



UNITED STATES MARINE CORPS
MARINE CORPS COMBAT DEVELOPMENT COMMAND
QUANTICO, VIRGINIA 22134-5001

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MEMORANDUM

From: Head, Ground Combat Element Branch, Equipment Requirements Division, Marine Corps Combat Development Command, 3300 Russell Road, Quantico, Virginia 22134-5021 (C 443)

Subj: DESIRED OPERATIONAL PERFORMANCE CHARACTERISTICS FOR A TACTICAL UNMANNED GROUND VEHICLE

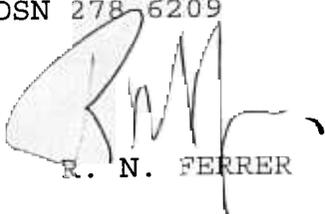
Ref: (a) Mission Need Statement for an Unmanned Reconnaissance, Surveillance and Target Acquisition (RSTA) Platform (NO. INT 12.1.1); Change 1

Encl: (1 List of Desired Operational Performance Characteristics for a Tactical Unmanned Ground Vehicle

1. Per the reference, the Marine Corps has established a requirement for an Unmanned RSTA Platform. One potential solution for meeting this Mission Need Statement is an unmanned ground vehicle.

2. The Equipment Requirements Division is in the process of completing a Draft Operational Requirements Document for a Tactical Unmanned Ground Vehicle. Enclosure (1) contains a list of the desired operational performance characteristics envisioned for a TUGV system. As this TUGV program continues to evolve, the desired performance characteristics will be modified to reflect the current state of the requirement.

4. The Marine Corps point of contact for this requirement is Captain David Hunt, Ground Combat Element Branch, Equipment Requirements Division, Marine Corps Combat Development Command, commercial (703) 784-6209 or DSN 278 6209


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DESIRED OPERATIONAL PERFORMANCE CHARACTERISTICS
FOR A
TACTICAL UNMANNED GROUND VEHICLE (TUGV)

1. System Description. The TUGV will provide Marine Corps forces with an unmanned, tele-operated/semi-autonomous ground vehicle for remoting combat tasks in order to reduce risk and neutralize threats. The primary function of the TUGV is to provide the Ground Combat Element (GCE) with an unmanned Reconnaissance, Surveillance, Target Acquisition (RSTA) and scouting capability. Additionally, the TUGV system will be capable of remotely employing the Anti-Personnel/Obstacle Breaching System (APOBS), M240G medium machine gun, and currently fielded chemical agent detection systems. The TUGV is designed to support dismounted infantry during the performance of their mission, across the spectrum of conflict and range of military operations. The system will utilize a modular plug-and-play configuration and will not increase the expeditionary embarkation footprint or manpower requirements of the MAGTF. The system will use designated, vice dedicated, operators and organic vehicles for transportation.

2. Operational Concept

a. The Marine Corps' vision for employing unmanned ground systems, now and in the future, will be to seize every opportunity to leverage technologies to minimize risk, neutralize threats, and enhance force capabilities to effectively and efficiently achieve operational endstates. These systems will be expeditionary in nature: inherently simple, durable, multi-functional, and easily transported and operated in the littoral battlespace. In pursuit of economy of force, the Marine Corps will take advantage of emerging technologies to remote current organic capabilities in order to minimize risk and neutralize threats to the MAGTF.

b. In the conduct of Expeditionary Maneuver Warfare (EMW), Operational Maneuver From The Sea (OMFTS), Ship To Objective Maneuver (STOM), Sustained Operations Ashore (SOA), and Operations Other Than War (OOTW), the TUGV will enhance the ability of Marines to accomplish assigned mission tasks. Operating well forward of GCE units, the TUGV will perform RSTA, scouting, obstacle breaching, NBC detection and direct fire while permitting Marines to remain covered and concealed. The basic platform will possess day/night video camera capable of performing as well as an individual Marine with binoculars and currently fielded thermal imaging equipment; GPS and laser rangefinder capable of providing an 8-digit grid location of targets; and currently fielded acoustic and chemical agent

detection systems. Additionally, the system will be capable of remotely employing the Anti-Personnel/Obstacle Breaching System (APOBS) and M240G medium machine gun. The TUGV will significantly enhance the ability of tactical units to rapidly detect, locate, and track close-in threats (natural, man-made, or enemy forces).

