SYSTEM SPECIFICATION
6x6 with Tag Axle Medium Tactical Truck

1. SCOPE.

1.1. Scope. This system specification identifies the physical, performance and inspection requirements for a 6x6 medium, Class 6/7, tactical truck with tag axle, which can be built from 4 to 10 wheels utilizing 90+% common components. This system specification is a modification of the ATPD 2131C system specification and establishes these requirements by identifying the following:

a. Technical data requirements from which the vehicle is to be produced.

b. Physical characteristics and performance requirements for the vehicles produced.

c. Identification of the performance and quality test requirements used to verify the vehicles meet the specified performance standards.

1.2. General Description. This new 6x6 with tag axle medium tactical truck will leverage the concepts of the MTTD (Medium Tactical Truck Demonstrator) and evolve that design by incorporating an enhanced ballistic/mine blast protected cab, signature suppression technology, a hybrid drive train capability with significantly reduced maintenance/replacement capability, disc brake/all wheel steer, independent suspension, expanded fording/trench crossing capability, improved and relocated MHE, and a light-weight tilt/roller bed for direct C-130 463L pallet removal, supporting two 463L pallets with a total gross weight of 20,000 pounds. This new 6x6 will incorporate a tag axle after the first axle which aides in distributing the weight of an armored steel cab, allowing this new truck to meet C-130 axle weight loads restrictions. The addition of a tag axle on the 6x6 truck also allows the truck to cross a much larger trench than a typical 6x6 truck. This vehicle must be capable of operating under on-road/off-road conditions and withstand the strain, shocks, vibrations and other detrimental conditions incident to off-road travel and operation. The vehicle will be capable of meeting all characteristics specified herein throughout a life-cycle-mileage profile consisting of 20% primary road, 50% secondary road, 15% trail, and 15% cross-country operations while carrying a 3-person crew and specified loads. In meeting highway specifications, this tactical truck showcases a 2004 EPA-certified diesel engine, automatic transmission, SAE J1708 and/or J1939 data bus, and Anti-lock Brake System (ABS).

2. APPLICABLE DOCUMENTS

2.1. Government and Commercial Specifications, Standards, and Handbooks. Specifications, standards, commercial item descriptions, drawings, and handbooks cited herein form a part of this specification to the extent indicated. Unless otherwise stated, the issue of the documents shall be those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplements in effect on date of contract award.

2.2. Commercial and Government Documentation.

2.2.1. Commercial or Industry Standard and Publications.

Commercial Item Descriptions (CIDs)

A-A-50271	Plates, Identification, Instructions, and Markings
A-A-52426	Hose & Hose Assy's, Non-Metallic, Silicone, Polyester and Wire-Reinforced
A-A-52484	Coupling, Automotive: Air Brake Lines
A-A-52513	Bracket Ass'y, Liquid Container – Five Gallon
A-A-52557	Diesel Fuel
A-A-52624	Antifreeze, Multi Engine Type
A-A-59294	Starter, Engine Electrical 24 Volt Direct Current

American Conference of Governmental Industrial Hygienists (ACGIH)

American Society for Quality Control (ASQC)
ASQC-A8402 Quality Management and Quality Assurance-Vocabulary

Standardization NATO Agreement (STANAG)

National Highway Safety Administration

Federal Motor Vehicle Safety Standards (FMVSS) 101, 102, 108, 119, 120, 121, 206, 209, 210, and 302 in particular, and all standards, at time of award, appropriate to vehicles of the types described herein.

Department of Transportation

Federal Motor Carrier Safety Regulations (FMCSR) 393.67, 393.70, 393.80, 393.83, and 393.86

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

Code of Federal Regulations

49 CFR Tiedowns

Environmental Protection Agency

Control of Air Pollution from New Motor Vehicles and New Motor Vehicle Engines.
Compliance with Interstate Motor Carrier Noise Emission Standard.

(Application for copies should reference Code of Federal Regulations 49CFR and the Federal Register, and should be addressed to the Superintendent of Documents, US Government Printing Office, Washington, D.C. 20402.)

SAE Standards And Recommended Practice:

SAE-J198	Windshield Wiper Systems - Trucks, Buses, and Multipurpose Vehicles
SAE-J366	Exterior Sound Level for Heavy Trucks and Busses
SAE-J382	Windshield Defrosting Systems Performance Requirements - Trucks, Busses, and Multipurpose Vehicles
SAE-J598	Sealed Lighting Units
SAE-J645	Automotive Transmission Terminology
SAE-J682	Rear Wheel Splash and Stone Throw Protection
SAE-J765	Crane Load Stability Test Code
SAE-J1063	Cantilevered Boom Crane Structures, Method of Test
SAE-J1100	Motor Vehicle Dimensions
SAE-J1436	Requirements for Engine Cooling System Filling, Deaeration, & Drawdown Tests
SAE-J1708	Serial Data Communications Between Microcomputer Systems in Heavy Duty Vehicle Applications
SAE-J1939	Recommended Practice for Serial Control and Communications Network (Class C) for Truck and Bus Applications

SAE J2014	Pneumatic Tires for Military Tactical Wheeled Vehicles
SAE-AMS-QQ-C-320	Chromium Plating (Electrodeposited)

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

American Welding Society (AWS)

AWS C1.3-70	Resistance Welding Coated Low Carbon Steels
AWS D1.1	Structural Welding Code Steel
AWS D1.2	Structural Welding Code Aluminum
AWS D1.3	Structural Welding Code Sheet Steel
AWS D14.3	Specification for Welding Earth Moving & Construction Equipment
AWS D8.7-88R	Automotive Weld Quality Resistance Spot Weld

(Application for copies should be addressed to the American Welding Society, 550 N.W. Lejeune Road, P.O. Box 351040, Miami, FL 33135)

American National Standards Institute (ANSI)

ANSI/ASME B30.5	Mobile and Locomotive Cranes
ANSI/ASME B30.22	Articulating Boom Cranes

(Application for copies may be addressed to the American National Standards Institute, 1430 Broadway, New York, NY 10018)

ANSI/ASQC Z1.4 Sampling Procedures and Tables for Inspection by Attributes

American Society of Testing and Materials (ASTM)

ASTM D396, ASTM D975, ASTM D1655 & ASTM D3699

ASME Boiler & Pressure Vessel Code Section IX Div 1

(Application for copies may be addressed to the American Society for Testing Materials, 1916 Race Street, Philadelphia, PA 19103)

Tire & Rim Association, Inc.

Year Book

(Application for copies should be addressed to the Tire and Rim Association, Inc., 3200 W. Market Street, Akron, OH 44313)

National Electrical Code 501-4(b)

NEC Article 347.9

2.2.2. Required Military Specifications/Standards. Compliance with the following specifications/standards is called out within this specification (latest current revision at time of proposal and or contract award, unless a specific revision is specified).

MIL-STD-209H	Slinging and Tiedown Provisions for Lifting and Tying Down Military Equipment
MIL-STD-810	Environmental Test Methods
MIL-STD-814B	Requirement for Tiedown, Suspension and Extraction Provisions on Military Material for Airdrop
MIL-STD-1179	Lamp, Reflectors & Assoc. Signaling Equip.
MIL-STD-1180	Safety Standards for Military Ground Vehicles
MIL-STD-1275	Characteristics for 24 Volt D.C. Electrical Systems in Military Vehicles
MIL-STD-1366	Transportability Criteria
MIL-STD-1472	Human Engineering Design Criteria Military Systems Equipment and Facilities
MIL-HDBK-1791	Designing for Internal Aerial Delivery in Fixed Wing Aircraft
MIL-S-43926	Chemical Protective Garments

Copies of listed military standards, specifications and associated documents listed in the DODISS should be obtained from the DOD Single Stock Point, Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.2.3. Required Military Performance Specifications. Compliance with following performance specifications is called out within this specification.

MIL-PRF-2104	Lubricant Oil, Internal Combustion Engine
MIL-PRF-2105	Lubricant Oil, Gear Multipurpose
MIL-DTL-5624T	Turbine Fuel, Aviation, Grades JP4 and JP5
MIL-V-81940	Oil Sampling Valves

Copies of listed military standards, specifications and associated documents listed in the DODISS should be obtained from the DOD Single Stock Point, Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.2.4. Other Government Documents. Compliance with the following documents is called out within this specification (latest current revision unless specific revision specified).

8710630	Pintle Assembly
7551383	Army Towbar

Copies of listed military standards, specifications and associated documents listed in the DODISS should be obtained from the DOD Single Stock Point, Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120. Copies of all other listed documents should be obtained from the contracting activity at TACOM or as directed by the Contracting Officer.

