

#### mission phase name: Monitor / Control FARV Signatures and Activities

description: FARV will determine the type of threat (air, ground, counterfire, NBC or a combination of these) that is most likely to be encountered, based on intelligence information provided by its C3 element. From this the FARV will determine the type of signatures or activities most likely to cause the FARV to be identified as a target by the enemy. For example, if the enemy has air superiority, the necessity to move less frequently is implied, thereby necessitating a reduction in movement activity and use of active sensors. The result would indicate the use of less frequent survivability moves using terrain that provided the most overhead concealment and sensors that were passive (versus active emitters). component tasks: Develop Sensor Plan, Develop Movement Plan

#### mission phase name: Monitor / React to Threat

description: In the event that a threat presents itself to the system, FARV must plan for and initiate an appropriate response. An appropriate response is based on the idea that a system has three options when confronted: run, hide, or fight. The plans developed in the previous two mission phases will have narrowed the options available and, in most cases, reaction to a threat will be no more than carrying out a previously- developed plan. However, each threat must be prioritized and dealt with as the situation dictates, thereby affecting the validity of any plan unless the circumstances are static.

component tasks: Determine Rationale to Run, Determine Rationale to Hide, Determine Rationale to Fight

July 18,1994

#### mission phase name: FARV Resupply

description: FARV stockage levels are reported to the POC or (in instances where the FARV is dedicated to a single howitzer or pair of howitzers) to the AFAS. Critical stockage levels are established by commander's guidance to the FARV. When FARV approaches the critical level in any required stockage item, it will send a request to the POC for resupply. Resupply of the FARV will normally be controlled to prevent more than one FARV being at the LRP at any given time. This reduces the risk of detection or the level of collateral damage possible in the event the LRP is attacked. FARV will proceed to the LRP as directed by the POC and procure the quantities of munitions and other classes of supply as directed by the POC. Upon completion of the upload, FARV will move to either a hide position or directly to an AFAS. component tasks: FARV Upload, FARV Download

#### mission phase name: AFAS Resupply

description: The POC or (in instances when FARV is under AFAS control) the supported AFAS, will contact FARV for resupply. FARV will rendezvous with the AFAS at the location and time designated in the request. This move will normally be conducted within the platoon position area. FARV will establish the intervehicular communications link when within docking range of AFAS. From that point on, all docking and resupply operations fall under the control of the receiving vehicle. For example, if FARV is to provide AFAS with 60 rounds of DPICM and receive 3 rounds of RAP from the AFAS, FARV would control receipt of the 3 rounds in order to control the rate of transfer. AFAS would control docking operations and transfer of the 60 rounds of DPICM. Fuel and ammunition transfer, with the exception of the cannon launched guided projectile (CLGP) and small arms, is automated. All other classes of supply can require manual hookups and crew egress to effect the resupply. Transfer of class I (food and potable water) is expected to be performed manually. AFAS crew members will not be required to dismount for any reason during transfer of supplies.

component tasks: none

#### mission phase name: Recovery

description: FARV will have the ability to recover (tow) an inoperative AFAS or FARV to the LRP, or assist and AFAS or FARV if the vehicle is stuck. Recovery operations may include providing auxiliary electrical power to operate on-board automated systems.

component tasks: none

## 50.3.3 Tasks (FARV)

## task name: Plan Route

description: When executing a Tactical Move, FARV will determine the best route from its current location to the start point (SP), and will plan its route from the release point (RP) to its first firing position (FP) within the new position area (PA). When executing a Survivability Move, FARV will plan routes from its current position to the next planned position.

## task name: Follow Route

description: When executing a Tactical Move, FARV will follow the route provided either in convoy or incrementally, as designated by the POC, from the SP to the RP. When executing a Survivability Move, FARV will follow planned route to next position.

## task name: Develop Position Defense Plan

description: Position defense plans establish the intended method of defense prior to or upon occupation of a position, based on what is known of the enemy. The FARV must take into account the intelligence information provided by C3 elements. This information includes air defense status based on the enemy air capabilities, enemy unit locations along with type of unit, and how the unit is equipped. NBC defensive posture is also provided. Based on this information, FARV will determine an overall defense plan by combining the strategy applied in its sensor, weapon and movement plan, taking into account commander's guidance.

## task name: Develop Route Defense Plan

description: Route defense plans are developed identically to the position defense plans with the exception that the location for the plan is continually changing. Some elements of the plan, such as the sensors, are affected by movement. This will limit the availability of certain data that can be used in position defense. For example, the FARV will not be able to use a motion detection device while it is moving and acoustic sensors may not be able to filter out the noise of its own passage.

## task name: Develop Weapons Plan

description: Weapons plans are developed to maximize the benefits of the available weapons systems, based on the threat. Weapons plans will be developed based on available intelligence and linked to sensor input during the course of surveillance by the sensor suite.

July 18,1994

### task name: Develop Sensor Plan

description: The sensor plan will provide the FARV with the ability to monitor its external environment. The plan is developed to provide FARV with a warning that a threat is approaching prior to the threat having the ability to strike. The plan will take into account the enemy capabilities and equipment when selecting the most appropriate options for sensor deployment. Terrain will play a major part in determining which sensor is most capable of monitoring which sector within the avenues of approach available to the enemy. For example, a sensor which requires line of sight to detect the enemy would not be used in a sector that had limited line of sight.

## task name: Develop Movement Plan

description: The movement plan establishes a sequence of positions within the position area for the FARV to use in the accomplishment of its mission. These movement plans expand on the position and route selection in that tactical considerations are applied based on the threat.

## task name: Determine Rationale to Run

description: Commander's guidance is the primary input to this task. FARV will normally run or hide from the threat.

## task name: Determine Rationale to Hide

description: The rationale to hide is based on the mission. If there is no immediate demand for resupply, the best approach may very well be to remain in place and not draw attention to the FARV, or move to a position that provides concealment. Again, the key to this strategy is the effect of the decision to hide on mission accomplishment and the commander's guidance provided.

### task name: Determine Rationale to Fight

description: The rationale to fight is linked to the requirements for the FARV to survive in order to continue its mission. There is considerable improvement in the FARV in terms of lethality. The decision to fight will normally be made after the ability to run and/or hide have been attempted and failed. Once FARV has committed to fight, it must engage targets with its available firepower and countermeasures until the threat is destroyed or neutralized to the point that the mission can be resumed.

#### July 18,1994

### task name: FARV Upload

description: Upon arrival at the LRP, FARV will upload the quantities of all classes of supply designated by the POC. The FARV crew will be required to manually unpackage and inspect the ammunition, fuze the projectiles with the appropriate fuze, weigh and bar-code the fuzed projectile and load the fuzed projectile, presumably through the docking attachment of the FARV. The FARV autoloader will receive the fuzed projectile and place it in a vacant storage slot. FARV will record the data on the bar-code label, storing the location of the fuzed projectile for use when selecting projectiles for resupply. Liquid propellant (LP) will be pumped into the FARV storage tanks from the containers on the PLS flatrack. FARV will carry sufficient LP to provide top charge for 75% of its projectile carrying capacity. FARV will receive fuel, while being simultaneously rearmed, from any Standard Army Refueling System (SARS) container or vehicle. Manual upload of 130 rounds by the crew and complete refuel process must be performed in less than 65 minutes. FARV will have the capability to receive ammunition from an AFAS or another FARV at a rate of 130 complete rounds within 20 minutes after docking.

#### task name: FARV Download

description: FARV will have the ability to completely and automatically download 130 complete rounds (excluding copperhead) and fuel to another FARV in 20 minutes after docking. FARV will be capable of downloading 130 complete rounds (LP to containers without contaminating the LP) to the ground within 30 minutes. FARV must allow the crew to manually unload 130 complete rounds in 90 minutes.

## 50.4 LRP (Logistics Resupply Point) SAFOR

In a virtual simulation, each LRP will be visually represented as a small gathering of distinct SAFOR entities, most of which are already implemented in ModSAF. For example, the following ModSAF entities could typically be included in the representation of an LRP: HMMWV, HEMTT (M977), HEMTT (M978), and US DI. New SAFOR entities may be needed to represent the palletized loading system (PLS) truck, and the PLS flatracks that it brings to the LRP and deposits on the ground.

The behavior of entities in the LRP "scene" will be very similar to the behavior they would display at an analogous resupply point for armor units. For example, it should be possible to represent arrival and departure of trucks as a function of supply inventories at the LRP and/or orders from higher echelons. Similarly, it should be possible to task this collection of SAFOR entities with movement to another location.

As a supplement to the foregoing descriptions, the following information from a U.S. Army Field Artillery School document (Preliminary Operational Concept for Advanced Field Artillery System (AFAS) and Future Armored Resupply Vehicle (FARV), 27 June, 1994, pp. 46-47) may be useful:

"... The AFAS battery will generally manage the LRP. The LRP itself is a point on the ground chosen to permit easy access by the FARVs and rapid turn- around for the PLS and HEMTTs, which have more limited cross-country mobility. Not only does the LRP support ammunition and fuel resupply, but it also is the point of exchange for all classes of resupply actions and maintenance supporting the batteries. There will be a HEMMT tanker located at each LRP to refuel the FARVs. The location of the LRP may change rapidly depending on the tactical situation. For example, when the force is conducting an offensive operation with long moves, the LRP will frequently shift forward to reduce the travel distance between the FARV and the AFAS. In a rapidly changing situation the PLS vehicles may retain the flatracks and not drop them on the ground, this will allow the LRP to keep pace with the force. In defensive operations, the LRP may move less frequently, only moving in response to security or survivability demands. . . . Once in the LRP, the PLS normally drops its CCL [Combat Configured Load] flatrack, though it may retain the flatrack on the vehicle depending on the tactical situation. Empty flatracks will be backhauled by a PLS that has dropped its CCL at the LRP."



Figure 50.4 Logistic Resupply Point (LRP) Layout

## 50.5 Other SAFOR

It is anticipated that a number of additional SAFOR entities will be involved in DIS exercises for AFAS/FARV in ways that will require no significant changes to either the physical models or behavioral repertoire of existing ModSAF entities.

For example, exercises concerned with the self defense capabilities of AFAS and FARV SAFOR may require characteristic behaviors by enemy entities such as Mi-28 Havoc, SU-25, T72, or BMP1. Again, characteristic recovery behavior by the M88A1 entity may be required for disabled AFAS or FARV SAFOR. Finally, AFAS/FARV exercises may reasonably be expected to involve characteristic behavior of U.S. entities such as M1A1, M2, M3, US DI, OH-58D, and AH-64.

An existing ModSAF tracked vehicle, the M577, may be used for visual representation of an AFAS/FARV POC. The missions for this unit would be those previously defined for the AFAS and FARV vehicles, although the individual vehicles would operate (as described above) in the role of subordinate units to the POC.



# AFAS/FARV ROM ESTIMATES

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## **APPENDIX F**

### COSTING DATA

60. AFAS/FARV ROM ESTIMATES. This section provides the detail to support the rough order of magnitude (ROM) estimates for an Advanced Field Artillery System/Future Armored Resupply Vehicle (AFAS/FARV) Simulation System (SS) Cell. The proposed architecture, functionality, hardware, software and support tasking are derived from requirements stated in the system specifications, operational requirements documents (ORDs), and the tasks of the AFAS/FARV Feasibility Analysis Study.

The AFAS/FARV Simulation System provides a Distributed Interactive Simulation (DIS) compatible simulation cell with reconfigurable crew station simulators and table top simulators along with the support subsystems needed to allow them to function in a stand-alone DIS compatible environment. The cell provides the functionality required to support a full complement of positions which may be needed to support a full up operational exercise. The cell will be integrated with the connectivity provided by the site to provide connectivity to site resources and DIS resources over long-haul networks.

60.1 Program Management. Program Management provides for the overall direction, coordination and control to successfully meet the requirements of the AFAS/FARV Delivery Order. Program management prepares for and conducts program management reviews, design reviews, preliminary design reviews, critical design reviews, and test readiness reviews. In addition, program management establishes and coordinates program controls including cost/schedule performance management, finance, contracts, and subcontracts management.

In order to meet the AFAS/FARV objectives, the program has been conceived in a phased approach. Each phase represents a milestone for hardware/software development fidelity, providing incremental functionality to the customer so that experiments can be supported during the full life cycle of the program. Although the direct implementation of the full requirements/objectives is the most cost efficient, a phased approach supports the development and demonstration of AFAS/FARV providing appropriate points for review of the direction and requirements of the simulation program with respect to the vehicle development. Adjustment and redirection of tasking can be introduced while minimizing the additional cost to the overall program. However, the phased approach does incur additional costs for additional integration efforts and some hardware.

We have divided the program in to four phases. Figure 60.1-1 illustrates the phased approach, while Table 60.1-1 summarizes the component description of each phase.



Figure 60.1-1 AFAS/FARV Phased Approach

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PHASE	Concept	Component Description
	Phase 1 is a very basic Table Top Simulator that would physically have two	• The simulation host will be on a ONYX desk side computer. This computer will use old M1 SIMNET SW models for the
	monitors, a SINCGARS	vehicle dynamics and ballistics.
Phase 1	screens and a mouse for	<ul> <li>The ONTX will produce one OTW view.</li> <li>The A2ATD CAC2 model will be used</li> </ul>
	user interface. The	for the command and control.
	simulator would be capable	• The A2ATD SINCGARS model will be
	of moving, shooting,	used for the radio and intercom
	communication, and	• A CAU will be used to meet the DIS
	interaction with other	compliant requirements.
	simulated vehicles. A very	<ul> <li>ModSAF will be enhanced to have an</li> </ul>
	basic ModSAF will be	AFAS and a FARV with the basic
	implemented according to $A E A S / E A P V$	capabilities and performance
	specifications.	
Phase 2	The phase 2 is a low fidelity Crew Station Simulator, which will be a reconfigurable simulator with a 9 OTW viewing capability generated from a GT111. The simulator will have basic hard switches and a joy stick. A sound system will be included with no new sounds from	<ul> <li>The approach is to build off of the previously built Table Top Simulator.</li> <li>The ONYX will no longer be needed to produce imagery for the one view port.</li> <li>The GT111 will do all of the visuals with an interface to the ONYX.</li> <li>The ONYX will be equipped with an analog and digital board to handle the joy stick and miscellaneous hard switches.</li> <li>The existing SIMNET sound systems will be purchased and integrated with the other statement of the systems will be purchased and integrated with the systems will be purchased and integrated with the systems will be purchased and integrated with the systems will be purchased and integrated with the systems will be purchased and integrated with the systems will be purchased and integrated with the systems will be purchased and integrated with the systems will be purchased and integrated with the systems will be purchased and integrated with the systems will be purchased and integrated with the systems will be purchased and integrated with the systems will be purchased and integrated with the systems will be purchased and integrated with the systems will be purchased and integrated with the systems will be purchased and integrated with the systems will be purchased and integrated with the systems with the systems with the systems with the systems will be purchased and integrated with the systems with the systems with the systems with the systems with the systems with the systems with the systems with the systems with the systems with the systems with the systems with the systems with the systems with the systems with the systems with the systems with the systems with the systems with the systems with the systems with the systems with the systems with the systems with the systems with the systems with the systems with the systems with the systems with the systems with the systems with the systems with the systems with the systems with the systems with the systems with the systems with the systems with the systems with the systems with the syst</li></ul>
	the SIMNET version. ModSAF performance capabilities will be enhanced as required.	<ul> <li>ONYX. The existing sound libraries will be utilized.</li> <li>ModSAF will be enhanced to meet the increased requirements of the customer. This could be enhancing the LRP from a vehicle to a full-up vehicle depot with DI interacting.</li> </ul>

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	The phase 3 Crew Station	The approach is to build off of the
	Simulator will be the same	previously built phase 2 Crew Station
	crew station as Phase 2 but,	Simulator.
	the imagery will be	<ul> <li>The GT111 will be replaced with a Level</li> </ul>
	enhanced to a Level II CIG.	II Image Generator. All environmental
	Environmental effects will	effects will be represented.
Phase 3	be included. The vehicle	<ul> <li>The SIMNET M1 vehicle dynamics will</li> </ul>
	dynamics will be modified	be replaced with a specification model of
	to model an actual AFAS/	the AFAS/FARV.
	FARV Vehicle. The ballistic	• The SIMNET M1 ballistics model will be
	model will be changed to	replaced with a model of the Copperhead
	act like a Copperhead and	for laser guide projectiles and for indirect
	other indirect fire	fire munitions.
	munitions. The fidelity of	<ul> <li>More hard switches and knobs will be</li> </ul>
	the simulator will be	added to the face plates. The crew shell
	increased to model or help	will be enhanced to more closely replicate
	define the growing cycle of	the AFAS/FARV conceptual designs.
	the prototype vehicles.	
	The phase 4 Crew Station	The approach is to build off of the
	simulator will be a	previously built phase 3 Crew Station
Phase 4	validated simulation to	Simulator.
	either the AFAS/FARV	• Validate the vehicle dynamics model.
	specifications or the actual	This will be a test-fix-test process.
	vehicles.	• Validate the vehicle ballistics model.
		This will be a test-fix-test process.