c. As part of an evolutionary acquisition strategy, the system will be modular and expandable to support the easy development and integration of future Mission Payload Modules (MPM). Future MPMs, tailored to specific applications, can be developed to support emerging requirements and preplanned product improvements. These modules will be simple to install in a field environment, allowing commanders to increase their operational capability by tailoring the capabilities of the TUGV to best meet their mission requirements. With the development of future MPMs, the TUGV operational capabilities may include:

- (1) obscurant delivery;
- (2) direct fire (lethal and non-lethal);
- (3) engineer reconnaissance;
- (4) communication relay;
- (5) tactical deception (electronic and acoustic);
- (6) tactical resupply;
- (7) casualty evacuation.

3. Support Concept. The TUGV must be supported within the existing Department of the Navy three-level maintenance concept (organizational, intermediate, and depot) using common tools and general-purpose test equipment to the maximum extent possible.

4. Capabilities Required

a. System Performance

(1) Mission Profiles. The TUGV would operate as a mobile scouting/reconnaissance platform 40% of the time and as an immobile surveillance platform 40% of the time during ongoing combat operations. During the remaining 20%, the TUGV would be utilized for the remoting of combat tasks. Approximately 25% of the distance traveled would be on primary

roads at speeds of 0 to 25 kilometers per hour (kph), 25% of the distance traveled would be on secondary roads at speeds of 0-15 kph, and 50% of the distance traveled would be cross-country at speeds of 0-10 kph, with sprints for repositioning reaching a maximum speed of 25 kph (terrain dependent). The TUGV is projected to be employed by Marines in all climates and terrain throughout the globe. For all operations, approximately 40% of the engine operation time is spent idling to include recharging batteries for immobile surveillance missions. Use of RSTA sensors is expected to be ongoing during all periods of operation.

(2) Mission Essential Functions (MEF)

(a) Provide day/night remote visual acuity equal to that of an individual Marine using currently fielded binoculars and thermal imaging devices (i.e., M-22 Binoculars and the Medium Range Thermal Weapon Sight).

(b) Possess battlefield mobility capable of supporting dismounted units in all environments, including MOUT rubble.

(c) Be modular in design and incorporate standard interfaces for attachment of future Mission Payload Modules.

(d) Remain operable and mission capable when impacted by multiple 7.62 mm small arms rounds (AK-47), anti-personnel mines, and fragmentation grenades.

(3) Environmental Conditions. The TUGV must be operational and maintainable in all types of climates, weather conditions, and terrain where Marines deploy. The TUGV must be capable of conducting sustained operations during full exposure to temperatures ranging from -25 degrees Fahrenheit (F) to +125 degrees F.

(4) Information Warfare (IW). Opposing forces will always attempt to deny, degrade, disrupt, or destroy the commander's ability to implement command and control. The enemy will attempt to use IW to target and attack the TUGV with human intelligence, signal intelligence, and electronic warfare. In response to this threat, the TUGV system must specifically support IW countermeasures to minimize detection, while ensuring the ability to effectively navigate and transmit/receive data.

b. Mission Performance Objectives

(1) Issue (Critical). The TUGV must possess sufficient mobility, maneuverability, and speed to directly support dismounted infantry, under loads and in rough terrain.

(a) Parameter (critical). The TUGV shall be capable of being teleoperated by a designated operator in a safe and effective manner under the following conditions: on improved roads at operating speeds of 25 kph (16 mph) (threshold), 35 kph (21 mph) (objective); unimproved roads at speeds of 15 kph (9 mph) (threshold), 25 kph (16 mph) (objective); cross-country at speeds of 10 kph (6 mph) (threshold), 20 kph (12mph) (objective).

(b) Parameter. The TUGV shall be capable of fording 18 inches of still water (threshold), 24 inches (objective).

