Attachment 1

Future Tactical Truck Systems Maneuver Sustainment Vehicle (FTTS MSV) Performance Specification

July 9, 2004

1.0 SCOPE

1.1 Scope. This performance specification relates to the Future Tactical Truck Systems (FTTS) Advanced Concept Technology Demonstration (ACTD) program in that it identifies:

a. Physical characteristics and performance requirements FTTS MSV (Maneuver Sustainment Vehicle) to be assessed in the Military Utility Assessment demonstration (see Attachment 3 for the minimum demonstrator functionality) and the Modeling & Simulation efforts contained in the FTTS ACTD Scope of Work.

b. Identification of the performance and quality test requirements used to verify the vehicles meet the specific performance.

1.2 General Description. The FTTS MSV is a motor transport vehicle system that primarily fulfills non-Future Combat Systems (FCS) manned ground vehicle roles of sustainment, support, and distribution in the Future Combat Systems (FCS) equipped Unit of Action (UA). The Army Unit of Action (UA) deploys throughout the world and must be prepared to conduct operations across the operational continuum. The mission of the FTTS MSV is to provide tactical/strategic transportation and support within all elements of the Unit of Action (UA). To successfully accomplish its mission, the UA requires a ground logistics system that is highly mobile, efficient, extremely reliable, and flexible. The FTTS MSV will be capable of keeping pace with the increasingly mobile and widely dispersed maneuver forces dictated by Objective Force Operational and Organizational Plan. The FTTS must be capable of operating over increased distances. The FTTS will distribute all classes of supplies without need of external Materiel Handling Equipment (MHE). The FTTS MSV will replace current heavy tactical wheeled vehicles in the objective UA.

1.3 Vehicle Variants. The FTTS MSV shall be capable of transport of equipment, NATO flatracks, varied mission module (e.g., bulk fuel and water, ammunition, and cargo transport), and receiving and transporting standardized containers (Twenty-foot Equivalent Units (TEU)). The FTTS MSV will be employed throughout the UA. The FTTS MSV will have the capability to collect, receive, and transmit asset tracking information and diagnostic/prognostic information utilizing known and emerging supply and maintenance management systems at the time of procurement.

2.0 APPLICABLE DOCUMENTS

2.1 Government documents. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issue of these documents is those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and in effect on the date of Request for Proposal.

MILITARY SPECIFICATIONS

DEPARTMENT OF DEFENSE:

A-A-50271	Plate, Identification	01FEB96	
A-A-52418	Light, Warning, Vehicular: Rotating, Unit, 14 and 28 Volt DC	11JAN93	
A-A-52432	Mirror Assembly, Rearview: Automotive Exterior Mounting	12OCT95	REV A.
A-A-52474	Electro coating Primer		
A-A-52507	Chain Assembly and Cross Chain, Tire: For Military Vehicles	14APR04	
A-A-52513	Bracket Assembly, Liquid Container, Five Gallon	14APR04	
A-A-52525	Horns and Buzzers, Air- and Electrically-Actuated	19APR04	REV A.
A-A-52557	Fuel Oil, Diesel; For Posts, Camps and Stations	16JAN01	REV A.
A-A-52624	Antifreeze, Multi-Engine Type	06SEPT01	REV A.
A-A-59326	Coupling Halves, Quick-Disconnect, Cam-Locking Type	01MAY03	
A-A-59487	Padlock (Key Operated)	03JUL01	REV A.
MIL-PRF-2104	Lubricating Oil, Internal Combustion Engine,	15APR04	REV G.
	Combat/Tactical Service		
MIL-PRF-2105	Lubricating Oil, Gear, Multipurpose	20APR04	REV E.
	(Metric)		
MIL-PRF-10924	Grease, Automotive And Artillery	24SEPT98	REV G.
MIL-PRF-20696	Cloth, Waterproof, Weather Resistant	02SEPT97	REV F.
MIL-S-40626	Sign Kit, Vehicle Class	31MAR94	REV D.
MIL-PRF-46167	Lubricating Oil, Internal Combustion	31JUL98	REV C.
	Engine, Arctic		
MIL-PRF-52308	Filter-Coalescer Element, Fluid Pressure	20MAR03	REV J.
MIL-C-53072	Chemical Agent Resistant Coating (CARC)		
	System Application Procedures and Quality		
	Control Inspection		
MIL-P-53084	Primer, Cathodic Electrodeposition, Chemical	24JUN94	

	Agent Resistant		
MIL-PRF-62048	Air Cleaners, Automotive: Heavy	15APR04	REV C.
	Duty, Dry-Type (For Internal Combustion		
	Engines) (Metric)		
MIL-DTL-83133	Turbine Fuels, Aviation, Kerosene Types,	04JAN99	REV E.
	NATO F-34 (JP-8), NATO F-35, and		
	JP-8+100		
MIL-V-81940	Valve, Sampling and Bleed, Hydraulic,	30AUG93	REV 1B.
	Type II Systems		

STANDARDS

FEDERAL

FED-STD-595	Colors Used in Government Procurement

DEPARTMENT OF DEFENSE

MIL-STD-129	Standard Practice For Military Marking	10FEB04	REV P.
MIL-STD-209	Lifting and Tie-down Provisions	28JAN00	REV J.
MIL-STD-461	Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment	20AUG99	REV E.
MIL-STD-462 Interim Notice 4	Measurement of Electromagnetic Interference Characteristics	20AUG99	REV E.
MIL-STD-462 Interim Notice 5	Measurement of Electromagnetic Interference Characteristics	20AUG99	REV D.
MIL-STD-704	Aircraft Electric Power Characteristics	12MAR04	REV F.
MIL-STD-810	Environmental Engineering Considerations and Laboratory Tests	05MAY03	REV F.
MIL-STD-889	Dissimilar Metals	17MAY93	REV B.
MIL-STD-1275	Characteristics of 28 Volt DC Electrical Systems in Military Vehicles	20APR04	REV B.
MIL-STD-1366	Transportability Criteria	31MAR03	REV D.
MIL-STD-1472	Human Engineering	05DEC03	REV F.
MIL-STD-1474	Noise Limits	29AUG97	REV D.

HANDBOOKS

DEPARTMENT OF DEFENSE

MIL-HDBK-454	General Guidelines for Electronic Equipment	03NOV00	REV A.
MIL-HDBK-1791	Designing for Internal Aerial Delivery in Fixed Wing Aircraft	14FEB97	

(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia PA 19111-5094.)

2.2. Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

Training and Doctrine Command Pamphlet 525-3-90/O&O(Change 2), The United States Army Objective Force Operational and Organizational Plan Maneuver Unit of Action, 30 June 2003.

TRADOC Pamphlet 525-4-0, US Army Concept for Maneuver Sustainment Operations in Support of the Objective Force (Draft), 23 Jan 03 U.S. Army White Paper: Concepts for the Objective Force

(Application for copies should be addressed to the U.S. Army Tank automotive and Armament Command, ATTN: AMSTA-LC-AH, Warren, MI 48397-5000)

C-130 Transportability of Army Vehicles, Military Traffic Management Command Transportation Engineering Agency, 11 Sept. 02, Joseph Cassidy.

US ARMY EDGEWOOD RESEARCH DEVELOPMENT AND ENGINEERING CENTER

D5-15-8779 Interface for M-8 Alarm

Application for copies should be addressed to the: Technical Director, US Army Edgewood Research Development and Engineering Center, ATTN: SCBRD-RT/ASM, Aberdeen Proving Ground, MD 21010-5423)

US ARMY COMMUNICATIONS ELECTRONICS MATERIEL READINESS COMMAND

A3013814	SINCGARS AN/VRC-90 Radio Set
A3013842	Antenna (AS-3684)
A3014039	Power Cable
A3019214	Mounting Base, Electrical Equipment For The MT6352/VRC-VEC
SCD189023	Antenna Support Assembly

(Application for copies should be addressed to the: US Army Communications and Electronics Materiel Readiness Command, Logistics Engineering Directorate, 12WD Bldg. 601 McAfee Center, Fort Monmouth, NJ 07703)

TECHNICAL BULLETIN (TB)

U. S. ARMY TANK-AUTOMOTIVE AND ARMAMENT COMMAND

TB 43-0213	Corrosion, Prevention and Control Including Rust proofing Procedures for Tactical Vehicles and Trailers	December 90

(Application for copies should be addressed to the U.S. Army Tank automotive and
Armament Command, ATTN: AMSTA-LC-AH, Warren, MI 48397-5000)

REGULATIONS, ARMY

AR 70-38	Research, Development, Test and Evaluation of Materiel for Extreme Climatic Conditions	15SEPT79

(Copies are available from the following website:
http://www.usace.army.mil/inet/usace-docs/army-reg)

GOVERNMENT AGENCIES

CALIFORNIA AIR RESOURCES BOARD (CARB)

Tank Pressure and Vacuum Requirements

(Application for copies should be addressed to the: California Air Resources Board, 2020 L Street, Sacramento, CA 95814)

DEPARTMENT OF TRANSPORTATION (DOT)

Federal Motor Vehicle Safety Standards (FMVSS)

178.346	Cargo Tank Motor Vehicle (DOT 406)	
571.101	Controls and Displays	01JAN68
571.102	Transmission Shift Lever Sequence, Starter Interlock, and Transmission Braking Effect	01JAN68
571.104	Windshield Wiping and Washing Systems	01JAN88
571.108	Lamps, Reflective Devices, and Associated Equipment	01JAN68
571.119	New Pneumatic Tires for Vehicles other Than Passenger Cars	01MAR75
571.120	Tire Selection and Rims for Motor Vehicles Other Than Passenger Cars	01AUG76
571.121	Air Brake Systems	01JAN75
571.124	Accelerator Control Systems	01SEPT73
571.208	Occupant Crash Protection	01SEPT98
571.209	Seat Belt Assemblies	01MAR67
571.210	Seat Belt Assemblies Anchorage	01JUL71
571.223	Rear Impact Guards	26JAN88
571.224	Rear Impact Protection	

Federal Motor Carrier Safety Regulations (FMCSR)

393.27	Wiring Specifications	07DEC88
393.28	Wiring to Be Protected	07DEC88
393.29	Grounds	07DEC88
393.30	Battery Installation	07DEC88
393.31	Overload Protection Devices	07DEC88
393.32	Detachable Electrical Connections	07DEC88
393.33	Installation Wiring,	07DEC88
393.40	Required Brake Systems	11MAR72
393.41	Parking Brake System	07DEC88
393.42	Brakes Required on All Wheels	17may94
393.43	Breakaway and Emergency Braking	07DEC88
393.45	Brake Tubing and Hose, Adequacy	07DEC88
393.46	Brake Tubing and Hose Connections	07DEC88
393.47	Brake Lining	07DEC88
393.48	Brakes to Be Operative	02OCT02
393.49	Single Valve to Operate All Brakes	07DEC88
393.50	Reservoirs Required	07DEC88
393.51	Warning Devices and Gauges	07DEC88
393.52	Brake Performance	07JUN72
393.55	Antilock Brake Systems	04MAY98
393.65	All Fuel Systems	29DEC72
393.67	Liquid Fuel Tanks	23FEB94
393.70	Coupling Devices and Towing Methods, Except for Driveaway-Towaway Operations	11OCT72
393.83	Exhaust Systems	07DEC88
393.86	Rear Impact Protection	02OCT02
393.95	Emergency Equipment on All Power Units	06JUL94

(Application for copies should be addressed to the Dept of Transportation, Federal Highway Administrations, Washington, DC 20591)

ENVIRONMENTAL PROTECTION AGENCY (EPA)

Control of Air Pollution from New Motor Vehicles and New Motor Vehicle Engines

Compliance with Interstate Motor Carrier Noise Emission Standards

(Application for copies should reference "Code of Federal Regulations 40 CAR and the Federal Register, and should be addressed to the Superintendent of Documents, US Government Printing Office, Washington, DC 20402)

NATIONAL FIRE PROTECTION AGENCY (NFPA)

NFPA 407	Standard for Aircraft Fuel Servicing (National Fire Codes, Vol. 7)	2001
NFPA 70	National Electrical Code	03APR03

(Application for copies should be addressed to the National Fire Protection Agency, One Batterymarch Park, PO Box 9101, Quincy, MA 02269-9101)

NORTH ATLANTIC TREATY ORGANIZATION (NATO) STANDARDIZATION AGREEMENT (STANAG)

STANAG 2413	Demountable Load Carrying Platforms (DLCP/Flatracks)	26NOV99
STANAG 4007	Electrical Connectors Between Prime Movers, Trailers and Towed Artillery	31MAY96
STANAG 4074	Auxiliary Power Unit Connections for Starting Tactical Land Vehicles	31MAY96
QSTAG 244 Ed 3	Nuclear Survivability Requirements For Military Equipment	

NORTH ATLANTIC TREATY ORGANIZATION (NATO) ALLIED VEHICLE TESTING PUBLICATION (AVTP)

AVTP 03-30WT	Steering and Maneuverability
AVTP 03-160 W	Dynamic Stability

(Applicable NATO documents are those that are current at NATO Headquarters (Military Agency for Standardization , 1110 Brussels). Copies are available from Global Engineering, Inc., 15 Inverness Way East, Englewood, CO 80112).

OCCUPATIONAL SAFETY & HEALTH ADMINISTRATION (OSHA)

Title 29, CFR, Part 1910.1000	Air Contaminants	29MAY71

(Application for copies should be addressed to the American Conference of Government Industrial Hygienists (ACGIH), 1330 Kemper Meadow Drive, Cincinnati, OH 45240).

2.3 Non-Government Publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted are those listed in the issue of the DoDISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS are the issues of the documents cited in the solicitation (see 6.2).

AMERICAN PETROLEUM INSTITUTE (API)

API STD 1529	Aviation Fueling Hose (DOD Adopted)	01MAY98
API SPEC 1581	Specifications and Qualification Procedures for Aviation Jet Fuel Filter/Separators	July 2002

(Application for copies should be made to the: American Petroleum Institute, 1220 L St NW, Washington, DC 200005)

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B30.22 Articulating Boom Cranes 01JAN00

(Applications for copies should be addressed to the: American Society of Mechanical Engineers, 345 East 47th Street, New York, NY 10017)

AMERICAN SOCIETY FOR TESTING & MATERIALS (ASTM).

D522 Mandrel Bend Test of Attached Organic Coatings (DOD Adopted) 01JAN01

D1171 Rubber Deterioration – Surface Ozone Cracking

Outdoors or Chamber (Triangular Specimens) (DOD Adopted)

(Applications for copies should be addressed to the: American Society for Testing & Materials 100 Bar Harbor Drive, West Conshohocken, PA 19428-2959)

GENERAL MOTORS (GM)

GM 9540P Accelerated Corrosion Test

(Application for copies should be addressed to Global Engineering, 7730 Carondelet Ave., Suite 407, St. Louis, MO 63105)

INTERNATIONAL ORGANIZATION OF STANDARDIZATION (ISO)

668 Series 1 Freight Containers – Classification, Dimensions and Ratings

(Application for copies should be addressed to International Organization of Standardization (ISO), Case Postale 56, Geneva, Switzerland CH-1211)

SOCIETY OF AUTOMOTIVE ENGINEERS, INC. (SAE)

AS8090	Mobility, Towed Aerospace Ground Equipment, General Requirements for (DOD Adopted)	01AUG97
J163	Low Tension Wiring and Cable Terminals and Splice Clips (DOD Adopted)	28DEC01
J198	Windshield Wiper Systems-Trucks, Buses, and Multipurpose Vehicles (DOD Adopted)	29JUL03
J318	Automotive Air Brake Line Couplers (Gladhands)	24APR03
J336	Sound Level for Truck Cab Interior (DOD Adopted)	12JUN01
J343	Test and Test Procedures for SAE 100R Series Hydraulic Hose and Hose Assemblies	19DEC03
J366	Exterior Sound Level for Heavy Trucks and Buses (DOD Adopted)	27APR01
J381	Windshield Defrosting Systems Test Procedures -Trucks, Buses, and Multipurpose Vehicles (DOD Adopted)	29SEPT00
J382	Windshield Defrosting Systems	29SEPT00

	Performance Requirements Trucks, Buses, and Multipurpose Vehicles (DOD Adopted)	
J516	Hydraulic Hose Fittings	19JAN01
J517	Hydraulic Hose	25JUL03
J534	Lubrication Fittings (DOD Adopted)	01JUL98
J560	Seven Conductor Electrical Connector for Truck-Trailer Jumper Cable (DOD Adopted)	21APR04
J682	Rear Wheel Splash and Stone Throw Protection (DOD Adopted)	30JAN03
J683	Tire Chain Clearance-Trucks, Buses (Except Suburban, Intercity, and Transit Buses), and Combinations of Vehicle (DOD Adopted)	01AUG85
J697	Safety Chain of Full Trailers or Converter Dollies (DOD Adopted)	01MAY88
J701	Truck Tractor Semitrailer Interchange Coupling Dimensions (DOD Adopted)	01AUG84
J706	Rating of Winches (DOD Adopted)	29AUG03
J994	Alarm - Backup - Electric Laboratory Performance Testing, Standard (DOD Adopted)	30OCT03
J1100	Motor Vehicle Dimensions (DOD Adopted)	11JUL02
J1292	Automobile, Truck, Truck-Tractor, Trailers, and Motor Coach Wiring (DOD Adopted)	01OCT81
J1436 (R)	Requirements for Engine Cooling System Filling, Deaeration, and Drawdown Tests, Information Report	Work In Progress
J1587	Joint SAE/TMC Electronic Data Interchange between Microcomputer Systems in Heavy Duty Vehicle Applications	07FEB02
J1708	Serial Data Communications between Microcomputer Systems in Heavy-Duty Vehicle Applications 13	19OCT93
J1850	Class B Data Communications Network Interface	30MAY01
J1939	Series: J1939-11 Physical Layer – 250K bits/s, Shielded Twisted Pair	05OCT99
J1939-13	Off-Board Diagnostic Connector	11MAR04
J1939-21	Data Link Layer	01APR04
J1939-31	Network Layer	02APR04
J1939-71	Vehicle Application Layer	12DEC03
J1939-73	Application Layer – Diagnostics	08MAR04
J1939-81	Recommended Practice for Serial Control and Communications Vehicle Network – Part 81 – Network Management	08JUN03
J1992	Wheels/Rims – Military Vehicles – Test Procedures and Performance	31MAR02

	Requirements	
J2014	Pneumatic Tires for Military Tactical Wheeled Vehicles	11DEC01

(Applications for copies should be addressed to the: Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096)

TIRE AND RIM ASSOCIATION (TRA) INCORPORATED

European Committee for Standardization EN-12999 Crane-Loader cranes

TRA 1-Year Book

(Application for copies should be addressed to the: TRA Inc., 175 Montrose West Avenue, Suite 150, Copley, OH 44321)

2.4. Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification should take precedence.

1. Contract Document
2. FTTS MSV Performance Specification, dated 09 July 2004.
3. Government Standards, specifications or handbooks.
4. Non-government standards, specifications or handbooks.

2.4.1 Compliance with Laws & Regulations. The requirements and specifications contained in the above documents shall not be interpreted as a waiver or allowance to supersede any law or regulation unless a specific exemption has been obtained.

3.0 VEHICLE REQUIREMENTS. Where applicable, requirements apply to the system as a whole (i.e. RAM-D). The FTTS MSV is defined as a System of Systems to include the truck chassis, the load handling system, the Companion Trailer, and applicable sub-components listed hereunder. Certain sections list requirements unique to a particular sub-system (i.e. Section 3.9 – Companion Trailer) not mentioned elsewhere in this Performance Specification.

***** If not specified, all requirements are threshold *****

3.1 Mission Profile.
FTTS MSV Tactical Mobility is defined as 60.9 percent improved roads (paved and gravel) and 39.1 percent-unimproved roads (trails) and cross-country. Cross-country includes beaches, forests, grasslands, tropical jungles, mountains, and deserts throughout all seasonal conditions.

Road Surface	Terrain	% Operation		*RMS
		(Threshold)	(Objective)	
Improved	Hard Surfaced	53.2	10	0.1" – 0.3"
	Gravel	7.7	20	0.3" – 1.0"
Unimproved	Trails & Cross-country	39.1	70	1.0" – 4.8"

* Root Mean Squared (RMS) is a measure of surface and terrain roughness used to evaluate trafficability

3.1.1 Weight Definitions.

3.1.1.1 Curb Weight (CW). Curb weight of the vehicle shall be defined as the Empty vehicle weight, full compliment of fuels, fluids, lubricants, coolant, integral survivability and BII.

3.1.1.2 Gross Vehicle Weight (GVW). CW plus the weight of 2 soldiers (4 soldiers desired) and their individual equipment and weapons, heaviest legacy rigid tongue trailer or Companion Trailer (threshold) , supplemental armor, and payload (payload includes mission essential support equipment, unique digital appliqué, and non-mission essential kits, such as cargo compartment heater kit and cargo compartment protection kit). The planning factor per soldier with individual equipment is 343 pounds.

3.1.1.3 Gross Combined Weight (GCW). Gross combined weight shall be defined as the gross vehicle weight plus the weight of the towed load. All characteristics requiring evaluation at GCW shall be performed using the FTTS MSV Companion Trailer (CT) at its maximum payload as well as towed loads required for specific mission applications.

3.1.2 Payload. The FTTS MSV shall be capable of transporting a payload of 11 ST plus 2 ST flatrack (Threshold) or 12 ST plus 1 ST flatrack (objective).

3.1.3 Dimensions. Dimensions shall be as follows, when the vehicle is at GVW, unless otherwise specified.

3.1.3.1 Width. The vehicle shall not exceed 96 inches in width when measured IAW SAE J1100 excluding grab handles and tire bulges.

3.1.3.2 Height. The FTTS MSV must be capable of negotiating a 4-meter underpass while transporting an empty ISO 668, Type 1C freight container mounted on a flatrack. Overall height of FTTS MSV must not exceed 142 inches. While being transported on a C-130 aircraft, height must not exceed 102 in (threshold).

3.1.3.3 Length. The overall length of the Mission System (uploaded prime mover coupled with uploaded Trailer) shall not exceed 60 ft during highway and secondary road operation (without extended drawbar

kit). Mission System may exceed 60 ft as required to preclude interference between the truck and trailer such as during cross-country operation. The Swing Radius (SR) and Clearance (CT) minimum dimensions shall comply with SAE J701.

3.1.4 Environment.

3.1.4.1 Operating Temperatures. The FTTS MSV shall be able to start and operate in temperatures from -25° to 120° F without special kits, maintaining full mission capability (threshold) and below –25° F with special kits while maintaining 90 per cent mission capability (objective). The vehicle must start and attain operating temperature at -25F start (threshold) and -50F (objective) in no more than 30 minutes. Personnel temperature tolerances shall be defined by MIL-STD-1472.

3.1.4.2 Storage Temperatures. The FTTS MSV and its Companion Trailer must be capable of being placed in storage at temperatures ranging between –60° F and 160° F without degradation.

3.1.4.3. Heater & Defroster. The vehicle shall come equipped with a heater, blower and defroster. The heater shall be capable of raising the cab temperature from -25 to +41 degrees F (-32 to +5 degrees C) within 45 minutes (threshold) 20 minutes (objective) after the vehicle has been started. The blower shall be operable independent of the heater. Windshield defrosting and defogging system shall operate at ambient temperatures of down to -50 degrees F (-46 degrees C) within 1 hour and tested in accordance with SAE J381.

3.1.4.4 Cab Cooling. The FTTS MSV shall have internal environmental control measures to ensure personnel can work in the vehicle for extended periods of time. Cab-cooling requirements shall be met with windows closed. Personnel temperature tolerances shall be defined by MIL-STD-1472. (A kit may be used to meet this requirement. If a kit is used, it shall be installed at field level.)