Army Publications:

UDLP/TACOM Ground Combat Welding Code

Copies of listed military standards, specifications and associated documents listed in the DODISS should be obtained from the DOD Single Stock Point, Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120. Copies of all other listed documents should be obtained from the contracting activity at TACOM or as directed by the Contracting Officer.

3. REQUIREMENTS.

3.1. System Definition. The basic chassis of the 6x6 with tag axle medium tactical truck hereinafter referred to as the vehicle shall be comprised of components, parts and accessories which meet or exceed the requirements of this specification and shall consist of chassis capable of accepting various body configurations to accommodate vehicle missions. All vehicles shall meet all requirements in all sections of this ATPD (unless otherwise indicated) in addition to the specific requirements in the respective annex for each model:

6x6 with tag axle tactical truck		
	Truck, Cargo	Annex A
	Central Tire Inflation System (CTIS)	Annex B
	Load Handling System (LHS)	Annex C

3.2. Vehicle Characteristics.

3.2.1. Performance Characteristics. Performance requirements shall be achieved with all models, with and without winch, at gross vehicle weight (GVW), to include all kits unless otherwise specified, but without towed load, unless curb weight or gross combination weight (GCW) is specified. All parasitic losses are to be used in performance calculations, i.e., fan, alternator losses, etc. Test criteria cited in section 4 of this specification are to be considered minimum standards.

3.2.1.1. Grade Operation. In both forward or reverse gear the vehicle shall be capable of climbing and descending a 60% longitudinal slope at GVW, 30% at GCW, with intermediate starts and stops on a dry hard concrete surface free from loose material. There shall be no evidence of stalling, slipping, overheating, upsetting, hesitation, leaking of fuels, lubricants or coolants, no loss of mobility or stability, and no loss of fuel or oil pressure or flow to the engine while performing these operations. Engine must start headed up and down slope.

3.2.1.2. Side Slope Operation. The base vehicle shall be capable of starting and stopping the engine while on, and traversing, side slopes of up to 40% at GVW on a dry, hard concrete surface, free from loose material. There shall be no evidence of stalling, slipping, overheating, upsetting, hesitation, leaking of fuels, lubricants or coolants, no loss of mobility or stability, and no loss of fuel or oil pressure or flow to the engine while performing these operations.

3.2.1.3. Steering and Handling. Power steering shall be furnished with capability at rated GVW to turn steered wheels to their limits on a stationary vehicle without leakage of power steering fluid. The vehicle incorporates an all-wheel steering system with a mechanical connection between steering wheel and axle steering mechanisms that exists under all conditions. The all-wheel steering system is designed for and utilizes full Ackermann principles that minimizes tire scrub and is easily changed for different wheelbase length configurations. The cab of this truck will be equipped with a common steering assembly consisting of the steering wheel, steering column, driver controls, and foot pedals. This common steering assembly will be capable of sliding from left to right while driving or stopped and allow for left or right hand drive at any time. This common steering assembly will be mechanically connected to the rest of the steering system and will meet all on and off-road vehicle requirements to be street legal.

3.2.1.4. Speed. The vehicles shall be capable of maintaining the following speeds on primary roads:

VARIANT	WEIGHT	SPEED (mph) on 2% Slope	SPEED (mph) on 3% Slope
BASE VEHICLE	GVW	55	45
BASE VEHICLE	GCW	40	30

3.2.1.5. Turning. The Wall to Wall turning radius for the vehicle shall not exceed 35 feet 6 inches (depending on length of vehicle and wheelbase) in one continuous movement. Vehicle with stated towed items shall be capable of turning, in one continuous movement, two standard NATO 24 x 24 feet (7.3 x 7.3 m) roads intersecting at 90°.

3.2.1.6. Vertical Step. The vehicle shall, at GVW, be capable of negotiating a 24 inch (61 cm) minimum vertical step in both forward and reverse directions in a CTIS setting of cross country.

3.2.1.7. Fording. The vehicle shall be capable of operating in fresh and salt water in depths to 48 inch (122 cm) without preparation. Fording for 15 minutes shall not cause engine stall, damage or degradation of vehicle components, need for maintenance actions nor render the vehicle incapable of performing any operation of this specification. Excepted from this requirement are any non-sealed brake components. While fording, the engine shall be capable of being restarted when stopped for 10 minutes. Seals shall restrict the entrance of foreign matter into bearings which are exposed to contamination during these operations. Water contamination of bearing lubricants shall not be more than 2.0% by volume. All bearing seals shall restrict the leaking of lubricants from the bearings. Water contamination of engine, brake fluid, transmission, transfer transmission, power steering pump, fuel tank(s) and all differentials shall not exceed 2.0% by volume. Vented components shall be vented above the 48-inch fording line without kit.

3.2.1.8. Range. The vehicle shall be capable at GCW of being operated for at least 450 miles on highway from integral fuel capacity at an average convoy speed of not less than 25 mph (40 km/h). This vehicle is being designed to incorporate technology insertion that will aid in fuel efficiency.

3.2.1.9. Noise. The exterior noise shall not be greater than 83 dB (A) at a distance of 15 meters from the centerline of the vehicle path when measured according to the procedure cited in paragraph

3.2.1.10. Emissions. The vehicle shall comply with Environmental Protection Agency (EPA) emission regulation/standards for new motor vehicles and new motor vehicle engines in effect at the time of sale of the vehicle, except as allowed by EPA exemptions.

3.2.1.11. Braking. All vehicles shall be equipped with in-board disc brakes and an Anti-lock Brake System (ABS) and shall comply with FMVSS 121. Brake linings shall be constructed from non-asbestos materials. The brake system shall be comprised of components that will not require maintenance due to corrosion, during durability testing per Section 4. In the event of an ABS failure, vehicle shall be able to continue the mission using the standard air/ hydraulic brake system for service brakes. The brake pads shall be easily removable on the vehicle without removing the wheels.

3.2.1.11.1. Service Brakes. The service brakes shall control and hold the vehicle on a dry hard surface 60% grade, when headed up or down slope. On a dry hard level road that is free from loose material, application of the service brakes shall bring the vehicle (at GVW) to a complete stop from a speed of 20 mph (32 km/h) within 32 feet (9.75 m), measured from the point of brake application. Brake pedal force to achieve above performance shall be within that possible by the full range of drivers. Application of service brakes shall cause activation of brake lights to include override of emergency flashers unless emergency flashers consist of separate lights.

3.2.1.11.2. Parking Brake. The parking brake shall be capable of holding the vehicle wheels from rotating where braking is applied, at GCW on a 30% grade, headed up or downgrade, on a dry hard surface free from loose material. An indicator light shall alert the crew when the parking brake is engaged. The parking brake system shall at all times be capable of being applied and released by any driver's muscular effort and immediately available for re-application. Braking energy shall not be dependent on maintenance of air or hydraulic pressure or electrical energy.

3.2.1.11.3. Emergency Brakes. The emergency brake system, in the event of a single point failure in the service brake system, shall stop the vehicle at least once on a 30% slope and, after emergency applications per FMVSS 121, shall remain engaged until intentionally disengaged by operating personnel. Emergency braking shall include a means of providing adequate vehicle stopping in the event of a trailer breakaway.

3.2.1.11.4. Glad Hands. Glad hands shall be provided at the rear of vehicle.

3.2.1.12. Survivability. Vehicle design shall incorporate consideration of vehicle and crew survivability as follows: in general, the design shall protect such vulnerable components as air, fluid, and electrical lines and components by routing or placement in areas shielded by heavier components. These and other components critical to vehicle operation shall be protected to the extent possible without serious departure from standard automotive design principles. Any components exposed up to 40 inches from the ground with the emergency CTIS setting in force, to include hoses, cables, lanyards, lines, tanks, valves, wires, cylinders, boxes, shall be shielded or able to withstand, going in forward or reverse, with no degradation of vehicle operation: the repeated impact of brush and tree branches; dry debris raised by cross country operation; soil scraping at 5 mph. The cab will provide protection against an 11 pound mineand against 7.62mm ball.

3.2.1.12.1. Blackout Condition Lighting. Blackout condition lighting shall be provided in accordance with MIL-STD-1179. No other vehicle lighting shall be capable of being activated while in the blackout mode except where otherwise required by this specification.

3.2.1.12.2 The Material Handling Equipment (MHE) equipped cargo model at GVW plus the equivalent weight of load handling system in the cargo bed and with all kits must be capable of operating over cross country terrain, primary and secondary roads and trails for the appropriate mobility level stated herein under the varied environmental conditions encountered.