Phase 1 represents a Table Top Simulator with limited fidelity. Phase 1 is based on existing software components from Simulation Network (SIMNET) software, Anti-Armor Advanced Technology Demonstration (A2ATD) DO, and other programs/sources integrated as a complete cell that is DIS compliant. Phase 1 provides the base platform to communicate with the outside world, i.e., the DIS environment. Stand alone components can be interfaced or ported using established and mutual interface definitions. The simulator will recognize all DIS Protocol Data Units (PDUs) through the use of a Cell Adapter Unit (CAU) and make this information available to the cell components. New software development is minimized. Characteristics and performance is modified through parameters and tables for a low fidelity simulation of an AFAS/FARV. The primary effort is in integration of the hardware and existing components. The out-the-window view is limited to one view on a large monitor that will also contain other command and control information. The table top simulator represents a single crew station position. The table top simulators will be able to play with the integrated Modular Semi-Automated Forces (ModSAF).

As an option to Phase 1, additional graphics boards and monitors can be added to represent additional crew station positions. Display priority software for control of display output and crew command/control input would have to be developed for crew coordination. The out-the-window view would remain a single view-point replicated on each out-the-window monitor.

Phase 2 develops low fidelity reconfigurable crew station simulators. Crew stations are fabricated that are modular and reconfigurable for each crew position. The crew station

position can be utilized as a stand-alone or co-located in a side-by-side arrangement for crew interaction and crew cab replication. Some software development is accomplished to integrate the multi-channel out-the-window computer image generator. Additional hardware is purchased, including a GT111 computer image generator (CIG) and a computing system. Individual points of view are made available for out-the-window display and sensor. It is assumed that the table top simulators from Phase 1 remain intact with upgraded software during Phase 2. We recommend that the GT111 be government furnished equipment (GFE) as a cost savings measure.

Phase 3 increases the functionality and fidelity of the crew station simulators developed in Phase 2. New software development is accomplished to better replicate the system fidelity and vehicle performance and provide a more robust development environment. Weapon systems fidelity is enhanced, utilizing higher fidelity ballistic models and data. A full suite of the DIS support subsystems is integrated. The Level 1 CIG is replaced with a Level II CIG supporting great entity resolution and additional environmental / battlefield effects, such as fog, haze, rain, smoke, time-of-day, illumination, etc.

Phase 4 provides the additional effort to accomplish validation and verification (V&V) of the simulator for obtaining accreditation. This effort requires documentation development, structured component testing and acceptance, and report generation to support the V&V. Additional software development is accomplished to provide a higher level of fidelity for the command and control, weapons systems, and vehicle performance, and to support the V&V tasks.

For purposes of preparing ROM estimates, a conceptual architecture and work breakdown structure were developed. Components of the AFAS/FARV Simulation System Cell are illustrated in Figure 60.1-2.



Figure 60.1-2 AFAS/FARV Simulation System Cell

From the simulation system cell, the AFAS/FARV Work Breakdown Structure (WBS) is defined. Figure 60.1.3 shows the top level structure, computer software configuration items (CSCIs), hardware configuration items (HWCIs), and supporting tasks for estimating purposes.



Figure 60.1-3 AFAS/FARV Work Breakdown Structure

Table 60.1 gives greater detail to the AFAS/FARV WBS. The elements of the WBS are used to structure the tasking, facilitate completeness and comprehension, and define estimatable tasks.

The elements of the WBS are based on experience of other Advanced Distributed Simulation Technology (ADST) DOs and simulation programs with similar functional requirements for experiment support and development. This architecture utilizes design concepts previously developed and leverages off of other DOs focused on developing infra-structure for DIS compatible simulation on local and distributed resources.

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<b>TABLE 60.1-2</b>	Work Breakdown	Structure Elements
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PARAGRAPH		WBS ELEMENT
3.1		PROGRAM MANAGEMENT
3 .1 .01		Program Management and Clerical Support
3 .1 .02		Quality Assurance Support
3 .1 .03		V&V Support
3 .1 .04		System Training Support
3 .1 .05		Facilities and Site Support
3.1.06		Finance and Contract Administration
3 .1 .07		Sub-contracts Administration
3.2		SYSTEMS ENGINEERING
3.2.01		SE Program Management and Clerical Support
	.01	Program management and clerical support
	.02	Early Systems Engineering Planning
3.2.02		Systems Engineering Process Control
	.01	Tools/Vendor Support
	.02	Metrics Assembly & Administration
	.03	Training Assembly & Course Administration
3.2.03		System Development
	.01	Program Planning
	.02	System Requirements Analysis
	.03	System Design
	.04	Configuration Item Requirements Analysis
	.05	Preliminary Design
	.06	Detailed Design
	.07	System Development
	.08	System Integration
	.09	System Acceptance Testing
· · · · · · · · · · · · · · · · · · ·	.10	System Installation
3.3		PRODUCT DEVELOPMENT ENGINEERING
3.3.01		Hardware Program management and clerical support
	.01	Program management and clerical support
	.02	Early HW Engineering Planning
3.3.02		Hardware Process Control
	.01	HW Configuration Management
	.02	Tools/Vendor Support
	.03	Training Assembly & Course Administration
3.3.03		Systems Engineering Support
	.01	HW (PRE) Support to System Analysis & Design
	.02	HW (POST) Support to System Analysis &
		Design

PARAGRAPH	WBS ELEMENT
3 .3 .04	SIM Host Computing System HWCI Development
.01	Technical Management
.02	HW Requirements Analysis
.03	HW Preliminary Design
.04	HW Detailed Design
.05	HW Assembly and Test
.06	HW Support to S/S Integration & Test
.07	HW Support to S/S Installation & Test
.08	Hardware Subcontract Management
.09	Hardware Product Training
3 .3 .05	Work Station Computing System HWCI Development
.01	Technical Management
.02	HW Requirements Analysis
.03	HW Preliminary Design
.04	HW Detailed Design
.05	HW Assembly and Test
.06	HW Support to S/S Integration & Test
.07	HW Support to S/S Installation & Test
.08	Hardware Subcontract Management
.09	Hardware Product Training
3.3.06	Session Manager Subsystem HWCI Development
.01	Technical Management
.02	HW Requirements Analysis
.03	HW Preliminary Design
.04	HW Detailed Design
.05	HW Assembly and Test
.06	HW Support to 5/5 Integration & Test
.07	Hw Support to 5/5 Installation & Test
.00	Hardware Subcontract Management
.07	Flatoware Product Training
J .J .U/	Development
.01	Technical Management
.02	HW Requirements Analysis
.03	HW Preliminary Design
.04	HW Detailed Design
.05	HW Assembly and Test
.06	HW Support to S/S Integration & Test
.07	HW Support to S/S Installation & Test
.08	Hardware Subcontract Management
.09	Hardware Product Training

## TABLE 60.1-2 Work Breakdown Structure Elements [Continued]

PARAGRAPH	WBS ELEMENT
3 .3 .08	Ops & Logistic Support Subsystem HWCI
	Development
.01	Technical Management
.02	HW Requirements Analysis
.03	HW Preliminary Design
.04	HW Detailed Design
.05	HW Assembly and Test
.06	HW Support to S/S Integration & Test
.07	HW Support to S/S Installation & Test
.08	Hardware Subcontract Management
.09	Hardware Product Training
3 .3 .09	After Action Review Subsystem HWCI Development
.01	Technical Management
.02	HW Requirements Analysis
.03	HW Preliminary Design
.04	HW Detailed Design
.05	HW Assembly and Test
.06	HW Support to S/S Integration & Test
.07	HW Support to S/S Installation & Test
.08	Hardware Subcontract Management
.09	Hardware Product Training
3 .3 .10	Mission Planning Subsystem HWCI Development
.01	Technical Management
.02	HW Requirements Analysis
.03	HW Preliminary Design
.04	HW Detailed Design
.05	HW Assembly and Test
.06	HW Support to S/S Integration & Test
.07	HW Support to S/S Installation & Test
.08	Hardware Subcontract Management
.09	Hardware Product Training
3 .3 .11	DIS LAN HWCI Development
.01	Technical Management
.02	HW Requirements Analysis
.03	HW Preliminary Design
.04	HW Detailed Design
.05	HW Assembly and Test
.06	HW Support to S/S Integration & Test
.07	HW Support to S/S Installation & Test
.08	Hardware Subcontract Management
.09	Hardware Product Training

TABLE 60.1-2 Work Breakdown Structure Elements [Continued]

## TABLE 60.1-2 Work Breakdown Structure Elements [Continued]

PARAGRAPH	WBS ELEMENT	
3 .3 .12	Gateway Interface HWCI Development	
.01	Technical Management	
.02	HW Requirements Analysis	
.03	HW Preliminary Design	
.04	HW Detailed Design	
.05	HW Assembly and Test	
.06	HW Support to S/S Integration & Test	
.07	HW Support to S/S Installation & Test	
.08	Hardware Subcontract Management	
.09	Hardware Product Training	
3 .4 .01	SOFTWARE ENGINEERING	
3 .4 .01	Software Program management and clerical support	
.01	Program management and clerical support	
.02	Early SW Engineering Planning	
3 .4 .02	Software Process Control	
.01	SW Configuration Management	
.02	Tools/Vendor Support	
.03	System/DB Administration	
.04	Metrics Assembly & Administration	
.05	Training Assembly & Course Administration	
3 .4 .03	Systems Engineering Support	
.01	SW (PRE) Support to System Analysis & Design	
.02	SW (POST) Support to System Analysis & Design	
3 .4 .04	Instructor/Operator Station Segment Development	
.01	Technical Management	
.02	SW Requirements Analysis	
.03	Preliminary Design	
.04	Detailed Design	
.05	Code & CSU Test	
.06	CSC Integration & Test	
.07	CSCI Test	
.08	Software Subcontract Management	
.09	Software Product Training	
3.4.05	Vehicle Dynamics Segment Development	
.01	lechnical Management	
.02	SW Requirements Analysis	
.03	Preliminary Design	
.04	Detailed Design	
.05	Code & CSU Test	
.06	CSC Integration & Test	
.07	CSCI Test	
.08	Software Subcontract Management	
.09	Software Product Training	

<b>TABLE 60.1-2</b>	Work Brea	kdown Structure	Elements	[Continued]
---------------------	-----------	-----------------	----------	-------------

PARAGRAPH	WBS ELEMENT
3.4.06	Vehicle Controls Segment Development
.01	Technical Management
.02	SW Requirements Analysis
.03	Preliminary Design
.04	Detailed Design
.05	Code & CSU Test
.06	CSC Integration & Test
.07	CSCI Test
.08	Software Subcontract Management
.09	Software Product Training
3 .4 .07	Propulsion Segment Development
.01	Technical Management
.02	SW Requirements Analysis
.03	Preliminary Design
.04	Detailed Design
.05	Code & CSU Test
.06	CSC Integration & Test
.07	CSCI Test
.08	Software Subcontract Management
.09	Software Product Training
3 .4 .08	Electronic Warfare Segment Development
.01	Technical Management
.02	SW Requirements Analysis
.03	Preliminary Design
.04	Detailed Design
.05	Code & CSU Test
.06	CSC Integration & Test
.07	CSCI Test
.08	Software Subcontract Management
.09	Software Product Training
3.4.09	Weapons Segment Development
.01	Technical Management
.02	SW Requirements Analysis
.03	Preliminary Design
.04	Detailed Design
.05	Code & CSU Test
.06	CSC Integration & Test
.07	CSCI Test
.08	Software Subcontract Management
.09	Software Product Training

PARAGRAPH	GRAPH WBS ELEMENT	
3 .4 .10	Navigation/Communication Segment Development	
.01	Technical Management	
.02	SW Requirements Analysis	
.03	Preliminary Design	
.04	Detailed Design	
.05	Code & CSU Test	
.06	CSC Integration & Test	
.07	CSCI Test	
.08	Software Subcontract Management	
.09	Software Product Training	
3.4.11	Physical Cues Segment Development	
.01	Technical Management	
.02	SW Requirements Analysis	
.03	Preliminary Design	
.04	Detailed Design	
.05	Code & CSU Test	
.06	CSC Integration & Test	
.07	CSCI Test	
.08	Software Subcontract Management	
.09	Software Product Training	
3 .4 .12	Environment Segment Development	
.01	Technical Management	
.02	SW Requirements Analysis	
.03	Preliminary Design	
.04	Detailed Design	
.05	Code & CSU Test	
.06	CSC Integration & Test	
.07	CSCI Test	
.08	Software Subcontract Management	
.09	Software Product Training	
3 .4 .13	Crew Station Segment Development	
.01	Technical Management	
.02	SW Requirements Analysis	
.03	Preliminary Design	
.04	Detailed Design	
.05	Code & CSU Test	
.06	CSC Integration & Test	
.07	CSCI Test	
.08	Software Subcontract Management	
.09	Software Product Training	