(c) Parameter (critical). The TUGV shall be capable of negotiating a vertical obstacle of 16 inches (threshold), 24 inches (objective).

(d) Parameter. The TUGV shall be capable of traversing 40 percent side-slopes at the cross-country operating speed (threshold).

(e) Parameter. The TUGV shall be capable of traversing 60 percent up/down slopes at the cross-country operating speed (threshold).

(f) Parameter. The TUGV shall be capable of accelerating/decelerating, stopping, and holding on a 60 percent slope (threshold).

(g) Parameter. The TUGV shall be capable of traversing over 12 inches of snow, mud, or sand on level ground (threshold).

(h) Parameter. The TUGV shall possess a turn radius not to exceed 3 meters (threshold), neutral steer (objective).

(i) Parameter. The TUGV shall be capable of backing-up at not less than 10 kph (threshold).

(j) Parameter. To minimize risk of rollovers while maneuvering, the TUGV shall automatically halt if it reaches an unsafe operating condition. System operators will be able to override any halts and disable this feature (threshold).

(k) Parameter. If rollover occurs, after being righted, the system shall be mission capable (threshold). The system shall have a capability to right itself (objective).

(l) Parameter. If any component of the TUGV has tires, they shall be run flat capable (threshold).

(m) Parameter. The TUGV shall possess an odometer and speedometer that transmits the distance traveled/speed of travel to the OCU for display to the system operator (threshold).

(2) Issue (Critical). The TUGV must possess sufficient operational range and mission duration.

(a) Parameter (KPP). The TUGV and attached MPMS shall be capable of being remotely employed by the operator when the TUGV and MPMS are within a 1 km (threshold), 4 km (objective) radius of the OCU under visual line of sight conditions, without the MBU and OCU being physically tethered or linked to one another (threshold).

(b) Parameter. The MBU shall have the capability of being remotely employed via fiber optic cable (threshold).

(c) Parameter. The TUGV shall be able to conduct a 24 hour mission without being refueled or receiving any type of operator maintenance. Within the 24 hour mission, the TUGV shall be capable of stationary surveillance for 16 continuous hours and moving for up to 8 continuous hours at an average speed of 10 kph (threshold), 12 continuous hours (objective).

(3) Issue (Critical). The TUGV must provide real-time detection of enemy threats.

(a) Parameter (critical). During daylight conditions, the optics shall allow the remotely located OCU operator to visually detect exposed stationary personnel at 3800 meters (threshold), 5,700 meters (objective) and HMMWV size vehicles at 5,700 meters (threshold), 10,000 meters (objective).

(b) Parameter (critical). During nighttime conditions, the optics shall allow the remotely located OCU operator to visually detect exposed stationary personnel and vehicles at 1000 meters (threshold), 2000 meters (objective).

(c) Parameter. The picture displayed to the OCU operator on the OCU screen shall be capable of displaying a reticle pattern comparable to the M-22 binoculars (threshold). The OCU operator shall be able to toggle on/off the reticle pattern (objective).

(d) Parameter. The TUGV system shall permit the operator to remotely conduct surveillance in 360 degrees (threshold).

(e) Parameter. The TUGV shall possess standard interfaces capable of incorporating COTS video cameras (i.e., snap-on capability) (threshold).

(f) Parameter. The system shall provide standard interfaces to allow for recording all data displayed at the OCU (threshold).

(g) Parameter. The TUGV shall be capable of elevating the RSTA sensors at variable heights, to a maximum elevation of six feet above ground level (threshold), ten feet (objective).

(h) Parameter. The TUGV shall possess a position locating system capable of accurately determining the location of the MBU within +/- one meter and relaying that data to the OCU for display to the operator (threshold).

(i) Parameter. The TUGV shall transmit its azimuth of travel in degrees to the OCU for display to the system operator (threshold).

(j) Parameter. The TUGV shall transmit the direction in which the optics is facing (in degrees and mils) to the OCU for display to the operator (threshold).

(k) Parameter. The TUGV shall possess an eye-safe laser rangefinder, capable of allowing the remotely located OCU operator to accurately determine the distance of a target from the MBU (+/- 5 meters), up to a distance of 5,700 meters (threshold), 10,000 meters (objective).