3.2.1.13. Approach and Departure Angles. The approach angle of all models with and without kits and with and without winch, shall be a minimum of 41°. The departure angle of the basic cargo trucks, with and without kits and with and without winch, shall be a minimum of 40°. Approach and departure angles shall be defined in accordance with SAE J1100.

3.2.1.14. Ground Clearance. The vehicle, with and without kits, with tire pressures at highway mode, shall have a maximum ground clearance of not less than 19.5 inches (49.5 cm) when vehicle is fully raised.

3.2.1.15. Ride Quality. The vehicle shall demonstrate controllability by MOS-designated drivers. In order to protect human health, whole body vibration shall meet the requirements of MIL-STD-1472, during testing. The vehicle shall attain no more than 6 watts average vertical absorbed power at the driver's station while negotiating a 0.7 inch Root Mean Square (RMS) course at speeds up to 25 mph, a 1.0 inch RMS course at speeds up to 17 mph, and a 1.5 inch, RMS course at speeds up to 12 mph with the tires at normal cross-country inflation pressure. The vehicle shall show no more than 2.5g acceleration at the driver's station while negotiating half-round obstacles of 8 inch height at a speed of at least 12 mph, and a 10 inch height at a speed of at least 7 mph, with tires at normal cross-country inflation pressure.

3.2.2. Physical Characteristics.

3.2.2.1. Dimensions. Dimensions shall be defined in accordance with SAE J1100 except for paragraph W103 vehicle width, which is redefined as: the maximum dimension measured between the widest points on the

vehicle, excluding exterior mirrors and marker lamps, but including bumpers, moldings, and sheet metal protrusions. The vehicle dimensions for worldwide operation and transportability, shall not exceed those stated in Section 6.

3.2.2.2. Vehicle Loading. Vehicle weights and loads shall be as defined and specified in Section 6.

3.2.2.3. Protective Coatings and Corrosion Control.

3.2.2.3.1. Painting. All exterior and interior paint shall be best commercial practice suitable for this application. Unless otherwise specified, color for the interior shall be tan, and color for the exterior shall be black.

3.2.2.3.2. Non-Skid Surfaces. Surfaces of a vehicle to be used as walkways, working areas, or steps shall be provided with non-skid protection.

3.2.2.4. Reliability (Warranty). Vehicle is warranted for 12 months, 12,000 miles and includes pass-through warranties from vendors on individual components.

3.2.2.5. Engine Accessibility. The vehicle shall have a 0.90 probability of removing and reinstalling an engine and transmission assembly, in less than 6 clock hours by no more than 2 individuals plus one crane/wrecker operator for all body styles utilizing existing Army maintenance equipment. There shall be easy accessibility to the engine for normal checks and services. The engine configuration described in this section is for a "dressed engine" as defined in Section 6.

3.2.2.6. Oil Sampling. Oil sampling valves (see MIL-V-81940 for guidance) shall be provided in a readily accessible location for the engine, transmission, and hydraulic system. The oil sampling valves shall be located ahead of the oil filters, and shall be usable while the engine is running. The valves shall be located in such a way as to insure that personnel shall not be exposed to danger when taking oil samples with the engine running. Each sampling valve location shall be labeled to identify the source of the sample.

3.2.3. Environmental Condition. The vehicle and its systems shall be capable of starting and operating in the ambient temperature range of 120^{o} F to -25^{o} F. Temperatures shall be recorded 6 feet (1.8 m) above the ground.

3.2.4. Transportability. The vehicle shall be transportable by highway, rail, marine, and air modes worldwide, without special permits. The applicable transportability criteria are set forth in MIL-STD-1366; additional transportability guidance can be found in MIL-HDBK-1791. The vehicle curb and gross weight shall include the crew for highway transport as a self-propelled vehicle.

3.2.4.1. Cargo Aircraft. The vehicle at GVW less crew shall be capable of being transported on C-130 and C-141 aircraft. The vehicle shall have a maximum preparation time for air transport of 15 minutes using only onboard equipment. Times stated are with two people (vehicle operators). All equipment removed in order to meet air transportability shall be stowed on the vehicle. The vehicle shall meet the requirements of MIL-HDBK-1791.

3.2.4.2. Lifting and Tiedown Provisions. The lifting and tiedown provisions, including the connecting structural members on the vehicle, at gross rigged weight for airdrop less crew and at GVW, less crew shall be in accordance with MIL-STD-209H. Complete diagrams and instructions for lifting and tying down the vehicles for the various transport modes shall be provided. Instructions shall be included for component removal and subsequent storage when required for transport. Stencil or decal markings shall be applied to the vehicle at each lifting and tiedown point. The tiedown procedure shall permit tiedown of the vehicles to the floor (or deck) of the transport medium in such a manner as to prevent shifting or movement in any direction. The vehicle tiedown provisions for railcar tiedown shall consist of four and only four provisions and shall meet the requirements of MIL-STD-209H with a tiedown procedure consisting of one and only one tiedown device per each tiedown provision per MTMCTEA PAMPHLET 55-19 and AAR Section 6. Dimension D in Figure 5 of MIL-STD-209H shall be large enough to accommodate the passage of the necessary number of tiedown devices through the tiedown provision.

3.2.5. Armored Cab. The vehicle cab shall be a cab-forward design having seating provisions for 3 or more crew members when radios/radio mounts are not installed, 2 or more crew members when installed. Doors shall comply with FMVSS 206. The cab is capable of being removable by the on-board crane. The cab is built with a mechanically connected steering column assembly that is capable of being left or right hand drive at any time. The cab contains mounting provisions to accept the High Mobility Multipurpose Wheeled Vehicle (HMMWV) light-weight machine gun ring-mount. The cab will be constructed from a steel material capable of meeting the necessary survivability requirements (See 3.2.1.12).

3.2.5.1. Water Resistance. When assembled, cab and all components shall be waterproof to preclude the entrance of water due to rain, melting snow, road splash and the penetration of moisture from all other causes. Vapor material shall be applied to prevent the possible accumulation of condensation on the interior of the cab. Seams shall be coated with a sealer to provide a waterproof joint.

3.3. Design and Construction.

3.3.1. Material. Radioactive materials shall not be used. All materials shall be new and unused. Materials not specified shall be selected by the supplier to conform to standards applicable to off-road/construction vehicles. Such selected material shall be galvanically compatible with, or insulated from, mating surfaces.

3.3.1.1. Component Ratings and Specifications. All system components shall be rated and approved by the component manufacturer for vehicle application. Existing ratings and specifications shall not be raised nor changed with the intention to meet the requirements of this specification.

3.3.1.2. Flammability of Interior Material. The interior material shall conform to the flammability requirements of FMVSS 302.

3.3.1.3. Material Durability. Nonmetal components shall not deteriorate due to mold, fungus, moisture, repeated exposure to bright sunlight, or use while stored in accordance with TM 9-2320-391-20, Section IV, Chapter 2-21.

3.3.2. Nameplates or Product Marking. Vehicle exterior markings will be stamped in a visible area in the front. The interior markings shall consist of a nameplate containing serial numbers of engine, transmission, vehicle weight, and other relevant information.

3.3.3. Workmanship. Workmanship shall be of the highest grade consistent with the intention of this specification. Each vehicle shall have no evidence of cracks, dents, scratches, burrs, sharp edges, loose parts, foreign matter, or any other evidence of poor workmanship that shall render the vehicle unsuitable/unsafe for the purpose intended. The cab, chassis and bodies shall be designed such that normal vehicle operation does not cause chafing, binding or other damage to any harness, hose, control cable, lanyard, tube or line.

3.3.3.1. Weld Procedure Qualification. For a production procurement, welding procedures shall be developed IAW American Welding Society (AWS) IAW AWS C1.3-70, AWS D1.1, AWS D1.2, AWS D1.3, AWS D14.3, or AWS D8.7-88R or similar commercial weld codes and submitted for Government approval for a production contract. The use of pre-qualified weld joints as specified in AWS D1.1 does not preclude submittal of welding procedures.

3.3.4. Safety. Exposed components and systems which are subject to high temperatures, high pressures, electrically actuated, or inherently hazardous, shall be provided with correct safeguarding and insulating features. Vehicle shall comply with all applicable requirements in MIL-STD-1180 for Type I vehicles. Type II seat belts, conforming to FMVSS 209 and 210, shall be provided at all crew seating positions.

3.3.4.1. Human Factors. Foot and hand holds that would be convenient for the 5th percentile female through 95th percentile male soldier (with combat equipment and in either arctic gear or MOPP-4) to climb into the cab, cargo bed, and mission equipment form a hard, level, dry surface. These foot and hand holds shall be able to

adequately support the 95th percentile infantry soldier with full equipment in either arctic gear or MOPP-4 (up to 300 lbs.) load without causing damage to the vehicle or components. All hand holds and steps necessary for the operator and maintenance personnel to gain access to various locations on the vehicle shall be integral to the vehicle.