3.2 PERFORMANCE CHARACTERSITICS.

All performance requirements shall be met with the vehicle at Gross Vehicle Weight (GVW) with uniformly distributed payload whose CG is 24 inches above the cargo bed, unless otherwise specified. If Gross Combination Weight (GCW) is specified, the CT (Companion Trailer with uniformly distributed payload whose CG is 24 inches above the cargo bed) shall be the trailer for all Mission Vehicles, unless otherwise specified. Minimum payload requirements are 11 ST plus flatrack (see paragraph 3.1.2.). All performance requirements shall be met while operating on JP-8(MIL-DTL-83133) (threshold). The system shall be capable of all slope operations as specified herein with 10% of the fuel tanks useable volume remaining and without leakage when at maximum rated capacity. Grade surface shall be smooth, dry, hard surface pavement. Annexes A, B, C, D and E contain the FTTS MSV mission specific variant requirements. Annex F contains the FTTS MSV Classified survivability requirements, and Annex G contains the FTTS MSV For Official Use Only (FOUO) survivability requirements.

3.2.1 Mobility. The mobility characteristics shall equal or exceed those quantified in the following paragraphs:

3.2.1.1 Dash Speed. The FTTS MSV at GVW must be capable of a dash speed which is characterized by the ability to accelerate from 0 to 48 kph (30 mph) on level hard terrain within 12 seconds (threshold)/10 seconds (objective). The FTTS MSV will be able to repeat this acceleration at least ten times in succession with a 30 second (threshold), 10 second (objective), interval between accelerations.

3.2.1.2 Governed Speed. Maximum geared speed at engine full load governed speed shall not exceed 70 mph for all vehicles. Engine governed speed shall not exceed the maximum RPM rating specified by the engine manufacturer.

3.2.1.3 Lateral Stability. For the FTTS MSV the roll stability as determined from a steady-state circular turn test on a 170 to 200 foot radius course with a level, paved surface shall meet or exceed a wheel-liftoff threshold of 0.5 g's.

3.2.1.4 Approach & Departure Angles. Protrusion of the tow eyes into the angle of approach plane is permitted. The angle of approach shall not be less than 41 degrees and the angle of departure not less then 39 degrees in the area of the pintle hook. Angles shall be defined in accordance with SAE J1100.

3.2.1.5 Braking. Unless otherwise specified in this performance spec, the performance of the brake system shall comply with FMVSS 571.121. The brake system of all vehicles post-production shall be burnished sufficient for the FTTS MSV to meet the grade holding requirements of this performance specification.

3.2.1.5.1 Service Brakes. Service brakes shall meet the requirements of FMVSS 571.121, without regard for the exceptions of paragraph S3. Service brakes shall bring the vehicle to a complete stop from a speed of 20 mph (32 km/hr) within 30 feet (9 M), measured from the point of brake application (to a tolerance of two (2) feet shall be acceptable). The service brakes shall hold the vehicle at GVW on a dry hard surface, 60% Grade(30.96 degree slope) pointing either uphill or downhill.

3.2.1.5.2 Parking Brakes. The vehicle parking brake shall be capable of holding the chassis motionless in either direction on a 30% (threshold), 40% (objective) grade (16.70 degree slope) with maximum payload, with the engine off and the transmission in neutral. An indicator light shall be provided to alert the crew when the parking brake is engaged.

3.2.1.5.3 Emergency brakes. The emergency brake system, in the event of a single point failure in the service brake system, shall stop the truck at GVW on a 30% grade (16.70 degree slope). The vehicle at GVW, on dry level primary roads, shall be capable of stopping within 170 feet (52 M) (measured at point of brake application) while traveling at least 30 mph (48 km/hr) and within 530 feet (162 M) while traveling at least 55 mph (90 km/hr). Emergency brakes shall activate after both the visual and audible low pressure warnings have activated. Emergency braking shall include a means of stopping the vehicle in the event of trailer breakaway. Emergency braking requirements shall be met without the use of the retarder.

3.2.1.5.4 Brake Configuration. Brakes shall conform to Federal Motor Vehicles Safety Standards (FMVSS) 571.121 and Federal Motor Carriers Safety Regulations (FMCSR) 393.40 through 393.42 (b), 393.43, and 393.45 through 393.52, and 393.55. All brakes shall be releasable from the cab in the tactical environment per FMVSS 393.41.c. Brake system shall be designed to minimize exposure to "off-road hazards" and maximize ground clearance. In case of a single point failure half of the system shall be able to build and maintain pressure as a limp home mode capability (objective).

3.2.1.5.5 Antilock Braking System (ABS). A multi-channel Antilock Braking System shall be installed on all variants that meet the requirements for brake performance specified within FMVSS 571.121 regulation. Deactivating the ABS shall not deactivate traction control system. The system shall have built in test for troubleshooting and crew indication. The diagnostic information shall display system error either on board or through the SAE J1587/J1939 data bus.

3.2.1.5.6 Brake Wear Indicator. The FTTS MSV shall be equipped with a warning system to quickly determine the brake pad's remaining life.

3.2.1.6 Terrain. The vehicle and its Companion Trailer shall be capable of operating over terrain, as shown in Table I. The mobility characteristics will be quantified using NATO Reference Mobility Model (NRMM), version 2.5.9a. The values in Table I will be used for evaluation purposes only.

Table I. Mobility Rating Speed (mph). FTTS MSV at GVW and GCW.

	Germany		Mideast	
Scenario	**Dry**	**Wet**	**Dry**	**Sand**
Tactical-High	17.1	2.1	17.7	N/A
Tactical-Standard	22.7	18.6	21.7	N/A
Tactical Support	28.9	26.4	25.8	22
Maximum No-Go, %	5.4	17.0	5.1	12.7

The FTTS MSV single pass vehicle cone index (VCI [VCI1]) for mud/sand/snow shall have a value no greater than 25.0 (threshold) 20.0 (objective) at GVW, with the tire pressure set at an appropriate reduced level, and using a corresponding increased section width.

3.2.1.7. Ride Quality. The FTTS MSV shall meet the ride quality requirements at curb weight and GVW.

3.2.1.7.1 Ride Limiting Speeds. The FTTS MSV shall attain no more than 6 watts average vertical absorbed power, as measured at all occupant seats of the FTTS MSV and its Companion Trailer, while negotiating the following Root Mean Square (RMS) ride courses at speeds listed below, with the tires at normal tire pressure (cross-country tire pressure, if equipped with a Central Tire Inflation System [CTIS]).

6-Watt Speeds (MPH)

US imperial units (RMS)	SI units (RMS)
31 mph at 0.85 in	49.9 kph at 2.16 cm
20 mph at 1.32 in	32.2 kph at 3.35 cm
17 mph at 1.83 in	27.4 kph at 4.65 cm
8 mph at 3.26 in	12.9 kph at 8.28 cm

3.2.1.7.2 Vertical Acceleration. The FTTS MSV shall sustain no more than 2.5-G peak vertical acceleration, as measured at the occupants' location as well as the entire cargo compartment of the FTTS MSV and its Companion Trailer, while negotiating a non-deformable, half-round obstacle at the rated speed as listed below with the tires at normal tire pressure (cross-country tire pressure, if equipped with a CTIS).

Obstacle Crossing Speeds (MPH)

	Obstacle Height (inches)	
	8	10
Speed at GVW (mph)	31	9

3.2.1.8. Reserved.

3.2.1.9. Reserved.

3.2.1.10 Grade & Slope Operations.

3.2.1.10.1 60% Grade(30.96 degree slope). The FTTS MSV at GVW (Threshold), GCW (Objective), shall be capable of ascending/descending, starting, and stopping on dry, hard-surfaced longitudinal slopes up to and including 60% grade (30.96 degree slope). The vehicle engine shall be capable of being turned off and restarted while on the 60% grade. The engine off times shall be of such long duration as to assure that there shall be no loss of fluids or other malfunction while parked on the slope.

3.2.1.10.2 Parking Brake Grade Operation. At GCW, the FTTS MSV shall be capable of holding in either direction on a 30-percent longitudinal Grade(16.70 degree slope) (Threshold) (40-percent(21.8 degree slope) - Objective) using only the FTTS MSV parking brake with the engine off and the transmission in neutral. Grade surface shall be dry, hard and free from loose material.

3.2.1.10.3 40% Side Slopes. The FTTS MSV at GVW, shall be capable of traversing side slopes up to and including 40 percent. Side slope operation shall be performed with either side of the vehicle facing up slope and without loss of stability or malfunction/degradation of stated requirements or loss of vehicle fluids.

3.2.1.10.4 2% Grade. The FTTS MSV at GVW shall be capable of continuously ascending a 2-percent grade at 55 MPH (Threshold), 65 MPH (Objective); and at GCW shall be capable of 45 MPH (Threshold), 55 MPH (Objective).

3.2.1.11 Tires.

3.2.1.11.1 Rims & Tires. Rims and tires shall meet the requirements of SAE J1992 and conform to FMVSS 571.119 and 571.120. Vehicle and trailer tires (threshold) shall be a tubeless radial design with bolt-together rims and beadlock. All tire and rim ratings shall conform to the Tire and Rim Association (TRA) 1 or the European Tire and Rim Technical Organization (ETRTO) Standards Manual for the maximum GCW and maximum speed of the vehicle. The vehicle shall have tires with tread design that maximizes off-road mobility but

maintains safe on-road handling. All wheel assemblies shall be interchangeable across all vehicle/trailer types. Tires shall have a minimum life of 18,000-miles over FTTS OMS/MP terrain, without retreading.

3.2.1.11.2 Run-Flat Capability. The run-flat capability shall permit safe driving after loss of air pressure in any two tires (Threshold) (all tires - Objective) for at least 30 miles (Threshold) (60 miles - Objective) with speed reduction (threshold), without speed reduction (objective), over the OMS/MP terrain.

3.2.1.11.3 Limp Home Capability. The loss of the function of one wheel (threshold), (two wheels-Objective) shall not impede the FTTS MSV from driving 30 miles (threshold)(60 miles – Objective) with speed reduction(threshold), without speed reduction (objective)over the OMS/MP terrain. This capability shall be for emergency operation only in case of wheel bearing failure, damaged wheel, inability to change wheel/tire, etc.

3.2.1.11.4 Central tire Inflation System (CTIS). The FTTS MSV and its Companion Trailer shall incorporate means to adjust tire pressure to increase cross-country mobility. The FTTS MSV shall incorporate this capability to allow the operator to adjust tire pressure:

- To/From GVW to GCW
- by axle or group of axles with equal loading
- For terrain conditions

The FTTS MSV and its Companion Trailer shall have the capability to inflate/deflate.

3.2.1.11.4.1 Tire Pressure Control. The system shall allow the driver to adjust all truck and Companion Trailer tires to any one of four preset tire pressures (highway, cross country, mud/snow/sand, emergency). The system control shall be located so that the system may be activated while the driver continues to operate the FTTS MSV.

3.2.1.11.4.2 Manual Tire Inflation/Deflation. The system shall provide for the isolation of any or all tires from the CTIS in the event of CTIS failure for any reason. Valves for manual inflation shall be readily accessible and compatible with the standard on-board inflation system.

3.2.1.11.4.3 Air-Priority System. The CTIS shall incorporate sufficient safeguards to assure that air pressure necessary to continue safe operation of the FTTS MSV System shall be available at all times during activation of CTIS or in the event of a CTIS failure. Use of brakes is the minimum requirement for safe operation.

3.2.1.11.4.4 Speed/Pressure Control Warning. The CTIS shall include sensing of the vehicle speed and comparing indicated speed to the maximum allowable speed for each control setting. An indicator shall activate to warn the driver of this condition until the system has automatically inflated to the appropriate pressure.

3.2.1.11.4.5 Maintenance of Tire Pressure. With the CTIS in operation, tire pressure shall be checked and adjusted at intervals necessary to assure that the tire pressure is no more than 3 PSI below selected pressure and actual pressure except during the inflation/deflation operation caused by the selection of a new tire pressure. With the CTIS not in operation and the vehicle engine not running after 24 hours, the tire pressure shall not drop below 97% of the pressure setting which existed before the vehicle was stopped. No action shall be required of crew personnel beyond normal shutdown to meet this requirement.

3.2.1.11.4.6 Time to Inflation/Deflation. The CTIS shall be capable of deflation within the time constraints as listed below, (minutes: seconds). Inflation times shall not exceed the lower of those which the tire manufacturer shall provide warranty for when the vehicle is traveling at the top speed of the next highest pressure setting during inflation, or the following:

Inflation

From	**To**	**Maximum Time Allowed**
Cross-country	Highway	12:30
Mud/Snow/Sand	Cross-country	5:30
Emergency	Mud/Snow/Sand	3:00
Deflation		
Highway	Cross-country	4:00
Cross-country	Mud/Snow/Sand	4:00
Mud/Snow/Sand	Emergency	3:00

3.2.1.12 Traction Control. The vehicle shall be equipped with a traction control system. This system, under conditions of varying traction, shall be capable of shifting power to the tire(s) with the highest degree of traction, such that the tractive effort is maintained to the maximum extent possible.

3.2.1.13 Turning Requirement. The FTTS MSV shall negotiate a three-point turn within a 50-foot wide well deck or a single point turn within 80-foot wide (Threshold) 72-foot wide (Objective).

3.2.1.14 Lane Changing. The vehicle at GVW shall be capable of making a lane change in accordance with AVTP 03-160W at speeds up to 40 mph (threshold), 45 mph (objective). The vehicle and Companion Trailer at GCW shall be capable of making a lane change in accordance with AVTP 03-160W at speeds up to 40 mph (threshold), 45 mph (objective).

3.2.1.15 Power Take-Off (PTO) Openings. The vehicle shall provide PTO on all variants. PTO openings shall be provided and independent of transmission operation. The PTO locations shall be of sufficient capacity to deliver a minimum of 150 hp. The PTO will be suitable for power assisted semi-trailer axles that would be driven hydraulically from this PTO.

3.2.1.16 Steerable/Lockable Rear Axle. If a steerable rear axle is used on the vehicles, a locked neutral steer position shall be provided. Transitions to and from the neutral steer position shall not adversely affects the handling of the vehicle. In the event of a rear steer system failure the rear axles shall assume a neutral, locked position.

3.2.1.17 Emissions. New production vehicles shall comply with Environmental Protection Agency (EPA) emission regulations/standards for new motor vehicles and new motor vehicle engines in affect at time of production.

3.2.1.18 Power Generation.

3.2.1.18.1 DC Power Source. The DC power generating system shall be capable, at engine idle speed, of charging the batteries as quickly as practicable while simultaneously supplying power equivalent to 200 amperes, 28 Volts DC, for all the other vehicle subsystems. Provisions shall be made to conveniently increase available power to these subsystems to a level equivalent to 400 Ampere at 28 Volts DC.

3.2.1.18.2 Reserved.

3.2.1.18.3 Slave Receptacle. A NATO electrical slave receptacle with electrical capability to jump-start vehicles with 24 volt systems shall be provided.

3.2.1.18.4 Depleted Battery Engine Start. In the event of the use of supplemental electronic devices (i.e. radios), the vehicle shall be equipped with a device, which prevents the batteries or other storage devices from being depleted past the appropriate charge level sufficient to start the vehicle.

3.2.1.18.5 Extended Electrical Capability/Capacity. Vehicle power generation and management shall be provided to power weapons systems, Army Battle Command System (ABCS), and/or support systems and to recharge Mounted Warrior Soldier System (MWSS) equipment by providing at least 33 kilowatts (kW) (Threshold) 80 kW (Objective) of AC for internal and external operational power demands.

3.2.1.18.6 Energy Storage. Energy storage devices shall be maintenance free and shall be of sufficient power to meet the demand of the vehicle subsystems in all climatic conditions. Any battery shall be readily accessible for service and shall be protected from the environment. The energy storage shall be insulated to prevent short circuiting during maintenance and operation. The energy storage shall not be located in the cab or vented into the cab. Battery enclosures shall be designed to preclude major systems damage or serious personnel injury in the event of a violent gas venting or rupture of battery cells causing high pressure within the box. Battery modules terminal

connectors shall be of such material as to prevent terminal corrosion while maintaining good conductivity. A battery management system with appropriate sensors shall be provided to optimize battery charging, to monitor battery performance, and to perform battery thermal management functions. The battery management system shall allow for the replacement of a single battery module at field level maintenance without power degradation or special tools. The replacement/repair of all energy storage components shall be accomplished by field level maintainers.

3.2.1.19 Silent Watch Capability. All FTTS MSV versions, without the power unit operating, shall have the capability of supplying 1.5 kW continuous electrical power usage for 4 hours (threshold), 8 hours (objective) without using the engine.

3.2.2 Operational Range.

3.2.2.1 Range. The FTTS MSV shall be capable of operating on internally carried fuel for a minimum distance of at least 600 miles (Threshold) 900 miles (Objective), at GVW across the OMS/MP and FTTS drive cycles. Onboard fuel storage shall not exceed 160 gallons (threshold), 60 gallons (objective). Internally carried fuel includes all fuel tanks at no more than 95 percent full, with 5 percent allowed for ullage. The FTTS MSV shall be capable of operating for an additional distance of at least 100 statute miles with the additional fuel reserves carried in standard Army containers and transported externally on mounting brackets provided as a kit.

3.2.3 Standard Obstacles.

3.2.3.1 Vertical Step. The FTTS MSV at GCW shall be capable of stepping up and down a vertical obstacle of 24 inches (Threshold) or 32 inches (Objective) in forward and reverse without preparation or modification of the vehicle.

3.2.3.2 Trench Crossing. The FTTS MSV at GCW must be capable of crossing trenches with a width of no less than 59 inches in forward and reverse without preparation.

3.2.3.3 Fording. The FTTS MSV and its Companion Trailer shall ford a 48” (Threshold) or 60” with kit, without kit(Objective) deep-water obstacle without preparation, special kits, or other fording device in forward and reverse while maintaining contact with the ground.

3.2.4 Towing.

3.2.4.1 Like Vehicle Towing. The FTTS MSV at GVW shall be capable of towing any other FTTS MSV/UV at GVW (Threshold) (GCW – Objective) over the FTTS MSV mission terrain profile using a standard Army heavy duty tow bar. Reduced speed of 15 percent for this operation is acceptable. Provisions to actuate the towed vehicle's brakes and lights shall be provided.

3.2.4.2 Reserved.

3.2.4.3 Recovery/Towing. The FTTS MSV shall be capable of being recovered/lift and flat towed from both the front (at GCW) and rear (at GVW) by all wrecker systems, existing and emerging, with no disassembly required. The towing vehicle shall be able to maintain active control of the towed vehicle's braking system.

3.2.4.4 Towed Load Capability.

3.2.4.4.1 Companion Trailer. The primary towed load for the FTTS MSV is the Companion Trailer (CT) and is described by section 3.9.

3.2.4.4.2 Backward Compatibility. The FTTS MSV shall also be able to safely tow, over the FTTS MSV OMS/MP.

3.2.4.5 Towed Load Braking and Lighting. Provisions to actuate the towed vehicle's brakes and lights shall be provided.

3.2.4.6 Reserved.

3.2.4.7 Tow Eyes. Tow eyes on the FTTS MSV must be of sufficient strength to withstand the maximum forces encountered while being used for towing and winch recovery operations. The tow eyes shall be of a size such that the vehicle can be towed with the heavy-duty towbar described on dwg 12322663. Towing shackles shall be provided with the towing eyes.

3.2.4.8 Backing. The FTTS MSV shall be capable of interfacing with the backing assist device of the M1076.

3.2.4.9 Pintle. A pintle shall be provided which permits a single operator to hook-up to a FTTS Companion Trailer and M1076 PLS trailer (Threshold), all lunette equipped medium/heavy trailers (Objective) or without the need for exact truck-trailer alignment (threshold), with only one mount/dismount by the operator. Hook-up shall be with the trailer tongue offset laterally up to 12 to 18 inches from the centerline of the truck and 12 to 18 inches aft of the towing position and shall not impede the turning radius of the truck and trailer combination. The pintle shall be capable of towing all pintle style trailers in common use with 5 and 10 ton vehicles (M1061, M1073, M989) (objective). A towing pintle at the rear of the vehicle shall be furnished. The assembly shall be furnished with mounting flanges and lubrication fitting. The pintle assembly should allow easy access and no interference when towing all Army trailers and Howitzers in a full cramp steer (right or left). The mounting of the pintle assembly shall include reinforcements to transfer pintle loads directly to the web of the chassis frame. Provision for attachment of trailer safety chains shall be provided as per SAE J849 (per truck installation note) for single axle trailers to be compatible with the M989 trailer that requires a one-inch safety chain bracket pin. Pintle height shall be appropriate to accommodate the following trailers with towbar height inches as listed: M332 (33-3/8), HEMAT (32-1/2 to 40)(Objective).

3.2.4.9.1 Second Pintle. The FTTS MSV shall have the capability to mount a second pintle on the front of the vehicle. The pintle may be demountable for use on both front and rear of the vehicle.

3.3 SURVIVABILITY.

FTTS Survivability is essential to achieving the Unit of Action (UA) Organization and Operational sustainment objectives and operations. To accommodate the expected wide range of missions and operational scenarios, the FTTS designs must incorporate provisions that allow survivability requirements to be met at different levels.

3.3.1 Level I Ballistic Protection.

3.3.1.1 Direct Fire. See FOUO Annex G.

3.3.1.2 Mine Protection. See FOUO Annex G.

3.3.1.3 Improvised Explosive Devise (IED) Protection. See FOUO Annex G.

3.3.1.4 Infantry Anti-Tank Protection. See FOUO Annex G.

3.3.2 Level II Ballistic Protection.

3.3.2.1 Direct Fire Protection. See FOUO Annex G.

3.3.2.2 Mine Protection. See FOUO Annex G.

3.3.2.3 Infantry Anti-Tank Protection. See FOUO Annex G.

3.3.2.4 Improvised Explosive Devise (IED) Protection. See FOUO Annex G.

3.3.2.5 Mounting Armor. See FOUO Annex G.

3.3.2.6 Armor Protection Maintenance. The FTTS MSV crew compartment protection shall require no maintenance beyond standard Preventive Maintenance Checks (PMC) performed by the operator using onboard tools. Replaceable parts shall permit unit level replacement of portions of ballistic solutions without special tools or unique skills (Objective).

3.3.2.7 Armor Protection Maintenance Vehicle Impact. When parts of the protection must be removed for maintenance, they shall be removed and reinstalled so as not to increase the maintenance ratio beyond the requirement.

3.3.2.8 Armor Protection Kit Storage. The FTTS MSV crew compartment protection solution shall be designed for storage for extended periods of time (60 month minimum) without adverse effects from weather (to include ice and blowing snow and sand), humidity, temperature, or sunlight in hot, basic, and cold climates as defined in AR 70-38, without additional preparation or preservation equipment.

3.3.3 Self-Defense Weapon Provisions:

3.3.3.1 Primary Self-Defense Weapon. The FTTS MSV shall have provisions for mounting self-defense weapons (e.g., M2, M240, M249, M60 Machine Gun, or MK-19 Grenade Machine Gun) with ammunition storage. The mounting device shall permit operation of the weapon while traversing 360 degrees horizontally without interfering with other crew

operations. Provision to enable the 5th to 95th percentile target audience soldier to operate the weapon (without interfering with other crew operations) is required. A mechanical traverse with a positive travel lock capability is required. The crew shall be able to perform all crew service functions on the weapon while it is mounted in operating position. Spent brass and links shall not enter the crew compartment. The crew shall be able to engage targets from within the crew compartment (Objective), gunner positioned in a ring mount (Threshold). Provisions for precluding the firing of the self defense weapon at the vehicle shall be included.

3.3.3.2 Secondary Self-Defense Weapon (Objective). There shall be provisions for mounting a second (rear-firing) self-defense weapon station (i.e., M2, M240, M249, M60 Machine Gun, or MK-19 Grenade Machine Gun) with ammunition can (if required) to provide defense to the rear 180 degrees of vehicle, in addition to the primary weapon station. The mount shall have provision to be capable of traversing with little effort from the gunner and without interfering with crew operation. Provision to enable the 5th to 95th percentile target audience soldier to operate the weapon (without interfering with other crew operations) is required. The crew must be able to perform all crew service functions on the weapon while it is mounted at the rear facing station. Spent brass and links shall not enter the crew compartment.

3.3.3.3 Gun Shield Kit (Threshold). If a ring mount self defense weapon is proposed, a gun shield kit shall be provided for use with the primary weapon station and shall be able to defend against the same threats as the FTTS base armor, as stated in the classified Annex F. The gun shield shall be installable and removable by the operator at the field maintenance level with on board tools within one hour(threshold), 30 minutes(objective).