## TABLE 60.1-2 Work Breakdown Structure Elements [Continued]

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TABLE 60.1-2 Work B	reakdown Structure	Elements [Continued]
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PARAGRAPH	WBS ELEMENT	
3 .4 .14	Visual Segment Development	
.01	Technical Management	
.02	SW Requirements Analysis	
.03	Preliminary Design	
.04	Detailed Design	
.05	Code & CSU Test	
.06	CSC Integration & Test	
.07	CSCI Test	
.08	Software Subcontract Management	
.09	Software Product Trailing	
3 .4 .15	Session Manager Subsystem Development	
.01	Technical Management	
.02	SW Requirements Analysis	
.03	Preliminary Design	
.04	Detailed Design	
.05	Code & CSU Test	
.06	CSC Integration & Test	
.07	CSCI Test	
.08	Software Subcontract Management	
.09	Software Product Training	
3 .4 .16	Semi-Automated Forces Subsystem Development	
.01	Technical Management	
.02	SW Requirements Analysis	
.03	Preliminary Design	
.04	Detailed Design	
.05	Code & CSU Test	
.06	CSC Integration & Test	
.07	CSCI Test	
.08	Software Subcontract Management	
.09	Software Product Training	
3.4.17	Operational & Logistic Support Subsys. Development	
.01	Technical Management	
.02	SW Requirements Analysis	
.03	Preliminary Design	
.04	Detailed Design	
.05	Code & CSU Test	
.06	CSC Integration & Test	
.07	CSCI Test	
.08	Software Subcontract Management	
.09	Software Product Training	
PARAGRAPH	WBS ELEMENT	
-----------	-----------------------------------------------	
3 .4 .18	After Action Review Subsystem Development	
.01	Technical Management	
.02	SW Requirements Analysis	
.03	Preliminary Design	
.04	Detailed Design	
.05	Code & CSU Test	
.06	CSC Integration & Test	
.07	CSCI Test	
.08	Software Subcontract Management	
.09	Software Product Training	
3 .4 .19	Mission Planning Subsystem Development	
.01	Technical Management	
.02	SW Requirements Analysis	
.03	Preliminary Design	
.04	Detailed Design	
.05	Code & CSU Test	
.06	CSC Integration & Test	
.07	CSCI Test	
.08	Software Subcontract Management	
.09	Software Product Training	
3 .4 .20	Gateway Interface Development	
.01	Technical Management	
.02	SW Requirements Analysis	
.03	Preliminary Design	
.04	Detailed Design	
.05	Code & CSU Test	
.06	CSC Integration & Test	
.07	CSCITest	
.08	Software Subcontract Management	
.09	Software Product Training	
3.5	SYSTEM INTEGRATION & TEST ENGINEERING	
3.5.01	SI&TE Program management and ciercal support	
.01	Program management and ciercal support	
.02	Early Si&I Engineering Planning	
3.5.02	Si&IE Process Control	
.01	1001s/Vendor Support	
.02	Metrics Assembly & Administration	
3.5.03	Systems Engineering Support	
.01	SI&TE (PRE) Support to Sys Analysis & Design	
.02	SI&TE (POST) Support to Sys Analysis & Design	

# TABLE 60.1-2 Work Breakdown Structure Elements [Continued]

PARAGRAPH	WBS ELEMENT
3 .5 .04	System Integration & Test
.01	SI&T Preliminary Design
.02	SI&T Detailed Design
.03	HWCI & CSCI Integration into the System
.04	First Article Testing
.05	On-Site Installation and Test
3.6	EXPERIMENT SUPPORT
3 .6 .01	Experiment Program and Clerical Support
3 .6 .02	Data Collection
3 .6 .03	Data Analysis
3 .6 .04	Final Report Production
3.7	MATERIAL
3.8	TRAVEL & OTHER DIRECT COSTS
3 .8 .01	ODC
3 .8 .02	Travel

TABLE 60.1-2 Work Breakdown Structure Elements [Continued]

60.2 Systems Engineering. System Engineering provides the multi-disciplined technical focus for the AFAS/FARV project which ensures implementation of a complete technical solution within the boundaries established by the AFAS/FARV Delivery Order.

System Engineering is active throughout the entire AFAS/FARV development cycle providing a consistent system-level focus for the design and development effort. System Engineering is charged primarily with:

- Ensuring system level requirements are captured, documented, and controlled, and that traceability is maintained to design components and test procedures.
- Establishing the system level design and providing a system view oversight for design of system components.
- Overseeing development and providing system level resolution of problems as they arise.
- Controlling AFAS/FARV internal interfaces and participating with external agencies in the control of external interfaces.
- Integrating developed and acquired components into the AFAS/FARV system.
- Integrating AFAS/FARV with external DIS systems.
- Ensuring testing is comprehensive and complete at the system level.

System Engineering provides the concurrent engineering framework necessary to coordinate and support simultaneous engineering efforts within the AFAS/FARV team with those external to the AFAS/FARV team. System Engineering will be responsible for the requirements baseline including obtaining data from the valid sources, including

manufacturers, and establishing the formal design criteria baseline for this effort. System Engineering will be responsible for leading design activities and overseeing implementation to effect a phased development program. This phased development effort is built upon a "spiral" development process which significantly reduces implementation and integration risk.

The spiral development process model was originally conceived as an approach to software engineering which reconciled the formality of a linear development process model with the real-world observation that for any significant development effort, the process tends to be cyclical with early design work contributing to the refinement of requirements for later design activities. Loral Team members have successfully used this process model. It is used as the *de facto* process model on selected contractual efforts where an incremental approach has been appropriate in order to resolve uncertainties in the early part of a program.

The spiral model allows the developers to focus on problem solving and risk avoidance rather than the large scale production of documents or the production-line generation of code that often results from a linear development model. The basic version of the Spiral Development Model, illustrated in Figure 60.2, shows that the spiral cycles are represented on polar coordinates. Each of the quadrants represents a different range of activities, and a cycle is a traversal of all four quadrants, represented by a 360 degree rotation in the graph that denotes that some aspect of the product has matured by a specified amount. The angular component, w, represents progress to date; it is not uniform over time. Some parts of a cycle may require months to complete, others may require days or hours. Cycles themselves will take varying times to complete, depending on their objectives. The radial component, r, indicates cumulative project cost, increasing over the time of the cycles





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Throughout the program, the Systems Engineering team has responsibility for and the support of the following tasks:

- Requirements Management
- Requirements Baseline
- Requirements Traceability
- System Specification
- Interface Management
- Interface Standards
- Interface Control
- Design Oversight
- Task and Skills Analysis
- Selective Fidelity Analysis
- Model Verification and Validation
- Safety Analysis

The ROM estimates for System Engineering is summarized in the summary tables presented in Paragraphs 60.9.

60.3 Product Development Engineering. Product Development Engineering provides the multi-disciplined technical focus for the hardware issues. The Product Development Engineering team has responsibility for hardware specification, procurement and integration. The team will work closely with the Systems Engineering team, coordinating the hardware tasks. Using commercial-off-the-shelf (COTS) components lessens the integration risk and effort.

For estimating purposes, the AFAS/FARV Crew Station Simulator Architecture illustrated in Figure 60.3 is used as a basis for estimate, which corresponds to the Phase 4 developmental approach. The cost summary of the material is presented in the tables of paragraph 60.7.



Figure 60.3 AFAS/FARV Crew Station Simulator Architecture

The ROM estimates for Product Development Engineering is summarized in the summary tables presented in Paragraphs 60.9.

60.3.1 Phase 1 Hardware Design Approach. Phase 1 represents a Table Top Simulator with limited fidelity. Phase 1 is based on existing COTS components and essentially providing a gateway to communicate with the outside world, i.e., the DIS environment. The approach behind the building of the Table Top Simulator is to provide a stepping stone for the customer on his way to the expensive V&Ved simulation world. The primary hardware effort is in integration of the COTS components. The out-the-window view is limited to one view on a large monitor that will also contain other command and control information. The table top simulator represents a single crew station position. Multiple Table Top Simulators could be built and placed in a side-by-side configuration, providing the customer with an entire AFAS or FARV simulator. Additional graphics boards and monitors would be added to represent additional crew station positions. Display priority software for control of display output and crew command/control input would be developed for crew coordination. The out-the-window view would remain a single view-point replicated on each out-the-window monitor. The table top simulators can play with Modular Semi-Automated Forces (ModSAF) or any other DIS compatible, networked simulator

or simulation. A minimal suite of DIS support subsystems can be integrated to provide control, data collection, and review. Phase 1 has two basic options. Option 1 will contain the host computing system for driving the simulation; controlling the vehicle dynamics and ballistics; providing the out-the-window view; and controlling the user inputs and outputs. The hardware involved is the computing system; primary monitor for command and controls screens, secondary monitor for user input and output; Single Channel Ground and Airborne Radiop Systems (SINCGARS) faceplate interface; and the keyboard/mouse.

The primary monitor will be used as the user interface to the Combined Arms Command and Control (CAC2). Other command and control system could be integrated into this phase very easily if they are developed to interface with the DIS Protocol. It will also provide the out-the window view for the operator of that vehicle position. The monitor provided for the Table Top Simulator will be the same type of monitor used for the following phases. This monitor could essentially be taken out of the Table Top Simulator and placed into the crew station simulator in the phase 2 design approach.

The secondary monitor will be used as the user interface to the vehicle and mission control buttons. This monitor should be developed with a touch screen to simulate more of what the operator would actually be doing. For example, the master power switch would be on this screen and the operator could turn it 'on' by touching it on the screen. The option is to use a mouse to control the buttons on this screen. This is not as feasible as the touch screen approach because the operator would only be using a mouse instead of being more interactive with the simulation.

The SINCGARS face plates will be the user interface to the controls on the simulated SINCGARS Radio. The simulated SINCGARS Radio will have the functionality required to executed the require tasking in the simulated world. There will be two face plates simulating two radios. These simulated radios will be connected to the simulator via the simulation network. The radios will be communicating in the DIS Protocol.

The AFAS/FARV is a drive-by-wiring vehicle, which would be simulated phase 1 by the mouse. The operator would control vehicle movement by the moving the mouse forward for the throttle and reverse for braking and reverse direction. Left and right movement would control the turning direction. The Phase 1 (option 1) simulator representation is shown in figure 60.3.1-1.



Figure 60.3.1-1 Phase 1 Table Top Simulator (Option 1)

Option 2 will contain the host computing system for driving the simulation; controlling the vehicle dynamics and ballistics; providing the out-the-window view; and controlling the user inputs and outputs. The hardware involved is the computing system; primary monitor for command and controls screens, switch panel for user input and output; SINCGARS face plate interface; and the joystick.

The primary monitor and SINCGARS face plates would have the same functionality as the previous option.

The switch panel is an integrated mixture of switches from the left and right sides of the large crew monitor in the vehicle. In the vehicle the left panel of switches would control the mission specific functions and the right panel would control the vehicle specific functions. These two switch panels would be mounted together for easy of usage on the table.

The joystick will provide the user with the capability to drive the vehicle. The same joystick would be mounted in the simulator with the same functionality as the Table Top Simulator. The various buttons and controls on the joystick would all be active. The thumb transducer knob would control the cursor on the screen. The Phase 1 (option 2) simulator representation is shown in figure 60.3.1-2.



Figure 60.3.1-2 Phase 1 Table Top Simulator (Option 2)

This Table Top Simulator can also be used in the following phases of this program. The goal is to use existing software and only develop new software if it can be used in some follow-on simulator. The hardware used in the Table Top Simulator can also be used for follow-on phases. However, this is not recommended in this situation if the phased approach is selected. The hardware purchased in this phase could be used as a simulator or a development platform in following phases. Once the development of the phase 1 is completed, the following phases will require a development platform, therefore it would make most sense for the customer to leave phase 1 equipment in tact and purchase new hardware for phase 2.

This phase is also unique because the hardware could be integrated into an existing simulator crew shell (i.e. M1 or M2 SIMNET Crew Shell) and modified to act as an AFAS/FARV on the virtual environment. This is shown in figure 60.3.1-3



Figure 60.3.1-3 Table Top Hardware Integrated into Existing Simulators

This option is essentially the same as all of the others in phase 1, except that a GFE crew shell would be used instead of a table. The software that controls the displays and user interface would all be the same. The hardware interface would be designed using the

backdoor methodology. The backdoor methodology is designing the system so that it can operate as a standalone or use the simulation network (ethernet or Fiber Optic Data Distribution Interface (FDDI)) to attach to the simulator. This would allow the Table Top hardware to be installed into the crew shell and the connection to occur directly onto the simulation network without any software modifications to the interface of the existing simulator.

60.3.2 Phase 2 Hardware Design Approach. Phase 2 develops low fidelity reconfigurable crew station simulators. Crew stations are fabricated that are modular and reconfigurable for each crew position. The crew station position can be utilized as a stand-alone module or co-located in a side-by-side arrangement for crew interaction and crew cab replication. The phase 2 design using modules will allow the customer to experiment with the three or four man crew configuration. The only major software development is accomplished to integrate the multi-channel out-the-window computer image generator. Other software may include some modifications to the digital or analog input/output signals. Additional hardware is purchased, including a GT111 computer image generator (CIG) and a computing system. This CIG will support the three or four man crew configuration. Individual points of view are made available for out-the-window display and sensor. It is assumed that the table top simulators from Phase 1 remain intact with upgraded software during Phase 2. We recommend that the GT111 be government furnished equipment (GFE) as a cost savings measure.

The components of the crew station will be mounted in a fashion that will allow easy removal and relocation. This aspect is required when designing a reconfigurable simulator to allow the basic crew shell to be modified along with the of the life cycle design of the actual vehicle.

The out-the-window views will be supplied through monitors mounted on the outside of the simulator. The monitors selected must be a multisync monitor to allow for the variation of CIGs. This multisync monitor will allow the customer to upgrade the CIG from phase 2 to phase 3 and not have difficulties with the pictures not syncing on the monitors. The operator's monitors will be on a sliding rack that is mounted to the ceiling of the crew shell. The ceiling of the each module will be outfitted for the out-thehatch view. If the module is configured so that it does not need the out-the-hatch view, there will be a hard cover that fastens to the roof from the outside.

The chairs will be on a sliding rack for purposes of entry and exit, in addition to the potential of wanting the chief of section to sit in a different location. The chairs will be designed to allow the position to be locked in the front (for the gunner or driver) or in the back (for the chief of section). Any of the crew locations will be reconfigurable to allow Soldier Machine Interface (SMI) experiments to take place on the internal positioning of the crew. The joysticks will be mounted under the operator's display area and extend with an elbow pad for the operator. Each of the joysticks will be mounted for usage with the right hand but, could be reconfigured for the left hand. The top view basic design is shown in figure 60.3.2-1.



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Figure 60.3.2-2 AFAS/FARV Phase 2 Crew Station Simulator - Side View

60.3.3 Phase 3 Hardware Design Approach. Phase 3 increases the functionality and fidelity of the crew station simulators developed in Phase 2. The Level 1 CIG is replaced with a Level II CIG supporting environmental effects, smoother texturing, and higher fidelity vehicle models. In addition to the CIG upgrade, vehicle specific software is upgraded/developed to model the AFAS and FARV. For example ballistic models and vehicle dynamics will replicate actual munition characteristics and vehicle mobility attributes. Ammunition transfer operations that were based on SIMNET conventions will be realistically modeled in accordance with system specifications. The other changes include the some interface boards and keyboards for inputting information by the operator. It has also been discussed about adding a disc drive for external data that may come from the field. This type of data could be the operation orders for each day in the field. As the vehicle develops through the first 2 phases there could be some changes or modification required to the switches, knobs, or dials.