3.4. Chassis Components.

3.4.1. Engine. The engines shall be fuel efficient and operate under all conditions specified. If vehicle is outfitted with a fan clutch, in the event of failure, the fan shall be constantly engaged. The oil filler tube shall allow the addition of oil from a standard 1 quart can without the use of a funnel. This vehicle shall incorporate an FMTV engine or one with better performance with at least 330HP and 860 ft-lb of torque.

3.4.1.1. Test Equipment. Built in Test Equipment (BITE) is required for common modes of failure which shall be identified on a within-the-cab display providing for rapid operator/ maintainer actions. Data bus communications for electronic controlled drivetrain components shall be in accordance with SAE J1939 or later CAN bus system. There shall be no DCA connector. Information diagnostics as available from drive-train ECU's/ECM's data bus shall be accessible at the on board diagnostic connector. The connector for the diagnostic shall be a J1939 or later connector. The connector shall include a cap that keeps the connector dry from water and moisture.

3.4.1.2. Heavy - Duty Cooling System. A heavy duty cooling system shall be furnished. The cooling system shall be capable of retention and recovery of 6% coolant overflow or have 6% expansion reserve capacity. The cooling system shall be capable of continuous de-aeration of 0.1 cfm of air per cylinder at rated engine speed at any slope the vehicle is required to operate on. The system shall fill completely, with an automatic de-aeration feature to preclude air cavitation at any coolant fill rate up to the maximum fill rate. The cooling system shall meet the following requirements:

a. Maintain the specified component operating temperatures within the specified limits while operating continuously at full load and 0.6 tractive effort to gross vehicle weight ratio (TE/GVW) while under the maximum conditions of 120° F for all models.

b. Does not exceed temperature limits while operating at rated engine power.

c. Meets the requirements after a drawdown of 10% of engine coolant. Specified fluid temperatures shall not exceed the lower of those for which the component manufacturer shall provide warranty, or the following:

Component/Location	Full Load
Engine Oil Sump	275° F
Transmission, Transfer Case, Differential	300° F
Radiator Top Tank, Coolant	230° F
Engine Oil Gallery and Transmission Sump	Maximum temperatures for which application vendors will provide application approval

d. The radiator shall be suitable for the application intended. Heavy-duty clamps shall be used, shall be clearly visible, located for ease of connection, and ensure positive sealing. The cooling system shall not be comprised of heat exchangers in series in areas prone to fouling.

3.4.1.3. Engine Coolant. If water-cooled, the engine shall be serviced with a solution of ethylene glycol conforming to CID A-A-52624, Type I, and water in equal parts by volume.

3.4.1.4. Engine Air Induction System. The air induction system as installed shall prevent entrance of foreign matter during vehicle operation. The air inlet shall be located to ensure that no water entry during splash and fording shall occur. The air inlet shall be located in a low dust area of the dust plume to extend element life.

Pre-shaped tubing shall be used in the air induction system. An in-cab, resettable, and graduated air filter restriction gauge shall be furnished.

3.4.1.5. Air Cleaner. The vehicle shall contain a dry-type air cleaner with a pre-cleaner standard.

3.4.1.6. Oil Filter. A full flow type oil filter system with integral emergency bypass, IAW the engine manufacturer's specification, shall be furnished to ensure maximum engine protection.

3.4.1.7. Fuel System. The fuel system shall meet the requirements of FMCSR, para 393 subpart E, and incorporate the Standard Army Refueling System (SARS) components. The fuel delivery system shall include an automatic water separator. A fuel preheater can be provided in an arctic kit to ensure satisfactory operation in cold climates specified in para 3.2.7.

3.4.1.8. Fuel Tank(s). Vehicle shall be equipped with corrosion resistant fuel tank(s) (i.e. composites with mechanical properties equal to existing fuel tanks or metal tanks with internal rust inhibitors). The dashboard fuel level gage shall operate within a 2.5% error rate. Metal fuel lines shall be galvanically insulated from adjacent surfaces. Mounting straps used to secure metal tanks to frame/chassis shall also be insulated. Non-metal fuel lines are also acceptable for this application. The fuel tank/line venting system shall not be combined or inter-connected with any other vent system. Fuel tank(s) shall be provided with drain plug(s) and safety type tank filler caps, captive chained to filler neck strainers, which are accessible and removable by personnel wearing arctic mittens. The vehicle shall be able to operate under all conditions specified herein with 10 % of the usable fuel remaining. Fuel tank ports must be a minimum of 2.25 inches (5.7 cm) inside diameter, and shall be compatible with NATO dispensing nozzles having a nominal outside diameter of 2 inches (51 mm).

3.4.1.9. Fuels and Lubricants. Vehicles shall be operable with applicable standard military fuel and lubricants without adverse effect on vehicle components and vehicle performance. The vehicle lubricants shall conform to the requirements of MIL-PRF-2104, MIL-PRF-2105, QPL-46167, QPL-10924, and QPL-23827. The vehicle's military fuels shall conform to the required fuels specified below.

Primary	Alternate	Emergency
A-A-52557 ASTM D1655 (JP8), F34	ASTM D1655 (DF1, DF2 & DFA) F54	ASTM D396 (Fuel Oil, No. 1 & 2 Reference No. I & II)
	MIL-DTL-5624T (JP5), F44	ASTM D975 (Fuel, MIL-DTL-5624T (JP-4)), F40
	ASTM D975 (Fuel Naval ASTM D3699 (Kerosene)) F45 Distillate, F76	

3.4.1.9.0 Fuels. The vehicle/engine shall be capable of operating in all environmental conditions.

3.4.1.9.1. Lubricating Oils and Greases. The lubrication intervals shall be as required by the component manufacturers. A lubrication chart shall be furnished with each vehicle and shall include interchangeable military lubricants as well as commercial lubricant designations. Lithium based grease shall be used in corrosion prone areas where grease lubrication is required.

3.4.1.9.2. Hydraulic System. If equipped with a PTO for winch or other driven equipment, the vehicle shall have a hydraulic tank and filter system. The tank must be flushable without removal from the chassis. Unused ports shall have metal plugs installed. The return line shall exhaust returning oil back into the tank below the level of fluid in the tank. Filter and strainer must be removable without dismantling the tank from the vehicle.

3.4.1.10. High Coolant Temperature Warning. The high coolant temperature warning shall be activated when coolant temperature is at the warranted operational temperature and in no event shall it fail to activate by the time the temperature reaches 5^{o} F above the warranted temperature.

3.4.2. 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 personnel occupied areas. The exhaust system shall be so located such that ignition of fuel from fuel system is minimized in the event a leak occurs from either system or spillage occurs during refueling. Exhaust mufflers and tail pipes shall be corrosion resistant (i.e. fabricated from stainless steel stock) with adequate guards to prevent personnel contact. Also, exhaust system mounting brackets and fasteners shall protect against dissimilar metal corrosion. Weather caps shall be provided on vertical exhaust stacks.

3.4.2.1. Toxic Gas Exposure. Operating and maintenance personnel shall not be exposed to dangerous concentrations of toxic gasses.

3.4.3. Power Train.

3.4.3.1. Transmission. The vehicle shall incorporate an FMTV transmission or one with better performance and shall meet the requirements of FMVSS 102. The transmission shall shift automatically in all forward ranges per SAE J645, and require no operator action uncommon to standard automatic transmissions. Exception to automatic shift may be made if manual shift to a single lower gear/range is in lieu of a two-speed transfer case, and is necessary only during extremes of the vehicle mission. It must have a gear range capable of meeting the performance specification. The main transmission shall include the following:

3.4.3.1.1. Inhibitor System. A reverse and down shift inhibitor system that prevents driver shift control action from overspeeding or damaging engine, transmission, or drive train components.

3.4.3.1.2. Transmission Filter. The transmission shall have a transmission fluid filter(s) and a heat exchanger which does not rely on air flow over the transmission, as recommended by the transmission manufacturer for the intended application.

3.4.3.1.3. Transmission Control System. An electronic transmission control system is required that meets the HAEMP requirements. A neutral interlock shall be used to insure that vehicle does not start in any forward or reverse gear.

3.4.3.2. Transfer Case. It is required that the transfer case provide torque proportioning full time all wheel drive to both the front and rear axles simultaneously. A multi-speed transfer case must possess a neutral range and either provide shift-on-the-move capability or a minimum low range speed of at least 25 mph (40 km/h).