(l) Parameter. The TUGV shall determine an 8 digit grid of the target ranged by the laser rangefinder and transmit that data to the OCU for display to the operator (threshold).

(m) Parameter. The TUGV shall have the ability to acoustically detect the presence of idling vehicles within 100 meters of the MBU (threshold), 300 meters (objective).

(n) Parameter. The TUGV shall allow standard point detection chemical agent alarms presently in service to be used. These alarms shall be capable of being attached in not more than five minutes. The TUGV will transmit the presence of chemical agents detected by the attached chemical alarms to the OCU operator. The chemical alarm will not create any noise, alarm, or tone that can be heard at the MBU location (threshold).

(o) Parameter. Each OCU shall be capable of independently controlling any other TUGV (threshold).

(p) Parameter (KPP). The TUGV shall provide a real-time flow of imagery/data from the sensors to the OCU operator (threshold) and transmit snap-shot imagery to higher headquarters (objective).

(q) Parameter. The TUGV shall transmit to the OCU its location and the status of its power level (fuel and battery level), critical systems, and attached mission payload modules (threshold).

(4) Issue (Critical). The TUGV must be configured to easily support a variety of mission payload modules.

(a) Parameter. The TUGV system shall be capable of employing the Anti-Personnel/Obstacle Breaching System (APOBS), M240G medium machine gun, and currently fielded chemical agent alarms (threshold).

(b) Parameter. The TUGV system shall accommodate future mission payloads weighing up to 150 pounds (threshold), 300 pounds (objective).

(c) Parameter. The TUGV system shall allow modular payloads to be mountable and dismountable in no more than 10 minutes by two Marines (threshold), 5 minutes (objective).

(5) Issue. The TUGV will be easily operated by designated (vice dedicated) personnel.

(a) Parameter. The system operator shall be

capable of converting the TUGV system to/from transportation and operational configuration in not more than 10 minutes (threshold), 5 minutes (objective).

(b) Parameter. The OCU shall display the last known position and status of the TUGV in the event that the data link is interrupted or during change of OCU batteries (threshold).

(c) Parameter. The OCU shall weigh no more than 20 lbs (threshold), 10 lbs (objective), including any batteries which may be required to power the OCU (threshold).

(d) Parameter. The OCU shall be capable of displaying the location of the TUGV, OCU operator, friendly units, enemy units, and threats identified by optic sensors and laser rangefinder on a digital map (objective).

(e) Parameter. All location information shall be made available to the system operator utilizing the Military Grid Reference System (threshold).

(f) Parameter. A single operator shall be able to remotely employ at least 1 TUGV and attached payloads (threshold), 2 TUGVs concurrently (objective), using a single OCU.

(g) Parameter. The OCU shall possess an ear piece to allow the operator to hear audio/alarms from the TUGV's acoustic sensors and attached MPMs (threshold).

c. Logistics and Readiness

(1) Logistics Supportability Objectives

(a) Issue. The TUGV must be supportable.

1. Parameter. Replacement of TUGV components shall take place at the intermediate level (threshold), organizational level (objective).

2. Parameter. The TUGV shall be supportable with in the current Navy/Marine Corps systems (threshold).

(2) Reliability, Availability, and Maintainability Objectives

(a) Issue. The TUGV must be reliable.

1. Parameter. Mean Time Between Operational Mission Failure (MTBOMF) shall be no less than 72 hours (threshold), 96 hours (objective).

(b) Issue. The TUGV must be available.

1. Parameter. The TUGV system shall have an Operational Availability of .85 (threshold), .90 (objective).

(c) Issue. The TUGV must be maintainable.

1. Parameter. Preventive Maintenance (PM). Preventive Maintenance will be performed weekly. Mean Time To Perform PM shall be 60 minutes (threshold), 30 minutes (objective) at the Organizational Level.

2. Parameter. Corrective Maintenance. At the Organizational Level, the Mean Time To Repair (MTTR) shall be less than two hours (threshold), one and one half hours (objective).