60.3.4 Phase 4 Hardware Design Approach. Phase 4 provides the additional effort to accomplish validation and verification (V&V) of the simulator for obtaining accreditation. It is anticipated that some new hardware will be required to better

replicate the actual vehicle as it grows through it's development cycle. It is ROM costed with some digital and analog (input/output) I/O boards and some miscellaneous switches and buttons.

60.4 Software Engineering. Software Engineering estimates are based on a proposed implementation of the standard Loral Software Development Process Model. This models is implemented utilizing the following constraints and objectives:

- 1) Developed software is built upon and is compatible with the existing Mod Sim design approach for manned simulators, including extensions to definitions of the sub-segment components.
- 2) Developed software functions are designed for reuse in accordance with recognized guidelines.
- 3) The Software Development Process is tailored to the specific needs of the program.
- 4) The software design represents a hierarchical approach, with the definition of objects and the mapping of the objects to the configuration item (CI) hierarchy, especially computer software configuration items (CSCIs), computer software components (CSCs), and computer software units (CSUs), as defined in DoD-STD-2167A.
- 5) CSCs are functionally tested in accordance with a series of "builds", in a "build-a-little", "test-a-little" approach that maps directly to a standard spiral model approach.
- 6) The software development process emphasizes an "Open Approach" that minimizes the development or use of proprietary software, except for commercial-off-the-shelf (COTS) components.

For purposes of this ROM, it is assumed that most of the development is done in-house. Databases are government furnished information (GFI). The predominant language of the existing code will be the development language. From our initial survey, the predominant language is a form of "C". We also assume that a relatively full suite of documentation is required to support experiment planning and preparation.

For purposes of this ROM, we have assumed that Phase 4 will be completed. Additional effort incurred due to the phased approach for integration and delay of certain software development, testing and documentation are presented in the cost summary tables of paragraph 60.9. Direct implementation of Phase 4 is the most cost efficient approach.

60.4.1 Software Estimation Process. The estimates for a ROM cost of the AFAS/FARV software development and support are made using the Loral Western

Development Laboratories (WDL) Software Estimation Process. This process was developed and is maintained by the Loral-WDL Division Software Technology Department. The process is described in the Loral-WDL Software Estimation Process Handbook.

The Loral-WDL Engineering Process Handbook defines the processes necessary for a structured approach to engineering. One of these processes is the Development of Software Size, Cost, and Schedule Estimates. The Loral-WDL Software Estimation Process Handbook defines a formal, repeatable procedure for generating and reviewing software size, cost, and schedule estimates. This handbook captures our experiences and is the basis for ongoing process improvement. The process is based on learning from mistakes and institutionalizing our successes.

Before software sizing and costing can begin, the nature, extent and scope of the software project must be determined. The customer's requirements documents will provide most of this information, e.g., Request for Proposal, Statement of Work, Operations Concept, etc. The key areas to investigate include (1) required functions to be performed by software, (2) specific deliverables, (3) extent of "user friendly", "self-diagnosing", or "fault-tolerant", or other requirements that would impact the development effort, and (4) number and types of customer involvement, including in-progress review, technical interchange meetings, major reviews, etc.

Once this is done, the system/software engineering team must allocate functions to hardware, software and user operations. After the team has allocated functions, and the functions allocated to software are understood, the estimation input activities are started. A software architecture is identified, and functions are allocated to the components of the architecture, including CSCIs, CSCs, and CSUs. A complete list of all deliverables to be costed is created and documented. A WBS is agreed upon, consistent with MIL-HDBK-WBS.SW and MIL-STD-881B. The Loral-WDL standard software WBS is consistent with the standard. Every attempt is made to map the CSCI structure onto the WBS structure.

With these inputs, software engineering can start the estimation process. The classification and sizing of code is a function of several different conditions. What is expected and/or acceptable to the customer. Is Ada required? What code is available for code type and size comparisons, and possible reuse? What code is government furnished? What software development methodology is to be used?

The code is classified as new code, modified code, and display code. Code sizing is estimated on display count and lines of code (LOC). Cost factors are analyzed and applied to the process. Historical data is analyzed for productivity rates, site requirements, and labor mix.

From this data, detailed costs and schedules are generated. A spreadsheet has been developed for the process using macros to generate this information. The process can rapidly respond to changes in date through the established links to input spreadsheets

of data and factors. The resulting information is reviewed by the engineering team and management. The process outputs software decomposition and LOC summary, software cost, schedule and resource summary, basis of estimates, and data for System Evaluation and Estimation of Resources (SEER) model runs and risk analysis.

The process creates a consistent quality approach to generating ROMs. It can be tailored for the specific program, and amended as new data or design decisions become available.

60.4.2 Objectives. The AFAS/FARV software shall be designed using a modular open architecture. The software shall be reconfigurable, reusable, DIS compliant, interoperable and "V&V-able". Common software objects and common DIS infra-structure components will be used to the maximum extent possible, along with common hardware components. The software design shall strive for high reuse of existing models, especially validated models and data. COTS development tools will be used. Table driven models shall be used to increase the flexibility and robustness of the software for experimentation. On-line parametric modification shall be available to the instructor/operator. This capability enhances the real-time response for software model modification during run-time.

**60.4.3 Software Architecture.** The software architecture for the AFAS/FARV Simulation System Cell centers around the FDDI local area network (LAN). All components are interfaced to the LAN and communicate using protocol packets. The LAN is also connected to the Defense Simulation Internet (DSI) via a gateway. The components attached to the LAN are basically of two types: 1) the crew station simulators and table top simulators, and 2) the DIS subsystems.

60.4.4 Crew Station Simulators. The crew station simulators and table top simulators software architecture's are based on the Mod Sim architecture developed by a tri-services program to reduce simulator development schedules and cost. The architecture promotes systematic reuse of software and hardware. The architecture defines a modular, reusable simulator architecture using a well-defined standardized communication interface. The interface provides the coordination between the loosely coupled segments, while standardization eliminated the need for proprietary interfaces and their associated costs. The architecture does not dictate hardware.

The Mod Sim architecture defines twelve segments. The radar segment is not used in the AFAS/FARV architecture. The names of the segments have been changed to reflect the nature of the AFAS/FARV as a ground vehicle. Segments can be allocated to a single processor or computing system, or grouped. A group of segments is referred to as a module. One segment does all communication with the outside world, the environment segment. This segment connects to the outside world via a FDDI LAN accepting protocol packets, including DIS Protocol Distribution Units (PDUs).

The central feature of the Modular Simulator (Mod Sim) System architecture is the virtual network. The virtual network is a mechanism for communication between segments using a message passing protocol. Each of the segments is connected to a virtual network by a network interface unit. The interface units send and receive messages providing the communication between segments required to execute the simulation. The Mod Sim virtual network has been carefully defined to be independent of specific hardware implementation. This concept provides the ability to scale the concept to both high end and low end applications and is adaptable to advances in hardware technology. The virtual network can be a physical connection, a back-plane, or shared memory.

The table top simulators shall use the same software components as the crew station simulators. The build files determine the software functionality available to the table top simulators. The table top simulators are assumed to provide a limited suite of functionality to the user, i.e., no full out-the-window presentation, limited sensors, etc.



Figure 60.4.4-1 AFAS/FARV Crew Station Simulator Software Segments

AFAS/FARV segments have been grouped into three modules: 1) the Simulation Systems Module (SSM), 2) the Crew Station Module (CSM), and 3) the Visual System Module (VSM). These modules and respective segments were grouped based on the functionality of the software, computational size, physical hardware allocation, and

**Control Support** 

Mode Control

State Control

Modification Control Synchronization

Parameter

Timina

Thermal Viewer

Single ton Spacence

1.11

relationship of message packets. Figures 60.4.2 and 60.4.3 illustrate the segment allocation to the modules.



Intercom

Antennae

**Digital Map Control** 

GPS

IFF

Transmission

Track Drives

Induction -

Exhaust

Cooling

# Figure 60.4.4-2 AFAS/FARV Simulation Systems Module

Software components are replaceable at the segment and subsegment level. The interface definition must be maintained. This allows functional model replacement with higher or lower complexity without disrupting the integrity of the remaining segments and subsegments.



## Figure 60.4.4-3 AFAS/FARV Crew Station Module and Visual System Module

Each segment is treated as a software CSCI. The eleven segments of the AFAS/FARV are described in the following paragraphs.

**60.4.4.1** Instructor/Operator Station Segment. The Instructor/Operator Station (IOS) provides the interface between the instructor or operator and the simulation. It includes the central control of the simulator. Sub-segment functions include mode control, state control, parameter modification control, synchronization, and timing.

For software estimation purposes, the IOS segment is referred to as CSCI #1. Lines-ofcode (LOC) estimates for CSCI #1 are summarized in Table 60.4.4.1. The estimates are based on previous development from the Advanced Rotary Wing Aircraft (ARWA) DO and from implementations at the Aviation Test Bed (AVTB), Fort Rucker, AL, and the Mounted Warfare Test Bed (MWTB), Fort Knox, KY.

UNITS	SOURCE Count (LOC/Displays)	CSCI #1	CSCI #2	CSCI #3	CSCI #4
New	New Application Code	6,727	279	70	335
LOC	<ul> <li>Non-Delivered Code</li> </ul>				
	Added Code	0	0	0	0
Modified	Changed Code	0	817	817	817
	Deleted Code	0	0	0	0
LOC	Unmodified Code	0	783	783	783
	Ported Code	0	279	0	0
	<ul> <li>COTS Integration Code</li> </ul>				
	• GUI (Displays)	3	1	0	1
Displays	<ul> <li>4GL (Displays)</li> </ul>				
	<ul> <li>Prototype GUI (Displays)</li> </ul>				

## Table 60.4.4.1 Software LOC for CSCIs #1 through #4

60.4.4.2 Vehicle Dynamics Segment. The Vehicle Dynamics includes the simulation of the vehicle including equations of motion and generation of the vehicles state vector. Sub-segment functions include vehicle forces, moments, equations of motion, and mass properties.

For software estimation purposes, the Vehicle Dynamics Segment is referred to as CSCI #2. Lines-of-code estimates for CSCI #2 are summarized in Table 60.4.4.1. The estimates are based on previous development from Simulation Network (SIMNET) models and from model implementations at the AVTB and MWTB.

60.4.4.3 Vehicle Controls Segment. The Vehicle Controls includes the simulation of the controls such as the steering yoke and brakes, and the associated components. Sub-segment functions include primary controls and brake system.

For software estimation purposes, the Vehicle Controls Segment is referred to as CSCI #3. Lines-of-code estimates for CSCI #3 are summarized in Table 60.4.4.1. The estimates are based on previous development from the SIMNET models and from implementations at the AVTB and MWTB.

60.4.4.4 Propulsion Segment. The Propulsion includes the simulation of the engine, powertrain, and associated subsystems. Sub-segment functions include engine and power generation, power train transmission, track drives, induction-exhaust system, and cooling systems.

For software estimation purposes, the Propulsion Segment is referred to as CSCI #4. Lines-of-code estimates for CSCI #4 are summarized in Table 60.4.4.1. The estimates are based on previous development experience and from implementations at the AVTB and MWTB.

60.4.4.5 Electronic Warfare Segment. The Electronic Warfare includes the simulation of the vehicle sensors and survivability systems. Sub-segment functions include Vehicle Integrated Defense System (VIDS), thermal sensor, and optics.

For software estimation purposes, the Electronic Warfare Segment is referred to as CSCI #5. Lines-of-code estimates for CSCI #5 are summarized in Table 60.4.4.5. The estimates are based on previous development from the ARWA DO, the VIDS DO, and from implementations at the AVTB and MWTB.

UNITS	SOURCE Count (LOC/Displays)	CSCI #5	CSCI #6	CSCI #7	CSCI #8
New	New Application Code	0	170	955	270
LOC	Non-Delivered Code				
	Added Code	3,000	388	6,247	0
Modified	Changed Code	3,717	817	2,033	817
	Deleted Code	5,000	0	1,500	0
LOC	Unmodified Code	717	783	35,567	783
	Ported Code	2,967	450	36,730	0
	COTS Integration Code				
	• GUI (Displays)	18	2	33	0
Displays	• 4GL (Displays)				
- +	<ul> <li>Prototype GUI (Displays)</li> </ul>				

## Table 60.4.4.5 Software LOC for CSCIs #5 through #8

60.4.4.6 Weapons Segment. The Weapons includes the simulation of the vehicle weapon systems and weapons. Sub-segment functions include ammo management, storage, auto handling system, armament fire control, oil management, liquid propellant (LP) management, and weapon dynamics and ballistics.

For software estimation purposes, the Weapons Segment is referred to as CSCI #6. Lines-of-code estimates for CSCI #6 are summarized in Table 60.4.4.5. The estimates are based on previous development from the ARWA DO and from implementations at the AVTB and MWTB.

## 60.4.4.7 Navigation/Communication Segment.

The Navigation/Communication includes the simulation of the vehicle navigation and communication systems such as radios and positioning, including the message handling. Sub-segment functions include Advanced Field Artillery Tactical Data System (AFATDS), Single Channel Ground and Airborne Radio Systems (SINCGARS), Intercom, global positioning system (GPS), digital map control, antennae, and Identification, Friend or Foe (IFF) System.

For software estimation purposes, the Navigation/Communication Segment is referred to as CSCI #7. Lines-of-code estimates for CSCI #7 are summarized in Table 60.4.4.5.

The estimates are based on previous development from the ARWA DO,  $A^2$  ATD DO, and from implementations at the AVTB and MWTB.

60.4.4.8 Physical Cues Segment. The Physical Cues includes the simulation of the motion and environmental sound cueing. Sub-segment functions include environmental sounds vibrations, vehicle system tones and warnings, and digital voice communications.

For software estimation purposes, the Physical Cues Segment is referred to as CSCI #8. Lines-of-code estimates for CSCI #8 are summarized in Table 60.4.4.5. The estimates are based on previous development from the ARWA DO and from implementations at the AVTB and MWTB.

60.4.4.9 Environment Segment. The Environment provides simulation of the natural environment, an interface to the FDDI LAN and tactical network environment. Sub-segment functions include atmosphere model, database management, entity handlers, DIS interface, and vehicle weapon update, and players database management.

For software estimation purposes, the Environment Segment is referred to as CSCI #9. Lines-of-code estimates for CSCI #9 are summarized in Table 60.4.4.9. The estimates are based on previous development from the ARWA DO and from implementations at the AVTB and MWTB.

UNITS	SOURCE Count (LOC/Displays)	CSCI #9	CSCI	CSA	TOTAL
			#10	#11	S
New	New Application Code	42,167	290	5,000	56,263
LOC	Non-Delivered Code				0
	Added Code	640	102	10,000	20,376
Modified	Changed Code	817	817	5,817	17,283
	Deleted Code	0	0	25,000	31,500
LOC	Unmodified Code	783	983	35,783	77,750
	Ported Code	1,220	60	0	41,706
	COTS Integration Code				0
	• GUI (Displays)	0	3	0	61
Displays	• 4GL (Displays)				0
	• Prototype GUI (Displays)				0

Table 60.4.4.9 Software LOC for CSCIs #9 through #11 and Total LOC

**60.4.4.10** Crew Station Segment. The Crew Station includes the physical crew positions(s), physical representation and instrumentation along with simulation of standard vehicle systems such as electrical power, fuel, and hydraulics. Sub-segment functions include Vetronics, fire extinguishing system, cockpit input/output (I/O), fuel system, environmental controls, fuel management, water system, boom management system, display control, and digital map display.

