



**NAVAIR LAKEHURST**

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**A/M32K-10**  
**USMC ROUGH TERRAIN MUNITIONS TRAILER**  
**PERFORMANCE SPECIFICATION**

**Naval Air Systems Command  
Naval Air Warfare Center, Aircraft Division  
Research and Engineering Group  
SE and ALRE Department  
GSE/PSE DEV & ISE DIV  
Aircraft & Armament Handling Branch, Code 4.8.6.9  
Lakehurst, NJ 08733**

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## 1.0 SCOPE

This Performance Specification is for the United States Marine Corps (USMC) A/M32K-10 Rough Terrain Munitions Trailer that will be compatible with the Medium Tactical Vehicle Replacement (MTVR), the prime mover, the A/S32A-45 Aircraft Tow Tractor and the A/S32K-1 series Air Launched Weapons Loader. The A/M32K-10 will replace the current A/M32K-4 series Rough Terrain Trailers. The prime mission of the A/M32K-10 is to transport air launched weapons from a storage site to the aircraft flight lines as part of the support equipment for the USMC Expeditionary Airfields (EAF). The use of commercially available components and those within the Department of Defense (DOD) supply system is encouraged in development of this trailer. The A/M32K-4A, part number 67A219J1, may be used only as historical reference for the design of the A/M32K-10.

## 2.0 APPLICABLE DOCUMENTS

The documents listed in this section are part of this specification. While every effort has been made to ensure completeness of this list, document users are cautioned that they must meet all specified requirements of the cited documents in this specification, whether or not they are listed. If the Contractor has any proposed new standards, they should be submitted to the following office for approval: Commanding Officer, Naval Air Warfare Center, Aircraft Division, Code 11723, Building 562-1, Highway 547, Lakehurst NJ 08733.

### 2.1 Government Documents

The following Government documents form a part of this specification to the extent specified herein.

### 2.2 Specifications, Standards, and Handbooks

The following specifications, standards, and handbooks of the exact revision listed below form a part of this specification to the extent specified herein.

(CID) A-A-1927D	Padlock
A-A-59545	Automotive Jacks
STANAG 4101	Towing Attachments, dated 000221

The following Federal Motor Carrier Safety Administration Regulations (FMCSR) are published in Code of Federal Regulations Title 49, Volume 4, Revision October 1, 2002:

FMCSR 393.27	Wiring Specifications
FMCSR 393.28	Wiring to be protected
FMCSR 393.29	Grounds
FMCSR 393.31	Overload Protective Devices
FMCSR 393.32	Detachable Electrical Connections
FMCSR 393.33	Wiring Installation
FMCSR 393.75	Tires

The following Federal Motor Vehicle Safety Standards (FMVSS) are the revision published in Code of Federal Regulations Title 49, Volume 5, Revision October 1, 2002:

FMVSS 108	Lamps Reflective Devices and Associated Equipment
FMVSS 119	New Pneumatic Tires for Vehicles Other than Passenger Cars
FMVSS 121	Air Brake Systems

FED-STD-595	Colors Used in Government Procurement
MS75021D	Connector, Receptacle, Electrical-12 Contact, Inter-vehicular, 28 Volt, Waterproof, dated 010612

MIL-STD-130M	Department Of Defense Standard Practice Identification Marking of U.S. Military Property
MIL-STD-209J	Interface Standard for Lifting and Tie-down Provisions, dated 980128
MIL-STD-810F	Environmental Engineering Considerations and Laboratory Tests
MIL-STD-889	Dissimilar Metals
MIL-STD-1179D	Lamps, Reflectors and Associated Signaling Equipment for Military Vehicles 921109
MIL-STD-1365	General Design Criteria for Handling Equipment Associated with Weapons and Related Items
MIL-STD-1366	Interface Standard, Transportability Criteria
MIL-STD-1472F	Human Engineering, dated 961031
MIL-HDBK-1791	Designing for Internal Aerial Delivery in Fixed Wing Aircraft
MIL-D-23003	Deck Covering Compound, Nonslip, Rollable
MIL-PRF-24712	Coatings, Powder
MIL-PRF-85285	Coating: Polyurethane, Aircraft and Support Equipment
MIL-DTL-81706	Chemical Conversion Materials for Coating Aluminum and Aluminum Alloys

### 2.3 Other Government Documents, Drawings, And Publications

The following other Government documents, drawings, and publications of the exact revision shown form a part of this document to the extent specified herein.