(3) Mobility, Deployability, and Transportability Objectives

(a) Issue. The TUGV must not pose a significant embarkation footprint.

1. Parameter. The TUGV shall allow for transportation using all insertion means for the using population.

d. Other System Characteristics

(1) Survivability and Vulnerability Objectives

(a) Issue (critical). The TUGV must minimize vulnerability to small-arms fire. The TUGV system must be capable of remaining operational and mission capable in a non-permissive, combat environment.

1. Parameter (KPP). The TUGV shall remain operational and mission capable against multi-hit small-arms fire up to and including 7.62 mm ball ammunitions (AK-47) at 1 meter standoff range when fired at 0 degrees elevation at any azimuth to the vehicle (threshold), 7.62 mm medium machine gun

(objective).

2. Parameter. The TUGV shall remain operational and mission capable when impacted by fragmentation and blast from anti-personnel mines and grenades (threshold).

(b) Issue. The TUGV and OCU must minimize the ability of the enemy to detect their presence.

1. Parameter. Moving at its cross-country speed in flat open terrain, the TUGV shall not emit any light, acoustic, or other signature that is detectable in any direction by dismounted personnel at a distance beyond 100 meters (threshold), 50 meters (objective).

2. Parameter. While stationary and in a surveillance mode operating on battery power, the TUGV shall not emit any noise or light signature that is detectable by dismounted personnel with unaided human eyes and ears at a distance beyond 25 meters (threshold), 10 meters (objective).

3. Parameter. While in operation, the OCU shall not be detectable by the human ear at a distance beyond 5 meters (threshold).

4. Parameter. While in operation, the OCU shall not be visually detectable by an unaided human eye at night beyond 20 meters in flat open terrain (threshold), 10 meters (objective).

5. Parameter. The system operator shall be alerted to the presence of a moving human sized object within a 25 meter radius of the TUGV in open terrain. The system operator will have the capability to remotely select or de-select this feature (threshold).

6. Parameter. The TUGV shall deny the enemy's use of the system through an anti-tampering capability that discourages someone from handling the system, disables the TUGV, and clears the memory and codes in any classified hardware and software. Operator and maintenance personnel must be able to safely disconnect the anti-tampering capability prior to performing maintenance (threshold).

(c) Issue. The TUGV must be able to operate in a Nuclear, Biological, and Chemical (NBC) contamination environment.

1. Parameter. The TUGV shall be capable of being operated and maintained by personnel in Mission Oriented Protective Posture (MOPP) Level IV (threshold).

2. Parameter. The TUGV shall be able to withstand the material-damaging effects of NBC contaminants (threshold).

3. Parameter. The TUGV shall be capable of being rapidly decontaminated using standard decontaminants and procedures to reduce the hazard to personnel operating and maintaining the system (threshold).

4. Parameter. The TUGV shall be capable of withstanding the material-damaging effects of NBC decontamination, except for system components which will be replaced instead of being decontaminated (threshold).

5. Parameter. The TUGV components which perform mission-essential functions shall be hardened to ensure that degradation of not more than 20 percent shall

occur over a 30-day period with 5 exposures to NBC contaminants, decontaminants, and standard decontaminating procedures.

(d) Issue. The TUGV must be able to survive the Initial Effects of Nuclear Weapons.

1. Parameter. The TUGV shall be able to survive the effects of high altitude electromagnetic pulse (HEMP) with no degradation in performance (threshold).

(e) Issue: Security. The TUGV must comply with current requirements and be capable of evolving to meet state-of-the-art technological advances designed to protect information from unwanted exploitation as imposed by national, DoD, and joint policy. The TUGV must be protected from an Information Systems Security (INFOSEC) perspective, which would include, but not be limited to, such services as confidentiality, availability, and integrity of information that is either processed, stored, or transmitted.