3.4.3.3. Differential. The differentials shall possess adequate strength and durability to perform the required duty cycles. If torque biasing is utilized, the rear differentials shall continuously and automatically provide output torque biasing such that without wheel slip and during turns they are capable of delivering continuously variable unequal/equal torque to both wheels. The differentials will feature an automatic mechanical “locking” system that will provide a posi-traction system that automatically unlocks when a side-to-side speed differential is sensed.

3.4.4. Frame. If frame rails are a steel design, they shall be of a 110 ksi minimum steel. The frames shall employ structural members which provide optimum section efficiency for torsional and bending stiffness. Frame shall be of a design to prevent permanent torsional warping, twist and deflection due to bending throughout the operating profile of the vehicle.

3.4.5. Suspension.

3.4.5.1. Suspension and Axles. The vehicle shall be equipped with independent suspension at all wheels. The suspension system components will have a rated capacity at least equal to the maximum load at GCW that can be imposed on each member measured at the ground. The suspension shall provide for seventeen (17) inches of wheel travel with less than 3 degrees of total camber change and virtually (designed for) zero degree bump steer. The suspension system is an active, pneumatic system that automatically raises and lowers the vehicle based on road speeds. The independent suspension will allow for the vehicle to be safe on side slopes by actively raising the suspension on one side and lowering the suspension on the other side keeping the vehicle level. The suspension can manually be adjusted to a kneeled position, within a few inches of the ground, allowing for easier cargo loading/unloading. The suspension shall be a modular design capable for the manufacture of vehicle variants using the same modular components, but a different number of axles.

3.4.5.2. Tag Axle. The vehicle shall incorporate a tag axle between the first and second axle of a 6x6 truck. To reduce vehicle weight, this tag axle shall not contain a differential carrier and will not be driven. This tag axle will be steered and maintain full Ackermann steering.

3.4.5.3. Wheels, Rims, and Tires. Vehicle shall be equipped with single front and single rear wheels on all models. Rims and tires shall conform to FMVSS 119, 120, SAE J2014, and SAE or Tire and Rim Association recommendations for the type and size tires furnished. A bead-lock feature shall be provided if necessary for low pressure operation. All tires, rims, wheels, and lug nuts shall be identical for all vehicles, to include trailers. The tires shall be tubeless radial ply design with a minimum 10,000 mile (16090 km) life, demonstrate good lateral stability for operation on wet highways and have an aggressive tread for good off-road mobility in all terrain to include mud, snow and sand. The tire/wheel shall maintain sufficient clearance to accept military style tire chains for arctic operations. Vehicle shall be equipped with rim covers to protect CTIS components on the wheel exterior. Covers shall be designed to minimize debris accumulation and heat build up such that CTIS component reliability is not degraded. Tires shall be of rated capacity at least equal to the load imposed on each tire measured at each wheel at the ground. Tires shall be repairable and replaceable at Organizational level. Special tools must be identified. A spare tire, wheel/rim assembly, and carrier shall be provided. A mechanical assist device, if required, shall be provided which shall permit dismounting and restowing of the spare assembly by no more than two crew members, one crew member preferred, within 30 minutes. Design shall facilitate inflation, deflation and pressure gauging with standard tools. If necessary to meet other requirements, a cab controlled tire inflation/deflation system shall be furnished. The vehicle shall be capable of being equipped with multiple wheel and tire sizes.

3.4.5.4. Tire Tread Design. Tire tread design shall be unidirectional and have suitable treads for all-weather, on and off-road.

3.4.5.5. Shock Absorber. Control of wheel jounce and rebound dynamics shall be provided consistent with suspension system design.

3.4.6. Windshield Wiper and Washers. Vehicle shall be equipped with multi-speed windshield wipers and washers meeting requirements of vehicle use in all-weather conditions. Washer reservoirs shall hold up to 3 quarts of commercial windshield solvent for normal climates. Washer reservoir shall not leak when the cab is rotated forward for maintenance.

3.4.7. Bumpers and Towing Devices. Front bumpers, and front and rear towing devices, shall be provided. Rear end protection shall be IAW FMCSR 393.86 to the maximum extent practical while not reducing vehicle/trailer departure angles from those specified herein. Bumpers and towing devices shall be fastened to the vehicle frame with sufficient structural integrity to withstand vehicle recovery, from the front or rear, and lifting/towing by standard Army 5 and 10 Ton wreckers using Army Towbar 7551383. An adjustable swivel pintle assembly, Ordnance part number 8710630, shall be provided at the rear . Towing devices shall conform to FMCSR 393.70. Suitable connectors shall be provided. The mounting of the pintle assembly shall include reinforcements (where necessary) to transfer vertical pintle loads of up to 2,100 lb. Provisions for attachment of trailer safety chains shall be provided.

3.4.8. Air-Conditioning, Heater, and Defroster. A personnel heater with defroster louvers and with blower(s) shall be provided that is capable of 25,000 btu/h. An air-conditioning system shall be provided inside the cab. The air-conditioning system shall be designed to maintain a 20 degree temperature differential between the cab and external environment.

3.4.9. Controls and Operating Mechanisms. Manufacturer's standard controls and operating mechanisms shall conform to FMVSS 101, all lighting functions controlled by GPV main lighting switch, windshield washer/wiper controls illumination, and engine start/stop designator and illumination.

3.4.10. Rear View Mirrors. Rear view mirrors and/or convex mirrors shall be provided on each side.

3.4.11. Drain Plugs. Drain plugs installed in engine, transmission, transfer case, and axles shall be of the magnetic type (MS equivalent) and be readily accessible to maintenance personnel.

3.4.12. Electrical System. Vehicle shall be equipped with a 24 volt D.C., waterproof, electrical system with a 12 volt D.C. lighting system. Reverse polarity protection shall be incorporated in the system. All circuit breakers, if used, shall be readily accessible manual resetting type, except where automatic resetting type is used.

3.4.12.1. Charging and Regulating System.

3.4.12.1.1. Alternator. Vehicle shall be equipped with a 100 amp, 12 & 24 volt DC radio suppressed alternator, which shall provide sufficient current to operate all electrical components when engine is operating at idle speed. The alternator shall be configured to prevent internal alternator corrosion during its expected normal service life.

3.4.12.1.2. Regulating System. Vehicle shall be equipped with a 100 amp dual voltage charging system that will provide up to full alternator output on demand to either the 24 volt load requirement, the 12 volt load requirement, or any combination thereof, from a single 100 amp, 12 & 24 volt DC alternator. The dual voltage control system must be capable of maintaining battery equalization and battery balance when batteries are unmatched or in the same state of charge and provide for separate voltage regulation for the batteries of each voltage system.

3.4.12.2. Starter. Vehicle shall be equipped with a starter suitable for the purpose intended. Starter protection shall prevent re-engagement of the starter with the engine running. The starter must be capable of re-engaging within two seconds (maximum) after the engine is stopped. The starter shall be sufficiently sealed and/or its mounting housing sufficiently vented to prevent starter corrosion.

3.4.12.3. Lighting. All vehicle lights, reflectors, and wiring shall be as specified herein. All vehicle exterior lights shall be mounted in protective locations, or protected to preclude any damage when interfacing with other vehicles, ancillary equipment, specified herein, or caused by terrain or natural obstacles. Vehicle shall be equipped with lamps, reflective devices, and associated equipment in accordance with FMVSS 108, except a) license plate lamps are not required, and b) activation of hazard warning lights shall require operation of not more than one switch in addition to the vehicle master power switch. All lamp connections shall be waterproof. Turn signals shall be of the self-canceling type. Marker light styles may vary based on the position on the vehicle at which they are used.

3.4.12.4. Batteries. Batteries shall be readily accessible for service. Negative ground shall be provided. The battery carrier shall not be located where fuel could drip on batteries. Battery carrier shall be outside the crew or passenger compartment, enclosed and insulated to prevent short-circuiting during maintenance or operation and vented to prevent build-up of gasses. The battery box lid and attendant battery casing shall be designed to prevent damage due to normal installation and use and shall seal batteries and attendant cabling from external road debris and road/tire spray.

3.4.12.4.1. Master Electrical Power Switch. A master electrical power switch shall be provided left of and lower than the steering column (as observed by driver) to allow the operator to shut off all battery power to the rest of the vehicle. The master electrical cutoff shall also turn off the engine before disconnecting electrical power.

3.4.12.5. Horn. Vehicle shall be equipped with a 12 or 24 volt electric horn. Horn is exempt from EME/EMI requirements.

3.4.12.6. Instruments. The vehicle shall be equipped with gauges/indicators which shall be readily visible to the full range of user personnel, adequately lighted for normal operation.