For software estimation purposes, the Crew Station Segment is referred to as CSCI #60. Lines-of-code estimates for CSCI #10 are summarized in Table 60.4.4.9. The estimates are based on previous development from the ARWA DO and from implementations at the AVTB and MWTB.

60.4.4.11 Visual Segment. The Visual includes the generation and display of out the window images, sensors, and optics. The database is assumed to be Government Furnished Information (GFI). Sub-segment functions include database, out-the-window display, entity models, special effects, and line-of-sight (LOS).

For software estimation purposes, the Visual Segment is referred to as CSCI #11. Lines of-code estimates for CSCI #11 are summarized in Table 60.4.4.9. The estimates are based on previous development from the ARWA DO and from implementations at the AVTB and MWTB.

60.4.5 DIS Subsystem Components. The Distributed Interactive Simulation (DIS) initiative focuses on implementation of a far ranging standards based environment for interactive simulation. When fully implemented, DIS compatible simulation assets are utilized in small to large simulation sessions involving geographically dispersed and dissimilar simulators capable of inter-operating on a "level playing fields". Multiple sessions, involving players in diverse locations may be in progress simultaneously.

The ADST Battlefield Distributed Simulation - Developmental (BDS-D) DO is responsible for the development and maintenance of the DIS Subsystem components. These components are assumed to be functional when required by the schedule and to meet the requirements of the AFAS/FARV experiments. ROM estimates are not given for these items except for modifications to the Modular Semi-Automated Forces (ModSAF) for AFAS/FARV functionality. Other modifications to subsystems, such as data logging requirements, on-line parameter modification, etc., are assumed to be minor in nature and usually accomplished with new tabular data. This type of modification has to be estimated on a base by base criteria depending on the data collection requirement.

Each DIS Subsystem component is treated as a CSCI.

60.4.5.1 Session Manager Subsystem. A Session Manager Subsystem performs BDS-D session management functions including allocation and initialization of simulation entities. The Session Manager is a BDS-D Architecture DO effort and is implemented on a COTS workstation.

60.4.5.2 Semi-Automated Forces Subsystem. ModSAF development is currently being conducted via two separate, but tightly intertwined, Delivery Orders --ModSAF Upgrades and ModSAF System Development. The objectives of both ModSAF Delivery Orders are to replace the previously fielded SAF systems used for research and

development; to ensure all requirements for Computer Generated Forces (CGF) at the BDS-D sites in support of Simulation Training and Instrumentation Command (STRICOM) projects are completed; and to provide the infrastructure to support Advanced Research Projects Agency research initiatives in the future.

ModSAF is an open architecture, modular software system that encourages users to extend and modify the system to support their applications. ModSAF is object-based, dividing the world into distinct objects whose activities are simulated individually. The architecture supports composing these objects from layers of sub-objects. Generic interfaces are defined to allow components in the same family to be interchanged. All the simulated entities are data-driven so that parameters of components, as well as the components comprising the entity, can be modified at runtime.

Behaviors are controlled by group tasks that execute concurrently and translate the entity's mission and sensor inputs into commands for the entity's physical actuators that generate movement, shooting, and communication.

The software architecture implements both behavioral tasks and physical systems as modules with strictly defined public interfaces. This architecture provides users with exceptional flexibility.

The ModSAF architecture divides its functions into three components: the ModSAF data logger or SAF-logger, which records the time evolution of the virtual battlefield; the ModSAF command workstation or SAF station; and the ModSAF simulator or SAF sim. The SAF station allows a user to monitor and control ModSAF forces, to set up exercises, and to plan missions. The SAF station does no simulation; it simply places requests for entities to be simulated and orders to be executed. The SAF sim accepts these requests and simulates the entities carrying out their orders. This division of labor is opportunistic, since it allows the use of different sources to generate entity missions. Different workstations, Artificial Intelligence (AI) programs, and even other SAF sims can generate orders for the SAF sim to execute.

ModSAF is hosted on a COTS workstations. ModSAF is able to operate with both the SIMNET and DIS protocol data sets, in order to meet the current training needs of the U.S. Army, and the requirements for DIS exercises now and in the future.

Modifications for the ModSAF are estimated in the following tables and a summary is presented in the tables of paragraph 60.9. ModSAF is implemented in Phase 1 with icons and basic behaviors. Each additional phase adds optional behaviors. We have not defined the optional behaviors. The estimates are based on historical data and experience in adding new models and behaviors.

ModSAF is assumed to be "V&V"-ed under the A2ATD DO. The AFAS and FARV entities would "V&V"-ed during Phase 4 under this DO.

Table 60.4.5.2-1 presents the cost summary for initially implementing AFAS and FARV models to the ModSAF entities. Icons and basic behaviors are added along with the appropriate documentation. The integration of the ModSAF subsystem is accomplished in Phase 1.

Phase One				
Item #	# Tasking	ROM Cost		
1	AFAS Model and Documentation	\$9,113		
2	FARV Model and Documentation	\$9,113		
3	LRP use HEMTT Model	· <b>\$</b> 0		
4	AFAS Icon	\$1,036		
5	FARV Icon	\$1,036		
	AFAS Old Behaviors			
6	Move	\$2,071		
7	Communicate	\$2,071		
8	Survive	\$2,071		
9	Digital Communication	\$2,071		
10	Inter-Vehicular Communication	\$2,071		
11	Attack Targets	\$2,071		
12	Plan Routes	\$2,071		
13	Follow Routes	\$2,071		
14	Determine Rationale to Run	\$2,071		
15	Conduct Fire Mission	\$2,071		
	FARV Old Behaviors			
16	Move	\$2 071		
17	Communicate	\$2,071		
18	Survive	\$2,071		
19	Tactical Move	\$2,071		
20	Digital Communication	\$2,071		
21	Inter-Vehicular Communication	\$2,071		
22	Resupply	\$2,071		
23	Recovery	\$2,071		
24	Plan Route	\$2,071		
25	Follow Route	\$2,071		
26	Determine Rationale to Run	\$2,071		
	Phase One: Total ROM Costing	<b>\$63,793</b>		

## Table 60.4.5.2-1 Phase 1 ModSAF Cost Summary

	Phase Two				
Item #	Tasking	ROM Cost			
1	LRP Design and Dev. w/Basic	\$31,615			
	Behaviors				
	AFAS Behaviors	•			
2	Behavior #1	\$4,142			
3	Behavior #2	\$4,142			
4	Behavior #3	\$5,058			
5	Behavior #4	\$5,058			
6	Behavior #5	\$5,058			
7	Behavior #6	\$5,058			
	FARV Behaviors				
8	Behavior #1	\$4,142			
9	Behavior #2	\$4,142			
10	Behavior #3	\$5,058			
11	Behavior #4	\$5,058			
12	Behavior #5	\$5,058			
13	Behavior #6	\$5,058			
Pha	se Two: Delta ROM Costing	\$88,652			
Pha	Phase Two: Total ROM Costing \$152,445				

# Table 60.4.5.2-2 Phase 2 ModSAF Cost Summary

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Table 60.4.5.2-3 presents the cost summary for adding six additional behaviors each to the AFAS and FARV ModSAF entities in Phase 3. The delta cost from Phase 2 is included in the table with the accumulative costs through Phase 3.

	Phase Three				
Item #	Tasking	ROM Cost			
	AFAS Behaviors				
1	Behavior #7	\$4,142			
2	Behavior #8	\$4,142			
3	Behavior #9	\$4,142			
4	Behavior #10	\$5,058			
5	Behavior #11	\$5,058			
6	Behavior #12	\$5,058			
	FARV Behaviors				
1	Behavior #7	\$4,142			
2	Behavior #8	\$4,142			
3	Behavior #9	\$4,142			
4	Behavior #10	\$5,058			
5	Behavior #11	\$5,058			
6	Behavior #12	\$5,058			
Phase	Three: Delta ROM Costing	\$55,205			
Phase	Phase Three: Total ROM Costing \$207,650				

## Table 60.4.5.2-3 Phase 3 ModSAF Cost Summary

Table 60.4.5.2-4 presents the cost summary for adding six additional behaviors for the AFAS simulation and two additional behaviors for the FARV simulation. The delta cost from Phase 3 is included in the table with the accumulative costs through Phase 4.

	Phase Four	
Item #	Tasking	ROM Cost
	AFAS Behaviors	
1	Behavior #13	\$4,142
2	Behavior #14	\$4,142
3	Behavior #15	\$5,058
4	Behavior #16	\$5,058
5	Behavior #17	\$5,058
6	Behavior #18	\$5,058
	FARV Behaviors	
7	Behavior #13	\$4,142
8	Behavior #14	\$5,058
Phase	Four: Delta ROM Costing	\$37,719
Phase	Four: Total ROM Costing	\$245,369

Table 60.4.5.2-4	Phase 4	4 ModSAF	Cost	Summary
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60.4.5.3 Operational and Logistic Support Subsystem. An Operational and Logistics Support Subsystem is a windowed COTS workstation environment allowing any or all tactical and logistical positions to be filled from a single workstation, or distributed across multiple workstations. This subsystem allows human inter-action during the exercise representing comm/net decisions for these functions.

60.4.5.4 After Action Review Subsystem. The After Action Review Subsystem provides the ability to capture and store PDUs during an exercise and play them back utilizing a commercial workstation and a mixture of COTS, developmental and non-developmental software. This workstation provides a large capacity disk storage capability for data logging and PDU playback. A single channel computer image generator (CIG) out-the-window view is provided for viewing the simulated battiefield and environment. A graphic user interface provides user friendly controls.

60.4.5.5 Mission Planning Subsystem. The Mission Planning Subsystem is an implementation of a preplanning workstation for crew mission planning activities, and exercise planning and development. The subsystem is hosted on COTS hardware.

60.4.5.6 Gateway Interface. The Gateway Interface provides an FDDI local area network (LAN) and Cell Adapter Unit (CAU). The network provides connection between the AFAS/FARV simulation system elements and the CAU to other DIS cells and resources. The CAU performs protocol translation as required to ensure inter-

operability. The FDDI network is readily available as COTS products, and the CAU is implemented on a COTS workstation with a software package developed by the BDS-D Architecture DO.

## 60.4.6 Software Development ROM Estimate Summary.

Table 60.4.6 summarizes the Software Development ROM Estimate.

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	SOFTWARE LABOR (SDR-FQT)	
	• Total LOE & Product Development Hrs	92,278
SW	- Admin & Clerical	3,723
LOE	-CM	5,897
Hrs	- Software QA	2,865
4	- Metrics	2,158
	- Tools, ADP, Process Eng	3,184
	- Technical Management	6,562
	- S/W Req. Analysis	4,832
Product	- Preliminary Design	13,079
Develop	- Detailed Design	16,247
Hrs	- Code & CSU Testing	14,262
	- CSC Int & Test	11,049
	- CSCI Test	8,421
K\$	ODC	\$68
	• TDY/Travel	\$58
	• Misc	\$10
K\$	CAPITAL (not additive)	\$1,184
	• SW Dev. Environment	\$650
	Hardware/Install	
	<ul> <li>S/W Licenses and Installation</li> </ul>	\$534
	• Facilities	<b>\$</b> 0
	Maintenance	\$0
K\$	TOTAL COST FOR SOFTWARE	\$5,904
	LABOR (SDR thru FQT)	\$4,807
	ODC (SDR thru FQT)	\$68
	Software Support Labor	\$1,030
K\$	CAPITAL	\$1,184
Mths	SCHEDULE (SDR thru CSCI FQT)	18
EqH	Peak Software Staff	71
Туре	Predominant Code Type	New C
Support	Support Hours	19,767
Hrs	- Software Subcontractor Management	6,645
	- Pre SDR Support	1,208
	- System Integration Support	11,909
EaH	Software Maintenance Staff	5

## Table 60.4.6 Software Development ROM Estimate

60.5 Systems Integration & Test Engineering. The AFAS/FARV SS integration and test program minimizes the time spent at the site by completing integration in the Loral Orlando Software Development Facility (SDF).

For estimating purposes, Loral proposes an incremental and progressive approach to system integration and test which builds up the full AFAS/FARV SS by successive additions of capabilities, this eliminating risks inherent in a single big-bang approach to system integration. The crew station simulators and support subsystems are brought into the integration activity according to a plan developed to effectively and efficiently resolve integration issues as each component is added to the system. The test program takes advantage of functional and performance testing carried out at the subsystem level to allow system testing to concentrate on system level requirements. At the end of system integration, the acceptance test procedures will be executed against the completely integrated AFAS/FARV SS to verify the system is ready for site installation and the final execution of the system acceptance test.

System Integration of the AFAS/FARV Simulation System takes place in an orderly incremental fashion providing increased functionality with each integration step. Implementation of the AFAS/FARV Simulation System involves bringing together a number of components in a comprehensive DIS compatible environment. Some of the components exist now or will exist in the near future as a result of other development efforts outside of the AFAS/FARV DO. Other components are being designed and developed on the AFAS/FARV project. In order to minimize cost and schedule risk associated with integrating all of these components an incremental approach to integration is established where a base is established and then other architectural components are added incrementally in a phased approach. Each additional architectural component brings with it added functionality, so that when the last component has been added, the system is complete.

Incremental integration of AFAS/FARV subsystems will be thought through to provide a plan which progressively builds up system capability. The plan would take into consideration the functionality each subsystem adds to the overall AFAS/FARV SS. The integration activity will staged in Orlando, and centered on adding increasingly more capabilities to the AFAS/FARV simulator on the integration floor.

If a phased approach is implemented, the following phases will have to be implemented at the hosting site location. The efforts involved in the phased approach are greater than the direct approach due to the additional integration required at the sites. The integration is minimal with the direct approach. The increased cost due to the additional integration is reflected in the summary cost presented in paragraphs 60.9.

Loral would coordinate facility upgrade needs with site personnel, and would actively participate in the site activation program. When System Integration is complete in Orlando, the Acceptance Test procedures would be dry run on the system to verify that the system is ready to ship, and a ship readiness review would be conducted with

STRICOM. Upon receiving permission to ship the system, the AFAS/FARV SS will be torn down, packed and shipped to the site. Upon arrival at the site, the system would be unpacked, reassembled, and checked out. A brief site integration activity would be conducted to verify readiness. Once this has been completed the entire Acceptance Test would be dry ran to verify that the system is ready for formal acceptance testing.