MTMCTEA PAM 700-4	Vessel Characteristics for Ship Loading
TM 55-2200-001-12	General Rules Governing the Loading of Commodities on Open Top Cars, Association of American Railroads (AAR) , dated 2000
TOP 1-2-500	Transportability
TOP 2-2-608	Vehicle Braking, dated 710115
TOP 2-2-610	Gradeability and Side-Slop Performance
TOP 2-2-612	Fording
NA 11-140-25	Armament Weapons Support Equipment (AWSE) Configuration Manual, Organizational and Intermediate Maintenance Activities
NAVSEA OP5	Ammunition and Explosives Safety Ashore
SK3847AS001, Rev A	Deck Arrangement Requirement
1541AS356	Tire Tread Design
2483567	Lock
2483568	Spindle
3909AS999	Identification Plate, Support Equipment
5SE00363	Modification Plate, Support Equipment

### 2.4 Non-Government Documents

The following documents of the exact revision listed below form a part of this specification to the extent specified herein.

ASME B18.2.1	Square And Hex Bolts And Screws (Inch Series)
ASTM B117	Salt Spray (Fog) Apparatus, Operating
ASTM D2000	Standard Classification System for Rubber Products in Automotive Applications, dated 001110
ASTM D3951	Standard Practice for Commercial Packaging, dated 980801
ASTM D4956	Standard Specification for Retroreflective Sheeting for Traffic Control

AWS D1.1-02	Welding Structural Welding Code- Steel
AWS D1.2-97	Welding Structural Welding Code-Aluminum
AWS D1.3-98	Welding Structural Welding Code-Sheet Steels
SAE J318	Air Brake Gladhand Service (Control) and Emergency (Supply) Line Couplers - Trucks, Truck-Tractors and Trailers, dated 970801
SAE J348	Wheel Chocks
SAE J1292	Automobile, Truck, Truck-Tractor, Trailer and Motor Coach Wiring, dated 811001
SAE J1703	Motor Vehicle Brake Fluid
SAE J2014	Pneumatic Tires for Military Tactical Wheeled Vehicles, dated 011201
SAE AS 8090	Equipment, Towed Aerospace Ground, Mobility

## 2.5 Document Source

Copies of military specifications, standards, handbooks, drawings, and publications can be obtained from the contracting activity or as directed by the contracting activity. Sources for other documents are listed below: Acquisition Streamlining and Standardization Information System (ASSIST) Website, <http://astimage.daps.dla.mil/online/new>. Department of Transportation Federal Highway Administration, Washington, DC 20591; Society of Automotive Engineers 400 Commonwealth Drive, Warrendale, PA 15096; American Conference of Governmental Industrial Hygienists (ACGIH) 6500 Glenway Avenue Building D-7, Cincinnati, OH 45211; NATO, MIL Agency for Standardization (MAS) 35 Chesam Place, London SW1, UK.

## 2.6 Order of Precedence

In the event of a conflict between this specification and the references cited herein, the text of this specification takes precedence. If a conflict exists between an English measurement and a metric measurement, the English measurement shall take precedence. In the event of a conflict between Section 3 and Section 4 of this Performance Specification, Section 3 shall take precedence. Nothing in this specification, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

## 3.0 REQUIREMENTS

Requirements specified in Section 3 are defined as thresholds unless otherwise noted. At least one, but no more than four A/M32K-10 Rough Terrain Munitions Trailers, hereinafter referred to as the trailer, shall be provided to meet the requirements defined in the following paragraphs. MIL-STD-1365 shall be used as design guidance.

### 3.1 Performance

Requirements shall be met by the trailer at curb weight (CW) through maximum payload while being towed by the MTVR prime mover and A/S32A-45 (secondary mover) at weights ranging from CW through Highway Gross Vehicle Weight (HGWW) unless otherwise noted.