3.4.12.7. Audible Warnings. Audible warning shall sound in the event of low vehicle air pressure.

3.4.12.8. Ignition Switch. Vehicle shall be equipped with an ignition switch that prevents damage to communication/radio and any other electrical/electronic accessories that draw power through the vehicle's power distribution system due to voltage/current spikes while the vehicle starter is engaged. Those components, sub-systems, and/or systems that draw power directly from the vehicle's batteries will not be protected by the ignition switch. Sufficient power from the vehicle's batteries shall be transmitted to the starter while the ignition switch is activated to ensure vehicle start under all climatic conditions.

3.4.13. Control Cables. If applicable, all control cables going outside the cab 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. Cables shall be routed in such a way as to insure freedom of movement in both directions without braiding or kinking.

3.4.14. Wheel Splash and Stone Throw Protection. Rigid fenders or flexible splash shields shall be installed with sufficient clearance for operation while using military standard tire chains. Protection to the rear against rear wheel splash and stone throw shall include anti-sail mud flaps that will not be lifted up by high speed air flow. If pinned under wheels or other objects, mudflaps shall tear away without causing any damage to supporting structures. Vehicle design shall to the maximum practical extent prevent wheel splash and stone throw damage to other parts of the vehicle, i.e., battery compartment; fuel, air and hydraulic tanks and components; vehicle framing; electrical, pneumatic and hydraulic tubing; harnesses and electrical components; drive train and cooling system; exhaust system; wheels and rims; suspension system.

3.4.15. Vehicle Winch. The vehicle winch shall be front or central mounted for self-recovery for forward deployment. The self-recovery winch shall be capable of forward deployment. All models shall be configured to accept the vehicle winch, which shall include all controls, electrical, hydraulic and mechanical linkage as necessary and all items necessary for permanent installation and operation. The winch shall be provided with a free spooling capability to permit rapid deployment of the line. The winch shall have sufficient braking devices to safely lower and hold its full rated load. Winch braking must be automatic and be fully engaged any time the winch is stopped or not in use, and must be essentially released during reel-in operation. With winch installed, the vehicle shall meet all approach and departure angles and ground clearance requirements. The winch shall provide a minimum specified line pull of 15,000 lb. (4,536 kg) +/-10% from a bare drum 1st layer (and not less than 50% of that force from the top layer). Winch cable shall be at least 150 feet in length, with a breaking strength to exceed 50% above maximum line pull capacity. A device shall be provided and set to prevent damage to any of the winching system components or their mating parts. End of wire rope shall be equipped with removable clevis. All winch functions, with the exception of the free-spooling, shall be controllable from the driver's position only. All controls shall be of the dead man type that revert to neutral (except free spool) when released. A snatch block shall be provided with the truck to permit using a two part line. Storage for this hardware shall be provided.

3.4.16. Roller Bed. The roller bed shall be a light-weight tilt roller bed and designed to load/unload from a C-130 at level floor height. The roller bed shall have rollers that are compatible to the rollers on the C-130 aircraft.

4. PREPARATION FOR DELIVERY

4.1. Vehicle Processing. Preserve and process vehicles in accordance with the Equipment Preservation Data Sheet for Shipment and Storage (EPDS) developed by the Contractor and approved by the Government prior to shipment.

4.2. Vehicle Storage. The Contractor shall develop processing instructions for storage and exercising directions of vehicles should they be shipped in place or conditionally accepted and be approved by the Government. Contractor shall assure that any extended storage shall not cause the produced vehicles to fail to meet the 22 year corrosion prevention design requirement and that normal washing and maintenance shall be in effect to assure that (a) contaminants do not build up on vehicles while in storage and (b) proper lubrication is maintained.

5. NOTES.

5.1. Intended Use. The intended use of this system is for operations throughout the theater as multipurpose transportation and unit mobility vehicles by combat, combat support and service support units to show new tactical truck capabilities.

5.2. Ordering Data. Procurement documents should specify the following:

a. Title, Number and Date of specification
b. Quantities of Initial Production Vehicles
c. Paint, if other than standard
d. Kits to be installed

Additional Requirements as addressed by Contracting Officer.

5.3. Definitions. For the purpose of this specification the following definitions shall apply.

5.3.1. Payload. RESERVED

5.3.2. Vehicle Curb Weight (VCW). The VCW shall include the weight of the empty truck (or trailer), including integral MHE and winch (if applicable), full complement of fuel, lubricants, coolants, hydraulic fluid, troop seat kits (if applicable), crew, crew gear and BII.

5.3.3. Gross Vehicle Weight (GVW). The GVW is defined as the sum of the VCW and maximum payload.

5.3.3.1. Maximum Towed load. RESERVED.

5.3.4. Gross Combination Weight (GCW). The GCW shall be defined as the sum of the GVW and the designated primary towed loads

5.3.5. Slopes. Defined as a sharp transition from one constant grade to another constant grade, which is up to a specified percentage difference in any direction.

5.3.6. Tractive Effort. Tractive Effort is defined as the drawbar pull plus the rolling resistance.

5.3.7. Mission Statement. One mission shall consist of a maximum 175 miles of operation under the herein described load, speed, terrain and environment, with special functions described.

5.3.8. Terrain Conditions.

5.3.8.1. Primary Roads. There are three types of primary roads: high quality paved, secondary pavement, and rough pavement. All may consist of two or more lanes, all weather, maintained, hard surface (paved) roads with good driving visibility used for heavy and high density traffic. These roads have lanes with a minimum width of 108 inches, road crown to 2 degrees and the legal maximum GVW/GCW for the county and state is assured for all

bridges. (a) High quality paved roads have surfaces having an average Root Mean Square (RMS) value of 0.1 inches. (b) Secondary pavement has an average RMS of 0.2 inches and can include significantly degraded concrete, macadam concrete or asphalt pavements (potholes, alligator cracking, freeze/thaw breakup). (c) Rough pavement consists of two lane roads with degraded shoulders, and marginal subgrades that produce long wavelength swells and additional degradation of the surface. Rough pavements have an average RMS of 0.3 inches. (d) The wave number spectrum equation and average travel speed for the three levels of pavement roughness are as follows:

Surface	Wave Number Spectrum	Average Speed (mph/kph)
High Quality Paved Road	$G_{xx}(n) = 1.4 \times 10^{-8}(n)^{-2.5}$	55/88
Secondary Pavement (Two Lane Paved Road)	$G_{xx}(n) = 1.9 \times 10^{-7}(n)^{-2.5}$	50/80
Rough Pavement (Degraded Paved Road)	$G_{xx}(n) = 8.0 \times 10^{-7}(n)^{-2.5}$	42/72

5.3.8.2. Secondary Roads. There are three types of secondary roads: loose surface, loose surface with washboard and potholes, and Belgian block. These roads are one or more lanes, all weather, occasionally maintained, varying surface (e.g., large rock, crushed rock, gravel and soil aggregate) intended for medium-weight, low-density traffic. These roads have lanes with minimum width of 8 feet and no guarantee that the legal maximum GVW/GCW for the county and state is assured for all bridges. These roads are surfaces having a RMS value varying between 0.3 inches to 1.0 inches.

The wave number spectrum equation, percentages of total travel, and average travel speed for the three levels of pavement roughness are as follows:

Surface	Wave Number Spectrum	Percent of total "Secondary" miles	Average Speed (mph/kph)
Loose Surface	$G_{xx}(n) = 3.0 \times 10^{-5}(n)^{-2.0}$	40%	30/48
Loose Surface w/ Washboard and Potholes	$G_{xx}(n) = 4.0 \times 10^{-6}(n)^{-2.4}$	50%	30/48
Belgian Block	$G_{xx}(n) = 4.0 \times 10^{-4}(n)^{-1.4}$	10%	20/32

Loose surface with washboard roads have a peak amplitude of 5.0×10^{-3} ft^2/cycle/ft at 0.3 to 0.5 cycle ft (2 to 3-foot wavelengths). Loose surface roads with a high density of potholes have a peak amplitude of 9.0×10^{-3} ft^2/cycle/ft at 0.1 to 0.2 cycle/ft (5 to 10 foot wavelengths). Generally, washboard occurs in operational areas that are dry, whereas pothole gravel roads occur in wet operational areas.

Belgian Block secondary roads have a peak amplitude of 8.0×10^{-2} ft^2/cycle/ft at .083 cycle/ft (12 foot wavelengths) and these wavelengths are 180° out-of-phase left to right which produces a racking input to the vehicle. The cobblestone blocks dominate the amplitude of the wavelengths at 1 cycle/ft.