5. Program Support

a. Maintenance Support Planning. The maintenance concept for the TUGV shall incorporate ease of accessibility to failed components, minimization of removal of non-failed parts, designated test points for Line Replaceable Units (LRUs), and fault detection and isolation. In order to optimize readiness and provide the most cost effective maintenance concept possible, the TUGV will use the best business practices, as most efficient within policy, to maintain the system. Maintenance of the TUGV will be conducted according to the maintenance categories defined by Marine Corps Maintenance Policy. Maintenance functions will be performed only within the echelon authorized to perform a particular function. Preventative and corrective maintenance will be accomplished at the lowest appropriate echelon depending upon the requirements for special tools, special procedures, or special skills necessary to accomplish the required corrective action. In using the best maintenance practices, TUGV maintenance actions normally associated with intermediate level may be performed by either contractor logistics support, depot or at organizational levels, as appropriate.

b. Support Equipment

(1) Standard Support Equipment. All components shall be easily removed and maintained with existing tools, test

measurement and diagnostic equipment. Specialized tools shall not be required.

(2) Test and Fault Isolation Capabilities. Built-in test equipment must be used to the maximum extent possible to facilitate diagnosis and repair.

c. Human Systems Integration (HSI)

(1) Manpower Constraints. The TUGV system must be designed so that there is no increase in manpower requirements. No new MOS or skill level within existing MOSs will be required.

(a) Operators. The TUGV will have a designated crew of one, sourced from within the unit that operates the system. MOSs 03XX and 13XX will operate the TUGV.

(b) Maintenance Personnel. Organizational maintenance personnel will be both dedicated and designated personnel from within the supported Ground Combat Element units. Maintenance will be performed by MOS 2175, 2818, 2841, 3521 and 3522.

(c) Support Personnel. Support personnel will be designated from supported units. A designated MOS 2841 will support communications gear.

(2) Training Concept. Manufacturer/factory representatives will provide new equipment training for instructors, operators, and maintenance personnel during initial fielding. Formal maintenance training will be incorporated into existing school curricula for each of the major components of the TUGV system. No formal operator training will be required. Training will be accomplished at the unit level by on-the-job-training (OJT) and use of standard curriculum. Embedded training hardware and software capable of providing simulation to support training in equipment operation and navigation will be incorporated to assist in training under the designated, vice dedicated, system operator concept. Particular emphasis shall be given to using training devices, embedded/onboard training, distributed interactive simulation, and interactive courseware.

(3) Human Factors and Safety Objectives

(a) Human Factors Objectives. The TUGV shall be user-friendly and minimize the skill needed to use and

maintain it. A qualitative assessment of the man-machine interface based on the judgment of the operators, maintainers, and human factors experts must be done. Design of the TUGV shall include the following human factors for ease of use:

1. Parameter (Critical). Controls and displays shall be easy to locate. All gauges, controls, and visual displays shall be operationally compatible with current night vision devices and the unaided eye for viewing during daytime and nighttime operations (threshold).

2. Parameter. The TUGV shall be capable of being operated with the wearing of Extreme Cold Weather System (ECWS) gloves (threshold), mittens (objective).

3. Parameter. Components shall not restrict operator activity or present an unsafe situation. Warning labels/indicators must be used to warn of human hazards.

4. Parameter. Components shall be easy to set-up, install, operate, maintain, trouble-shoot, and teardown.

5. Parameter. Cables shall be labeled and easy to connect/disconnect.

6. Parameter. Operators and maintainers shall be provided manuals and help files that are easy to read and understand.

(b) Safety Objectives

1. Issue: The TUGV must be safe to operate.

a. Parameter. Trained operators shall be able to operate the TUGV under normal operational conditions without being exposed to unsafe conditions.

b. Parameter. The TUGV system shall comply with all applicable safety and health requirements so as not to present uncontrolled safety and health hazards to the system operators or maintenance personnel throughout its life cycle. If the TUGV fails, it shall fail in a safe mode. A component or subsystem failure shall not cause the TUGV to issue false functions such as alerts or warnings.

d. Other Logistics and Facilities Considerations

(1) Unique Facility or Shelter Requirements. No unique or special facilities will be needed to support the TUGV.

(2) Special Packaging, Handling and Transport Requirements. None.