3.3.3.4 Ammunition Storage. Provisions shall be made for self-defense weapon ammunition storage that meets U.S. Army Defense Ammunition Center and School (USADACS) security certification requirements to transport ammunition over the vehicle mission profile. Storage provisions shall have a readily accessible quick release. Space allocations shall be provided for at least the following type and quantity of standard Army ammunition as shown below in table 1.

Table 1

Space Allocation for Onboard Ammunition

Ammunition for Weapon Type	Quantity
M16	2 cans
M203	1 can
Mk-19, M2 or M60/M240	6 cans
M249	4 cans

3.3.3.5 Stored Ammunition Safety. Each FTTS MSV must protect the crew from on-board self-defense weapon stored ammunition detonation and/or fuel fires to minimize crew casualties. Emergency evacuation procedures must not be impeded by having to move or relocate parts of the system.

3.3.4 Signature Management. The FTTS MSV shall employ signature reduction techniques and materials in order to reduce its detection by visible, acoustic (Threshold) and infrared, near-infrared, radar (Objective).

3.3.4.1 Visual Signature. The FTTS MSV shall be painted in NATO three-color camouflage or desert tan using Chemical Agent Resistant Coating (CARC) or a DA G4 approved substitute (Threshold). All vehicles shall be finished or painted to provide a low reflectance surface. The vehicle body and components shall be cleaned, treated, and painted in accordance with the MIL-C-53072.

3.3.4.2 Thermal Signature. See Classified Annex F.

3.3.4.3 Radar Signature. See Classified Annex F.

3.3.4.4 Acoustic Signature. See Classified Annex F.

3.3.4.5 Noise Limits. The FTTS MSV shall comply with the impulsive and steady state noise limits of MIL-STD-1474 at all crew locations, both inside and outside the vehicle. The vehicle shall comply with category C* interior steady state noise limits as outlined in MIL-STD-1474, Table 2, at all personnel occupied areas. This limit shall be measured while the FTTS MSV is moving at 2/3 top rated speed and the test conditions as stated in MIL-STD-1474.

3.3.5 Nuclear, Biological, and Chemical (NBC).
The FTTS MSV shall be capable of operating in NBC environments and have NBC contamination/decontamination survivability through the use of onboard vehicle subsystems, thereby eliminating the opportunity to have contact with outside contagions.

3.3.5.1 Chemical Detection. Each FTTS MSV must possess a capability to detect chemical hazards (Threshold) prior to incapacitating dose time. This warning will automatically populate the Common Operating Picture

(COP).

3.3.5.2 Chemical Protection.

3.3.5.2.1 Protection. The FTTS MSV shall have a Chemical, Biological, Radiological, Nuclear (CBRN) protection capability to sustain the crew without the use of individual protective over-garments and masks while operating in a CBRN environment for 6 hours (Threshold)/12 hours (Objective). The manned systems capability must allow for exiting the vehicle from one door without compromising crew safety to loss of protection.

3.3.5.2.2 Filtration. Each FTTS manned system must possess a CBRN filtration system that interfaces with individual crew and passenger protective garments and equipment, to allow for continued operation with open doors and windows.

3.3.5.2.3 Air Quality Monitoring. FTTS manned systems must include an inside air quality monitoring capability for CBRN/TIC/TIM and carbon monoxide.

3.3.5.2.4 Collective Protection. FTTS manned systems must include an indicator of collective protection system performance (i.e. residual filter life).

3.3.5.3 Nuclear Detection. FTTS MSV shall possess the capability to detect Nuclear Contamination.

3.3.5.4 High-Altitude Electromagnetic Pulse (HEMP): The critical functions of the FTTS MSV shall survive the initial effects from nuclear weapons where at least one crewmember remains combat effective. The critical functions of the FTTS MSV shall be High-Altitude Electromagnetic Pulse (HEMP) survivable. The FTTS MSV does not have to operate through the HEMP event. Recycling power to restore operations after a HEMP event is acceptable. The critical functions of the FTTS MSV are driving and providing power to the payload, to include vehicle subassemblies and component parts needed to accomplish these tasks.

3.3.5.4.1 Electromagnetic Emissions and HEMP. Electromagnetic Interference (EMI). The FTTS MSV shall comply with military EMI and electromagnetic emission susceptibility requirements, and commercial electromagnetic compatibility standards/ recommendations to support electronic engine, transmission, braking, CTIS controls, and other vehicle electronic components/controls.

3.3.5.5 Decontamination: The vehicle shall be capable of being decontaminated with DS2 decontaminating solution. The FTTS MSV shall include the capability to decontaminate personnel and equipment (operational) by use of standard decontamination systems to reduce CBRN and HAZMAT hazards to negligible risk.

3.3.5.6 Biological. FTTS MSV shall possess the ability to detect and identify Biological Agents (Objective). This warning will automatically populate the COP.

3.3.5.7 Monitoring. FTTS MSV must be capable of monitoring personnel for chemical contamination prior to entry of the vehicle (Objective).

3.3.5.8 DEW and RF Protection. FTTS must survive the effects of Directed Energy Weapon (DEW) and Radio Frequency (RF) threats such that all essential mission functions are operating within the system initialization times generated IAW TRADOC Pamphlet 71-9, Annex S (Threshold).

3.3.5.9 Chemical Agent Resistant Coating (CARC). FTTS MSV must be hardened against agent absorption to preclude damage to the FTTS MSV during decontamination operations. Also, the CARC will be able to be touched up without special equipment and monitoring requirements (Objective).

3.4 TRANSPORTABILITY.
The FTTS MSV and its Companion Trailer shall be transportable worldwide without disassembly and without shoring by air on USAF C-130, USAF C-17, and C-5 cargo aircraft and by highway, rail, and water without exceeding any of their peacetime operational limits. Criteria for transporting in USAF cargo aircraft are defined in MIL-HDBK-1791, as referenced in MIL-STD-1366. When configured for transport, the vehicles shall fit within U.S. and NATO transport envelopes defined in MIL-STD-1366. The FTTS MSV shall be C-5 and C-17 transportable to support intertheater deployment and C-17 and C-130 transportable to support intratheater operational maneuver.

3.4.1 Onboard Calculations. All FTTS MSVs shall be capable of onboard, automatic weight, axle-load, and center-of-gravity calculation for movement aboard air, sea, and land transport modes.

3.4.2 Reserved.

3.4.3 Lifting & Tie-Down Provisions. FTTS MSVs and Companion Trailers shall be securable to the floor or deck of transport craft. Lifting and tie-down provisions (both vehicle and cargo) shall be in accordance with MIL-STD-209 and shall be permanently marked (threshold). Lift and tie-down provisions shall be sized for full GVW and shall not interfere with the payload of the vehicle.

3.4.3.1 Lifting Eyes. Two lifting eyes shall be installed on both the front and rear of the FTTS MSV.

3.4.4 C-130 Air Transport. The FTTS MSV shall be transportable by a single up-armored C-130-profile aircraft without waiver at a weight no greater than 18.1 Short Tons (ST) including a 4 ST payload (Threshold), 6 ST payload (Objective). The FTTS MSV shall not exceed at any time during loading or flight an axle load of 13,000 lb or a tire pressure of 100 psi. The FTTS MSV (Threshold) or Companion Trailer (Objective) shall be roll-on/roll-off transportable under its own power by all cargo versions of the USAF up-armored C-130 aircraft models E through J. No shoring of any type shall be allowed.

3.4.4.1 C-130 Ramp. The FTTS MSV shall be capable of negotiating the worst case C-130 ramp angle of 15 deg by the roll-on/roll-off method, without ramp approach shoring and without any portion, except the

tires, of the vehicle contacting the surface of the ground, ramp, or aircraft cargo compartment floor. A minimum 1-in clearance between all components of the FTTS (excluding the tires) and the C-130 ramp, floor, and the ground shall be maintained.

3.4.4.2 Preparation Time. The FTTS MSV and its payload shall not require more than 30 total minutes by the operator with on-board tools and equipment to prepare for embarkation or debarkation on any form of transport (air, land, or sea) (threshold), 15 minutes/no tools (objective).

3.4.5 C-5 Air Transport. Up to four FTTS MSVs (threshold), six (objective) at GVW or two at GCW shall be roll-on/roll-off transportable under their own power, without disassembly, by all cargo versions of the USAF C-5 aircraft. No shoring of any type shall be allowed. The FTTS MSV shall not exceed any of the C-5 design limits as defined in MIL-HDBK-1791 and referenced in MIL-STD-1366.

3.4.6 C-17 Air Transport. Up to two FTTS MSVs(threshold) and three FTTS MSVs (objective) at GVW or one at GCW shall be roll-on/roll-off transportable under its own power, without disassembly, by all cargo versions of the USAF C-17 aircraft at 130,000 lbs. No shoring of any type shall be allowed. The FTTS MSV shall not exceed any of the C-17 design limits as defined in MIL-HDBK-1791 and referenced in MIL-STD-1366.

3.4.7 Commercial Transport. The FTTS MSV shall meet the Army force deployment guidelines be capable of transport on commercial contracted airframes and vessels designed for movement of wheeled vehicles and other outsized cargo in accordance with the Civil Reserve Air Fleet (CRAF) guidelines and the Voluntary Intermodal Shipping Agreement (VISA).

3.4.8 Highway Transport. The FTTS MSV shall not exceed highway permit limits, either when operated as a self-propelled vehicle or when carried as cargo by highway transportation assets of the Army, NATO, or allied countries. All FTTS MSVs shall not exceed highway weight and dimensional permit limits. This requirement applies to all self-propelled vehicles and those carried as cargo by Army highway transportation assets in CONUS and NATO countries, as detailed in MIL-STD-1366.

3.4.9 Rail Transport. All towing/towed vehicles shall be capable of being transported attached to their towed/towing vehicle (prime mover). The FTTS MSV, when loaded on 51-in deck-height railcars, shall meet the dimensional requirements of the Association of American Railroads (AAR) "Outline Diagram for Single Loads, Without End Overhang, on Open Top Cars" (covered in MIL-STD-1366) and the *Gabarit International de Chargement* (GIC) gauge shown in MIL-STD-1366 and NATO Standardization Agreement (STANAG) 2832. This requirement applies to the standard gauge rail lines in CONUS and in NATO countries. Any disassembly of the FTTS MSV will not be permitted.

3.4.10 Water Transport. The FTTS MSV shall be capable of negotiating 15-deg ramps without any portion of the vehicle, except the tires, contacting the surface of the ground, ramp, or deck (threshold). Shoring will not be allowed as a solution to meeting the ramp angle requirement (objective). All FTTS MSVs shall be transported without disassembly on all classes of ocean-going ships, including breakbulk (general cargo), roll-on/roll-off, barge carrying (LASH and SEABEE), and on all vessels of Army, Navy, and Marine Corps tactical watercraft fleet, in accordance with MIL-STD-1366.

3.4.11 Hazardous Material Transport. FTTS MSV and FTTS MSV CT shall meet all CONUS, OCONUS and NATO highway safety requirements for the transport of class VIII (medical), class III (POL), class V (ammunition and missiles) where applicable.

3.5 VEHICLE COMMAND, CONTROL, COMMUNICATIONS, COMPUTERS & INTELLIGENCE (C4I).

3.5.1 Reserved.

3.5.1.1 Reserved.

3.5.1.2 Reserved.

3.5.1.3 Common Operating Picture (COP). The FTTS shall integrate with the (COP) via embedded C4I equipment on the FTTS MSV to include different types of suites, architectures, network peripherals, subsystems, and radios. The FTTS MSV shall have sufficient space and power for on-board integration of C4ISR systems without inhibiting any vehicle operation by any operator within the cab space of the FTTS MSV (to include line of sight, safety issues, MANPRINT, ergonomics, etc…) or without using room dedicated for TA-50, individual weapons, rucksack/backpack storage, crew gear, duffle bags, or other cab occupant belongings.

3.5.1.4 Reserved.

3.5.1.5 Sustainment Data & Reporting. FTTS systems must be capable of automatically monitoring, collecting, storing and reporting real-time cargo (payload) and maintenance data from the platform/system level sensors (Non-real time sensitive data will remain stored on board for downloading as required).

3.5.1.6 External Interfaces. Vetronics computing hardware and software shall interoperate with other onboard computing hardware and software including FBCB2 and MTS. Such hardware includes interfaces to the crew station, other crew workstations, dismounted soldier equipment (mounted warrior soldier system), C4ISR computing/communications equipment, and other vehicle subsystems (e.g., propulsion, survivability, lethality).

3.5.1.7 Objective Performance (OP) C4I Hardware Package. The contractor shall, as a minimum, incorporate the following components into the FTTS MSV Objective Performance (OP) designs as representative space and weight claims for C4I hardware that is currently under development in the Future Combat Systems (FCS) program.

Common Part Name	Weight		Dimensions									
			length		width		height		Thermal	PWR	Internal/	Operator
	lb	kgs	in.	mm	in.	mm	in.	mm	BTU/HR	(watts)	External	Interface
Joint Tactical Radio System (JTRS)	43	20	13.5	343	15.3	389	7.5	191	479	TBD	I	Y
Joint Tactical Radio System (JTRS)	43	20	13.5	343	15.3	389	7.5	191	479	TBD	I	Y
Camera-Rear	30	14	10.25	260	4	102	3.75	95			E	N
Camera-Front	30	14	10.25	260	4	102	3.75	95			E	N
Combat ID Processor	10	5	6.4	163	5.7	145	8.2	208	102.39	30	I	N
Combat ID Transceiver	7	3	5	127	9	229	8	203	102.39	30	I	N
Integrated Computer System (ICS) 1	67	30	21.6	549	11	279	10.125	257	2006.34	588	I	N
Integrated Computer System 2	67	30	21.6	549	11	279	10.125	257	2006.34	588	I	N
Integrated Computer System 3	65	30	21.6	549	11	279	10.125	257	2006.34	588	I	N
Cosite Interface Mitiagtion Dev	50	23	8	203	15.75	400	13.75	349	426.625	125	I	N
Cosite Interface Mitiagtion Dev	50	23	8	203	15.75	400	13.75	349	426.625	125	I	N
Universal Hd Power Amp in Mount	3	1	9.65	245	5.88	149	7	178			I	N
Universal Hd Power Amp in Mount	3	1	9.65	245	5.88	149	7	178			I	N
Universal Hd Power Amp in Mount	3	1	9.65	245	5.88	149	7	178			I	N
Universal Hd Power Amp in Mount	3	1	9.65	245	5.88	149	7	178			I	N
JTRS Remote Control Head	2.1	1	3.75	95	5.75	146	1.75	44	13.65	4	I	N
Software Loader Verify	1.75	1	1.8	46	7.5	191	5.25	133	6.83	2	I	Y
Software Loader Verify	1.75	1	1.8	46	7.5	191	5.25	133	6.83	2	I	Y
R2 Data Storage Unit Removable	10	5	10	254	5.75	146	4.5	114	1802.065	528	I	N
R2 Data Storage Unit Removable	10	5	10	254	5.75	146	4.5	114	1802.065	528	I	N
Multiple Antenna Array	22	10	24	610	24	610	7.5	191			E	N
Multiple Antenna Array	22	10	24	610	24	610	7.5	191			E	N
Whip Antenna	8	4		0		0	42	1067	3.415	1	E	N
Whip Antenna	8	4		0		0	42	1067	3.415	1	E	N
Automatic RF Distribution	25	11	10	254	19	483	5.25	133	17.065	25	I	N
Automatic RF Distribution	25	11	10	254	19	483	5.25	133	17.065	25	I	N

3.5.2 Minimum Demonstrator C4I Functionality. Because of the expected unavailability of the hardware listed above and the requirement to demonstrate improved C4I capabilities for the ACTD, the contractor shall provide the following minimum C4I functionality. The contractor is not limited to providing only this level of C4I functionality.

3.5.2.1 Force XXI Battle Command Brigade & Below. The FTTS must automatically collect critical sustainment data and have the capability to report sustainment data automatically, or upon request report to other systems or organizations as required and display it to the crew as needed (Threshold).

3.5.2.2 Movement Tracking System (MTS). The system shall allow the Government to track its assets worldwide. The FTTS must also be capable of integrating sustainment data from FCS FoS equipment in the UA. When connected to approved Army/Joint C4ISR systems this data must be capable of automatic distribution through them as required to maintain the current relevant, common logistics environment and log status at all levels.

3.5.2.3 Reserved.

3.5.3 Electrical System. Electrical system shall be in accordance with Federal Motor Carrier Safety Regulations 393.27 through 393.33. Variants shall be equipped with a 24 VDC electrical system with either a 12 VDC lighting system or a 24 VDC lighting system. Electrical systems shall be waterproof with the exception of components and connections inside the cab or other enclosures. Circuits and components shall be protected from corrosion by the use of corrosion resisting materials or by the application of corrosion resisting compound that is readily removable for maintenance. The 24 VDC electrical circuits shall conform to the limits prescribed in MIL-STD-1275. Reverse polarity and over-voltage protection shall be incorporated into all electrical systems. All manual circuit breakers shall be readily

accessible to facilitate manual resetting. Circuits shall be identified with the contractor's code for electrical wiring and electrical components. A manually operated, keyless ignition switch with "off", "on" and "start" positions shall be provided.

3.5.3.1 System Grounding. Vetronics equipment shall adhere to the following power, grounding, signal interfacing, and shielding guidelines:

a. Equipment design for FTTS requiring 28-V dc vehicle power shall be compliant with MIL-STD-1275 and E38249. All equipment shall be designed with separate power input(s) and power return(s) (two-wire circuit). Vehicle chassis should not be used as a power return.
b. Vetronics equipment power returns shall be connected to a single-point ground location.
c. Equipment vehicle power returns and signal returns shall be electrically isolated from the equipment chassis.
d. Equipment chassis shall be electrically bonded to the vehicle structure.
e. DC returns distributed from vetronics equipment shall not be interconnected with other dc returns without first providing isolation.
f. The data network and the test and maintenance bus will be the only interfaces connected directly to multiple processor units.
g. When connecting signal interfaces between processors and other vetronics entities, the following types of interfaces should be used in the order listed:
   1. Fiber optic.
   2. Differential signals with transformer coupling and isolated grounds.
   3. Differential signals with dc coupling and single-point ground at the station.
   4. Single-ended signals with optical coupling and isolated grounds.
   5. Single-ended signals with dc coupling and single-point ground at the processor.
h. Cables shall have an overall shield connected to the equipment chassis at each piece of equipment connected to the cable.
i. Signals requiring individual shields within a cable shall have their shields connected to equipment terminated.
j. Shielding shall not be pinned through a connector.

3.5.3.2 Electrical Accessories.

3.5.3.2.1 DC Electrical Power. A minimum of 2 convenience outlets (one 12v outlet and one 24v outlet, 15 amp including on/off switch) shall be provided as a power source for portable electrical equipment in the cab compartment. A grounding circuit shall be autonomous and separate from the chassis.

3.5.3.2.2 AC Clean Electrical Power. Electrical power source outlet for 110v AC, 15 amp shall be provided in the cab compartment with minimum interference to the occupants with outlets being easily accessible (Threshold). A 220V AC, 20 amp outlet and a 110v AC, 20 amp outlet shall be provided outside the cab with outlets being easily accessible from ground level (Objective). All outlets shall be ground fault interrupt.

3.5.3.2.3 Power & Data Growth Capability. Provisions must be made for the wiring (power and data) of future systems that may be mounted on the FTTS MSV.

3.5.4 Vehicle Management Software. The vehicle management function shall be implemented in software that executes on general-purpose processors dedicated to vehicle control. The function shall provide a standard status and control data interface to all vehicle and mission subsystems. The vehicle management function shall provide the interface between C4ISR systems and the vehicle subsystems.

The vehicle management functional and performance requirements are divided into three segments:
1. Vehicle operational management.
2. Vehicle safety management.
3. Vehicle reporting.

3.5.4.1 Vehicle Operational Management. Vehicle operational management complements the overall requirements for vehicle capability. Vehicle operational management shall provide the functionality and performance covered in the paragraphs below.

3.5.4.1.1 Reserved.

3.5.4.1.2 Initialization. Initialization shall check vehicle electronics operational readiness and initialize the vehicle management software.

3.5.4.1.3 C4ISR Computer Startup. The vehicle management function shall turn on the C4ISR computer. Startup of the C4ISR system will be initiated by C4ISR organic software.

3.5.4.1.4 Reserved.

3.5.4.1.5 Reserved.

3.5.4.1.6 Sensor Control Support. The vehicle management software shall support sensor control actions with respect to enabling or disabling interlocks on sensors.

3.5.4.1.7 Vehicle Safety Management. Vehicle safety management is part of the overall safety system. FTTS MSV subsystems shall not introduce any uncontrolled safety hazards to the host platform.

3.5.4.1.8 Status Acquisition & Control. Status acquisition and control shall nominally provide fixed (4-Hz, Objective) monitoring and control of all vehicle and mission subsystems. The vehicle management function shall monitor and provide control as required and control changes commanded no more frequently than 1 time per 0.01 sec.

3.5.4.1.9 Reporting (Objective). Reporting shall enable C4ISR, C2, training, and sustainability applications to receive information about vehicle and mission subsystems health and status and from the vehicle management software. Reporting shall

a. Extend for no longer than 1 sec during battle conditions.

b. Provide integrated vehicle health and status reports at rates up to 5 Hz.
c. Provide mission subsystems status reports at rates up to 5 Hz.
d. Provide alarm reports at rates up to 10 Hz, by exception.
e. FTTS MSV shall have sensors which collect and transmit fuel on-board, potable water on-board, and rations on-board.
f. FTTS Manned Systems must provide interfaces necessary to support the LWFCS and Mounted Warrior (MW) physiological monitoring systems to report Soldier medical status when mounted or dismounted. (Objective)

Reporting shall extend for no longer than 1 second per request during battle conditions.

3.5.5 Lighting. All clearance lights, marker lights and military composite lights shall be LED (threshold). All interior lighting shall be LED (threshold). The vehicle exterior and interior lights shall be protected to preclude any damage when interfacing with other vehicles or ancillary equipment and shall be protected from terrain and natural obstacles while traveling cross-country. The vehicle shall be equipped with lamps, reflective devices, and associated equipment as specified per FMVSS 571.108. Actuation of the brakes shall override the vehicle hazard lights. All indicators and gauges shall be illuminated in service mode.

3.5.5.1 Headlights. The FTTS MSV shall incorporate headlights. The headlight height requirements in FMVSS 571.108 do not apply. Headlights shall meet DOT illumination requirements; 24-volt headlights are permitted.

3.5.5.2 Exterior Work lamps. The FTTS MSV shall be equipped with a minimum of 2 permanently mounted work lamps to facilitate night operation and maintenance and meet the requirements below:

a. Lamp housing shall be mounted in a protected position and such that the lamps are aimed at areas around the rear and sides of the vehicle.
b. The work lamps shall provide a minimum of 1,500 candlepower (c.p.) and equipped with an individual on/off switch plus a master switch in the vehicle cab accessible to the driver.
c. An on/off switch accessible from the driver's position shall be furnished and operate individually from the light itself.
d. 2 additional work lamps (threshold) that shall be demountable and provide the capability to permit hand illumination of the truck pintle areas and 20 ft. beyond.

3.5.5.3 Convoy Warning Lights. There shall be provisions for readily mounting and connecting a commercial, yellow strobe type warning light on the vehicle. The strobe light shall have a light intensity equal to or greater than warning light A-A-52418. The warning light shall be visible for 360 degrees and shall not be capable of being activated during the blackout mode.

3.5.5.4 Secure Lighting. A 24 VDC or 12 VDC blackout lighting system shall be furnished. The blackout system shall be controlled by an interior switch, readily accessible to the driver, which shall prevent accidental disengagement of the blackout system from the blackout mode and shall automatically disengage all lights and devices required by

paragraph 3.5.5, 3.5.5.1, 3.5.5.2, 3.5.5.3, the backup alarm (see 3.5.12). Exterior blackout lighting shall consist of, either separately mounted or in a composite light assembly, one blackout drive lamp (reference 12360910), and two rear mounted blackout stop lamp assemblies (reference 12360870). Interior blackout lighting shall be as required for safe operation of the vehicle and compatible with night vision devices (i.e. night goggles) in use at time of fielding. The emission of any vehicle interior or exterior light source, which may be illuminated (including warning lights) in the blackout mode, shall be limited to the visible spectrum (380 to 700 nanometers). No energy shall be emitted in the 700 to 1200-nanometer portion of the electromagnetic (EM) spectrum. (Emission peaks shall not exceed 1% relative to the peak emission in the visible spectrum.) Colored warning lights shall be maintained as necessary while meeting the above requirements.