Experiment Support. The experiments are broken down into 4 phases 60.6 corresponding to the simulation development phases listed previously. There are 20 experiment categories listed for each phase of experiments. These categories are the recommended testing areas that can be achieved using the DIS architecture in the virtual simulation. The second column shown in each of the tables is a ranking of whether or not that experiment category could be tested in that simulation development phase. The column will have a "Y", "N", or a "P". The "Y" is signifying 'yes', that simulation can be used to fully test the entire capabilities of that experiment category. The "N" is signifying that simulation can not be used to test the capabilities of that experiment category and you must wait until the next development phase is achieved. The "P" is signifying that simulation could partially test the capabilities of that experiment category. In the third column, there will be comments explaining each of the responses (Y, N, or P) in column two. The results in column two could change depending on the actual development level reached in each phase. For instance, phase 2 could include some of phase 3 capabilities. This will depend on the customer's priorities, goals, and timelines. Therefore, the responses in column two are derived from the proposed development cycle and have the potential of changing at a later date. It should also be known that the design and development of the simulator strongly depends on the experiments that the customer would like to accomplish.

60.6.1 Experiment ROM Costing. The methodology used to determine the cost of each experiment depends on three criteria. This method considers DIS PDUs, video and audio data. Each of these categories are run through some developed algorithms that will calculate the number of hours required to bring each of these categories of data to an analysis stage. The analysis stage is the point where all three of these categories are equivalent (i.e. comparing apples to apples). At this point, the total number of hours is multiplied by a factor to determine how much time is required to develop the final report. The experiment ROM cost estimate is one estimate that will vary more then any other. There are many factors involved in developing the cost estimate and any one variable has a major impact in the cost. For example, considering the video reduction, it's estimated that every one hour of video tape will take four hours to reduce this data. But, if the information that you're interested in is the initial detection of a threat, this might only take the first 5 minutes of the video tape to find. The cost estimates that are summarized in section 6.9 are broken into phased and direct approaches. The phased approach will be less then the direct approach because the set-up time for the Measures of Performances (MOPs) might have been completed in the previous phase. The direct approach assumes that the set-up for data reduction has not taken place.

60.6.1.1 DIS PDU Data Collection. The collection of DIS PDUs is accomplished through the use of a Data Logger. This logger will collect every PDU on

the network and store them on some media (i.e. magnetic tape, hard disc, etc.). Once the Data Logger has stored this information, it can replay the entire exercise including all events that took place during the live exercise. This stored data file is then run through a data reduction routine which will separate the PDUs and reformat them into correlated tables. These tables are then analyzed to answer the MOPs and Measures of Effectiveness (MOEs) that were developed by the customer. The table output is at the analysis stage that needs to be correlated with the other two categories.

60.6.1.2 Video Data Collection. The collection of video data is accomplished through the use of video cassette recorders (VCRs), video converters, video multiplexers, and video encoder / decoders. The VCR will ultimately contain all of the video data. The types of video data that could be collected are video from the Chief of Section's view; the sensor view; any out-the-window view; AFATDS map view; camera view of the crew; or camera view of joysticks. The view is determined once the desired data to be collected (i.e. SMI) is determined. The video data reduction is a long process that requires every video tape to be reviewed and metrics collected from each. The metrics collected are put into table format and then prepared for the analysis stage.

60.6.1.3 Audio Data Collection. The collection of audio data is accomplished through the use of VCR's and audio mixers. The VCR will ultimately contain all of the audio data. This data can potentially be stored on the same tape as the video depending on the quantity of audio channels desired to be analyzed. The types of audio data that could be collected are communications from the Chief of Section to the outside world (radio communication) or the Chief of Section to others inside the vehicle (intercom). The intercom data would contain all member inside the vehicle. The audio data reduction is a long process that requires every VCR tape to be reviewed and metrics collected from each. The metrics collected are put into table format and then prepared for the analysis stage.

60.6.2 Phase 1 Experiments. As previously discussed, phase 1 is a very basic Table Top Simulator that could have two monitors, a SINCGARS radio face plate, touch screens and a mouse for user interface depending on the option selected in phase 1. The simulator would be capable of moving, shooting, resuppling, digital communication, and interaction with other simulated vehicles. This phase would integrate software developed under the existing SIMNET simulation devices. The phase 1 simulation would be able to transfer fuel and ammunition with the same characteristics as simulation in the existing SIMNET simulators. This is accomplished by getting within 100 feet of the resupply vehicle and the transfer begins once the simulators have been placed in their proper modes. The vehicle dynamics of the AFAS and FARV simulators will be modeled after the M1 SIMNET simulators. The ballistics of the artillery will be modeled after the existing artillery models in the SIMNET simulation. All of the parameters could be modified to closely resemble the parameters of the AFAS and FARV.

A very basic ModSAF will be implemented according to the AFAS/FARV specifications. The basic existing behaviors will be implemented into ModSAF. These

include movement, shooting, communicating and resuppling. Other new behaviors are proposed to be added in the follow-on phases. Table 60.6.1 lists the experiment categories and whether the experiment can be executed or not.

Phase 1 ROM experiment cost is \$58,905. These costs are summarized in section 60.9

	PDUs		Video		Audio
# of MOEs	0	# of Views	0	# of channels	2
# of MOPs	35	# of Runs	20	# of Runs	20
Subtotal	35	Subtotal	0	Subtotal	40
PDU Set-up Time	63	Video Factor	4	Audio Factor	2
Reduction Time	<b>4</b> 0	<b>Reduction Time</b>	0	Reduction Time	80
Analysis Time	140	Analysis Time	0.	Analysis Time	20
Subtotal		Subtotal		Subtotal	
Analysis Time	243	Analysis Time	0	Analysis Time	100

## Table 60.6.2-1 Phase 1 Experiment Evaluation

### Table 60.6.2-2 Phase 1 Experiments

Phase			
<b>Experimentation Categories</b>	1	Comments	
Command, Control, and Communications	P	The C3 will be implemented into the simulation with the capabilities of the CAC2 being developed for the A2ATD Project. These capabilities include; overlays, contact rpt., spot rpt., call for fire, sit rpt., adjust fire, position and ID rpts. Further capabilities will be included in phase 3, which will include the full operational AFATDS. This may be included in phase 1 if there is a DIS compatible software package currently developed.	
AFAS primary armament	P	The primary armament can be tested with the flyouts of the old SIMNET simulation and the parameters modified after the AFAS. The ballistic algorithms will not be fully accurate because they will be modeled after the M109s from the SIMNET simulations.	
Secondary armament	N	The secondary armaments will not be implemented in phase 1.	
Decision aids: RSOP, SD, FMP, SUST, MM, ET	Y	The decision aids should be able to be tested, pending the delivery of decision aids that are DIS compatible. These test should be run throughout all of the phases to understand how the fidelity helps or hurts the operator when using the decision aids.	
Sensor assets to support SD, i.e., FLIR, video, other	Р	There will be one out-the-window view that can be tested. This will only be a video type view. Phase 2 will add IR canabilities	

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Countermeasure suite	P	The capabilities developed under the ADST Vehicle Integrated Defense System (VIDS) could be implemented onto phase 1. This is very limited until the level 2 CIG gets integrated
Firing position parameters	P	The parameters to be measured are ranges, firing from various slopes, number of rounds fired, and location of detonation. These can be tested but, the results should not be considered valid until a V,V&Aed model is inputted.
Ammunition capacity	Y	The capacity of ammunition that the AFAS and FARV can hold could be tested in phase 1. This test should also be repeated in phase 4 for a V,V&Aed solution.
Docking c perations	P	Docking in this phase will be very minimal. It would have to take place considering a closed or degraded operation because there will only be one out-the-window view. The models and the resolution will be a low fidelity until phase 3 is achieved.
Ammunition transfer operations	P	There will be the capability to transfer fuel and ammunition. This transfer will match the capabilities of the SIMNET simulations. The timing parameters could be modified to resemble the AFAS, FARV and LRP but, the data collected should not be considered valid until V,V& A has been achieved in phase 4.
LRP operations	P	In phase 1, there will be a Heavy Expandable Mobile Tactical Truck (HEMTT) that will provide all ammunition and fuel resupply. Therefore, the entire LRP will not be simulated but, some testing can take place.
Degraded operations	P	The simulator will contain degraded visuals due to only one out-the-window; communication and uploading/downloading can also be degraded. Various other systems could be degraded to help consider options to evaluate in the degraded mode. The testing will be very limited and is recommend that in depth testing wait until phase 3.
Crew size	N	It would be very difficult to obtain accurate MOPs or MOEs with Table Top Simulators when considering crew size. Phase 2 is a minimum and phase 3 is recommended.
Crew MOPP levels	P	It could be completed with a Table Top Simulators by comparing the time it takes to operate in level 1 compared to level 4. It is recommended that this test begin in phase 2 when a simulator crew shell is built.

Phase		
<b>Experimentation Categories</b>	1	Comments
Crew position intra/intervisibility	N	It would be very difficult to obtain accurate MOPs or MOEs with Table Top Simulators when considering crew position intra/intervisibility. Phase 2 is a minimum and phase 3 is recommended.
Crew environment	N	It would be very difficult to obtain accurate MOPs or MOEs with Table Top Simulators when considering crew environment. Phase 2 is a minimum and phase 3 is recommended.
System safety	Р	The only portion of system safety that could be tested is the audio tone that come from the radio. Further testing is needed in phase 2.
Vehicle mobility	Р	Some of the soldier machine interface functions could be tested on the joystick for driving the simulator. Different types of joysticks for driving the simulator could be tested. The vehicle performance characteristics could not be tested in this phase.
Auxiliary power	Р	Very basic test could be run on the length of time the operator needs power before a critical point is reached. These test can be varied many ways but, the data should not be considered valid until V,V&A has been achieved.
Interoperability	P	The simulator will be able to interoperate with other simulators and simulations but, these interoperabilities are from the SIMINET Simulations. It is recommended that the test that are critical wait until phase 3.

## Table 60.6.2-3 Phase 1 Experiments [Continued]

**60.6.3** Phase 2 Experiments. Phase 2 simulation will take the development efforts accomplished in phase 1 and integrate a GT111 CIG. This CIG will provide up to 9 out-the-window channels. Individual points of view are made available for out-the-window display and sensor. Phase 2 simulation also includes the development of a low fidelity reconfigurable crew station simulator. The crew stations are fabricated with a modular and reconfigurable design for each crew position. The crew station position can be utilized as a stand-alone or co-located in a side-by-side arrangement for crew interaction and crew cab replication. The simulation will stay very much the same as phase 1 except for the additional out-the-window views and the crew shell to house the operators.

ModSAF will be enhance with a fully operational LRP. This includes the variety of vehicles that would normally reside at an LRP. The AFAS and FARV will be upgraded with new behaviors each.

Phase 2 direct approach ROM experiment cost is \$137,224. Phase 2 phased approach ROM experiment cost is \$131,869. These costs are summarized in section 60.9

	PDUs		Video		Audio
# of MOEs	0	# of Views	4	# of channels	2
# of MOPs	68	# of Runs	20	# of Runs	20
Subtotal	68	Subtotal	80	Subtotal	40
PDU Set-up Time	59.4	Video Factor	4	Audio Factor	2
<b>Reduction</b> Time	40	<b>Reduction</b> Time	320	<b>Reduction Time</b>	80
Analysis Time	272	Analysis Time	80	Analysis Time	20
Subtotal		Subtotal		Subtotal	
Analysis Time	371.4	Analysis Time	400	Analysis Time	100

## Table 60.6.3-1 Phase 2 Experiment Evaluation

## Table 60.6.3-2 Phase 2 Experiments

Phase			
<b>Experimentation Categories</b>	2	Comments	
Command, Control, and Communications	Р	No real change from phase 1. The C3 will be implemented into the simulation with the capabilities of the CAC2 being developed for the A2ATD Project. These capabilities include; overlays, contact rpt., spot rpt., call for fire, sit rpt., adjust fire, position and ID rpts. Further capabilities will be included in phase 3, which will include the full operational AFATDS. This may be included in phase 2 if there is a DIS compatible software package currently developed.	
AFAS primary armament	P	The primary armament can be tested with the flyouts of the old SIMNET simulation and the parameters modified after the AFAS. The direct fire can be tested in this phase. The ballistic algorithms will still not be fully accurate because they will be modeled after the M109s from the SIMNET simulations.	
Secondary armament	N	The secondary armaments will not be implemented in phase 2.	
Decision aids: RSOP, SD, FMP, SUST, MM, ET	Y	Same test as phase 1. These test should be run throughout all of the phases to understand how the fidelity/type of the simulator helps or hurts the operator when using the decision aids.	
Sensor assets to support SD, i.e., FLIR, video, other	P	There will be an IR sensor view integrated in this phase. This will allow more testing then phase 1. The total view in this phase include 5 out-the-windows, 3 Television (TV) views, and 1 sensor view.	
Countermeasure suite	Р	The same test as phase 1. Need a level 2 CIG for further testing.	
Firing position parameters	P	The same test as phase 1.	

Ammunition capacity	Y	This test should be repeated in both phase 3 and 4 for V,V&Aed solution.	
Docking operations	P	More testing could take place due to the additional out- the-window views. The models and the resolution will still be a low fidelity until phase 3 is achieved.	
Ammunition transfer operations	Р	Same as phase 1. Further testing should wait until V,V& A has been achieved in phase 4.	
LRP operations	Р	In phase 2, there will be a fully operational LRP implemented into ModSAF but the AFAS and FARV will still be using the transfer models of the SIMNET simulation. Testing should continued in the follow-on phases.	

# Table 60.6.3-2 Phase 2 Experiments [Continued]

	Phase	
<b>Experimentation Categories</b>	2	Comments
Degraded operations	P	Very similar to phase 1. The simulator will contain degraded visuals due to only one out-the-window; communication and uploading / downloading can also be degraded. Various other systems could be degraded to help consider options to evaluate in the degraded mode. The testing will be limited and is recommend that in depth testing wait until phase 3.
Crew size	Ŷ	Crew size could be tested very well in this phase. The crew modules will be fabricated to allow different crew configurations.
Crew MOPP levels	Ŷ	Crew MOPP level could be tested very well in phase 2. The crew shell will be fabricated with reconfiguration in mind and the component can be moved around to measure the impact to the operators with various levels of MOPP.
Crew position intra/intervisibility	Y	Crew position intra/intervisibility could be tested very well in phase 2. The crew modules will be fabricated to allow different crew configurations to measure the impact to the Chief of Section's view with various positioning and different crew locations.
Crew environment	Y	Phase 2 would support testing on the crew environment. This involves the measurement of crew tasking and load during various operations. These could be accomplished with the crew shell developed in phase 2.
System safety	Ŷ	The audio portion of this was began in phase 1, phase 2 could expand on this with the addition of lights and gauges built into the simulator crew shell.
Vehicle mobility	Р	Very similar to phase 1. The only major difference is the driver will now have a full out-the-window view. The vehicle performance characteristics could not be tested in this phase.
Auxiliary power	Р	Same as phase 1. These test can be varied many ways but, the data should not be considered valid until V,V&A has been achieved.
Interoperability	Р	Same as phase 1. It is recommended that the test that are critical wait until phase 3.
**60.6.4 Phase 3 Experiments.** Phase 3 increases the functionality and fidelity of the crew station simulators developed in Phase 2. New software development is accomplished to better replicate the system fidelity and vehicle performance and provide a more robust development environment. Weapon systems fidelity is enhanced, utilizing higher fidelity ballistic models and data. A full suite of the DIS support subsystems is integrated. The Level 1 CIG is replaced with a Level II CIG supporting additional environmental effects.

ModSAF will be upgrade with additional new behaviors over phase 2.