5.3.8.3. Trails. One lane, unimproved, seldom maintained loose surface roads, intended for low-density traffic. Trails have no defined road width and can include large obstacles (boulder, logs, and stumps) and no

bridging. These are surfaces having a RMS value varying between 1.0 inches and 3.4 inches. The wave-number spectrum equation for the trail roughness is as follows:

Surface	Wave Number Spectrum	Average Speed (mph/kph)
Trails	$G_{xx}(n) = 4.6 \times 10^{-4}(n)^{-1.9}$	20/32

5.3.8.4. Cross-Country. Vehicle operations over terrain not subject to repeated traffic. No roads, routes, well-worn trails, or man-made improvements exist. (This definition does not apply to vehicle test courses that are made to simulate cross-country terrain.) In addition, cross-country terrain can consist of tank trails with crushed rock or having large exposed obstacles (rocks, boulders, etc). These are surfaces having a RMS value varying between 1.5 inches and 4.8 inches. The wave-number spectrum equation for the cross-country roughness is as follows:

Surface	Wave Number Spectrum	Average Speed (mph/kph)
Cross-Country	$G_{xx}(n) = 9.2 \times 10^{-4}(n)^{-2.1}$	15/24

5.3.8.5. Road Left and Right Track Correlation. Fixed frequency, RMS, and half-round obstacles shall include roughness or events where the left and right wheel paths are shifted longitudinally up to ± 45 degrees (approximately 6 1/2-ft (2m)).

5.3.8.6. Roughness Tolerances. The random roughness' expressed through the straight-line wave number spectrum relationships are average values and actual road roughness will naturally contain variability. The upper and lower limits for the random portion of the road roughness have a ± 3 dB envelope.

5.3.8.7. Process Average. Sampling may only be activated by the procuring activity, and then if the process average value for first twenty vehicles inspected than the A.Q.L. specified in the classification of defects for major and minor defects. Process average shall be computed as follows:

Process Average = (# defects/ # vehicles inspected) x 100.

5.3.8.8. Computed Process Average. If the computed process average exceeds the specified A.Q.L., 100 percent inspection shall be performed and continued until such time that the process average for twenty consecutive vehicles is less than the specified A.Q.L.

5.3.8.9. Definitions of Recurring Major and Minor Defects. The inspector shall verify that an inspection of each vehicle is performed by the contractor. The Government inspector shall assure that all deficiencies encountered during the inspection are enumerated on the deficiency sheet for the vehicle. The defects noted on the deficiency sheet shall contain sufficient description to allow the Government inspector and the contractor's representative to classify the deficiency IAW the classification of defects of the vehicle specification and definitions contained in ANSI/ASQC Z1.4. Corrective action shall be taken for recurring deficiencies.

5.3.8.10. Fluid Leaks

5.3.8.10.1. Classification

a. a. Class I - Seepage of fluid (as indicated by wetness or discoloration) not great enough to form drops.
b. b. Class II - Leakage of fluid great enough to form drops but not enough to cause drops to drip from item being inspected.
c. c. Class III - Leakage of fluid great enough to form drops that fall from the item being inspected.

5.3.8.10.2. Category of Defect

a. Class I - Minor Defect
b. Class II - Major Defect
c. Class III - Major Defect

5.3.9. Certification. The supplier and his component sub-suppliers shall certify that the chassis, components and materials conform to the requirements specified herein.

5.3.10. Dimensions. Dimensions shall be defined in accordance with SAE J1100 except for para W103, vehicle width, which is redefined as: the maximum dimension measured between the widest points on the vehicle, excluding exterior mirrors and marker lamps, but including bumpers, moldings, and sheet metal protrusions. The vehicle dimensions for worldwide operation and transportability shall not exceed the following:

Width - 96 inches

Length- The length of all models shall not exceed 394 inches, unless required for payload

Height- As required to meet aircraft maximum cargo height from 102 inches

5.3.11. Dressed Engine. A dressed assembly shall consist of the assembly and all components, brackets, hang-ons and attaching hardware (i.e., air compressor, starter, turbocharger, pulleys etc.) that is common to all vehicle variants (within a family or series of vehicles).

ANNEX A

6x6 WITH TAG AXLE TRUCK, CARGO

A.1. Cargo. The 6x6 with tag axle cargo truck shall meet all requirements of the main body of the 6x6 with tag axle performance specification (unless otherwise indicated) and all requirements of this annex.

A.2. General Requirements. Axle loading for the vehicle shall be capable of 20,000 lbs. Removable components shall have recesses or specific handles to facilitate removal and handling. The cargo bed shall accept at all locations, with covering kit installed, loads up to 54 inches (137 cm) in height. Bed shall be capable of withstanding lateral and longitudinal load forces as exerted by a 2,500 lb. (1,134 kg) pallet.

A.2.1. Cargo Bed Tiedowns. The cargo body shall have tiedowns. No portion of the bed shall fail when maximum rated load is placed on any opposing tiedowns.

A.3. Specific Requirements.

A.3.1. Trucks, Long Cargo. The Long Cargo (LC) version shall have a minimum internal bed length of 15 feet (4.57 m) and a minimum usable width of 90 inches (229 cm) and a total maximum width of not more than 96 inches (244 cm).

ANNEX B

CENTRAL TIRE INFLATION SYSTEM (CTIS)

B.1. Scope. This specification establishes the performance and test requirements for an 6x6 with tag axle central tire inflation system.

B.2. Applicable Documents. The basic 6x6 with tag axle specification applies to this annex; all documentation specified therein is incorporated by reference herein.

B.3. Requirements

B.3.1. Tire Pressure Control. This system shall allow the driver to adjust all truck tires to any one of four preset tire pressures. System control shall be mounted within the cab so that the driver may activate the system while continuing to operate the truck.

B.3.2. Provision and Storage of Air. The CTIS shall contain necessary compressor and/or stored air capability to meet the inflation and deflation time requirements as stated herein. CTIS shall be operable with or without an operable spare tire. The system shall provide infinitely repeatable adjustments of air pressures among those specified. System recovery time shall be such that the operations in para B.3.8 shall be accomplished within the time limits stated immediately subsequent to any other inflation/deflation activity and are included in those stated times.

B.3.3. 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. Manual tire inflation procedures may require two persons. Valves for manual inflation shall be readily accessible and compatible with on-board manual inflation system, if equipped.

B.3.4. Air-Priority System. The CTIS shall incorporate sufficient safeguards to assure that air pressure necessary to continue safe operation of the truck shall be available at all times during activation of CTIS or in the event of CTIS failure. Use of brakes is a minimum requirement for safe operation.

B.3.5. Speed/Pressure Control and Warning. The CTIS shall include sensing of the truck speed and comparing the indicated speed to the maximum allowable speed for each control setting. In the event that truck speed exceeds maximum allowable speed for that setting, a panel-mounted light shall activate to warn the driver of this condition. If average speed exceeds maximum allowable speed for a period of more than one minute, the system shall automatically inflate to the appropriate pressure.

B.3.5.1. Speed Detection/Driver Alert Sensors shall alert the truck operator by a flashing light whenever speed exceeds that suitable for sustained operation at tire pressures appropriate to mobility requirements. As a minimum, four pressure settings shall be available to the driver. Settings shall be designated as Emergency, Mud/Snow/Sand, Cross-country, and Highway. A dimming feature shall not be required for the LED indicators and legend illumination associated with the CTIS driving mode selector.

B.3.6. Maintenance of Tire Pressure. With the CTIS in operation, tire pressure shall be certified and adjusted at intervals necessary to assure that no more than a 5 psi (.34 atm) variation exists between 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 truck engine not running after twenty-four hours, the tire pressure shall not drop below 97% of the pressure which existed before the truck engine was stopped. No action shall be required of crew personnel beyond normal trucks shutdown to meet this requirement. The gas law pressure/temperature relations shall be taken into account when determining compliance with this requirement.

B.3.7. Operating Environment. The CTIS shall be fully operational under all the operating conditions and environments described in the basic specification.

B.3.8. Time to Inflation/Deflation. The CTIS shall be capable of inflation or deflation from minimum to maximum tire pressures in under five (5) minutes

ANNEX C

LOAD HANDLING SYSTEM (LHS)

C.1.0 Load Handling System (LHS). The 6x6 with tag axle LHS shall meet the requirements of the main body of the 6x6 with Tag Axle System Specification (unless otherwise indicated) and all requirements of this annex.

C.2.0 General Requirements. The Load Handing System (LHS) shall consist of a crane and tilt roller bed. This LHS shall be capable of loading/ unloading palettes from a C-130 with no external assist from any other devices. The LHS should be able to operate on a flat, level surface (suitable for the aircraft) and carry out self-loading/unloading operations.