3.5.6 Wiring. All wiring shall be in accordance with SAE-J1292 and SAE-J163. Unless otherwise specified herein, wiring not protected from accidental contact with troops, terrain or vegetation shall be a minimum of 14 gauge. Vehicle junction boxes/connectors shall be furnished at multiple disconnect points.

3.5.7 Reserved.

3.5.8 Electrical Connectors. All electrical connector bodies, pins and contacts shall be made of corrosion resistant material or shall be coated with a corrosion resistant material that is readily removable for maintenance. The vehicle shall be equipped with all connectors necessary to operate electrical components of towed military trailers. Connectors shall allow for disconnection and reconnection without damage. Inter-vehicle slaving connections will be accomplished through cable and plug assembly. The slave receptacle shall be located so as to preclude damage, corrosion and contamination. The receptacle cover shall stay in place under all mission scenarios.

3.5.9 Crew Indicators. The vehicle shall be equipped with gauges/indicators, which shall be readily visible to the driver/assistant driver and illuminated for night operation. Gauges may be replaced by an on board message center. Gauges/indicator shall include as a minimum, fuel level, engine coolant temperature, transmission fluid temperature, engine oil pressure, engine tachometer, speedometer/odometer, power management suite, air pressure (air assist vehicle/trailer brakes), brake warning, park brake on and air filter gauge and Power Take-Off (PTO) engagement light. The speedometer shall be calibrated in both MPH and KPH. An odometer shall be provided to indicate mileage and kilometers. Warning lights shall be provided and shall include, engine temperature, headlight high beam, emergency brake engaged and an ABS error indicator (as applicable). There shall be a warning light and an audible warning to indicate low air pressure, and high coolant temperature. The audible warning indicators shall be inactive while in the blackout mode. There shall also be self canceling turn indicators, emergency flasher system, light switch which controls service lights, blackout lights, driving and instrument panel lights. Gauges and switches shall be color coded on the face scale indicators to indicate information such as: desirable operating range in green; cautious, undesirable, or ineffective usage in yellow; dangerous or

harmful operating level in red. Lenses shall not discolor throughout the life of the vehicle. Two map lights with one located in each upper rear corner of the cab with individual switches shall be provided. These lights shall be overridden during blackout mode.

3.5.9.1 Master Power Cutoff Switch. The vehicle shall be equipped with a master power cutoff switch that, when activated, disconnects power to all systems in the truck and towed trailer. The switch shall be capable of handling all electrical systems. Switch shall have a failsafe system that prevents damage for shutoff.

3.5.10 Databus Connectors. Databus-sensor connections shall interface with the engine, transmission, antilock brake system, Central Tire Inflation System and as many other electronic subsystems as possible.

3.5.11 Data Storage. The vehicle shall be equipped with a system that shall be capable of accumulating, recording, and storing (30 (threshold)/90 days (objective)) vehicle diagnostics, prognostics, and operational data such as coolant temperature, oil temperature, oil pressure, throttle position, speed, timing, fuel pressure and vehicle speed. The data shall be protected by security measures from tampering.

3.5.12 Interrogation Capabilities. The FTTS will have vehicle-to-vehicle diagnostics interrogation and data collection capabilities (mechanical-threshold; wireless-objective) enabling the operator and/or Combat Repair Team (CRT) to diagnose vehicle failures without leaving their vehicle and without ancillary Test Maintenance and Diagnostic Equipment (TMDE).

3.5.13 Vehicle Backup Alarm. The FTTS will have a backup alarm that shall be installed on the vehicle in accordance with SAE J994 requirements. The crew shall have a control to disable this function. The backup alarm shall be automatically disabled while vehicle is in blackout mode.

3.5.14 Identifying Friend or Foe (IFF) Devices. FTTS must provide combat identification (CID) of friend or unknown in a Joint, Allied/Coalition environment through platform-to-platform (manned and unmanned, ground and air), platform-to-soldier, soldier-to-platform and soldier-to-soldier under all battlefield and weather conditions across the spectrum of operations. CID systems must interface with the C4ISR communications network for development and maintenance of the COP.

3.5.15 Driver's Vision Enhancements.

3.5.15.1 Night Vision Enhancer. An integrated driver's vision enhancement which improves vision in all obscure conditions (e.g. snow, fog, dust, smoke, etc.) shall be provided.

3.6 RELIABILITY, AVAILABILITY, MAINTAINABILITY, & DURABILITY (RAM&D).

3.6.1 Reliability. In order to meet self-contained sustainment of the UA for periods of 3-day and/or 7-day mission pulse throughout the full spectrum of combat requirements for the FTTS MSV, it is imperative that platforms/vehicles achieve the mission reliability requirements. Commanders and their soldiers will have the confidence that systems will not fail during mission execution or, if they do, that they can be

quickly and easily returned to combat effectiveness.

The extremely high system-level reliability of the FTTS MSV platform coupled with a trained operator/maintainer is essential to make platform availability goals. It is through inherent, high reliability and maintainability that the UA is able to meet its operational goals with a smaller force and logistics footprint.

3.6.1.1 Mean Time Between System Aborts. System abort failures are defined as failures (operational hardware and software) that render the system non-mission-capable, including the network causing the associated platform/vehicle to become unable to continue in service, deadline the platform, or platform operation becomes unsafe. Non-mission-capable shall be defined (at a minimum) as loss of any of the following functions:

a. Mobility.
b. Survivability.
c. Command, control, communications, and computers.
d. Distribution capability (LHS).

This state is entered when a FTTS MSV system or subsystem fails so that operations and mission capabilities are not maintained.

This state is also entered when any failure results in a significant increase in crew workload, causing the crew to fail to successfully operate or maintain the FTTS MSV network-critical/essential functions and carry out the intended mission. FTTS MSVs shall be capable of operating 3 days under high operational tempo and 7 days under medium operational tempo without a system abort for at least 2800 hours. The FTTS MSV platform/vehicle shall meet this requirement under operation environmental conditions and per the mission profile defined herein.

To determine conformance to the reliability requirements, reliability requirements shall be demonstrated at the paragraph specified point estimate (threshold).

3.6.1.2 Mean Time Between System Aborts–Mobility. System abort–mobility failures are those failures (operational hardware and software) that render (deadline) the basic platform/vehicle mobility subsystem immobile/maneuverable, resulting in unsafe operation or making it non-mission-capable. The Mean Time Between System Aborts–Mobility (MTBSA-M) for each FTTS MSV shall be greater than or equal to 6450 hours.

3.6.1.3 Mean Time Between Essential Function Failures. Essential function failures are those failures (operational hardware and software related) that result in system degradation but still leave the platforms/vehicles in a full-mission or partial-mission-capable condition. Essential function failures also include failures that result in a significant increase in crew/operator workload. Each FTTS MSV shall have a mean time between essential function failures (MTBEFF) of not less 675 hours (Current complex systems have demonstrated a ratio of 4 EFFs for each SA).

3.6.2 Maintainability. Achieving the FTTS maintainability requirements increases available combat power and limits the maintenance force structure with respect to maintainers by

a. Ensuring that failed systems shall be rapidly returned to full combat capability.
b. Detecting impending incidents through prognostics prior to operational periods.
c. Accomplishing scheduled and unscheduled maintenance during pulse logistics periods.
d. Ensuring the success of the crew chief maintenance concept and its contribution to the reduction of logistics footprint

The FTTS MSV shall be supported by the two-level Army maintenance system, which consists of field and sustainment maintenance:
a. **Field maintenance** shall consist of on-system repair and return-to-user tasks, those tasks that do not consist of disassembly of a component (primarily LRU/line-replaceable module [LRM] level replacement). Field maintenance shall be conducted forward in the battlespace as the battle rhythm of the supported unit permits and shall be conducted by the system crew chief/operator and ordnance Combat Repair Teams (CRT) equipped with the Forward Recovery and Maintenance Vehicle (FRMV).
b. **Sustainment maintenance** shall consist of off-system repair and return-to-supply tasks, those tasks required to return components, subassemblies, and/or end item systems to a serviceable condition. Sustainment maintenance may take place at designated locations in the UE, or even as far back as CONUS, and shall be performed by military personnel, government civilians, and/or contractors.

3.6.2.1 Automation. Systems with STAMIS network communication linkage capability must monitor, receive, and transmit equipment operation, sustainment, and maintenance data. Systems designed with no communication capability will be designed with on-system sensors, data collection, storage, and down-load capability of non-time sensitive operation, sustainment, and maintenance data.

3.6.2.2 Design for Maintainer. To ensure ease of maintenance, MIL-STD-1472, Design for Maintainer section, shall be used appropriately to ensure that the system is designed for compatibility with human maintainers wearing full combat weather equipment. MIL-HDBK-759 shall be used to calculate anthropometrical dimensions. Where arm, hand, and thumb-finger controls requiring high control forces are to be used, the maximum force requirements shall not exceed those specified in MIL-STD-1472.

3.6.2.2.1 Component Accessibility and Identification. Components shall utilize only those tools used in 3.6.2.10.4. All reservoirs, filters, drains, vents and valves shall be easily accessible and identified for inspection and servicing. Drain plugs installed in engine, transmission, transfer case, axles, and hydraulic reservoir shall be of the permanent magnet type and readily accessible. The function of all drains, vents and valve openings shall not adversely affect the function of or damage to any other vehicle component (i.e. battery box). Provisions shall be in place to prevent draining fluids from contacting other components of the vehicle. All seals shall restrict the entrance of all foreign materials and prevent the leaking of lubricants. At a minimum, the engine, transmission, antilock brake system (if installed) and Central Tire Inflation System shall be electronically controlled. All lines and fittings shall be secured in

such a manner to prevent rubbing on adjacent lines or vehicle appendages. The FTTS MSV shall be equipped with all items necessary to accomplish all mission objectives and tasks. The FTTS MSV shall have mounting and stowage provisions for all Basic Issue Items (BII) and onboard tools.

3.6.2.3 Maintenance Ratio–Maintenance Man-Hours per Operating-Hour. Each FTTS MSV shall achieve the following maintainability requirement: the FTTS MSV maintenance ratio (MR) shall not exceed 0.025 maintenance man-hours per operating-hour (MMH/OH) (threshold), which includes field and sustainment maintenance tasks. The crew chief shall be able to isolate, remove, and replace 60% of all field-level failures (SA/EFF) resulting in a non-FMC system (excluding battle damage) and 60% of all field level system unscheduled failures (NEFF), without special tools or capabilities (lift). The MR includes operator/crew preventive maintenance checks and all unscheduled maintenance, preparation, inspection, diagnostics, removal, replacement of LRUs/LRMs (including software reloads/reboots), and adjustments/tests required to restore the platform/vehicle to mission-capable status. Does not include annual/9000 mile scheduled maintenance event.

3.6.2.4 Time to Repair. Each FTTS MSV shall not exceed 0.5 clock-hours Mean Time To Repair (MTTR)(Threshold), 0.25 clock-hours (Objective). Maximum Time To Repair (max TTR) for 95% of all maintenance actions for the operator field level maintenance tasks shall not exceed 0.5 clock-hours. MTTR is the sum of all active corrective maintenance times divided by the total number of failures (SA, EFF, and non-EFF). Active repair time does not include cool down, waiting time for spares, locating ladders, getting out technical manuals, cure time for gaskets/seals, etc.

The FTTS MSV shall not exceed maximum time to repair of 0.5 hr (clock hours) for all operator field-level maintenance actions, with or without armor protection.

3.6.2.5 Preventive Maintenance Checks & Services. Preventive maintenance for the FTTS MSV shall consist of daily Preventive Maintenance Checks (PMC), annual scheduled maintenance checks and services, and anticipatory maintenance enabled by prognostics. The crew chief/operator shall perform PMC that includes required before-, during-, and after-operation checks and services. Anticipatory maintenance enabled by embedded prognostic sensors and software shall detect failure of critical components and assemblies so equipped in sufficient time to allow for replacement before failure.

3.6.2.5.1 Preventive Maintenance Checks (PMC). Each FTTS MSV shall provide the capability for automated PMC. The PMC results shall be displayed to the crew/operators. Crew/operators/maintainer shall be capable of performing PMC and capable of confirming as necessary fluid/oil levels, operation of lights, ancillaries, pressure, and any equipment wear.

Crew chief/operator PMC requirements must be automated to the maximum extent possible using onboard sensors and diagnostics to simplify checks and reduce operator workload. Non-automated portions of the PMC must require no more than 5 minutes to complete. PMC results must be

displayed to the operator and critical information reported to maintenance through the FTTS MSV mission readiness system (Manned systems). Non-critical PMC data results must be stored on board by the mission readiness system for download periodically and input to the logistics management database. Unmanned systems must automatically report status (if enabled) or report through the controlling manned FTTS MSV system. (Threshold)

3.6.2.5.2 Scheduled Services. The FTTS MSV manned system design shall allow for a single annual, scheduled maintenance service period that meets the parameters of 9,000 mi, 3,000 operating-hours, or annually, whichever occurs first. Total time for the scheduled maintenance service shall not exceed 24 man-hours per vehicle per service with a goal of 12 man-hours per vehicle per service. Servicing shall be defined as cleaning, replacement and maintenance of selected equipment. All vehicle variants of this family shall be designed so that the following (if applicable) can be removed from the vehicle and replaced in less than one hour by 2 Operators or maintainers

a. Transfer Case

All vehicles variants of this family shall be designed so that each of the following (if applicable) can be removed from the vehicle and replaced in under 0.5 hours by 2 operators or maintainers.

b. Engine (only)
c. Transmission (only)
d. Engine – Transmission Assembly

The criteria is from hood up to hood down and includes all preparation, i.e., hood removal, tilting the cab or draining fluids, etc. Routing, daily maintenance checks, i.e., engine oil, coolant level, battery liquid level, etc., must be readily accessible without the use of tools. Pre-operation fluid level checks shall not take longer than 5 minutes. Components of the chassis shall be accessible for servicing, repair, and replacement. Ease of maintenance provisions shall incorporate features insuring operating clearances and facilitating maintenance and service operations.

3.6.2.6 Doors & Maintenance Access. Each FTTS MSV shall provide ready accessibility compatible with the maintenance ratio requirement, for servicing, adjusting, and replacing elements of the installation without teardown of any major part, component, or element. The FTTS MSV doors and maintenance access panels shall be located such that equipment that requires more frequent maintenance is given prime locations. They shall have an automatically applied positive means of being latched in open and closed positions that prevents unintended hatch closing or opening. Access mechanisms shall be designed so that it is obvious how they open and close. Access covers that remain attached to the basic equipment shall be designed so that they do not have to be held open and do not dangle in the way. Vibration or shock during operation or the accumulation of dirt, debris, shell casings, snow, ice, and the like shall not prevent proper door and access opening function. Access openings shall be large enough so that a maintainer can see what he is doing with his hands in the opening.

3.6.2.7 Subsystem/Component Serviceability. Subsystems and components shall be designed for automatic, self-aligning, tool-less, and self-torquing installation and engagement of mountings and interconnections. Use of slides, alignment pins, captive hardware, installation levers, and similar devices shall be used to minimize human error and task requirements for all field maintenance tasks.

3.6.2.8 Electrical Connectors. Each FCS platform/vehicle shall contain the minimum number of distinct electrical connectors interfacing with LRUs, platform/vehicle/system/subsystem/mission equipment, and the platform. Electrical/electronic connectors to be used on LRUs shall be keyed to prevent incorrect application. Electrical connectors shall be selected that provide for connection and tightening without the use of tools and with ease of installation and replacement of LRUs.

3.6.2.9 Filters. Each FTTS MSV engine shall include filtering for fuel, lubricating oil, and intake air to prevent excessive contaminants from entering the engine system. The filter assemblies shall be designed so that the filters can be conveniently and easily removed. The engine air cleaner element efficiency shall be 99.8% with SAE coarse test dust and 99.5% with SAE fine test dust.

All filters within the FTTS MSV for water, fuel, oil, hydraulic, NBC, pneumatic, and air, shall be designed with the following additional features:

a. All filters shall be directly accessible by the operator/maintainer/crew (with or without armor plating installed).
b. Health monitoring systems shall monitor the performance and life of the filters.
c. Service life of all filters shall be at least 2 years.

3.6.2.10 Prognostics & Diagnostics. Each FTTS MSV shall incorporate and enable embedded prognostics and embedded diagnostics that identify down to the LRU/LRM level and present fault/failure data for display to the crew/maintainer/operator. All fault message and associated platform/vehicle conditions and status shall be maintained and stored on board the platform/vehicle for up to 90 days. Diagnostic systems shall automatically notify the crew and supporting maintenance system of status via the embedded prognostic and diagnostic system.

3.6.2.10.1 Prognostics. All FTTS platforms/modules will incorporate an embedded prognostics capability that will accurately predict pending critical system failures (any failures that cause system aborts IAW the reliability definition) to the appropriate LRU (LRU defined as any part or component replaceable by field maintenance personnel) that might occur in a 72 hour mission, early enough to allow corrective action before the unit begins the mission. Prognostics will provide coverage for 35% SA and 26% EFF at a 90% accuracy rate (threshold) 70% SA and 53% EFF at a 99% accuracy rate (objective).

3.6.2.10.2 Diagnostics.

Each FTTS MSV shall incorporate embedded diagnostics/BITE that unambiguously detects and isolates 80% (threshold)/ 99% (objective) of all essential and mission-critical functions. The diagnostics shall be able to fault isolate:

a. To one LRU 80% of the time (threshold)/99% of the time(objective).

b. To two or fewer LRUs 90% of the time (threshold)/ 95% (objective).
c. To three or fewer LRUs 99% of the time (threshold).

The background Built in Test Equipment (BITE) will store fault data for maintenance recall and will be available for use by maintenance personnel to verify repairs.

All FTTS platforms/modules will incorporate a capability that will identify the system failures accurately to the appropriate LRU (LRU being defined as any card, module or component replaceable by field maintenance personnel), with notification first to the crew, then to the supporting maintenance personnel (through the logistics STAMIS).

3.6.2.10.3 Vehicle-to-Vehicle Umbilical Diagnostics.

A system umbilical (threshold), wireless system (objective)shall be available so that the each FTTS MSV shall be capable of receiving platform-to-platform interrogation and internal system access from supporting platforms, including power transfer, power sharing/charging, software recovery/updates, interactive electronic technical manuals (IETM) access (includes supporting updates), and performing all levels of prognostics and diagnostics. The vehicle-to-vehicle umbilical link shall allow for data transfer between vehicles that are 10 m apart. When the wireless system objective is attained it will add to and not replace the umbilical of the system.

Each FTTS MSV umbilical connection/receptacle shall allow easy vehicle hookup/connectivity to fixed-facility (motor pool, battle simulation center) auxiliary/commercial electric power and network (fixed tactical network) and enable maintenance, readiness reporting, and training to occur without running the vehicle engine or an external generator.

3.6.2.10.4 Common Tools. The FTTS will require no more than 10 common tools on the on board to perform all operator maintenance and 10 additional tools (carried by the CRT) to perform the remainder of the Field Level tasks. There will be no special tools or external TMDE required for field level maintenance.

3.6.2.10.5 Reserved.

3.6.2.10.6 Interactive Electronic Technical Manuals (IETM). Each FTTS MSV manned system must have an on-board, full IETM capability that includes operator and maintainer technical manuals (TMs) and Repair Parts and Special Tool Lists (RPSTL) for all onboard equipment, including GFE items (Threshold). The embedded virtual full task trainer will be fielded concurrently with the FTTS. All technical manuals must be Class 5, Interactive Electronic Technical Manuals, and include an embedded training to assist the mechanic/operator in performing maintenance tasks and diagnosis.

3.6.2.10.7 I.E.T.M Embedded Video Maintenance Support. The FTTS IETM software platform will allow the operator/maintainer to view actual video coverage on all Field Level Maintenance Tasks. The operator/maintainer will use the IETM for standard maintenance fault isolation tasks, on-system video maintenance task demonstration, and on-system video instructional or refresher training. The IETM will have a multi option capability allowing the maintainer to access various

tasks and use links to access video instructions/demonstrations for the task. The video function must allow start, stop, pause, rewind, fast-forward, and return to the maintenance window. This will allow the maintainer the option of viewing a maintenance task on video and returning to the maintenance procedures to begin the task. The video will be formatted using memory-reduced compression, and can be viewed through a high quality resolution screen.

3.6.3 Durability.

3.6.3.1 Drive Train Components. The vehicle shall not have less than a 60% probability of completing the first 32,000 kilometers (20,000 miles) of operation of a components lifecycle without overhaul, rebuild, or replacement of any of the following

1. Engine
2. Transmission
3. Transfer Case (if applicable)
4. Axles (if applicable)
5. Suspension
6. Drive motors (if applicable)
7. Propulsion Generator (if applicable)

3.6.3.2 Wear Out. Each FTTS MSV shall not have any assemblies/components that wear out or need replacement in less than 15,000 km (9,000 mi) or 2 years of operation.

3.6.4 Availability.

3.6.4.1 Operational Availability (Ao). Each FTTS MSV shall be fully operationally available 95% of the time (threshold)/99% (objective). Ao is the percentage of time during a mission pulse that a FTTS MSV (including all GFE/M and CFE/M) is operable and capable of performing its intended mission (no system aborts). Ao is calculated as the uptime divided by the sum of uptime and downtime during the mission pulse of the 3-day and/or 7-day mission lengths.

3.6.4.2 Service Life. The FTTS MSV shall have a design life that maintains the RAM requirements and is supportable for at least 25 years under the same environment and failure criteria. For 25-year life there will be

a. 10**% High Operational Tempo Missions.** 3-day high OPTEMPO.
b. **15% Medium Operational Tempo Missions.** This equates to the 7-day mission.
c. **50% Low Operational Tempo Missions.** Potentially defined as a standard peacetime CONUS training mission profile. Motor pool training using the network and commercial power will limit the number of miles driven (low mileage) while increasing the electronics/power systems "on" time for training.
d. **25% Idle.** This time is defined as those days when the platform/vehicle is not training or on a mission and is positioned as idle in the motor pool ready for use/deployment. Examples are when the platform/vehicle is in the post-support cycle and is not

doing any military training. Basically the vehicle sits in the motor pool unoccupied.

3.7 MANPOWER & PERSONNEL INTEGRATION (MANPRINT).

3.7.1 Human Factor Engineering. The vehicles shall be in conformance with MIL-STD-1472. Conformance shall be based on a 5th percentile female to 95th percentile male wearing NBC and cold weather protective clothing. All vehicle configurations shall ensure functionality, ease and safety of operation for all functions performed by operational and maintenance personnel based on 5th percentile female through 95th percentile male. The crew station for TOW weapon operation and ambulance litter loading shall accommodate the range between 95th through 5th percentile male soldier. The FTTS MSV shall be operational and maintainable by Military Operational Specialties while wearing the full range of army clothing, including arctic, and MOPP IV clothing. The FTTS MSV shall be operational and maintainable by Military Operational Specialties while wearing full combat gear (to include Load Bearing Equipment (LBE), personal body armor and protective mask), individual MOPP IV and arctic clothing. All operations for the FTTS MSV shall be capable of being performed by a crew of two soldiers (threshold) (objective - one soldier). System design and integration, to include operation of all equipment, shall accommodate operation and maintenance by a target audience of 5th percentile female through 95th percentile male. *(Ref MIL-STD-1472 for guidance)*

3.7.2 Crew Compartment.

3.7.2.1 Cab. The FTTS MSV shall provide capability for a crew of 2 personnel (threshold), up to 4 personnel (2 crews) (objective) to conduct 24-hour operations. Crew is defined by all prime mover and/or other systems' operators supported by the prime mover. Operator shall have visibility of the ground when negotiating terrain at maximum break-over angles.

3.7.2.2 Crash Protection. The cab shall have cab crash protection that provides survivable space for the occupants as described in FMVSS 571.208 for occupant crash protection and roll over situations. Cab shall be protected from terrain and natural obstacles while traveling cross-country.