(3) Unique Data Requirements. None.

e. Command, Control, Communications, Computers, and Intelligence Integration

(1) Command and Control

(a) Issue (Critical). The TUGV must integrate current and future command & control and intelligence dissemination systems.

1. Parameter (KPP). The TUGV shall comply with applicable information technology standards in the Department of Defense Joint Technical Architecture and allow for the future integration of upgrades in these requirements (threshold).

(2) Communications

(a) Issue (Critical). The TUGV must be capable of transmitting images and data to the system operator.

1. Parameter (critical). The TUGV shall provide communication and data ports that allow onboard sensors and future MPMs to send real-time video and data to the OCU (threshold) and snap-shot information to higher headquarters or adjacent units (objective).

2. Parameter. If operating via fiber optic cable, the MBU shall automatically activate the RF data link in the event that the fiber optic link between the TUGV and OCU is interrupted (threshold).

3. Parameter. The TUGV shall be able to automatically retrotraverse to re-establish the data link in the event that communication connectivity with the OCU is lost. The operator shall be able to disable this feature (threshold).

(b) Issue. The TUGV system must provide an organic communications capability.

1. Parameter. The TUGV system shall not require the use of the supported unit's existing or projected voice and data communications devices to transmit or receive information between the TUGV and OCU (threshold).

2. Parameter. The system shall have data communications capability and interoperability within the Marine Corps Tactical C4I system (threshold).

3. Parameter. The OCU shall be weatherproof (threshold).

f. Transportation and Basing Support

1) Movement

(a) Issue (critical). The TUGV system will be easily transportable.

1. Parameter. The TUGV shall be capable of being internally air transported by MV-22 and larger fixed-wing aircraft, and CH-46 and CH-53 rotary-wing aircraft. The system must also be capable of helicopter external air transport. The system must be transportable by amphibious ships and landing craft. The TUGV must meet these requirements without any disassembly other than removing the mission payload modules (MPMs).

2. Parameter (critical). Two TUGV systems and their associated equipment shall be capable of being transported inside the back of a single HMMWV without requiring any permanent modifications to the vehicle. A single TUGV system must be capable of being transported inside an AAV (threshold).

3. Parameter. The TUGV shall have a clearly identifiable tow point, both in the front and rear of the vehicle, that may be used in hasty recovery and towing operations.

g. Standardization, Interoperability, and Compatibility

(1) Interoperability with Marine Corps, Other Service, Joint, and Allied Systems (KPP). The TUGV shall comply with all applicable standards in the Department of DoD Joint Technical Architecture (JTA). The TUGV shall leverage existing JTA-compliant fielded systems to achieve efficient joint standardization, interoperability and commonality. The TUGV shall provide for future growth through planned insertions of advanced technology that shall meet the JTA standardization, interoperability, and commonality parameters. The standards include, but are not limited to:

(a) Joint Architecture for Unmanned Ground Vehicles

(2) Energy Standardization and Efficiency Needs

(a) Fuels. The TUGV must comply with the Department of Defense single fuel policy.

1. Parameter (Critical). The TUGV shall be able to operate on multifuels without engine adjustment (threshold).

(b) Electrical Power. The TUGV must be interoperable with standard electronic equipment.

1. Parameter. The TUGV batteries shall be capable of being recharged from other military vehicles via standard NATO Power Connectors or 110/200, 60 Hz VAC (threshold).

2. Parameter. The OCU shall be capable of operating on COTS rechargeable and non-rechargeable batteries. The TUGV system shall include an OCU battery charging system that is capable of utilizing host vehicle power, NATO Power Connectors, 24 VDC, or commercial 110/220, 60 Hz VAC (threshold).

3. Parameter. The OCU shall be capable of being battery operated for 4 hours without a change of batteries (threshold), 8 hours (objective).

h. Mapping, Charting, and Geodesy Support

(1) Issue. If the TUGV uses digitized maps, it must utilize digitized terrain mapping products produced by the National Imagery and Mapping Agency.

(a) Parameter. The OCU shall utilize and display digital topographic maps (objective).

(b) Parameter. The OCU shall display standard military symbols and overlays on the digital maps (objective).