Phase 3 direct approach ROM experiment cost is \$200,345. Phase 3 phased approach ROM experiment cost is \$189,941. These costs are summarized in section 60.9

	PDUs		Video		Audio
# of MOEs	0	# of Views	4	# of channels	2
# of MOPs	115	# of Runs	20	# of Runs	20
Subtotal	115	Subtotal	80	Subtotal	40
PDU Set-up Time	84.6	Video Factor	4	Audio Factor	2
Reduction Time	40	<b>Reduction Time</b>	320	Reduction Time	80
Analysis Time	460	Analysis Time	80	Analysis Time	20
Subtotal		Subtotal		Subtotal	
Analysis Time	584.6	Analysis Time	400	Analysis Time	100

#### Table 60.6.4-1 Phase 3 Experiment Evaluation

#### Table 60.6.4-2 Phase 3 Experiments

]	Phase							
Experimentation Categories	3	Comments						
Command, Control, and Communications	Y	AFATDS will be fully functional.						
AFAS primary armament	Y	The primary armament will now use the ballistic algorithms that the AFAS has defined. The actual flyouts and all ammunition types will be implemented. These test should also be repeated in phase 4 for a V,V&Aed solution.						
Secondary armament	Y	The secondary armaments will now be implemented and can be run through any variety of tests. These test should also be repeated in phase 4 for a V,V&Aed solution.						
Decision aids: RSOP, SD, FMP, SUST, MM, ET	Y	Any new decisions aids can be tested. We anticipate that new decision aids will be implemented in every phase. These test should be run throughout all of the phases to understand how the fidelity/type of the simulator helps or hurts the operator when using the decision aids.						

•

Sensor assets to support SD, i.e., FLIR, video, other	Y	There will be a new IR sensor view and out-the-window views integrated in this phase. This will allow more testing then phase 1 or 2. All of the environmental effects (i.e. fog, haze, rain, day, night, etc.) will be included. The smoke models for a degraded battle field will be included.
Countermeasure suite	Y	All countermeasures will implemented in this phase. The environmental and smoke models are includes by the integration of the level 2 CIG, this will allow any countermeasure testing to occur.
Firing position parameters	Y	The vehicle dynamics and model will be upgrade as the new CIG is integrated. This show enhance the testing of the firing position parameters.
Ammunition capacity	Y	Continue testing from phase 1 & 2. These test should also be repeated in phase 4 for a V,V&Aed solution.
Docking operations	Ŷ	All testing could take place due to the additional out-the- window views and the high resolution CIG. The models and the resolution will now be a higher fidelity allowing better resolution in the docking operations.

	Phase							
<b>Experimentation Categories</b>	3	Comments						
Ammunition transfer	Y	The transfer models will now be modeled after the AFAS						
operations		and FARV specifications allowing more accurate testing						
-		to be completed. These test should also be repeated in						
		phase 4 for a V,V&Aed solution.						
LRP operations	Y	In phase 2, there will be a fully operational LRP						
		implemented into ModSAF. Phase 3 will include the						
		transfer models from the AFAS and FARV specifications						
		allowing more accurate testing to be completed. That will						
		provide capabilities to resupply ammunition and fuel.						
		The uploading and downloading timings could be varied						
		to run a wide variety of test. lesting should continue in						
		phase 4 with V, V&Aed models.						
Degraded operations	Y	All of the models included in phase 5 for the AFAS and FADV will be derived from the AFAS and FADV						
		FARV will be derived from the AFAS and FARV						
		specifications, therefore the testing of degraded operation						
1		the operators would choose to function while some of						
		their systems have failed. Testing should continue in						
		nhase 4 with V V&Aed models						
Crew size	Y	Continue testing from phase 2. The crew modules will be						
	•	fabricated to allow different crew configurations.						
Crew MOPP levels	Y	Continue the same testing as phase 2.						
Crew position	Y	Continue the same testing as phase 2.						
intra/intervisibility		<b>U</b> 1						
Crew environment	Ŷ	Continue the same testing as phase 2.						
System safety	Y	Continue the same testing as phase 2.						
Vehicle mobility	Y	The vehicle performance characteristics could be tested in						
		this phase. All of the AFAS/FARV vehicle dynamics will						
		be correctly modeled after the AFAS and FARV						
		specification.						
Auxiliary power	Y	All of the models included in phase 3 for the AFAS and						
		FARV will be derived from the AFAS and FARV						
		specifications, therefore the testing of different auxiliary						
		power sources could be achieved.						
Interoperability	Y	All of the models included in phase 3 for the AFAS and						
1		FARV will be derived from the AFAS and FARV						
]		specifications and with the level 2 CIG, the						
		interoperability testing could be achieved more						
		accurately.						

#### Table 60.6.4-2 Phase 3 Experiments [Continued]

60.6.5 Phase 4 Experiments. Phase 4 provides the additional effort to accomplish validation and verification (V&V) of the simulator for obtaining accreditation. This effort requires documentation development, structured component testing and acceptance, and report generation to support the V&V. Additional software development is accomplished to provide a higher level of fidelity for the command and control, weapons systems, and vehicle performance, and to support the V&V tasks.

Phase 4 direct approach ROM experiment cost is \$200,345. Phase 4 phased approach ROM experiment cost is \$200,345. These costs are summarized in section 60.9

	PDUs		Video		Audio
# of MOEs	0	# of Views	4	# of channels	2
# of MOPs	115	# of Runs	20	# of Runs	20
Subtotal	115	Subtotal	80	Subtotal	40
PDU Set-up Time	207	Video Factor	4	Audic Factor	2
<b>Reduction Time</b>	40	<b>Reduction Time</b>	320	Reduction Time	80
Analysis Time	460	Analysis Time	80	Analysis Time	20
Subtotal		Subtotal		Subtotal	
Analysis Time	707	Analysis Time	400	Analysis Time	100

## Table 60.6.5-1 Phase 4 Experiment Evaluation

## Table 60.6.5-2 Phase 4 Experiments

	Phase	
<b>Experimentation Categories</b>	4	Comments
Command, Control, and	Y	All vehicle performance models, algorithms and ballistic
Communications		solutions will be V,V&Aed. Therefore, the test results are
		fully valid.
AFAS primary armament	Y	ti
Secondary armament	Ŷ	#
Decision aids: RSOP, SD, FMP, SUST, MM, ET	Y	~
Sensor assets to support SD, i.e., FLIR, video, other	Y	"
Countermeasure suite	Y	M
Firing position parameters	Y	66
Ammunition capacity	Y	17
Docking operations	Y	11
Ammunition transfer	Y	H
I RP operations	V	11
Degraded operations	Ŷ	n
Crew size	Y	10
Crew MOPP levels	Y	<b>e</b>
Crew position	Y	•
intra/intervisibility		
Crew environment	Y	*
System safety	Y	**
Vehicle mobility	Y	H.
Auxiliary power	Y	R
Interoperability	Y	*

**60.7 Material.** The hardware equipment and material is detailed in the following tables. The hardware and material is arranged by development phase. The hardware and material requirements are dependent upon the purchase and integration of all hardware and material of the current and previous development phases. The only exception is the Level I CIG purchased in Phase 2. If development begins with Phase 3, the GT111 is not purchased. If development is started at Phase 2 or lower, the Level I CIG is purchased, and then shelved when development moves into Phase 3. It is recommended that the Level I CIG for Phase 2 be government furnished equipment (GFE). GFE GT111s should be available from the A²ATD DO following the upgrade of the M1A2 devices at the MWTB to Level II CIGs.

It is assumed that the hardware and materials for the Table Top Simulators in Phase 1 are not used for the Crew Station Simulators. Dedicated equipment and hardware for the Crew Station Simulators is purchased starting in Phase 2.

Table 60.7-1 summarizes the material for Phase 1 development of the table top simulator.

Table 60.7-1	Phase 1 Material	Summary	for the Table	<b>Top Simulator</b>
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COMPONEN	SUB	TASKING	SOURCE	ROM	SUB	TOTAL
Т	COMPONENT			COST	TOTAL	COST
ONYX	Computer/IG	CPU & Visuals	SGI	\$210 K		
	2nd Monitor	User Interface	SGI	\$2 K		
	Development	Development	SGI	\$40 K		
	SŴ	Environment				
	Graphics Board	Second Monitor	SGI	\$2 K		
	Audio Board	Intercom & Radio	A2ATD	\$2 K		
			Purchase			
	2-Touch Screen	Drive the Touch	AZATD	\$8 K		
	& Board	Screen	Purchase	AM 1/2		
	FDDI Board	Network Interface	AZAID	\$/ K -	\$2/1 K	
			Furchase			:
SINCGARS	Face Plate	User Interface	A2ATD	\$5 K		
DITCORIO	I ace I late		Purchase	<i>40</i> IC		
	Digital I/O	Controlling Switches	A2ATD	\$2 K		
	Board		Purchase			
1	Head Set &	User Interface	Engineerin	\$1 K	\$8 K	\$278 K
	Misc. HW		g Est.			
OPTIONS						
COMPONEN	SUB	TASKING	SOURCE	ROM	SUB	TOTAL
T	COMPONENT			COST	IUIAL	CUST
Joy Stick	Joy Stick	Driving Simulator	Measurem ent Sys	\$10 K		
1	Mount	Holding Joy Stick	Engineerin	\$1 K	\$11 K	
	4120 Wall	1010116,00,000	g Est.		•	
			0			
ONYX	Digital I/O	<b>Controlling Switches</b>	Engineerin	\$2 K		
	Board	0	g Est.			
	Analog Input	Reading Joy Stick	Engineerin	\$2 K	\$4 K	
	Board	Outputs	g Est.			
		· · · · ·	<b>.</b>	A. T.C.		
Switch Panel	Key Pad	Numerical Inputs	Engineerin	\$1 K		
	Duch Duttoma	Distant I Termontes	g Est. Engineerin	¢1 K		
[	rush buttons	Digital inputs	o Fet	ΨI K		
	Panel / Mount	Holding Switches	Engineerin	\$1 K	\$2 K	\$17 K
ľ	- manua / warvalle		g Est.	¥		<b>* *</b> -
			0 -		For	\$50 K
					Three	
					Crew	
8					Stations	

COMPONEN	SUB	TASKING	SOURCE	ROM	SUB	TOTAL
T	COMPONENT			COST	TOTAL	COST
3 Crew Stations	Large High Res. Monitor	Graphics Display	SGI	\$4 K		
	Large High Res. Monitor	Graphics Display	SGI	\$4 K		
	2 - Graphics Boards	Communications w/Monitor	SGI	\$6 K		
				<i>.</i> .	For Three Crew Stations	\$14 K
	-					
			TOTAL R COST	OM MAT	TERIAL SE 1	\$342 K

## Table 60.7-1 Phase 1 Material Summary for the Table Top Simulator [Continued]

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Table 60.7-2 summarizes the material for Phase 2 development of the crew station simulator.

COMPONEN	SUB	TASKING	SOURCE	ROM	SUB	TOTAL
T	COMPONENT			COST	TOTAL	COST
ONYX	Computer	CPU	SGI	\$210 K		
	Development	Development	SGI	\$40 K		
	SŴ	Environment				
	Graphics Board	Second Monitor	SGI	\$2 K		
	Graphics Board	Third Monitor	SGI	\$2 K		
	Touch Screen	Drive the Touch	A2ATD	\$2 K		
	Board	Screen	Purchase	-		
	Touch Screen	Drive the Touch	A2ATD	\$2 K		
	Board	Screen	Purchase			-
	Touch Screen	Drive the Touch	A2ATD	\$2 K		
	Board	Screen	Purchase			
	Audio Board	Intercom & Radio	A2ATD	\$2 K		
			Purchase			
	Digital I/O	Controlling Switches	Engineerin	\$2 K		
	Board	<b>o</b> . <b>m o</b>	_ g Est.	AD 1/		
	Digital I/O	Controlling Switches	Engineerin	\$2 K		
	Board	Des line Tem Offele	g Est.	60 V		
	Analog input	Reading Joy Stick	Engineerin	92 K		
	Board Tabler Not	Curputs	g Est.	\$0 V		
	Ether Net		Engineerin	72 N		
	EDDI Board	W/IG Notwork Interface	A 2 A TT	\$7 K	\$277 K	
	rDDi boalu	INCLUOIR INCLIACE	Purchase	φ/ K	<i>ф611</i> р.	
CT111 CIC	Image	Create Visuals	LADS-	\$250 K		
	Generator	Cicule Vibuub	Bellevue	<b>4100</b> X1		
	SW and	Operational	LADS-	\$50 K	\$300 K	
	Licenses	•F	Bellevue		<b>.</b>	
Crew Station	3 - Crew Shells	Frame of Individual	Engineerin	\$200 K		
		Units	g Est.			
	3 - Chairs	Crew Seating	Engineerin g Est.	\$1 K		
	5-Multisync Color Monitor	OTW Viewing	Sony	\$15 K		

## Table 60.7-2 Phase 2 Material Summary for the Crew Station Simulator

COMPONEN	SUB	TASKING	SOURCE	ROM	SUB	TOTAL
Т	COMPONENT			COST	TOTAL	COST
-	1-Multisync	CoS OTW Viewing	Sony	\$2 K		
	Color Monitor	·	·			
	3 - Power	Driving Misc. I/O	Engineerin	\$1 K		
	Supplies	-	g Est.			
	Cabling and	Dressing and	Engineerin	\$1 K		
	Mounting HW	Cleanup	g Est.			
	3 - 19" Color	Crew Operators	SGI	\$9 K		
	Monitors					
	3 - 19" Touch	Crew User Interface	A2ATD	\$6 K	\$235 K	
	Screens		Purchase			
SINCGARS	Face Plate	User Interface	A2ATD	\$5 K		
			Purchase			1
	Digital I/O	Controlling Switches	A2ATD	\$2 K		
	Board		Purchase			
	Head Set &	User Interface	Engineerin	\$1 K	\$8 K	
	Misc. HW		g Est.			
Sound System	Computer	CPU	Perceptron	\$14 K		
	Amplifiers	Sound Boosting	Engineerin g Est.	\$2 K		

Table 60.7-2 Phase 2 Material Summary for the Crew Station Simulator [Continued]

## Table 60.7-2 Phase 2 Material Summary for the Crew Station Simulator [Continued]

COMPONEN	SUB	TASKING	SOURCE	ROM	SUB	TOTAL
Т	COMPONENT			COST	TOTAL	COST
	Speakers	Outputting Sound	Engineerin g Est.	\$2 K	\$18 K	
User Inputs	3 - Joy Sticks	Driving Simulator	Measurem ent Sys.	\$30 K		
	3 - Key Pads	Numerical Inputs	Engineerin g Est.	\$2 K		
	3 - Sets of Push Buttons	Digital Inputs	Engineerin g Est.	\$2 K		
	3 - Left Panel / Mount	Holding Switches	Engineerin g Est.	\$2 K		
	3 - Right Panel / Mount	Holding Switches	Engineerin g Est.	\$2 K		
	3 - Head Set & Misc. HW	User Interface	Engineerin g Est.	\$2 K	\$40 K	
			TOTAL R COST	\$876 K		

Table 60.7-3 summarizes the material for Phase 3 for the enhancement of the crew station simulators. This includes an upgrade to a Level II CIG.