3.7.2.3 Seating. Seats shall be individually adjustable fore and aft and to the occupant's height. The design shall provide leg, back and shoulder and head support. All seating shall be designed to safely accommodate soldiers outfitted with combat gear (i.e. Load Bearing Equipment (LBE) and flack vest, Mounted Warrior Soldier System (MWSS), etc.) and/or mission Oriented Protective Posture IV (MOPP IV) equipment to include headgear.

3.7.2.4 Crew Restraint System. Each occupant seat shall have modern integrated safety restraint equipment, active/passive, that meets or exceeds Federal Motor Vehicle Safety Standards when operated over the full vehicle mission profile, to include off-road use, at rated speeds. This system shall accommodate a soldier wearing full combat gear (to include LBE, personal body armor, and protective mask) and individual MOPP IV protective gear without interfering with vehicle or crew operation.

3.7.2.5 Windshield & Windows. Windshields and windows shall be configured to minimize solar glare. Visors or other means shall be used to preclude performance degradation due to glare from external sources such as sunlight or headlights. Full frontal and side glare or shade protection shall be provided to all vehicle occupants. However, windshields or other transparent areas through which high acuity vision is required shall not be impaired. Visors shall also be capable of telescoping to provide coverage across the entire width of the windshield and folding toward the vehicle's body sides to fully protect the occupants from side glare. Visors shall have a mechanical detent to prevent movement while in the stowed position. Windshield and windows must incorporate the requirements located in the classified annex G.

3.7.2.6 Windshield Wipers & Washers. The cab shall be equipped with multi-speed windshield wipers and windshield washing system. A 3-qt (2.8 l) washer reservoir compatible with cleaner and appropriate additives for the climatic conditions for destination shall be furnished. Windshield wipers and washers shall conform to FMVSS 571.104 and SAE J198.

3.7.2.7 Vehicle Cab Interior. The vehicle cab interior and upholstery color shall be black, dark green, or dark brown. If the vehicle exterior is tan, then the interior shall be either black or tan. A first aid kit and a #10 BC fire extinguisher IAW FMCSR 393.95 shall be mounted within the cab interior and shall be detachable to allow removal from the cab. The upholstery (seat cover leather/vinyl/canvas/mesh) shall be repairable/replaceable by the operator.

3.7.2.8 Cab Floor Drains. The cab floor shall be provided with floor drains to permit draining of freestanding water on the cab floor. Removable plugs shall be provided for sealing of each hole. The plugs shall be captively restrained to the cab floor with a tether. The drainage system shall be NBC compatible.

3.7.2.9 Chemical Protective Equipment Storage. Space shall be provided inside the cab for the following: NBC garment suit, two per crewmember; NBC mask, one per crewmember; NBC gloves, two pair per crewmember; NBC overboots, one pair per crewmember; NBC hood, one per crewmember. The specified protective clothing shall be restrained by a quick disconnect type device to prevent unseating when traveling over rough terrain and when only a portion of the garments are being utilized.

3.7.2.10 M4/M16 Rifle Mounting. This kit will provide the necessary hardware for the mounting of two government-furnished rifle mounting kits inside the cab, such that they are easily accessible. The kits shall consist of the items found on drawing 5705590 or equivalent design that for easy accessibility. Holes will be provided for attachment of all items and will be filled with threaded fasteners.

3.7.2.11 Cab Temperature Control. The FTTS MSV environmental control system shall consider the NBC requirements in its design.

3.7.2.12 Rear View Mirrors. Mirrors conforming to A-A-52432 shall be provided on the left and right hand sides, be capable of folding toward the body sides in at least one direction, and prevent vibration during operations.

3.7.2.13 Stowage. Stowage space with latching device to utilize a standard military padlock shall be provided to accommodate Basic Issue Items (BII), publications (operator, hand receipt and warranty) and operator's Common Table of Allowances (CTA) 50-900 personal clothing and equipment. All stowage boxes shall contain drain holes. Publications shall be stowed inside of the cab above the fording line. Provisions shall be included that prevent contents of BII from obstructing the drain holes.

3.7.2.14 Displays. Crew compartment integration and assignment of functions to displays shall consider population characteristics, crew task requirements, crew workload through the mission, functional relationships between controls and displays, crew compartment physical constraints, operating environment, assessments of available display technologies, and crew physical limitations.

The loss of a single primary display device shall not prevent mission completion.

The integrated crew system interface shall consist of an optimal display configuration that can be appropriately configured for any mission phase, shall accommodate the display of all critical information, shall facilitate the efficient access to secondary information, and shall facilitate collaboration.

The crew station shall include the controls and displays that enable the crew to record display images and training video.

3.7.2.14.1 Display Visibility & Audibility. Displays shall be located and designed to be visible and legible from the crew design eye position under all expected vibration and illumination conditions.

Visual displays shall be designed to minimize glare and reflections and shall not be obstructed by controls, limbs, or equipment.

Displays, which have a corresponding auditory function, shall be designed so that their message content is audible and easily understood under all operational and auditory environmental conditions.

3.7.2.14.2 Visual Display Performance. Display performance parameters (e.g., luminance, resolution, color generation, contrast) shall be optimized for the human visual system performance characteristics, and for the type, quantity, and precision of information being displayed.

Crew control of display parameters (e.g., brightness, contrast, and color) shall be provided.

Visual displays shall not exhibit or produce distracting visual effects, artifacts, or anomalies (e.g., flicker, jitter, or noise) that will induce fatigue or degrade human performance.

Visual displays shall be easily readable throughout the entire expected range of ambient illumination with special consideration for any anticipated extreme viewing conditions that may occur within that range.

Displays shall be night-vision imaging system compatible.

3.7.2.14.3 Controls. Crew compartment integration and assignment of functions to controls shall consider population characteristics, crew task requirements, crew workload through the mission, functional relationships between controls and displays, crew compartment physical constraints, operating environment, assessments of available control technologies, and crew physical limitations.

The crew compartment system shall be capable of arming and disarming self-defense weapons independent of weapon release consent.

The ingress/egress doors shall latch securely in the closed position from the inside.

Provision shall be made to prevent inadvertent actuation of internal door/control handles while entering or leaving the platform, performing routine mobility duties, or performing maintenance on the platform.

3.7.2.15 Control Design & Mechanization. Controls shall be designed and coded to enable the crew to effectively accomplish all required control tasks, maximize head-up operation, and optimize sequential operation.

Controls shall not be susceptible to inadvertent actuation, particularly those critical controls that, if inadvertently actuated, may result in damage to equipment, injury to personnel, or degradation of system functions.

Methods used to protect from inadvertent actuation shall not preclude control operation within the time required.

Controls shall be mechanized to provide appropriate feedback (intrinsic/extrinsic) to indicate whether the control is properly actuated.

Controls shall accommodate the crew's anthropometric dimensions and strength limitations, taking into consideration all environmental conditions and any required mission equipment (armor, biological-chemical protective gear, NVGs, laser eye protection, gloves, etc).

3.7.2.16 Control/Display Integration. The relationship of a control to its corresponding display shall be apparent and unambiguous.

Control and display complexity and precision shall not exceed the capability of the operator or exceed the operator's motor, cognitive, and perceptual capabilities under the dynamic mission conditions and environment.

Displays shall clearly and unambiguously direct and guide the appropriate control response.

3.7.2.17 Position Relationships. Controls shall be positioned so that neither the control nor the hand normally used for setting the control will obscure the display.

Functionally related controls and displays shall be located and sequenced to provide for left-to-right (preferred) or top-to-bottom order of use (or both) and shall be in proximity to one another and arranged in functional groups (e.g., power, status, and test).

In instances when an operator must use a large number of controls and displays, their locations and arrangement shall be designed to aid in determining which controls are used with which displays, which equipment component each control affects, and which equipment component each display describes. The more important groups and functional groups that are used most frequently used should be in the areas that are most easily accessed.

Emergency displays and controls shall be located where they can be seen and reached with minimum delay.

A visual display that must be monitored concurrently with the manipulation of a related control shall be located so that the operator is not required to observe the display from an extreme visual angle, thus introducing the possibility of parallax error.

The arrangement of functionally similar or identical primary controls shall be consistent from panel to panel throughout the system.

3.7.2.18 Movement Relationships. The response of a display to control movements shall be consistent, predictable, and compatible with the operator's expectations (e.g., direction of control movement shall be consistent with related movement of an associated display, equipment component, or platform).

3.8 MATERIAL HANDLING EQUIPMENT (MHE).

3.8.1 Intelligent Load Handling Systems (ILHS). The ILHS is a multi-functional system that loads/unloads containers, flatracks, iso-configured shelters, and platforms on the FTTS as well as configure modular packaged loads (sustainment modules and other preformed packages) on platforms. The ILHS shall have the capability to handle individual flatracks up to 11 ST payload and handle individual sustainment packages up to 3,100 lbs. (threshold) and 6,100 lbs. (objective). For clarity, this specification will address the requirements of each function separately; however, this specification does not preclude the development of a single system capable of performing both functions.

3.8.1.1 Vehicle Integration. The ILHS shall be integrated into the FTTS MSV and shall not degrade the responsiveness, crew safety, deployability, transportability, agility, reliability, sustainability, operation, and survivability of the vehicle.

3.8.1.2 Reserved.

3.8.1.3 Operation. All ILHS functions shall be capable of one-man operation. The ILHS shall be operable by military personnel of the same skill level required for tactical truck operation, such as skill level 1 Career Management Field (CMF) 12, CMF 33, CMF 51, CMF 62, or CMF 63 operator. The ILHS operator station and operator control unit shall accommodate the range between a 5th percentile and 95th percentile Soldier.

3.8.2 ILHS Systems Components.

3.8.2.1 Reserved.

3.8.2.1.1 Reserved.

3.8.2.1.2 Reserved.

3.8.2.1.3 Semi-Autonomous Transport Path (Objective). This feature is a preprogrammed/programmable path around the truck that permits the operator to simply command speed and direction without concern of the orientation of the payload or avoidance of known obstacles in the workspace, resulting in maximum speed and efficiency. A 'Transport Path' strategy for rapid positioning of the crane around its perimeter eliminates the need for an operator to teleoperate the system in gross positioning tasks. The operator simply commands the crane to attach to a preprogrammed path and the system executes the move automatically. The operator is only required to command direction and velocity along the path. This feature requires that the ILHS system provides teach, record, and execution of programmed paths, as well as the ability to locate the closest position on the path from an arbitrary position. A programming capability can also be used for recording positions and orientations for repetitive operations, storage positions on the truck, and the stowage configuration of the ILHS for transport.

3.8.2.1.4 Reserved.

3.8.2.1.5 Payload Capacity and Reach. For transloading individual sustainment packages, the ILHS shall have a payload capacity of >= 3,100 pounds (threshold), >= 6,100 pounds (objective) at a >= 17ft reach (threshold), >= 23 ft reach (objective). Reach shall be defined as the centerline of the ILHS to the boom end.

3.8.2.1.6 Reserved.

3.8.2.1.7 Reserved.

3.8.2.1.8 Reserved.

3.8.2.1.9 Reserved.

3.8.2.1.10 Reserved.

3.8.2.1.11 Position Feedback (Objective). During the entire ILHS operation, the operator shall have active control over the movement of the ILHS, the cargo being transloaded, and shall have the ability to implement an emergency stop to prevent damage to the load, the truck, or the ILHS.

3.8.2.1.12 Stowage. All components of the ILHS shall be accommodated onboard the FTTS MSV.

3.8.2.1.13 Safety. The ILHS shall conform to ASME/ANSI B30.22-2000 standard and EN-12999, the European Standard for cranes and loader cranes, via British Standards Institution (BSI) and European Committee for Standardization (CEN) technical committees. The ILHS shall incorporate safety measures (e.g. valves) in the event of control, hydraulic supply, or electrical failure. Normal leakage cannot permit loss of the payload and must lower the payload in a stable manner. In the event of a failure in the ILHS, a back up means by which to stow the ILHS is required.

3.8.2.1.14 Reserved.

3.8.2.2 Flatrack Load Handling System. Flatrack load handling cycle time shall not exceed 3 minutes (threshold), less than 1 minute (objective). Cycle time is defined as time the lift arm is engaged to the time the load is in place and secured.

3.8.2.2.1 Payload. The FTTS MSV and its Companion Trailer shall each carry 11 ST cargo payload on a flatrack, which weighs no more than 2 ST (threshold), 1 ST or less (objective). Payload consists of cargo on a flatrack or CROP, sustainment modules, shelters / modular/configured loads and/or other containers / tank racks / quadcons / tricons or LHS compatible devices (i.e. with integrated bail bar or other LHS compatible lift point) (herein referred to as LHS payloads).

3.8.2.2.2 Operation.

3.8.2.2.2.1 Reserved.

3.8.2.2.2.2 Self Load/Off Load. The FTTS MSV shall directly load/off load cargo laden or empty flatracks/pallets to/from military cargo aircraft and to/from the TSV without additional interfaces and/or material handling equipment (including other services' equipment) up to the allowable handling capacity of the ILHS with one operator exiting the cab (threshold), no operators exiting the cab (objective). The FTTS MSV shall also move containers up to the allowable handling capacity of the truck or trailer within the TSV cargo hold. The MSV shall be capable of transloading 463L Pallet, flatrack, tankrack, other payloads, and containers to/from the FTTS MSV, to another FTTS MSV, a FTTS MSV CT, an aircraft (C-130, C-17, or C-5), TSV and other Army and Navy watercraft, a flatdeck railcar, a semi-trailer (M871 or M872), or the ground (+/- 12 inches and level ground (threshold). The ILHS shall transload from/onto an uneven ground slope of five degree (threshold), ten degrees (objective), from the prime mover's lateral and horizontal axes.

3.8.2.2.2.3 Reserved.

3.8.2.2.2.3.1 Reserved.

3.8.2.2.2.3.2 Reserved.

3.8.2.2.2.3.3 Approach Angle. Attach to a payload from an approach angle of 10 degrees (threshold), 20 degrees (objective), from the vehicle centerline and load and secure the payload to the prime mover. 10 degrees (threshold), 20 degrees (objective)

3.8.2.2.3 Overload. A safety allowance that meets industry standards for overload will be incorporated into the FTTS MSV ILHS.

3.8.2.2.4 International Standards Organization (ISO) Locks. The platform handling system shall accommodate ISO locking device-equipped cargo containers (objective).

3.8.2.2.5 Modular Intermodal Platform (MIP) Interface. The ILHS must interface to the MIP, which is currently under development.

3.8.2.2.6 Redundancy & Manual Backup. Provisions shall be incorporated to enable the operator to complete the material handling operation and properly stow the system for repair later. If the cargo platform system fails, a means by which the operator can move the system back into a stowed position on the vehicle is required. In summary, the ILHS must be at a minimum one fault tolerant (T), two fault tolerant (O), excluding battle damage.

3.8.2.2.7 Vehicle Alignment System. A vehicle alignment system must enable the FTTS MSV operator to safely and effectively align with modular platforms, containers, Air Force aircraft, trailers, or other trucks for loading, unloading, or trans-loading.

3.8.3 Stabilization System. If required, a stabilization system shall be incorporated into the FTTS MSV ILHS design if a stable base is not inherent to the design of the FTTS MSV. The stabilization system shall not restrict the operational range of the ILHS' workspace while manipulating the system's full payload at full extension. Outriggers or articulated support structures can be designed integral with the vehicle platform or the ILHS.

3.8.3.1 Ground Inclination Limits. While using the ILHS for cargo handling, the stabilization system shall provide a secure base throughout the ILHS payload and reach range on a ground slope of five degrees (threshold), with ten degrees (objective), from the prime mover's lateral and horizontal axes. The operator will be responsible for the evaluation of soil conditions to ensure adequate support of the ground contact points of the system.

3.8.3.2 ILHS Inhibit & Backup. The control system will inhibit ILHS operation without verification of deployment of the support structure. Once deployed, the stabilization system shall be locked to prevent collapse due to power loss or hydraulic supply failure. In the event of a failure in the stabilization system, a back up means by which to retract the support structure is required.

3.8.4 Power. The ILHS will operate on power provided by the FTTS MSV vehicle platform.

3.8.5 Reserved.

3.8.6 Operator Interface. The operator interface for the ILHS will consist of an operator control station within the cab and a hand held remote control device for use outside the cab. The ILHS operator interface shall be consistent with the requirements stated in paragraphs 3.5 and 3.7.

3.8.6.1 Operator Control Station. The operator control station within the cab shall consist of a display and an operator input device(s), such as keyboard, mouse, touchscreen or voice input. The interface will enable the operator to perform all operations of the system including teleoperation, teach, program, and execution modes of operation. In addition, this interface will enable the operator to monitor the diagnostics of the ILHS system, access operation and training documentation, as well as interface with C2 and existing inventory and other military databases relevant to material handling operations.

3.8.6.2 Remote Control Device. The ILHS system shall include an remote control device to enable all ILHS functions outside of the cab. The remote control device shall be operable as a tethered (threshold) or wireless (objective) device.

The wireless transceiver shall have a minimum range of operation of up to 30 feet from the vehicle platform. The wireless remote control pendant shall incorporate batteries that ensure 8-hour continuous operation without recharge. An onboard recharge station shall be incorporated into the system, and the ILHS shall include two additional battery modules for replacement. Wireless transmissions shall not interfere with other C4I equipment.

3.9 FTTS MSV COMPANION TRAILER (CT).

3.9.1 General. The FTTS MSV CT will support the FTTS MSV's capability of keeping pace with the increasingly mobile and widely dispersed maneuver forces dictated by Future Army Concepts. The FTTS MSV CT must be capable of operating over increased distances with increased payloads. The FTTS MSV CT will rapidly distribute all classes of supply.

3.9.1.1. Commonality. The FTTS MSV CT shall utilize common components compatible to the FTTS MSV to the maximum extent possible (i.e. tire/wheel assemblies, and same tools).

3.9.2 Reserved.

3.9.3 Trailer Payloads. The FTTS MSV CT shall carry any load carried by the FTTS MSV. The FTTS MSV-CT shall receive loads directly from the FTTS MSV either connected to or not connected to the FTTS MSV (threshold) or shall self-load/off-load any load carried by the FTTS MSV (objective) without additional interface, kits, or MHE.

3.9.4 Dimensions. Dimensions shall meet the requirements of the FTTS MSV except as noted below

3.9.4.1 Height. The FTTS MSV CT must be capable of negotiating a 4-meter underpass while transporting an empty ISO 668, Type 1C freight

container mounted on a flatrack without preparation. While being transported on a C-130 aircraft, the height of the CT, while carrying a CROP, must not exceed 102 in (threshold/objective).

3.9.5 PERFORMANCE CHARACTERISTICS. The FTTS MSV CT performance characteristics shall meet those of the FTTS MSV with additions noted below.

3.9.5.1 Mobility. The FTTS MSV CT shall meet the FTTS MSV mission profile. The FTTS MSV Companion Trailer while empty or fully loaded shall cause no less than 20% mobility degradation over the OMS/MP of the FTTS MSV when towed behind the prime mover (threshold) no decrease in the mobility characteristics of the prime mover (objective) and shall follow the track behind the FTTS MSV.

3.9.5.1.1 Reserved.

3.9.5.1.2 Autonomous Operation (Objective). The FTTS MSV CT shall be self-mobile and controlled independent of the FTTS MSV, although this does not preclude from being controlled from onboard the FTTS MSV, for autonomous missions.

3.9.5.1.2.1 Range. When used for autonomous missions, if a combustion engine is used, the propulsion system shall use the standard Army battlefield fuel and shall have the range of 46 mi (75 km) threshold, 93 mi (150 km) objective on a single tank of fuel while carrying a full load over the OMS-MP and where the fuel tank does not exceed the size of the HMMWV fuel tank (threshold) or one-half that of the HMMWV fuel tank (objective).

3.9.5.1.2.2 Semi-Autonomous RO/RO. The FTTS MSV CT shall have semi-autonomous Roll-On/Roll-Off capability, aboard any means of conveyance, and have a self-deployable range of 1000m (threshold), 2000m (objective) operable by a single operator (i.e. one load master) only utilizing onboard systems and BII. The means by which to power the FTTS MSV CT shall be consistent with closed confined quarters such as a ship deck or cargo well and shall not cause interference with other C4ISR or electronic systems.

3.9.5.1.3 Braking.

3.9.5.1.3.1 Separated Brake System. The FTTS MSV CT shall have a braking system that activates when separated from the prime mover and shall hold the trailer on a 30 percent longitudinal Grade (16.7 degree slope) (in either direction) (threshold) (40 percent longitudinal Grade(21.8 degree slope) (objective)) when uncoupled. The operator shall disengage this capability within 30 seconds (threshold), 15 seconds (objective) in the event the trailer must be moved when uncoupled from the prime mover.

3.9.5.1.3.2 Military & FMVSS Compliance. The FTTS MSV CT shall meet current military and federal motor vehicle safety standards.

3.9.5.1.4 Coupling/Uncoupling. The FTTS MSV CT shall be capable of being coupled/uncoupled by one soldier and free standing on both hard and soft surfaces when fully loaded.

3.9.5.2 Reserved.

3.9.5.3 Expediency/Emergency Towing. The FTTS MSV CT shall capable of being safely towed by current medium and heavy fleet trucks for emergency movement.

3.9.5.3.1 Backing Truck-Trailer Combination. The FTTS MSV CT shall be capable of being backed safely from any normal position (such as when in a turn but not from full jackknife) without damage to truck, trailer, or payload, and without necessity for operator dismounting or other preparation.

3.9.5.4 Trailer Transloading Capability (Objective). The FTTS MSV CT shall be capable of transloading 463L Pallet, flatrack, tankrack, other payloads, and containers to/from the FTTS MSV, to another FTTS MSV, another FTTS MSV CT, an aircraft (C-130, C-17, or C-5), a flatdeck railcar, a semi-trailer (M871 or M872), or the ground (+/- 6 inches and level ground (threshold); +/- 12 inches and +/- 5 degree (objective)) without disengaging from the prime mover (threshold) disengaged from the prime mover (objective).

3.9.5.5 FCS Interface (Objective). The FTTS MSV CT shall have capability to transload a FCS sustainment module directly to/from: the ground (+/- 6 inches and level ground (threshold); +/- 12 inches and +/- 5 degree (objective)) a flatrack, 463L pallet, itself, another FTTS MSV CT, or an FTTS MSV to/from a FCS ground system or between FCS ground systems without disengaging from the prime mover (threshold) disengaged from the prime mover (objective).

3.9.6. Reserved.

3.9.7. Reserved.

3.9.8. Reserved.

3.9.8.2 C-130 Transportability. One FTTS MSV-CT shall be transportable aboard an up-armored C-130 aircraft (all types) with a 6 ST load on a 2 ST flatrack (threshold), 9 ST load on a 1 ST flatrack (objective).

3.9.9 Trailer Command, Control, Communications, Computers & Intelligence (C4I). C4I systems onboard the FTTS MSV CT shall be interoperable with the C4I system aboard the FTTS MSV and compatible with FCS C4ISR systems for data reporting/recording and other C4I functions.

3.9.9.1 Sustainment Data & Reporting. The FTTS MSV CT shall utilize the FTTS MSV to automatically collect maintenance and cargo (payload) sustainment data (threshold) or have the capability to self-report sustainment data upon demand (objective).

3.9.9.2 Reserved.

3.9.9.2.1 Payload Data. All FTTS MSV-CT shall be capable of onboard, automatic weight, axle-load, and center-of-gravity calculation for movement aboard air, sea, and land transport modes.

3.9.9.2.2 Anti-Rollover System. The FTTS MSV CT shall incorporate an Anti-Rollover / Warning System. This system will warn the driver of conditions which may result in the trailer rolling-over (threshold), and automatically apply mechanisms to prevent a roll-over (objective).

3.9.9.3 Reserved.

3.9.9.4 Unique Identification (UID). The FTTS MSV CT shall incorporate Unique Identification markings. (*Ref SECDEF policy memo dated 29 June 2003, subject: Policy for Unique Identification (UID) of Tangible Items – New Equipment, Major Modifications, and Reprocurements for Equipment and Spares).*

3.9.10 Power Generation (Objective). The FTTS MSV CT shall provide exportable power in accordance with paragraph 3.2.1.18.5.