C3.0 Specific Requirements. Cargo trucks which have the MHE shall be separate models, and shall meet all requirements in the 6x6 with tag axle performance specification. The MHE shall include a fully hydraulic constant torque crane and may be powered by the vehicle's hydraulic system. The crane shall be operated by controls at the side of the vehicle, and, if applicable, a remote control shall be provided. The crane for road and air transportability shall not exceed 96 inches (244 cm) width and shall not extend beyond the chassis frame nor below 30 inches (76 cm) above the ground. All exposed hydraulic lines and fittings shall be shielded to preclude damage when the crane is interfacing with other vehicles, and ancillary equipment specified herein, or caused by terrain or natural obstacles. Crane design shall provide for smooth and quiet operation, ease and flexibility of operation, and versatility of performance. A flexible/swiveling 1 foot (31 cm) minimum interface is required between boom and hook to facilitate attachment of the load, without precise positioning of the boom. Vertical lift of load is required. All cranes shall be fully operable without movement of other on-vehicle equipment, such as spare tire/carrier assemblies. The crane shall include a minimum of two removable worklights with sufficient power cord to illuminate all areas within the span of the crane boom. These lights shall require specific override action to activate during the blackout mode. All crane booms shall have a fixed location for stowage of the hook assembly. A means shall be provided which prevents the load hook assembly from contacting the upper pulley (Anti-two blocking).

C3.1 Location & Capability. The crane shall be mounted on or near the longitudinal centerline of the truck to the front of the cargo bed and be capable of:

a. Lifting 2,500 lb. (1,134 kg) to a minimum of 14 feet (427 cm) lift radius to allow pick up of a pallet or item of cargo at the outermost location of the cargo body. The crane shall be capable of off-loading pallets to either side of the vehicle.

b. Lifting 5,000 lb. (2,268 kg) at 7 feet (213 cm) lift radius.

c. The crane shall have a lift radius minimum such that a pallet can be loaded or unloaded from the rearmost portion of the cargo platform. (Lift radius distance as measured from the crane's rotational center to the center of the lifting hook).

C3.2 Stabilizing System. Outriggers shall be fully hydraulically operated and mounted directly to the crane base or chassis frame of vehicle. The outrigger legs shall be independently hydraulically controlled for leveling the vehicle on slopes up to 7%. The outrigger legs shall use check valves to lock in place when extended in order to stabilize the vehicle at all times. The outrigger legs shall not protrude into the plane of the departure angle and shall positively lock when in stowed position. The landing pads shall be capable of holding and stabilizing the crane at maximum load on level ground. If not designed to be attached to the landing legs during vehicle movement, pads shall be pinned to landing legs for quick removal and stowable by the full range of Army users. A safety switch shall be integrated with the system to preclude use of the crane unless outriggers are in place.

C3.3 Crane Hydraulic System and Controls. Integrated within the hydraulic system shall be the necessary hydraulic cylinder(s), strainer(s), filter(s), reservoir(s), pressure relief valve(s), and all necessary lines, lockout(s), restrictor(s), and control valve(s) to insure positive and safe control of all operations and to provide protection in the event of a hydraulic power failure. The hydraulic filters and strainers shall be located to provide direct access and to

allow removal without causing damage to the vehicle. Bypasses shall be furnished where necessary to protect filters during cold temperature operation. A means shall be provided for bleeding all air trapped in the hydraulic system. A means shall be provided to lower any load to the ground in the event of a hydraulic system or control failure. All cylinder rods which are exposed during operations shall have a hard chromium plating with a crack-free thickness. All high-pressure hydraulic hoses and fittings shall be capable of withstanding a bursting test pressure of four times the working pressure and proof pressure of at least two times the working pressure. There shall be no leakage of hydraulic fluid past couplings or seals at maximum load and speed within the operational conditions cited herein. Directional control valves shall be designed to permit operating a minimum of two functions simultaneously. The crane control actuation directions shall comply with Table A-1 (if applicable):

TABLE A-I

CONTROL

Crane Action	Vertically Mounted	Horizontally Mounted
Boom Up	Move Knob Up	Toward Operator
Boom Down	Move Knob Down	Away From Operator
Boom Extension In	Move Knob Down	Away From Operator
Boom Extension Out	Move Knob Up	Toward Operator
Crane Winch Up	Move Knob Up	Toward Operator
Crane Winch Down	Move Knob Down	Away From Operator
Crane Winch CW	Move Knob Up	Toward Operator
Crane Winch CCW	Move Knob Down	Away From Operator
Crane Mast Down	Move Knob Down	Away From Operator
Crane Mast Up	Move Knob Up	Toward Operator
Outrigger Pad Up	Move Knob Up	Toward Operator
Outrigger Pad Down	Move Knob Down	Away From Operator

Table A-I does not define mounting position or location. Vertical and horizontal nomenclature indicates direction of control knob movement.

C3.4 Fixed Operator's Station. All crane controls and indicators shall be located within clear view and easy reach of the operator at the fixed operator's station and shall be readily accessible under all conditions of operation. Each functional control, both crane and outrigger, shall be of the deadman type automatically returning to the neutral position should the operator inadvertently or intentionally release the control. All controls governing a function (rotation, boom extension and retraction, vertical lift and drop) shall be proportionately variable. All controls shall be clearly marked as to use and function. Control spacing and size shall be such that they are operable by an operator wearing arctic mittens. Controls shall be waterproof and performance shall not be diminished when wet. Controls shall be protected from weather and accidental damage.

C3.5 Remote Control. If applicable, the remote control system shall operate the spools of the directional control valve. Remote control shall be proportionally variable, provided with an emergency shut down capability and designed such that when activated, all crane functions cease. It shall not leak or have diminished performance when tested wet. Remote control connection shall be at the rear of the cargo box. The remote control box weight shall be lightweight and operable by one person. A shoulder strap shall be provided with each remote control box. The controller shall have multiple functions to match control levers on fixed control except for the mast and outrigger controls. A stowage box shall be provided for the remote control which shall be lockable with a standard padlock, padded to take shock loads, and waterproofed against impingement of water.

C3.6 Transportability. The crane shall meet all 6x6 with tag axle vehicle transportability requirements.

C3.7 Overload Shutdown System. The crane shall be provided with overload protection which shall preclude structurally overloading the crane. The system shall initiate shutdown of crane functions, except for functions which would reduce or alleviate the overload condition when any crane movement causes the moment on

the crane to exceed 110% of the crane's rated capacity. Shutdown shall be completed within a period of time such that a load exceeding 110% of the crane's rated capacity cannot be lifted to a height of more than 18 inches above ground level when lifted at maximum winch speed. Loads of more than 150% of the crane's rated capacity shall not leave the ground.

C3.8 LineLoad Winch. The crane shall provide vertical lift using one control. If utilized, the line load winch shall not prevent the crane from folding into the stowed position to meet the requirements set forth in this specification. The winch shall have the capacity of lowering or raising a 5,000 lb. (2,268 kg) load at a speed not less than 30 feet/min (9 m/min). The crane manufacturer shall supply a minimum of 50 feet (15 m) of wire rope. No less than two full wraps of rope shall be remaining on the hook line drum when the hook is in its extreme low position with the boom at maximum extension in the most upright position. The winch shall be operable by the fixed and remote controls, if applicable, for the crane. The system shall distribute the cable evenly and tightly over the width of the spool while winching in or out from zero to maximum rated load. The distribution requirement shall not interfere with the winching speed (in or out) of the cable.

C3.9 Signs.

C3.9.1 Crane Instruction Plate. Two crane operating instruction plates shall be furnished.

C3.9.2 Outrigger Leg Sign. One sign shall be placed next to the control station stating CAUTION, OUTRIGGER BEAMS MUST BE FULLY EXTENDED AND OUTRIGGER LEGS IN PLACE BEFORE LIFT CAN BE MADE.

C3.9.3 Load Capacity Sign. A load capacity sign shall be visible from any control station.

C3.9.4 Boom Angle Indicator. A boom angle indicator shall be provided visible from both sides which shall indicate the boom's angle from maximum elevation to maximum depression relative to horizontal and marked in 5° increments with 0° correlating to horizontal. The boom angle indicator shall show a direct correlation to the crane load capacity.

C3.9.5 MHE Boom Extension Indicator. A boom extension indicator shall be provided, if necessary, which shall be visible from both sides and shall indicate the boom's extension from minimum retraction to maximum extension. Each boom section shall be marked at one (1) foot, maximum, intervals.