COMPONEN	SUB	TASKING	SOURCE	ROM	SUB	TOTAL
Т	COMPONENT			COST	TOTAL	COST
ONYX	I/F Board	Interface to Key Board	SGI	\$2 K		
	I/F Board	Interface to Key Board	SGI	\$2 K		
	Digital I/O Board	Controlling Switches	Engineerin g Est.	\$2 K	\$6 K	
ONYX CIG	Image Generator	Create Visuals	LADS- Bellevue	\$644 K		
	SW and Licenses	Operational	LADS- Bellevue	\$100 K	\$744 K	
Crew Station	Key Board Key Board	Key Board Input Key Board Input	SGI SGI	\$2 K \$2 K		
	Disc Drive Misc. Switches	Crew Data Inputs User Interface	SGI Engineerin g Est.	\$4 K \$1 K	\$9 K	
			ROM MAT UPGRA	ERIAL CO DE TO PH	OST FOR IASE 3	\$759 K

Table 60.7-3 Phase 3 Material Summary for the Crew Station Simulator Upgrade

Table 60.7-4 summarizes the material for Phase 4 enhancements.

# Table 60.7-4 Phase 4 Material Summary for the VV&A Crew Station Simulator Enhancement

COMPONEN	SUB	TASKING	SOURCE	ROM	SUB TOTAL	TOTAL
ONYX	Digital I/O	Controlling Switches	Engineerin	\$2 K	TOTAL	031
	Board		g Est.	<b>60</b> 7/	<b>*</b> 4 <b>*</b> 7	
	Analog Input Board	Reading Joy Stick Outputs	e Est.	\$2 K	\$4 K	
Switch Panel	Key Pad	Numerical Inputs	Engineerin g Est.	\$1 K		
	Push Buttons	Digital Inputs	Engineerin g Est.	\$1 K		
	Panel / Mount	Holding Switches	Engineerin g Est.	\$1 K	\$2 K	\$6 K
ł				<u></u>		
			COST	FOR PHA	SE 1	<b>\$6 K</b>

60.8 Travel & Other Direct Costs. Travel costs are estimated on the basis of approximately \$1500 for each trip per person. This figure includes an estimated \$1000 for airfare and \$500 for room, meals, and transportation for two and one half days. Based on 24 months of total program, we estimate one trip a month for program management, 18 trips for technical meetings, 8 day trips each for Progress Design Review (PDR) and Critical Design Review (CDR), and 18 trips for integration, data collection, and acceptance.

Other direct costs (ODC) includes reproduction, postage, shipping, and miscellaneous costs not included under labor, materials, or travel.

The travel and other direct costs are summarized in the tables in paragraph 60.9.

60.9 Program Cost Summary. The following paragraphs summarize the estimated ROM costs for the AFAS/FARV program. Each table presents a summary for a specific phase along with a delta cost and total costs. The direct cost is an accumulative cost and includes a savings over the phased cost because some additional effort such as integration and material are not required. The phased cost reflects an incremental phased program with delayed software development tasks, additional integration tasks and hardware that is replaced in later phases.

A labor summary is presented in paragraph 60.9.4. The labor summary assumes a direct approach to Phase 4.

**60.9.1 Phase 1 Summary.** Table 60.9.1 summarizes the program cost for Phase 1 implementation of the table top simulators. Also included are options for expanding the number of crew stations available while retaining a single view point.

Item	Description	Cost	Options	Comment
1	Labor	\$450,000	\$455,000	PM, SW Dvlpmt, HW Dvlpmt, Sys. Eng., Exp. Support
2	Materials (* See Note)	\$278,000	\$341,500	One View Image Generator, User I/O Monitor, SINCGARS
3	ModSAF Development	\$53,793	\$63,793	Supply AFAS/FARV Models and Basic Behaviors
4	Experiments	\$58,905	\$58,905	Test Ops/Dev, Data Analysis & Final Rpt.
5	Travel	\$15,000	\$15,000	This travel covers all areas of the AFAS/FARV development
6	Other Direct Cost	\$1,000	\$1,000	ODC are the Misc. items that occur during the length of the project
	·			
	Subtotal Experiment	\$866,698	\$935,198	<ul> <li>This cost is for the purchase of the required material for the upgraded version of the</li> </ul>
	G&A:	\$4,767	\$5,144	Table Top Simulator. It includes the ONYX computer, joy stick, hard switches, and
	Fee (10%):	\$87,146	\$94,034	the SINCGARS Radio.
	Total Program ROM Cost:	\$958,611	\$1,034,376	
		· · · · · · · · · · · · · · · · · · ·	22.0	

## Table 60.9.1 Phase 1 - Table Top Simulator Cost Summary

**60.9.2 Phase 2 Summary.** Table 60.9.2 summarizes the program cost for Phase 2 implementation of the crew station simulators.

		Direct	Delta	Phased	
Item	Description	Cost	Cost	Cost	Comment
1	Labor	\$1,600,00 0	N/A	\$1,760,00 0	PM, SW Dvlpmt, HW Dvlpmt, Sys. Eng., Exp. Support
2	Materials (* See Note)	\$876,400	N/A	\$1,1 <b>54,4</b> 0 0	Build Crew Stations and Incorporate GT111 Image Generator
3	ModSAF Development	\$152,445	\$88,652	\$152,445	Add LRP Models and Behaviors & more Behaviors for AFAS/FARV
4	Experiments	\$137,224	N/A	\$131,869	Test Ops/Dev, Data Analysis & Final Rpt.
5	Travel	\$55,000	\$40,000	\$55,000	This travel covers all areas of the AFAS/FARV development
6	Other Direct Cost	\$6,000	\$5,000	\$6,000	ODC are the Misc. items that occur during the length of the project
					This cost is for the contracted the reported material for these relevance work Wernafigurable
	Subtotal Experiment Cost:	\$2,827,06 9	N/A	\$3,259,71 4	Come Station Simulator, Mora Doces the ONDA computer of CITULE C.P. Saturs, narri, switches and the SINICE ARS Radio This cost assumes the
	G&A:	\$15,549	N/A	\$17,928	that no other hardwate as available of meriously purchased.
	Fee (10%):	\$284,262	N/A	\$327,764	
	Total Program ROM Cost:	\$3,126,87 9	N/A	\$3,605,40 6	
3541	Same Contract	N 12 2 74			

## Table 60.9.2 Phase 2 - Crew Station Simulator Cost Summary

**60.9.3 Phase 3 Summary.** Table 60.9.3 summarizes the program cost for Phase 3 implementation with upgrades of fidelity and integration of a Level II CIG.

		Direct	Delta	Phased	
Item	Description	Cost	Cost	Cost	Comment
1	Labor	\$5,000,00 0	N/A	\$6,160,00 0	PM, SW Dvlpmt, HW Dvlpmt, Sys. Eng., Exp. Support
2	Materials	\$1,335,40 0	\$759,000	\$1,913,40 0	Enhanced Internal Components, Level II IG
3	ModSAF Development	\$207,650	\$55,205	\$207,650	Add more Behaviors for AFAS/FARV
4	Experiments	\$200,345	N/A	\$189,941	Test Ops/Dev, Data Analysis & Final Rpt.
3	Travel	\$85,000	\$30,000	\$85,000	This travel covers all areas of the AFAS/FARV development
6	Other Direct Cost	\$11,000	\$5,000	\$11,000	ODC are the Misc. items that occur during the length of the project
	A Carl	المناجع المح	<b>**</b> ********	San tanàn amin'ny faritr'o amin'ny faritr'o amin'ny faritr'o amin'ny faritr'o amin'ny faritr'o amin'ny faritr'o	
	Subtotal Experiment Cost:	\$6,839,39 5	N/A	\$8,566,99 1	
	G&A:	\$37,617	N/A	\$47,118	
	Fee (10%):	\$687,701	N/A	\$861,411	
	Total Program ROM Cost:	\$7,564,71 2	N/A	\$9,475,52 0	
24252	Contraction .	u Standa		Quat ie.	

#### Table 60.9.3 Phase 3 - Enhanced IG Crew Station Simulator Cost Summary

60.9.4 Phase 4 Summary. Table 60.9.4-1 summarizes the program cost for Phase 4 implementation with additional upgrades for fidelity and a V&V effort.

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## Table 60.9.4-1 Phase 4 - VV&A: Crew Station Simulator Cost Summary

		Direct	Delta	Phased	
Item	Description	Cost	Cost	Cost	Comment
1	Labor	<b>\$7,030,37</b> 5	N/A	\$8,692,000	PM, SW Dvlpmt, HW Dvlpmt, Sys. Eng., Exp. Support
2	Materials	\$1,341,40 0	\$6,000	\$1,919,400	Misc. HW Components for Upgrades
3	ModSAF Development	\$245,369	\$37,719	\$245,369	Add more Behaviors for AFAS/FARV
4	Experiments	\$200,345	N/A	\$200,345	Test Ops/Dev, Data Analysis & Final Rpt.
5	Travel	\$115,000	\$30,000	\$115,000	This travel covers all areas of the AFAS/FARV development
6	Other Direct Cost	\$16,000	\$5,000	\$16,000	ODC are the Misc. items that occur during the length of the project
<b>.</b>	en ( <b>A</b> tser, 199	Mi dana	r star 2	1. A. A.	
	Subtotal Experiment Cost:	\$8,948,48 8	N/A	\$11,188,11 4	
	G&A:	\$49,217	N/A	\$61,535	
	Fee (10%):	\$899,771	N/A	\$1,124,965	
	Total Program ROM Cost:	\$9 <mark>,897,47</mark> 6	N/A	\$12,374,61 3	
	Well's series	<b>4</b>		e gote ( <b>Ø</b> l-	

Table 60.9.4-2 presents an assumed period of performance for a Phase 4 direct approach.

Task	Schedule: For ROM Purposes	Period of Perf.
3.1	Program Management	mon 1 - mon 24
3.2	Systems Engineering	mon 1 - mon 18
3.3	Product Development	mon 2 - mon 12
3.4	Software Engineering	mon 2 - mon 15
3.5	Systems Integration & Test Engineering	môn 11 - môn 18
3.6	Experiment Support	mon 17 - mon 24

## Table 60.9.4-2 AFAS/FARV Assumed Period of Performance

Table 60.9.4-3 presents the labor summary for a Phase 4 direct approach in more detail for each WBS element.

3.1 Program Management		ROM Cos
DO Manager		\$280,593
Quality Assurance		\$0
System Training		\$16,570
Facilities and Site Support		\$0
Administrative Support		\$9,058
Clerical		\$4,959
	Subtotal:	\$311,180
3.2 Systems Engineering	•	ROM Cos
Lead Engineer		\$281,257
V&V Plan Development		\$49,709
V,V&A Specialist		\$70,314
Systems Development		\$66,898
Administrative Support		\$12,961
Clerical		\$8,563
	Subtotal:	\$401,280
3.3 Product Development	[	ROM Co
Crew Station Design		\$46,890
I/O Interface Design		\$8,285
Hardware Procurement		\$9,394
Systems Engineering Support		\$29,970
Crew Station Development		\$0
Administrative Support		\$4,017
Clerical		\$2,654
	Subtotal:	\$101,210
	T	ROM Cos
3.4 Software Engineering		
3.4 Software Engineering Figures taken from SW Spread SI	heets	5900000

Table 60.9.4-3 Labor Summary	for a Phase 4 Direct Approach
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Table 60.9.4-3	Labor Summary fo	r a Phase 4	Direct Approach	[Continued]
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5 Systems Integration & Test Engineering	ROM Cost
HW/Systems Integration	\$28,543
SW/Systems Integration	\$28,543
Command & Control System Integration	\$14,272
Indirect Fire Control System Integration	\$14,272
Administrative Support	\$3,336
Clerical	\$2,204
Subtotal:	<b>\$</b> 91,169
.6 Experiment Support	ROM Cost
Technician Support	\$18,175
Field Technician Support	\$22,450
SAFOR Operators	<b>\$</b> 15, <b>994</b>
Battle Master	<b>\$15,994</b>
Research Assistant	<b>\$</b> 7,483
Data Analysis Engineer	\$8,753
Administrative Support	<b>\$4,72</b> 6
Clerical	\$3,122
Subtotal	<b>\$96,698</b>

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Table 60.9.4-4 summarizes the total labor cost for a Phase 4 direct approach.

	Ramt No.	Requirement Description	ROM Cost
ROM Tasks	3.1	Program Management	\$311,180
	3.2	Systems Engineering	\$401,280
	3.3	Product Development	\$101,210
	3.4	Software Engineering	\$5,900,000
	3.5	Systems Integration & Test Engineering	<b>\$</b> 91,16 <del>9</del>
	<b>3.6</b>	Experiment Support	\$96,698
		· · · · · · · · · · · · · · · · · · ·	
PMO LABOR		Contracts	\$49,709
·		Subcontracts	\$22,299
		ROM/SOW/Proposal Preparation	\$16,570
		Finance	\$40,260
		Subtotal (Labor Cost):	\$7,030,375

Table	60.9.4-4	Labor	Summary
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60.10 Assumptions. Throughout the development of this AFAS/FARV ROM, certain assumptions were made with regard to requirements, performance, schedule, and available models and hardware from other sources. We have repeated the assumptions here for reference and convenience of the reader.

The following assumptions were made during the development of this AFAS/FARV ROM.

- 1) The table top simulators and the crew station simulators each use dedicated hardware, i.e., a new computing system is acquired in Phase 2 for the crew station simulator.
- 2) Site facilities, including the DSI network connection, is GFE. No estimates are made for physical site preparation.
- 3) Software development is done in-house.
- 4) The predominant software language will be "C".
- 5) Visual databases, validated weapons models and data, MWTB software, AVTB software, SIMNET software, ARWA software, A²ATD software, VIDS software, and IVIS software are GFI.

- 6) A relatively full suite of documentation is required to support experiment planning and preparation.
- 7) A full program through Phase 4 will be completed without delays between phases.
- 8) DIS standard for PDU definition will be Version 2.03 as a minimum. Requirements proposed in Draft 4 are considered.
- 9) COTS hardware and software will be used to the maximum extent possible.
- 10) V&V is required.
- 11) ModSAF is assumed to be "V&V"-ed under the A2ATD DO, less the AFAS/FARV entities.
- 12) The DIS support subsystems are developed and are available as GFI and GFE. The level of functionality are sufficient as provided, or can be modified with minimal effort for control and data. The ModSAF subsystem will be modified to include the AFAS/FARV icons and behaviors.
- 13) The DIS support subsystems are not costed in this FAS and are assumed that the hardware will be purchased through another contract, unless the ROM estimates are requested to reflect the additional hardware required.
- 14) No schedule has been assumed except as that which falls out of the estimation. The resulting nominal program schedule appears to be approximately 24 months through the completion of Phase 4.
- 15) Integration and testing is completed in the Loral SDF prior to shipment and final test on site.
- 16) The site is assumed to be at Ft. Sill, Okalhoma.
- 17) The simulation system is DIS compliant. All PDUs are accepted and may be filtered. PDU information and content may be passed to independently developed segments. The simulation system provides the DIS environment connectivity for the cell.