3.9.11 Water Generation (Objective). The FTTS MSV-CT shall provide water generation in accordance with paragraph 3.10.3.1.

3.10 General.

3.10.1 Fuels & Lubricants.

3.10.1.1 Fuels & Lubricants. The FTTS MSV shall be operable with applicable standard military fuels (JP-8 and diesel, if the design incorporates a fuel burning engine), lubricants and fluids as required by the climatic operating requirements without component degradation and adverse affect on the vehicle performance or warranty provisions. All initial fills shall be of standard military fuels, lubricants and fluids including those called out in A-A-52557, MIL-PRF-46167, MIL-PRF-2105, MIL-PRF-2104, MIL-PRF-10924, MIL-DTL-83133, and A-A-52624. If liquid cooled, the engine shall be serviced with a solution of ethylene glycol conforming to A-A-52624 and water in equal parts by volume.

3.10.1.2 Vehicle Lubrication. Two fluids (threshold) and a single fluid (objective) (excluding grease) shall be used for all lubrication and hydraulic applications. All fluid analysis, if required, shall be performed on system with the result provided to the interface of the maintenance system. The manufacturer shall make maximum use of single point/central lubrication system to lubricate multiple components from one location where commercially available. Where possible use of permanently lubricated components such as universal joints and unitized wheel hubs shall be utilized. Grease fittings shall only be used when maintenance free components are not available. Grease lubrication fittings shall conform to SAE J534. Pressure relief shall be provided in all cases when lubricating pressure may damage grease seals or other parts. Fluid changes directed though on-board fluid analysis are not considered a scheduled maintenance event; however, the platform will have a 95% probability that it can complete 7,000 miles (or equivalent hours) between fluid replacement.

3.10.1.3 Self Refueling. The vehicle shall be capable of accepting fuel at a minimum flow rate of 50 gallons per minute, and accept a full fuel load from a single filler hose. Additionally, each FTTS platform must be capable of open port, gravity refuel (Threshold). Each FTTS MSV

must have an internally operated, self-refueling capability that allows the platform to refuel itself or discharge its internally stored fuel into another FTTS MSV or fuel storage receptacle at a rate of 15 GPMs using automated/robotic means (Objective).

3.10.1.4 Fuel Access Connection. The FTTS MSV shall have a fuel access connection to allow access to FTTS MSV fuel for power units.

3.10.2 Materials, Painting, & Corrosion.

3.10.2.1 Material. Unless specified otherwise in the contract, all materials provided as part of the Production Variants shall be new and unused. Recycled material is acceptable when processed to make new material. The recycled material shall consist of at least 50% virgin material.

3.10.2.2 Camouflage. The FTTS MSV shall be painted in NATO three-color camouflage or desert tan using Chemical Agent Resistant Coating (CARC) or a DA G4 approved substitute.

3.10.2.3 Corrosion Resistance. Corrosion resistance shall be sufficient to ensure serviceability for the entire expected 25 year EUL (Economic Useful Life) of the vehicle without rebuild.

3.10.3 Potable Water.

3.10.3.1 Water Generation. The FTTS-Variants shall incorporate an embedded potable water generation and storage capability that allows the FTTS-Variants and assigned operator/crew to operate without external water re-supply.

3.10.3.2 Water Dispenser. The FTTS-Variants shall be capable of separately dispensing cold (ambient temperature) and hot (115-120 Degrees F) potable water from the embedded potable water generation system in order to provide drinking water and hydration of compressed rations.

3.10.3.3 Water Cross-Leveling. The FTTS Variants- shall incorporate an internally operated cross-leveling capability to re-distribute water between other FTTS MSV/FCS systems and crews. The FTTS-Variants shall be capable of both dispensing/receiving water during cross-leveling operations and open port gravity fill.

3.10.3.4 Captured Water from Environmental Control System. All condensation from environmental control system shall be captured and recycled and must be potable.

3.10.4 Commerciality/Commonality, Components, Parts, & Accessories. All power train components shall be certified by the contractor as being compatible with and properly matched with all related or affected components assembled to meet the specifications stated herein. . The components of the FTTS MSV variants shall be 70% common (threshold), 90% or greater (objective).

3.10.5 Vehicle Security. The FTTS MSV shall have a means to provide vehicle security (e.g., door locks, locking hatches and fuel tanks,

etc.). The security system shall provide the capability to lock the entry points from inside the vehicle without inhibiting a quick exit from the vehicle. When the FTTS MSV is locked from the outside, it shall be in compliance with requirements for securing communications equipment when vehicle is unattended, but shall not inhibit quick exit from the inside.

3.10.6 Controls & Control Cables. Identifying symbols for controls and operating mechanisms shall be in accordance with FMVSS 571.101 and 571.102. All control cables shall be of the low friction type protected at both ends with adequate seals to prevent entry of moisture and contamination into the support tube and to provide a bearing surface for smooth motion of the end rod.

3.10.7 Rear Reflective Signature. Exterior safety markings meeting the intent of the requirements of FMVSS 571.108, section 5.7, shall be applied on the rear of the FTTS MSV. Marking system shall be easily removable or readily obscured and designed for ease of removal/reattachment and storage requirements for repeated use.

3.10.8 Collision Warning System. A collision warning system shall be installed on the vehicle that shall provide the driver a visual/audible indication when objects are too close to the vehicle. The central processing unit shall be able to compute closing speeds from 0.25 to 100 mph (minimum). The front antenna transmitter/receiver shall have a range of 1 to 350 feet (minimum). Side blind spot and indicator shall be provided to right hand side for blind spot detection. Driver interface unit shall warn driver both visually with LED indicators and audibly with tones for approaching, potential hazardous situations. Components shall be constructed for external mounting and operate in the environmental conditions of the vehicle. Vehicle operator shall be able to turn the entire system on and off. Blackout controls for the Collision Warning System shall permit all of the indicator lights to be shut off during blackout situations. The audible alarm shall be controlled by the volume knob on the dash display unit. Collision warning system displays and controls shall include requirements listed in paragraphs 3.5 and 3.7.

3.10.9 Kits. The vehicle shall be capable of accepting all kits as specified herein. Each kit, shall not take longer than 4 man-hours to initially install at Field Level maintenance and subsequent installation shall be completed by the operator within .5 hours. Holes shall be provided for the attachment of all kits and shall be filled with threaded fasteners or plugs. When specified the following kits shall be provided.

3.10.9.1 Engine Arctic Kit. The contractor shall provide an engine arctic kit that allows the vehicle to be started within 1 hour (threshold), 15 minutes or less (objective) and operated within 15 minutes after starting, at temperatures down to -50 degrees F (-46 degrees C).

3.10.10 Workmanship. Workmanship shall be of such a quality so as to assure that the vehicle and its components are free of defects that compromise, limit or reduce the capability of the vehicle system in the performance of its intended use. Bolted and riveted construction shall

be secure IAW its intended use. All fuels, lubricants, and hydraulic fluids shall be provided clean and filtered IAW their intended use.

3.10.11 Servicing & Adjusting. Prior to acceptance of the vehicles by the Government, contractor shall service and adjust each vehicle including at least the following: Focusing of lights; adjustment of engine and transmission; adjustment of electrical and brake systems; burnishing of the brakes sufficient for the vehicle to meet the grade holding requirements of this performance specification; alignment of steering and front wheels; inflation of all tires; complete lubrication of chassis, engine, running gear, and mounted equipment with grades of lubricants required for the ambient air temperature at the delivery point; filling of windshield washer reservoir with water and appropriate additives rated to -25° F(-31° C); check of wheel lug nut torque; check of the continuity of the electrical system; and filling and charging of batteries. A minimum of 1/4 fill of fuel shall be provided in each vehicle's fuel tank.

3.10.12 Interoperability, Standardization & Compatibility with other NATO Countries. Interoperability with similarly equipped NATO country equipment is mandatory. Trailer interface shall be in accordance with NATO STANAG 4007 12 pin connector requirements.

3.10.13 Components & Vehicle Ratings. Vehicle/trailer ratings shall be manufacturer's current published ratings for on/off road operating conditions as applicable to the vehicle/trailer type. Component and vehicular ratings shall not be raised to meet the requirements of the specification. When published ratings are not available, component manufacturer's verification of rating must be submitted to the Engineering Office of the Procuring Activity. Maximum axle loads allowed by all State and NATO countries shall be complied within relation to load distribution, front to rear.

3.10.14 Specific Automotive Requirements.

3.10.14.1 Engine.

3.10.14.2 Engine Cooling System. The cooling system shall meet the requirements of SAE J1436 except for the following:

Inspection of fluid fill levels shall be accomplished without removal of caps from coolers or surge tanks. A cooling system shall be furnished capable of maintaining engine and transmission operating temperatures within the specified limits while operating continuously under full load at a 0.60 Tractive Effort to Gross Vehicle Weight ratio (TE/GVW) under the maximum conditions of 120 degrees F (49 degrees C) and the cooling system shall be capable of not exceeding temperature limits while operating at rated engine power. The radiator shall be guarded against thrown stones and damage by contact with vegetation.

3.10.14.3 Fan clutch. If a fan clutch is used, a positive lockup shall be provided in case of a clutch or a control system failure.

3.10.14.4 Permanent Oil Filtration. A permanent filtration system with

a filter rating of 10 microns or less shall be installed. Cleanable filters, if used, shall have a filtering rating of at most 10 microns. A restriction indicator cab mounted light shall be used to indicate when the element needs cleaning.

3.10.14.5 Engine Speed Control. An idle RPM control is required to permit increasing and setting engine idle RPM without using a foot and/or hand throttle to support winch operations and cold weather start procedures. This high RPM control shall operate only when the vehicle is in park or neutral and automatically disengage when the vehicle is placed in gear. Tamper resistant means shall be provided to limit the maximum engine speed to the engine manufacturer's maximum recommended operating speed. The accelerator control system shall conform to FMVSS 571.124.

3.10.14.6 Air Cleaner. The vehicle shall incorporate an air cleaner that complies with the requirements of MIL-PRF-62048, Air cleaner, automotive, heavy duty dry type, except that the cleaner shall provide a minimum dust capacity sufficient for 200 hour service life without removal and cleaning. The induction air ducts shall not require disassembly for normal vehicle maintenance or element servicing. Air cleaner restriction indicator, visible from the driver's seat, shall be provided. The restriction indicator shall retain and display the highest restriction level attained during vehicle operation. The indicator shall be resettable from inside the cab and shall retain the reading after the engine is shut off.

3.10.14.7 Retarder. A retarder with modulated driver control shall be provided which develops at least 70% of the rated horsepower output of the engine as measured at the wheels.

3.10.14.8 Sampling Valves. Oil sampling valves (reference MIL-V-81940, part number M81940/2-1), shall be provided in a readily accessible location for the engine, transmission, and hydraulic system. The oil sampling valves shall withdraw from the oil pressure galleys ahead of the oil filters while the engine is running. The valves shall be located in such a manner as to insure that personnel shall not be exposed to danger when taking samples with the engine running. Each sampling valve location shall be labeled to easily identify the source of the sample.

3.10.14.9 Visual Filter Condition Indicators (Objective). All oil filters on the steering and hydraulic system shall include filter condition indicators to determine need for replacement visible from the driver's seat.

3.10.14.10 Exhaust System. The exhaust system shall conform to FMCSR 393.83. The exhaust system as installed shall be gas tight and leakproof to prevent the accumulation of exhaust gas in the occupied areas in accordance with best commercial practice. The exhaust pipe(s) shall be configured to prevent entry of water when vehicle is not operating. Exhaust mufflers and exhaust pipes shall be corrosion resistant and shall be furnished with adequate guards/shielding to prevent personnel contact.

3.10.14.11 Gear Train.

3.10.14.11.1 Transmission (If Applicable). The transmission shall be an automatic and shall have a gear range capable of meeting the performance specification as stated herein. The main transmission, shall include the following:

a. A downshift inhibitor system that prevents driver shift control action from overspeeding or damaging engine, transmission, or drive train components.
b. Starter Interlock. The engine starter shall be inoperative when the transmission shift lever is in a forward or reverse drive position.
c. A means to manually select and identify the gear range.
d. A neutral interlock shall be provided which shall allow the truck to start only in neutral.

3.10.14.11.2 Transfer Case (If Applicable). If utilized, the transfer case shall be installed which has the ability to provide all-wheel drive. If a single speed transfer case is used, it shall contain a planetary differential that shall provide full time all-wheel drive. A multi-speed transfer case, if used, shall provide a low range speed capability of at least 20 mph.

3.10.14.12 Steering. Power steering shall be furnished and have full limit steer when the vehicle is stationary while at GCW. In the event power assist is lost, the system shall be manually steerable and capable of being brought to a safe stop (threshold). The system at all payload conditions shall meet the requirement of the TECOM/CSTA test methodology for Dead Engine Steering Test, "Y-Course", derived from the Allied Vehicle Testing Publication (AVTP), No. 03-30WT. Throughout its entire steering arc (lock-to-lock) and including maximum tire side wall deflection, no components of the steering system shall contact or bind. All interface points within the steering system which requires lubrication shall utilize permanently lubricated joints. The steering wheel shall be capable of being locked with a standard padlock A-A-59487 (Part Identification Number AA59487-1BC).

3.10.14.13 Hydraulics System. The hydraulic system, if used, shall have provisions for operating a crane and/or other hydraulic equipment external to the vehicle and include such provisions for future use. Removable caps or plugs shall be installed at the points of attachment of the external hydraulic system to prevent dirt or other foreign objects from contaminating the system.

3.10.14.13.1 Hydraulic Reservoir. Vehicle shall have a hydraulic reservoir of sufficient capacity to operate vehicle systems and auxiliary equipment for all mission types. Reservoir shall be provided with at least the following:

a. Filter(s) shall be readily accessible for cleaning or replacement without draining the reservoir in all hydraulic circuits. Bypasses shall be furnished where necessary to protect filters during cold temperature operation.
b. Baffles to preclude foaming.
c. Dip stick, sight gage, and pressure vented type filler cap of no less than 5 psi.

d. Access size to allow manual cleaning of the reservoir.
e. Reservoir shall allow for hydraulic maintenance without draining the systems (objective).
f. Hydraulic system cooler.

3.10.14.13.2 Hydraulic Hoses & Fittings. High-pressure hoses and fittings shall conform to the requirements of SAE J516, SAE J517 and SAE J343.

3.10.14.14 Component Protection. The design shall prevent accidental damage from standing or stepping over components to gain access to other areas of the Mission System.

3.10.15 Service & Adjustment Prior to Acceptance. Prior to government acceptance of the vehicle the contractor shall fully inspect, service and adjust each vehicle in accordance with the Vehicle Inspection Record (VIR)

4.0 VERIFICATION.

4.1 Responsibility for inspection. Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or this specification, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any inspections set forth in this specification where such inspections are deemed necessary to assure supplies and service conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall meet all requirements of Section 3. The inspections set forth in this specification shall become part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in Quality Conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

4.1.2 Certifications. Certification(s) of those items identified in Table I, shall be documented IAW contract requirements or instructions. Certifications do not release the contractor of 4.1.1 ("Responsibility for compliance") requirements.

4.2 Methods of Verification.

4.2.1 Test. Verification shall be accomplished through systematic operation of the end item under specified conditions, with or without instrumentation, and the collection, analysis, and evaluation of quantitative data.

4.2.2 Analysis. Verification by analysis (Table I), shall be accomplished by the application of technical or mathematical evaluation, mathematical models or simulations, algorithms, charts, or diagrams, and representative data.

4.2.3 Examination. Verification by examination shall be accomplished by visual examination (Table I) of the end item or its components, reviewing descriptive documentation, certifications, and comparing characteristics to specified criteria.

4.2.4 Demonstration. Verification by demonstration shall be accomplished by specified functional checks and/or operation of the end item or its components (Table I).

4.2.5 Certification. Verification by Certification is documented conformance to a specific requirement or standard signed by the certifying official or responsible party. When required by contract or this specification, Table I, certifications may be used in lieu of specified verification methods and must include supporting documentation (test data, material analysis, etc.). Acceptance of certifications not identified in Table I, is contingent upon government approval.

4.3 Classes of verification.

4.3.1 First Article Test. When required by contract, the First Article Test (FAT) is conducted and consists of the First Production Vehicle Inspection (FPVI) and Production Verification Test (PVT) specified in Table I.

4.3.2 First Production Vehicle Inspection. A First Production Vehicle Inspection (FPVI) is a contractor performed and government witnessed inspection of the first vehicle produced under contract (Table I), usually at the place of manufacture, utilizing one or more of the verification methods specified in Table I.

4.3.3 Production Verification Test. A Production Verification Test (PVT) of the first production end item conducted by the government and performed at a Government test site, to establish product conformance to contract, specification requirements and production capability (Table I).

4.3.4 Follow-on Production Test. Follow-on Production Test (FPT) of production end item similar is conducted as specified in Table I, to assess continued conformance to specification and contract requirements, and production capability.

4.3.5 Quality Conformance Inspection. A Quality Conformance Inspection (QCI) of the end item(s) are performed prior to government acceptance of a production vehicle, utilizing the Vehicle Inspection Record (VIR). The Vehicle Inspection Record is a record which documents all contractor verification actions and results performed on each production vehicle, including in process, and all corrective actions.

4.3.6 Control Test. When required by contract, Control Tests (CT) for maintaining and evaluating process controls, shall be conducted by the contractor as referenced in Table I. This test is performed on government selected vehicles after completion of Quality Conformance Inspection.

4.4 Verification Matrix. TABLE I displays the verification methods and classifications (events) for each applicable section 3 requirement. All verifications referenced in TABLE I may be modified at the discretion of the government by deletion or addition of items listed to assure conformance to specification and/or contractual requirements.

TABLE I - VERIFICATION MATRIX

VERIFICATION LOCATION:

First Production Vehicle Inspection (FPVI)	Manufacturer's Facility
Production Verification Test (PVT)	Government Test Site
Follow-on Production Test (FPT)	Government Test Site
Quality Conformance Inspection (QCI)	Manufacturer's Facility
Control Test (CNT)	Manufacturer's Facility

		Verification Method		Verification Class/Event							
Section 3	Paragraph Title	CERT	ANLS	DEMO	EXAM	TEST	PVT	FPVI	FPT	OCI	CNT
3.1	MISSION PROFILE										
3.1.1	Weight Definitions										X
3.1.1.1	Curb Weight (CW)		X	X	X		X	X	X		
3.1.1.2	Gross Vehicle Weight (GVW)		X	X	X		X	X	X		
3.1.1.3	Gross Combined Weight (GCW)		X	X	X		X	X	X		
3.1.2	Payload			X		X	X		X		
3.1.3	Dimensions										X
3.1.3.1	Width		X		X		X	X	X		
3.1.3.2	Height		X		X		X	X	X		
3.1.3.3	Length		X		X		X	X	X		
3.1.4	Environment										
3.1.4.1	Operating Temperatures		X			X	X	X	X		X
3.1.4.2	Storage Temperatures		X			X	X		X		
3.1.4.3	Heater And Defroster				X	X	X	X	X		X
3.1.4.4	Cab Cooling				X	X	X	X	X		X
3.2	PERFORMANCE CHARACTERSITICS										
3.2.1	Mobility										
3.2.1.1	Dash Speed					X	X		X		
3.2.1.2	Governed Speed			X		X	X	X	X		X
3.2.1.3	Lateral Stability		X	X		X	X	X	X		
3.2.1.4	Approach & Departure Angles					X	X		X		
3.2.1.5	Braking										
3.2.1.5.1	Service Brakes			X		X	X	X	X	X	X
3.2.1.5.2	Parking Brakes			X		X	X	X	X	X	X
3.2.1.5.3	Emergency Brakes					X	X		X		
3.2.1.5.4	Brake Configuration	X	X	X			X	X	X		X
3.2.1.5.5	Antilock Braking System (ABS)			X		X	X	X	X		
3.2.1.5.6	Brake Wear Indicator			X		X	X	X	X	X	X
3.2.1.6	Terrain					X	X		X		
3.2.1.7	Ride Quality			X			X		X		

3.2.1.7.1	Ride Limiting Speeds	X	**X**	X		X	X		X		
3.2.1.7.2	Vertical Acceleration	X	**X**			X	X		X		
3.2.1.8	Reserved										
3.2.1.9	Reserved										
3.2.1.10	Grade and Slope Operations										
3.2.1.10.1	60% Grade			X		X	X	X	X		X
3.2.1.10.2	Parking Brake Grade Operation			X		X	X	X	X	X	X
3.2.1.10.3	40% Side Slopes			X		X	X	X	X		X
3.2.1.10.4	2% Grade					X	X		X		
3.2.1.11	Tires	X	**X**				X	X		X	X
3.2.1.11.1	Rims And Tires			X		X	X		X		
3.2.1.11.2	Run-Flat Capability					X	X		X		
3.2.1.11.3	Limp Home Capability					X	X		X		
3.2.1.11.4	Central Tire Inflation System (CTIS)			X		X	X	X	X	X	X
3.2.1.11.4.1	Tire Pressure Control			X		X	X	X	X	X	X
3.2.1.11.4.2	Manual Tire Inflation/Deflation			X			X	X	X		
3.2.1.11.4.3	Air-Priority System		**X**	X		X	X	X	X		
3.2.1.11.4.4	Speed/Pressure Control Warning			X		X	X	X	X		X
3.2.1.11.4.5	Maintenance Of Tire Pressure			X		X	X	X	X		X
3.2.1.11.4.6	Time To Inflation/Deflation			X		X	X	X	X		
3.2.1.12	Traction Control		**X**			X	X	X	X		
3.2.1.13	Turning Requirement			X		X	X	X	X		
3.2.1.14	Lane Changing					X	X		X		
3.2.1.15	Power Take-Off (PTO) Openings			X		X	X	X	X		
3.2.1.16	Steerable/Lockable Rear Axle			X		X	X	X	X		
3.2.1.17	Emissions	X	**X**					X	X		X
3.2.1.18	Power Generation										
3.2.1.18.1	DC Power Source			X		X	X	X	X		
3.2.1.18.2	Reserved										
3.2.1.18.3	Slave Receptacle	X		X			X	X	X		X
3.2.1.18.4	Depleted Battery Engine Start					X	X		X		
3.2.1.18.5	Extended Electrical Capability/Capacity					X	X		X		
3.2.1.18.6	Energy Storage		**X**	X	X	X	X	X	X		X
3.2.1.19	Silent Watch Capability					X	X		X		
3.2.2	Operational Range										
3.2.2.1	Range		**X**			X	X	X	X		
3.2.3	Standard Obstacles										
3.2.3.1	Vertical step			X		X	X	X	X		
3.2.3.2	Trench Crossing					X	X		X		
3.2.3.3	Fording			X		X	X	X	X		
3.2.4	Towing										

3.2.4.1	Like Vehicle Towing		X			X	X	X	X		
3.2.4.2	Reserved										
3.2.4.3	Recovery/Towing		X			X	X	X	X		
3.2.4.4	Towed Load Capability										
3.2.4.4.1	Companion Trailer										
3.2.4.4.2	Backward Capability					X	X		X		
3.2.4.5	Towed Load Power and Control					X	X		X		
3.2.4.6	Reserved										
3.2.4.7	Tow Eyes	X						X			X
3.2.4.8	Backing					X	X		X		
3.2.4.9	Pintle			X		X	X	X	X		X
3.2.4.9.1	Second Pintle			X			X	X	X		X
3.3	SURVIVABILITY	TBD					TBD				
3.3.1	Level I Ballistic Protection						TBD				
3.3.1.1	Direct Fire						TBD				
3.3.1.2	Mine Protection						TBD				
3.3.1.3	Improvised Explosive Devise (IED) Protection						TBD				
3.3.1.4	Infantry Anti-Tank Protection						TBD				
3.3.2	Level II Ballistic Protection										
3.3.2.1	Direct Fire Protection						TBD				
3.3.2.2	Mine Protection						TBD				
3.3.2.3	Infantry Anti-Tank Protection						TBD				
3.3.2.4	Improvised Explosive Devise (IED) Protection						TBD				
3.3.2.5	Mounting Armor			X		X	X	X	X		
3.3.2.6	Armor Protection Maintenance			X		X	X	X	X		
3.3.2.7	Armor Protection Maintenance Vehicle Impact			X			X	X	X		
3.3.2.8	Armor Protection Kit Storage	X	X			X		X			
3.3.3	Self-Defense Weapon Provisions										
3.3.3.1	Primary Self-Defense Weapon			X	X	X	X	X	X		
3.3.3.2	Secondary Self-Defense Weapon										
3.3.3.3	Gun Shield Kit (Threshold)			X	X		X		X		
3.3.3.4	Ammunition Storage			X	X		X		X		
3.3.3.5	Stored Ammunition Safety		X		X		X	X	X		
3.3.4	Signature Management	TBD									
3.3.4.1	Visual Signature	TBD									
3.3.4.2	Thermal Signature	TBD									
3.3.4.3	Radar Signature	TBD									

3.3.4.4	Acoustic Signature	TBD									
3.3.4.5	Noise Limits	X	X			X	X		X		
3.3.5	Nuclear, Biological, and Chemical (NBC)		X	X		X	X	X	X		
3.3.5.1	Chemical Detection		X	X		X	X	X	X		
3.3.5.2	Chemical Protection		X	X		X	X	X	X		
3.3.5.2.1	Protection										
3.3.5.2.2	Filtration			X		X	X	X	X		X
3.3.5.2.3	Air Quality Monitoring			X		X	X	X	X		X
3.3.5.2.4	Collective Protection			X			X	X	X		
3.3.5.3	Nuclear Detection			X			X		X		
3.3.5.4	High-Altitude Electromagnetic Pulse (HEMP)		X			X	X	X	X		
3.3.5.4.1	Electromagnetic Emissions and High-Altitude Electromagnetic Pulse (HEMP). Electromagnetic Interference (EMI)		X			X	X	X	X		
3.3.5.5	Decontamination		X	X			X	X	X		
3.3.5.6	Biological		X	X			X	X	X		
3.3.5.7	Monitoring		X	X		X	X	X	X		
3.3.5.8	DEW and RF Protection		X	X			X	X	X		
3.3.5.9	Chemical Agent Resistant Coating (CARC)	X				X		X			X
3.4	TRANSPORTABILITY										
3.4.1	On-Board Calculations										
3.4.2	Reserved										
3.4.3	Lifting & Tie-Down Provisions	X		X		X	X	X	X		X
3.4.3.1	Lifting Eyes					X		X			X
3.4.4	C-130 Air Transport		X	X			X	X	X		
3.4.4.1	C-130 Ramp			X			X		X		
3.4.4.2	Preparation Time			X			X		X		
3.4.5	C-5 Air Transport			X			X		X		
3.4.6	C-17 Air Transport			X			X		X		
3.4.7	Commercial Transport			X			X		X		
3.4.8	Highway Transport			X			X		X		
3.4.9	Rail Transport			X		X	X		X		
3.4.10	Water Transport		X	X		X	X	X	X		
3.4.11	Hazardous Material Transport	X	X					X			
3.5	VEHICLE COMMAND, CONTROL, COMMUNICATIONS, COMPUTERS AND INTELLIGENCE (C4I)										
3.5.1	Reserved										
3.5.1.1	Reserved			X			X		X		

3.5.1.2	Reserved										
3.5.1.3	Common Operating Picture (COP)		X	X		X	X	X	X		
3.5.1.4	Reserved		X	X		X	X	X	X		
3.5.1.5	Sustainment Data and Reporting		X	X		X	X	X	X		
3.5.1.6	External Interfaces		X	X		X	X	X	X		
3.5.1.7	Objective Performance (OP) C4I Hardware Package		X	X		X	X	X	X		
3.5.2	Minimum Demonstrator C4I Functionality		X				X	X			
3.5.2.1	Force XXI Battle Command Brigade and Below (FBCB2)		X	X			X	X			
3.5.2.2	Movement Tracking System (MTS)		X	X			X	X			
3.5.2.3	Reserved		X	X			X	X			
3.5.3	Electrical System	X	X	X		X	X	X	X		
3.5.3.1	System Grounding			X		X	X	X	X		
3.5.3.2	Electrical Accessories										
3.5.3.2.1	DC Electrical Power			X		X	X	X			
3.5.3.2.2	AC Clean Electrical Power				X			X			
3.5.3.2.3	Power & Data Growth Capability		X					X			
3.5.4	Vehicle Management Software		X	X			X	X	X		
3.5.4.1	Vehicle Operational Management			X		X	X	X			
3.5.4.1.1	Reserved			X			X	X			
3.5.4.1.2	Initialization			X		X	X	X			
3.5.4.1.3	C4ISR Computer Startup			X		X	X	X			
3.5.4.1.4	Reserved			X		X	X	X			
3.5.4.1.5	Reserved			X		X	X	X			
3.5.4.1.6	Sensor Control Support			X		X	X	X			
3.5.4.1.7	Vehicle Safety Management		X	X			X	X			
3.5.4.1.8	Status Acquisition and Control			X		X	X	X			
3.5.4.1.9	Reporting (Objective)		X	X			X	X			
3.5.5	Lighting	X		X		X	X	X			
3.5.5.1	Headlights	X		X		X	X	X			
3.5.5.2	Exterior Work Lamps			X		X	X	X			
3.5.5.3	Convoy Warning Lights	X		X		X	X	X			
3.5.5.4	Secure Lighting	X		X		X	X	X			
3.5.6	Wiring	X			X			X			
3.5.7	Reserved										
3.5.8	Electrical Connectors	X			X		X	X			
3.5.9	Crew Indicators			X	X		X	X			
3.5.9.1	Master Power Cutoff Switch			X		X	X	X	X		
3.5.10	Databus Connectors	X				X	X	X			
3.5.11	Data Storage		X	X		X	X	X			
3.5.12	Interrogation Capabilities		X	X		X	X	X	X		
3.5.13	Vehicle Backup Alarm			X		X	X	X	X		

3.5.14	Identifying Friend or Foe (IFF) devices			X		X	X	X			
3.5.15	Driver's Vision Enhancements										
3.5.15.1	Night Vision Enhancer			X		X	X	X	X		
3.6	RELIABILITY, MAINTAINABILITY, & DURABILITY (RM&D)										
3.6.1	Reliability	X	X	X	X	X	X	X			X
3.6.1.1	Mean Time Between System Aborts					X	X				
3.6.1.2	Mean Time Between System Aborts–Mobility					X	X				
3.6.1.3	Mean Time Between Essential Function Failures					X	X				
3.6.2	Maintainability					X	X				
3.6.2.1	Automation			X		X	X	X			
3.6.2.2	Design for Maintainer	X	X	X				X			
3.6.2.2.1	Component Accessibility and Identification		X	X			X	X			
3.6.2.3	Maintenance Ratio–Maintenance Man-Hours per Operating-Hour		X	X			X				
3.6.2.4	Time to Repair					X	X		X		
3.6.2.5	Preventive Maintenance Checks and Services		X	X		X	X	X			
3.6.2.5.1	Preventive Maintenance Checks (PMC)			X			X				
3.6.2.5.2	Scheduled Services			X			X				
3.6.2.6	Doors and Maintenance Access			X		X	X	X			
3.6.2.7	Subsystem/Component Serviceability			X		X	X	X			
3.6.2.8	Electrical Connectors		X	X	X		X	X			
3.6.2.9	Filters	X		X		X	X	X			X
3.6.2.10	Prognostics and Diagnostics			X		X	X	X	X		X
3.6.2.10.1	Prognostics			X		X	X	X			
3.6.2.10.2	Diagnostics			X		X	X	X			
3.6.2.10.3	Vehicle-to-Vehicle Umbilical Diagnostics			X		X	X	X			
3.6.2.10.4	Common Tools			X			X	X			
3.6.2.10.5	Reserved										
3.6.2.10.6	Interactive Electronic Technical Manuals (IETM)			X		X	X	X	X		
3.6.2.10.7	I.E.T.M Embedded Video Maintenance Support			X			X	X	X		
3.6.3	Durability										
3.6.3.1	Drive Train Components			X		X	X	X	X		
3.6.3.2	Wear Out	X	X		X		X	X	X		
3.6.4	Availability										
3.6.4.1	Operational Availability (Ao)					X	X				
3.6.4.2	Service Life					X	X				
3.7	MANPOWER & PERSONNEL INTEGRATION (MANPRINT)										
3.7.1	Human Factor Engineering			X		X	X	X			

3.7.2	Crew Compartment										
3.7.2.1	Cab			X	X	X	X	X			
3.7.2.2	Crash Protection		X			X	X		X		
3.7.2.3	Seating			X		X	X	X			
3.7.2.4	Crew Restraint System			X		X	X	X			X
3.7.2.5	Windshield And Windows			X			X	X			
3.7.2.6	Windshield Wipers And Washers			X		X	X	X			X
3.7.2.7	Vehicle Cab Interior			X	X		X	X			
3.7.2.8	Cab Floor Drains			X			X	X			
3.7.2.9	Chemical Protective Equipment Storage			X			X	X			
3.7.2.10	M4/M16 Rifle Mounting			X			X	X			
3.7.2.11	Cab Temperature Control			X		X	X	X	X		
3.7.2.12	Rear View Mirrors	X		X			X	X			
3.7.2.13	Stowage			X	X		X	X			
3.7.2.14	Displays			X		X	X	X	X		X
3.7.2.14.1	Display Visibility and Audibility					X	X				
3.7.2.14.2	Visual Display Performance			X		X	X				
3.7.2.14.3	Controls			X		X	X	X			
3.7.2.15	Control Design and Mechanization			X		X	X	X			
3.7.2.16	Control/Display Integration			X		X	X	X			
3.7.2.17	Position Relationships			X		X	X	X			
3.7.2.18	Movement Relationships			X		X	X	X			
3.8	MATERIAL HANDLING EQUIPMENT (MHE)										
3.8.1	Intelligent Load Handling Systems (ILHS).			X		X	X	X	X		
3.8.1.1	Vehicle Integration			X		X	X	X			
3.8.1.2	Reserved										
3.8.1.3	Operation			X		X	X	X	X		
3.8.2	ILHS Systems Components			X							
3.8.2.1	Reserved			X		X	X	X			
3.8.2.1.1	Reserved			X		X	X	X			
3.8.2.1.2	Reserved			X		X	X	X			
3.8.2.1.3	Semi-Autonomous Transport Path (objective)			X		X	X	X			
3.8.2.1.4	Reserved			X		X	X	X			
3.8.2.1.5	Payload Capacity and Reach			X		X	X	X			
3.8.2.1.6	Reserved										
3.8.2.1.7	Reserved			X		X	X	X			
3.8.2.1.8	Reserved			X		X	X	X			
3.8.2.1.9	Reserved			X		X	X	X			
3.8.2.1.10	Reserved			X		X	X	X			
3.8.2.1.11	Position Feedback (objective)			X		X	X	X			
3.8.2.1.12	Stowage			X		X	X	X			

3.8.2.1.13	Safety										
3.8.2.1.14	Reserved			X		X	X	X			
3.8.2.2	Flatrack Load Handling System			X		X	X	X			
3.8.2.2.1	Payload			X		X	X	X			
3.8.2.2.2	Operation			X		X	X	X			
3.8.2.2.2.1	Reserved										
3.8.2.2.2.2	Self Load/Off Load			X		X	X	X			
3.8.2.2.2.3	Reserved			X		X	X	X			
3.8.2.2.2.3.1	Reserved			X		X	X	X			
3.8.2.2.2.3.2	Reserved			X		X	X	X			
3.8.2.2.2.3.3	Approach Angle			X		X	X	X			
3.8.2.2.3	Overload			X		X	X	X			
3.8.2.2.4	International Standards Organization (ISO) Locks			X		X	X	X			
3.8.2.2.5	Modular Interface Platform (MIP) Interface			X		X	X	X			
3.8.2.2.6	Redundancy and Manual Backup			X		X	X	X			
3.8.2.2.7	Vehicle Alignment System			X		X	X	X			
3.8.3	Stabilization System			X		X	X	X			
3.8.3.1	Ground Inclination Limits			X		X	X	X			
3.8.3.2	ILHS Inhibit & Backup			X		X	X	X			
3.8.4	Electrical System			X		X	X	X			
3.8.5	Reserved			X		X	X	X			
3.8.6	Operator Interface			X		X	X	X			
3.8.6.1	Operator Control Station			X		X	X	X			
3.8.6.2	Remote Control Device			X		X	X	X			
3.9	FTTS MSV COMPANION TRAILER (CT)										
3.9.1	General			X		X	X	X	X		
3.9.1.1	Commonality	X	X		X			X			
3.9.2	Reserved					X	X		X		
3.9.3	Trailer Payloads			X		X	X	X	X		
3.9.4	Dimensions			X		X	X	X			
3.9.4.1	Height			X		X	X	X			
3.9.5	Performance Characteristics										
3.9.5.1	Mobility					X	X		X		
3.9.5.1.1	Reserved			X		X	X	X			
3.9.5.1.2	Autonomous Operation (Objective)			X		X	X	X	X		
3.9.5.1.2.1	Range					X	X		X		
3.9.5.1.3	Braking			X		X	X	X	X		
3.9.5.1.3.1	Separated Brake System			X		X	X	X	X		
3.9.5.1.3.2	Military & FMVSS Compliance	X						X			
3.9.5.1.4	Coupling/Uncoupling			X		X	X	X			X
3.9.5.2	Reserved					X	X				
3.9.5.3	Expediency/Emergency					X	X				

	Towing										
3.9.5.3.1	**Backing Truck-Trailer Combination**			X		X	X	X	X		X
3.9.5.4	**Trailer Transloading Capability (objective)**			X		X	X	X			
3.9.5.5	**FCS Interface (objective)**			X		X	X	X			
3.9.6	**Reserved**										
3.9.7	**Reserved**										
3.9.8	**Reserved**										
3.9.8.2	**C-130 Transportability**		X			X	X		X		
3.9.9	**Trailer Command, Control, Communications, Computers and Intelligence (C4I)**		X	X	X	X	X	X	X		X
3.9.9.1	**Sustainment Data and Reporting**			X			X	X			
3.9.9.2	**Reserved**			X		X	X	X			
3.9.9.2.1	**Payload Data**			X		X	X	X			
3.9.9.2.2	**Anti-Rollover System**			X		X	X	X			
3.9.9.3	**Reserved**			X		X	X	X			
3.9.9.4	**Unique Identification (UID)**				X			X			
3.9.10	**Power Generation (objective)**			X		X	X	X			
3.9.11	**Water Generation(Objective)**		X	X		X	X	X	X		
3.10	**GENERAL**										
3.10.1	**Fuels and Lubricants**										
3.10.1.1	**Fuels and lubricants**	X						X		X	X
3.10.1.2	**Vehicle lubrication**	X			X		X	X			
3.10.1.3	**Self refueling**			X			X	X			
3.10.1.4	**Fuel Access Connection**			X				X			
3.10.2	**Materials, Painting, and corrosion**										
3.10.2.1	**Material**	X									
3.10.2.2	**Camouflage**	X			X		X	X	X	X	X
3.10.2.3	**Corrosion Resistance**	X						X			
3.10.3	**Potable Water**										
3.10.3.1	**Water Generation**			X		X	X	X	X	X	X
3.10.3.2	**Water Dispenser**			X		X	X	X	X	X	X
3.10.3.3	**Water Cross-Leveling**			X			X	X			
3.10.3.4	**Captured Water from Environmental Control System**			X		X	X	X	X		
3.10.4	**Commerciality/commonality, components, parts, and accessories**	X						X		X	X
3.10.5	**Vehicle security**			X		X	X	X		X	
3.10.6	**Controls and Control Cables**			X		X	X	X	X	X	X
3.10.7	**Rear Reflective Signature**	X						X			
3.10.8	**Collision Warning System**			X		X	X	X	X	X	X
3.10.9	**Kits**			X		X	X	X		X	
3.10.9.1	**Engine Arctic Kit**					X	X		X		

3.10.10	**Workmanship**	X			X		X	X	X	X	X
3.10.11	**Servicing and Adjusting**			X	X			X		X	X
3.10.12	**Interoperability, Standardization and Compatibility with other NATO Countries**	X		X				X		X	X
3.10.13	**Components and Vehicle Ratings**	X						X		X	
3.10.14	**Specific Automotive Requirements**										
3.10.14.1	**Engine**										
3.10.14.2	**Engine Cooling System**	X						X		X	
3.10.14.3	**Fan Clutch**			X				X		X	
3.10.14.4	**Permanent Oil Filtration**	X		X				X		X	X
3.10.14.5	**Engine Speed Control**	X		X		X	X	X		X	
3.10.14.6	**Air Cleaner**	X				X	X	X		X	
3.10.14.7	**Retarder**			X				X			
3.10.14.8	**Sampling Valves**	X		X	X		X	X			
3.10.14.9	**Visual Filter Condition Indicators (objective).**			X			X	X	X	X	
3.10.14.10	**Exhaust System**	X				X	X	X	X	X	
3.10.14.11	**Gear Train**										
3.10.14.11.1	**Transmission (If applicable).**			X		X	X	X	X	X	X
3.10.14.11.2	**Transfer case (If applicable).**			X		X	X	X	X	X	X
3.10.14.12	**Steering**			X		X	X	X	X	X	X
3.10.14.13	**Hydraulics System**			X		X		X		X	
3.10.14.13.1	**Hydraulic Reservoir**			X	X		X	X	X	X	X
3.10.14.13.2	**Hydraulic Hoses and Fittings**	X			X		X	X	X	X	X
3.10.14.14	**Component protection**			X			X	X	X		
3.10.15	**Service and Adjustment Prior to Acceptance**	X	X	X	X	X	X	X	X	X	X

ANNEX A: FTTS MSV Distribution Variant

A.1 General. The FTTS MSV DV is the primary platform from which other FTTS variants will be derived.

A.2 The FTTS MSV DV performs the primary, dry cargo hauling mission and the Material Handling Equipment (MHE) section (paragraph 3.8) contains the specific MHE equipment performance. There are no additional requirements identified for the FTTS MSV DV at this time.

ANNEX B: FTTS MSV Fuel Variant (FV)

B.1 General. The FTTS Fuel Variant (FV) is the fuel supply system envisioned for employment within both the Unit of Action and Unit of Employment. Requirements common to all FTTS are discussed in the main body of this Performance Specification.

The FTTS MSV FV provides the ability to rapidly establish a fuel distribution and storage capability at any location regardless of the availability of construction equipment or material handling equipment. The FV consists of two different modules; a pump filtration module, and a tankrack module. The modules of the FV can be recovered and moved by organic assets of the using unit. A FTTS MSV can recover the tankracks and pump module, transport them to the new location, and emplace the system. Empty, full or partially loaded tankracks can be readied for transport, uploaded, and moved in a fraction of the time required for a collapsible tank.

The pump module can be used with as many manifolded tankracks as feasible or with a collapsible storage tank. The collapsible tank provides a way to increase capacity for operations that are expected to last for extended periods. Operations can continue in an uninterrupted fashion by replacing empty tankracks with full ones.

The FV tankracks can also be used for line haul of bulk fuel throughout the theater. A FTTS MSV can transport two tankracks, one on the truck and one on the CT, for a total of up to 5,000-gallons of bulk petroleum. The truck off-loads the full tankrack in the required position and loads any empty tankracks for transport back to the fuel resupply point. The selected site does not require any preparation prior to deployment. The use of the FTTS MSV as the prime mover results in increased cross-country mobility. This increased capability is critical to uninterrupted resupply of maneuver forces.

B.2 FTTS MSV FV Unique Requirements.

B.2.1 The FTTS MSV FV shall be capable of receiving, storing, filtering, and issuing kerosene based fuels (i.e. Jet Propellant (JP)-5, JP-8, Jet A, Jet-A1) and diesel fuel.

B.2.2 The FTTS MSV FV shall include a pump filtration module capable of refueling both ground vehicles and aircraft. The module shall be capable of providing bulk filtered fuel at a rate of 400 gallons per minute (GPM) (threshold) and 600 GPM (objective). The pumping assembly shall be self-priming. The pumping system shall be capable of providing at least 50 GPM to eight retail refueling points simultaneously.

B.2.3 The FTTS MSV FV will be capable of refueling a minimum of eight vehicles simultaneously. This shall include the capability to perform retail refueling using eight - 1 ½ inch automatic shut-off open port nozzles or eight - 1 inch automatic shut-off open port nozzles. When not performing retail refueling of vehicles using the open port nozzles, the FV shall be capable of bulk bottom loading a minimum of four HEMTT tankers, tank and pump units, or 5,000-gallon tankers simultaneously. The FV shall also be capable of filling two 500-gallon

collapsible drums simultaneously. All nozzles, fittings, and valves required to refuel, bottom load and fill drums shall be equipped with sexless dry disconnect couplings. Each dispensing point shall be a minimum of 100 feet from the pump filtration module. Spacing between the dispensing points shall be a minimum of 100-feet. The FV shall be capable of providing a minimum of 400 GPM to the bulk refuel points, 50 GPM to each retail nozzle, and 100 GPM to each bulk filling station.

B.2.4 The FTTS MSV FV pump filtration module shall be capable of accepting/integrating an additive injection system that is capable of injecting a minimum of three fuel additives simultaneously. The pump filtration module shall include provisions for transport of the injection system.

B.2.5 The FTTS MSV FV pumping filtration module shall contain secure storage for all hoses, fittings, nozzles, fire extinguishers, water containers, and other equipment necessary to perform refueling operations.

B.2.6 The FTTS MSV FV will have the ability to recirculate filtered fuel within the system. Each tankrack shall be capable of receiving filtered fuel through a single point receptacle that discharges into the bottom of the tank.

B.2.7 The FTTS MSV FV shall be equipped with an emergency shut-off located at the operator's position that stops the flow of fuel in the event of an emergency while refilling the tank or while performing refueling operations. Include a reel-mounted "deadman" switch that, when released, stops the flow of fuel from the pump filtration module.

B.2.8 The FTTS MSV FV pump filtration module shall be capable of being slave started by a tactical military vehicle.

B.2.9 All modules of the FTTS FV shall be capable of being loaded by and transported on a FTTS MSV. All modules shall be capable of being loaded onto the FTTS MSV CT. Two fuel tankracks must be capable of being transported on the FTTS MSV, coupled with a FTTS MSV CT, at any fuel level from empty to full over the terrain specified in the operational mode summary/mission profile (OMS/MP) without limitations. When a module is positioned on the truck or trailer for transport, the combined height shall not exceed 4 meters.

B.2.10 Each module shall be capable of being off-loaded and operated on slopes up to 5 degrees in any direction.

B.2.12 The FTTS MSV FV tankrack module shall have a minimum capacity of 2,500 gallons (T), greater than 2,500 gallons (O).

B.2.13 The FTTS MSV FV tankrack shall be equipped with a manual pumping capability that allows fuel to be dispensed in emergency situations. Each pump shall include a 25-foot section of hose and open port nozzle. Flow through the pump shall allow for gravity operations.

B.2.14 The FTTS MSV FV shall be capable of receiving fuel from and providing fuel to the storage and distribution systems of other

services and allied nations. The FV shall also be capable of refueling vehicles and aircraft of other services and allied nations.

B.2.15 The FTTS MSV FV shall conform to NATO standards for demountable cargo beds (flatracks, see Section 2.0).

B.2.16 The FTTS MSV FV shall include the ability to perform quality surveillance tests, as defined in Field Manual 10-67-2, on the fuel stored in the tanks. The pump filtration module shall include a sampling probe on the discharge side of the filter separator for obtaining product samples for testing.

B.2.17 All FTTS MSV FV tankracks shall be capable of being bottom loaded using both a single point refueling nozzle, D-1 type, and a 4-inch cam lock coupling connection. The tankracks shall be capable of receiving fuel from military and commercial tankers, fuel farms, and aircraft.

B.2.18 The FTTS MSV FV tankracks shall be capable of capturing the vapors displaced from the tank during the refueling process. The connection shall be a 4-inch cam lock type located at the rear of the tankrack.

B.2.19 The FTTS MSV FV tankracks shall include an opening in the tank top to allow personnel, equipped with proper safety equipment, access for cleaning and repair. The opening shall also include a drop tube to aid in emergency top loading of the tank when bottom loading is not possible. The drop tube shall extend to the bottom of the tank.

B.2.20 Each FTTS MSV FV tankrack shall be capable of being interconnected to another tankrack positioned 30 feet apart using non-collapsible hose. The tankrack shall include provisions for providing secure storage for the necessary hose.

B.2.21 Suction and discharge hoses shall be lightweight, durable petroleum hoses. Hoses shall have a minimum shelf life of at least 10 years (T) 20 years (O) and a useful life of at least 5 years (T), and 10 (O) years once wetted with fuel.

B.2.22 The FTTS MSV FV shall be capable of evacuating all but residual fuel from the hoses and other system components prior to teardown.

B.2.23 The FTTS MSV FV shall include a method of visually determining the quantity of fuel stored in any tankrack without the operator having to access the top of the tankracks or leave the operator's position.

B.2.24 The FTTS MSV FV shall maintain complete electrical continuity throughout the system.

B.2.25 Each module of the FTTS MSV FV shall be equipped with reel mounted bonding and grounding cables and adequate quantities of grounding rods to ground the tankrack, pump filtration module, and refueling points (one per refueling point). The tankracks and pump filtration module shall include provisions for secure storage of the ground rods when the rods are not in use.

B.2.26 The FTTS MSV FV shall comply with all current military electromagnetic interference and military and commercial electromagnetic emission susceptibility requirements as applicable.

B.2.27 The FTTS MSV FV shall be capable of determining the fuel flow rate and total amount of fuel passed into and out of the FV.

B.2.28 The FTTS MSV FV shall be equipped with an adequate quantity of fire extinguishers and other safety equipment necessary to suppress a fire that starts within the operational area of the system.

B.2.29 The FTTS MSV FV shall be designed to comply with all environmental requirements concerning the transfer and storage of fuel. The FTTS FV shall include on-board supplies and equipment to allow the containment and cleanup of up to a 50-gallon fuel spill.

B.2.30 The FTTS MSV FV shall be capable of being operated in temperatures from –25° to 120° F under all environmental conditions experienced at those temperatures.

B.2.31 The FTTS MSV FV shall be capable of being operated by any 5th percentile female to 95th percentile male soldier while wearing cold weather and/or mission oriented protective posture IV (MOPP IV) protective clothing. The FTTS MSV FV shall automate operations to reduce the number of personnel required to operate the system (O).

B.2.32 Once the FTTS MSV FV tankracks have been positioned, an FV fuel farm consisting of 14 tankracks and two pump filtration modules shall be fully operational in a maximum of 1 hour without the need for material handling equipment.

B.2.33 The FTTS MSV FV modules shall include brackets that aid in the deployment of camouflage netting.

B.2.34 The FTTS MSV FV shall have a useful life of at least 25 years.

B.2.35 The total FTTS MSV FV maintenance ratio (MR) must not exceed .07 maintenance man-hours/operating hour. The FV will not require a new MOS to operate or maintain. The current maintenance and operator skill levels are adequate to maintain the FV. The FV must attain full mission status using standard test, measurement, and diagnostic equipment (TMDE). Electronic technical manuals/interactive electronic manuals shall be considered for the FV. Special consideration shall be given to a system design that limits the number of special tools. Emphasis shall be on designs that replace and discard components/repair parts.

B.2.35.1 The FTTS MSV FV Mean Time to Repair (MTTR) for all essential unscheduled maintenance demands (EUMD) must not exceed 1 hour. The maximum time to repair for 90 percent of all EUMD (MAXTTR 90) must not exceed 1.5 hours.

B.2.36 Survivability.

B.2.36.1 The FTTS MSV FV must be NBC contamination survivable. The FTTS MSV FV must be able to withstand the materiel damaging effects of NBC contaminants and decontaminants; be decontaminable to negligible

risk levels to reduce hazard to personnel operating and maintaining the system; and be capable of being operated and maintained by personnel wearing full NBC protection (MOPP IV). The LMFF shall be designed so that performance degradation when wearing special clothing does not exceed 50 percent.

B.2.36.2 The FTTS MSV FV must be high-altitude electromagnetic pulse (HEMP) survivable, reference 3.3.5.3.

B.2.37 Transportability. The FTTS MSV FV, with fuel, shall be capable of being transported by highway, rail, air, and marine transport methods. In addition, the tankrack, with fuel, shall be capable of external transport by heavy lift helicopters and airdropped from fixed-wing aircraft. Fixed-wing air transport and airdrop shall be by C-130 and larger cargo aircraft. External/sling-load rotary-wing transport shall be by CH-47. During transport, the FV modules shall be able to fit inside a 20-foot ISO container cell.

B.2.37.1 The FTTS MSV FV tankracks and the pump filtration modules shall be able to fit inside and be transported in a standard 20-foot ISO container ship cell and be capable of meeting ISO requirements for stacking empty.

B.2.37.2 Each FTTS MSV FV module will be equipped with ISO corner fittings and lifting and tie-down provisions that allow loading, unloading and transport by all modes of container handling and transportation systems.

ANNEX C: FTTS MSV Water Variant (WV)

C.1 General. The FTTS MSV Water Variant (WV) is the water supply system envisioned for employment within both the Unit of Action and Unit of Employment. Requirements common to all FTTS are discussed in the main portion of this ORD.

The FTTS MSV WV will enhance and expedite the delivery of bulk water into the division and brigade areas. The WV will allow water transport directly from water purification points to supported maneuver elements. The WV can be used as a water distribution point. The WV will enhance water distribution by providing one system that enables both hardwall bulk water transportation and unit retail water support.

C.2 FTTS MSV WV Unique Requirements. FTTS MSV WV will possess the following characteristics in addition to the basic vehicle requirements.

C.2.1 The FTTS MSV WV variant shall be capable of transporting all water loads - full and partial - over the approved OMS/MP for the FTTS MSV (T).

C.2.2 The FTTS MSV WV shall be capable of transporting 2,000 gallons (T) of water or more (O).

C.2.3 The FTTS MSV WV shall be able to maintain the potability of its water load over its OMS/MP. It will accomplish this with a recirculatory capability driven by an integrated pump and a means to rechlorinate using chlorine compounds currently available in the supply system (T).

C.2.4 The operator shall be able to perform all WV loading and dispensing operations while the water variant is mounted on the FTTS MSV, while it is mounted on the FTTS MSV CT, or while it is sitting on the ground (T).

C.2.5 The FTTS WV shall be capable of dispensing, by gravity flow (no pump assistance), while mounted or on the ground, 90 percent (T) or more (O) of the tank volume.

C.2.6 The FTTS WV shall be capable of unloading and loading water, with its own pump, at a minimum rate of 125 gallons per minute (GPM) (T) or greater (O) against a maximum hydraulic/static head of 35 feet.

C.2.7 The FTTS WV pump engine must be capable of operating on the same type of fuel as the FTTS MSV (T).

C.2.8 All materials that come into contact with the water payload of the WV shall meet (T) or exceed (O) American National Standards Institute/National Sanitation Foundation (ANSI/NSF) standards for chlorinated potable water contact and corrosion resistance.

C.2.9 The FTTS WV shall have 2-inch bottom load connections that allow loading with current Army water supply and distribution systems (T).

C.2.10 The FTTS WV shall have 35 feet (T) or more (O) of a bulk load/unload hose that is compatible with current Army water supply and distribution systems.

C.2.11 The FTTS WV shall include storage tubes capable of storing the bulk load/unload hoses. Storage tubes shall be located to be accessible from the ground level when the system is truck or trailer mounted (T).

C.2.12 The FTTS WV shall include a canteen refilling stand and 5-gallon can refilling stand with at least five filling positions that can be placed up to 20 feet (T) from the WV to distribute water.

C.2.13 Include a hose reel, with a quick-release dispensing nozzle, that is capable of dispensing potable water to unit water trailers and other water containers at any distance up to 35 feet (T) or farther (O) from the WV.

C.2.14 The FTTS WV shall have a water level indicator that allows an operator standing on the ground to visually determine the amount of water in a module that is either mounted on the FTTS MSV, its CT, or sitting on the ground, with an accuracy of +/-50 gallons (T).

C.2.15 The FTTS WV shall have adequate protected storage capacity to allow for storage of all hoses, nozzles, adapters, and other equipment necessary to perform water supply operations (T).

C.2.16 The FTTS WV must include a manhole opening in the tank top to allow access for cleaning, inspecting, and chlorinating (T).

C.2.17 Noise levels at the operator's position of the FTTS WV shall not exceed 85dB(A) (T) or less (O).

C.2.18 The 125 GPM pump shall be easily removed from and replaced on the WV (T).

C.2.19 The FTTS WV shall be capable of operation and storage in the same environmental conditions as required for the FTTS MSV (T).

C.2.19.1 The FTTS WV shall have a capability that will protect the water tank and its components from freezing and, thus, allow operation in ambient temperatures down to -25 degrees F (T), or lower (O).

C.2.20 The FTTS WV shall be capable of being loaded by and transported on a FTTS MSV, or being loaded to a FTTS MSV CT by FTTS MSV, and of having two water modules transported by a FTTS MSV and its CT (T).

C.2.20.1 The FTTS MSV WV, when full, shall meet Military Traffic Management Command's (MTMC) published dimension and weight limits for unrestricted Continental United States (CONUS) and North Atlantic Treaty Organization (NATO) highway transport (T).

C.2.20.2 Each FTTS WV will be equipped with ISO corner fittings and lifting and tie-down provisions that allow loading, unloading, and transport by all modes of container handling and transportation systems (T).

C.2.20.3 The FTTS WV shall be able to fit inside a standard 20-foot ISO container ship cell and be capable of meeting ISO requirements for stacking empty (T).

C.2.20.4 The FTTS WV shall be capable of inter-theater transport by highway, rail, air, and marine transport modes when empty (T) or full (O).

C.2.20.5 The FTTS WV, when full, shall be capable of transport by C-130 and larger aircraft (T) and external transport by helicopter (T) and be low-velocity air droppable (O).

C.2.20.6 The FTTS WV shall conform to NATO requirements for demountable cargo beds (flatracks) (T).

C.2.21 Logistics and Readiness. The total maintenance ratio must not exceed 0.01 maintenance man-hours/operating hours. The WV will not require new military occupational specialties (MOS) to operate or maintain. The WV must attain full mission status using standard test, measurement, and diagnostic equipment (TMDE). Special consideration shall be given to system design to limit the number of special tools. Replacement of components and modules and completion of all repairs shall be accomplished at the lowest possible level of maintenance.

C.2.21.1 The Mean Time to Repair (MTTR) for all Essential Unscheduled Maintenance Demands (EUMD) must not exceed 1 hour (T) or less (O). The Maximum Time to Repair for 90 percent of all EUMD (MaxTTR 90) must not exceed 1.5 hours (T) or less (O).

C.2.22 Survivability

C.2.22.1 The WV must be high-altitude electromagnetic pulse (HEMP) survivable (T).

C.2.22.2 The WV must be nuclear, biological, and chemical (NBC) contamination survivable (T).

C.2.22.3 The WV must be able to withstand the materiel damaging effects of NBC contaminants and decontaminants, be decontaminable to negligible risk levels to reduce hazard to personnel operating and maintaining the system, and be capable of being operated and maintained by personnel wearing the full NBC protection (MOPP IV) (T).

C.2.23 The WV shall be maintained primarily with standard tools, general purpose test, measurement, diagnostic equipment, and existing MOS soldiers. Maintenance support levels shall be as follows:

(1) Unit. Operator procedures in –10 manual and maintenance procedures in –20 manual.

(2) Direct Support/General Support (DS)/ (GS). Diagnosis and module exchange and GS repair of defective modules and major assemblies in the –34 manual and –24 parts manual.

(3) Depot Support. No depot support is envisioned.

C.2.24 MANPRINT

C.2.24.1 Training. The WV's design and use of a standard Army water pump will minimize training requirements. The WV will require an estimated 2 hours of institutional training at a 1:6 ratio at the Quartermaster Center and School.

C.2.24.2 Human Factors Engineering (HFE). The WV design, to include controls, displays, configuration, required operating and maintenance procedures, and operating environment, will minimize human performance errors, interface problems, and workload requirements. The user interface should be uncomplicated and respect appropriate design guidance in MIL-STD-1472. The WV shall be designed for use by the 5^{th} percentile female to 95^{th} percentile male soldier and must promote ease of use. The WV must be compatible with the range of environmentally protective clothing.

C.2.24.3 System Safety. The WV will be designed IAW all applicable system safety and health standards so as to minimize risks associated with operating or maintaining the equipment. All safety hazards will be eliminated or reduced to an acceptable level of risks. The WV must not have any uncontrolled safety or health hazards that may adversely impact upon the health or safety of the operator.

C.2.25 Objective Performance

C.2.25.1 The FTTS WV shall include an automated volume monitor (O).

C.2.25.2 The FTTS WV shall include automated water quality surveillance functions, to include automated chlorine residual monitor (O).

C.2.25.3 The FTTS WV shall include an Auto-injecting chlorine residual generation and control (O).

C.2.25.4 The FTTS WV shall include an automated data communications capability, to include system location, volume, and water quality (O).

C.2.25.5 Water potability and palatability enhancements (O).

ANNEX D: FTTS MSV Wrecker Variant (WRV)

D.1 General. The FTTS wrecker is the recovery and maintenance system envisioned for employment within both the Unit of Action and Unit of Employment. Requirements common to all FTTS are discussed in the main portion of this Performance Specification.

Field Level maintenance will consist of repair-and-return-to-user on system-tasks, those tasks that do not require disassembly of a component (Primarily LRU/LRM replacement), and will be performed forward in the battle space, as the supported units battle rhythm permits. Sustainment maintenance will consist of repair-and-return-to-supply off-system tasks, required to return components, subassemblies, and/or end item systems to a serviceable condition. Each UA will have a small number of 2-3 men Combat Repair Teams (CRT) within their organic Forward Support Battalion (FSB) to perform field maintenance requirements beyond the capabilities of the crew chief/crew. These include, in-depth Battlefield Damage and Repair (BDAR) and limited recovery operations when equipped with the FTTS MSV Wrecker. Platforms and systems deemed unsuitable for repair on site will be recovered to a safer location for those repairs necessary to allow the platform to return to action and complete its current mission. Primary method of recovery will be self or like vehicle recovery, augmented by the CRT/FTTS wrecker/FRMV capabilities when required.

D.2 FTTS MSV WRV Unique Requirements. FTTS MSV WRV will possess the following characteristics in addition to the basic vehicle requirements.

D.2.1 FTTS MSV WRV will possess the following characteristics in addition to the basic vehicle requirements.

D.2.2 The FTTS MSV Wrecker must be capable of recovering and righting all FTTS, Stryker variants and FCS ground platforms under all conditions (climatic and terrain) in which the UE will operate, from the point of failure to the mission stating site.

D.2.3 The FTTS MSV Wrecker variant shall be able to lift and tow, as well as flat tow, all UA systems and current TWV at GCW front or rear without damage to either the towed or towing vehicles through the full range of the towing vehicle’s performance characteristics without restriction.

D.2.4 The FTTS MSV Wrecker variant shall provide the ability to umbilical the brake system for towed loads.

D.2.5 The FTTS MSV Wrecker shall be designed to perform its functions with a crew of two.

D.2.6 Tool storage capacity shall be sufficient to provide secure storage for all required collateral and on-vehicle equipment (OVE) as well as general mechanics tool kits, BDAR kits, and selected critical combat spares. All stowage shall be rainproof and equipped with drain holes. Equipment subject to damage from water that would make it inoperable shall be stored in rainproof stowage above the fording line to avoid requiring waterproofing storage compartments. Access to storage will be unhindered. Tool storage areas shall be designed to prohibit damage to all contents.

D.2.7 A capability to employ power tools to speed recovery / repair operations shall be incorporated in the FTTS MSV Wrecker variant.

D.2.8 The FTTS MSV Wrecker shall incorporate the capability to cut both ferrous and non-ferrous metals.

D.2.9 The winch or winches shall be of sufficient capacity to perform up to a double line recovery of 150% of the HGVW of the recovered vehicle.

D.2.10 The FTTS MSV Wrecker variant shall incorporate the ability to remove, traverse, and place the heaviest powerpack from all platforms within the UA.

D.2.11 The FTTS MSV must possess a capability to power the hydraulic lift system on the FTTS MSV wrecker variant.

D.2.12 Interactive Electronic Technical Manuals (IETM). Each FTTS MSV must have an on-board, full IETM for all systems in the UA/UE that includes operator and maintainer technical manuals (TMs) and Repair Parts and Special Tool Lists (RPSTL) for all onboard equipment, including GFE items (Threshold/Objective). The embedded virtual full task trainer will be fielded concurrently with the FTTS. All technical manuals must be Class 5 or higher, Interactive Electronic Technical Manuals, and include an embedded training to assist the mechanic/operator in performing maintenance tasks and diagnosis.

ANNEX E: FTTS MSV Non Line of Sight Launch System (NLOS LS) Variant

E.1 General. The FTTS MSV NLOS LS is a system envisioned for employment within both the Unit of Action and the Unit of Employment. Requirements common to all FTTS are discussed in the main portion of this document.

The FTTS MSV NLOS LS provides networked, extended-range targeting and precision attack of armored, lightly armored and other stationary and moving targets during day, night, and obscured and adverse weather conditions. The system's primary purpose is to provide responsive precision attack of High-Payoff targets (HPF) in support of the Unit of Action (UA) in concert with other UA NLOS, external and Joint capabilities. The NLOS LS consists of two missiles: the Loitering Attack Munition (LAM) and the Precision Attack Munition (PAM).

The Container Launch Unit (CLU) serves as a firing platform and the primary transport platform base. There are two primary components of the CLU. These are the Computer and Communications System (CSS) and the Base Platform. The CLU holds fifteen missile containers in a four by four matrix. The sixteenth holds the CSS. The CSS contains all fire mission processing, communication (to include antenna, position locating, weapon interface, power supply, and anti tamper capability). The CLU's primary role is to act as the transportation and firing platform for the missiles. It will be either fired off of the FTTS or be fired after the FTTS unloads it to the ground. The CLU weighs 3,150 lbs and has dimensions of 45" (L)x 45"(W) x 69"(H) (the height is 74" with fork lift tubes).

E.2 Requirements.

E.2.1 The FTTS MSV NLOS LS shall be able to load and unload flatracks containing the launcher system (CLU). The FTTS MSV NLOS LS material handling equipment (MHE) shall be able to individually unload CLUs off the flatrack while the flatrack is on the back of the vehicle. The MHE also shall be able to move CLUs that are on the ground.

E.2.2 The FTTS MSV NLOS LS shall from inside the cab launch the munitions from the CLU while positioned on the vehicle or while the CLU is on the ground.

E.2.3 The FTTS MSV NLOS LS shall be able to launch the munitions while located on the vehicle.

E.2.4 The FTTS MSV NLOS LS shall be designed to perform its functions with a crew of two.

E.2.5 The FTTS MSV NLOS LS shall conform to NATO standards for demountable cargo beds (flatracks).

E.2.6 The FTTS MSV NLOS LS shall be able to report status information from the launcher system.

E.2.7 The FTTS MSV NLOS LS shall comply with all current military electromagnetic interference and military and commercial electromagnetic emission susceptibility requirements as applicable.

E.2.8 The FTTS MSV NLOS LS shall be capable of being stowed and transported in temperatures from −65° to 160° F under all environmental conditions experienced at those temperatures. The FTTS MSV NLOS LS shall be capable of being operated in temperatures from −60° to 140° F under all environmental conditions experienced at those temperatures.

E.2.9 Any human interfaces with the launcher system shall be performed by any 5th percentile female to 95th percentile male soldier while wearing cold weather and/or mission oriented protective posture IV (MOPP IV) protective clothing.

E.2.10 The FTTS MSV NLOS LS shall have a man rated cab to withstand the impact of the launch system upon firing.

E.2.11 Survivability.

E.2.11.1 The FTTS MSV NLOS LS shall be NBC contamination survivable. The FTTS MSV FV shall be able to withstand the materiel damaging effects of NBC contaminants and decontaminants; be decontaminable to negligible risk levels to reduce hazard to personnel operating and maintaining the system; and be capable of being operated and maintained by personnel wearing full NBC protection (MOPP IV). The LMFF shall be designed so that performance degradation when wearing special clothing does not exceed 50 percent.

E.2.11.2 The FTTS MSV NLOS LS shall be high-altitude electromagnetic pulse (HEMP) survivable.

E.2.12 Transportability. The FTTS MSV NLOS LS shall be capable of being transported by highway, rail, air, and marine transport methods. The FTTS MSV NLOS LS with CLUs shall have drive-on/off capability for C-130 and all strategic lift aircraft.

Acronyms

ABS	Anti-lock Braking System
AC	Alternating Current
BII	Basic Issue Items
C2	Command and Control
C4ISR	Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance
CARC	Chemical Agent Resistant Coating
CBRN	Chemical, Biological, Radiological, and Nuclear
CDD	Capability Development Document
CID	Combat Identification
CNT	Control Test
CONUS	Continental United States
CROP	Common Relevant Operating Picture
CROP	Container Roll-on/off Platform
CRT	Combat Repair Team
CSTA	Combat Systems Test Activity
CT	Companion Trailer
CTIS	Central Tire Inflation System
CW	Curb Weight
DC	Direct Current
DEW	Directed Energy Weapon
DOD	Department of Defense
DODISS	Department of Defense Index of Specifications and Standards
DTS	Defense Transportation System
EMI	Electromagnetic Interference
EPA	Environmental Protection Agency
FAT	First Article Test
FBCB2	Force XXI Battle Command Brigade and Below
FCS	Future Combat Systems
FMCSR	Federal Motor Carriers Safety Regulations
FMVSS	Federal Motor Vehicle Safety Standards
FPT	Follow-on Production Test
FPVI	First Production Vehicle Inspection
FRMV	Forward Recovery and Maintenance Vehicle
FTTS	Future Tactical Truck Systems
GCW	Gross Combined Weight
GVW	Gross Vehicle Weight
HEMAT	Heavy Expanded Mobility Tactical Truck
HEMP	High-Altitude Electromagnetic Pulse
HMMWV	High Mobility Multi-Purpose Wheeled Vehicle
IAW	In Accordance With
IETM	Interactive Electronic Technical Manuals
IFF	Identifying Friend or Foe
ILHS	Intelligent Load Handling System
ISO	International Organization for Standardization
JOA	Joint Operational Area
JTF	Joint Task Force
LED	Light Emitting Diode

LHS	Load Handling System
LRM	Line-Replaceable Module
LRU	Line-Replaceable Unit
LS	Launch System
MANPRINT	Manpower and Personal Integration
MHE	Material Handling Equipment
MIP	Modular Intermodal Platform
MP	Mission Profile
MSV	Maneuver Sustainment Vehicle
MTMC-TEA	Military Traffic Management Command Transportation Engineering Agency
MTS	Movement Tracking System
MTTR	Mean Time To Repair
MWSS	Mounted Warrior Soldier System
NATO	North Atlantic Treaty Organization
NBC	Nuclear, Biological, and Chemical
NEFF	Non-Essential Function Failure
NFPA	National Fire Protection Agency
NLOS	Non-Line of Sight
NVG	Night Vision Goggles
OCONUS	Outside the Continental United States
OMS	Operational Mode Summary
OPTEMPO	Operating/Operations Tempo
PLS	Palletized Load System
PMC	Preventative Maintenance Checks
PTO	Power Take Off
PVT	Production Verification Test
QCI	Quality Conformance Inspection
RAMD	Reliability, Availability, Maintainability, and Durability
RF	Radio Frequency
RMS	Root Mean Squared
SAE	Society of Automotive Engineers
STAMIS	Standard Army Management Information System
TECOM	Test & Evaluation Command
TIC	Toxic Industrial Chemical
TIM	Toxic Industrial Material
TMDE	Test Maintenance and Diagnostic Equipment
TUAV	Tactical Unmanned Aerial Vehicle
TVW	Tactical Wheeled Vehicles
UA	Unit of Action
UE	Unit of Employment
VCI	Vehicle Cone Index
VETRONICS	Vehicle Electronics
NRMM	NATO Reference Mobility Model
LW	Land Warrior
MW	Mounted Warrior