#### 3.1.1 MTVR Prime Mover Interface

The trailer shall be capable of being towed by the MTVR series tactical vehicles (MK 23, 25, 27 and 28). The trailer shall be compatible with, and within the performance limits of, the MTVR.

##### 3.1.1.1 A/S32A-45 Interface

As a secondary interface, the trailer shall be capable of being towed by the A/S32A-45 Aircraft Tow Tractor.

### 3.1.2 Payload Capacity

The trailer shall be capable of transporting payloads of 15,000 lbs over the entire mission profile.

#### 3.1.2.1 Proof Load

The trailer when supported by its spindles shall withstand without failure, permanent deformation or deflection a static proof load of 30,000 +100/-0 pounds.

#### 3.1.2.2 Safety Factor

The trailer shall be designed with a safety factor of 3:1.

### 3.1.3 Cargo Transport

The trailer shall be capable of transporting an assortment of weapons that are secured in weapon adapters/cradles and locked to the trailer bed. The trailer shall be designed for use with the A/S32K-1(series) Air launched Weapons Loader, where it is used to load/download the weapons on the trailer and load them on the aircraft.

#### 3.1.3.1 Cargo Containment - General

The trailer shall be equipped with stake racks on all sides to contain mission related AWSE equipment. Two trailer bed sections (one on each side) of the trailer shall be removable to facilitate loading and downloading of the transported weapons. The trailer shall also be equipped with six tie-down channels and locking clamps assemblies for securing cradles and containers to the trailer bed.

#### 3.1.3.2 Stake Racks

All stake racks shall be removable to facilitate loading and unloading of break-bulk and other cargo by hand, weapons loader or forklift. The material used for the slats (horizontal members) of the stake racks shall be non-sparking. The stake racks retaining system shall be integral to the trailer deck and shall not extend beyond the 90 inch width of the trailer. The maximum height of the trailer with the racks installed shall not exceed 74 inches.

#### 3.1.3.3 Cargo Tie-downs

The trailer shall be equipped with internal and external cargo tie-downs of sufficient strength, quantity, and location to secure the full range of cargo up to the maximum payload. The location of these tie-downs shall maximize available cargo space with the cargo containment provisions installed. All tie-downs shall accept a 10,000 lb cargo strap and meet MIL-STD-209. Straps with integral ratchet tightening action are preferable. Each trailer shall be equipped with a total of four cargo straps. Each trailer shall be equipped with 12 each 5/8" dia, 6,000 lb SWL D-rings that will interface with the tie down channels and utilize spindles 2483568, lock 2483567 and bolt ASME B18.2.1 (B1821BH075C175N).

#### 3.1.3.4 (reserved)

### 3.1.3.5 Tie Down Channels

Six tie-down channels running the width of the trailer bed are to be provided as an integral part of the trailer bed assembly. Six spindle, slide lock and bolt assemblies, see SK3847AS001 Rev A, 2483567, 2483568, and ASME B18.2.1 (B1821BH075C175N) shall be located in each tie down channel to provide a means of securing weapons cradles and containers to the trailer bed.

### 3.1.3.6 Transport Equipment and Loads

The trailer shall be capable of securing the equipment listed in Table 3-1 to the trailer bed with the slide locks and when carrying maximum loads. NA 11-140-25 may be used for trailer/adapter/weapons interface reference.

**Table 3-1 Transport Equipment and Loads**

Item Nomenclature		PART NO.	Dimensions (inches)			Weight (lbs)/
			Height	Width	Length	SWL
Adapter Skid	AERO 74A	67A311J2	17.0	51.2	50.75	301/3000
Adapter	ADU-876/E	2445AS100	18.0	30.5	50.0	250/3000
Cradle	MHU-61A/E	3508AS300	32.5	16.0	51.6	125/2700
Cradle	MHU-63E	2560340	9.0	12.25	60.5	102/3000
Cradle	MHU-65E	2560341	9.25	20.0	60.2	125/3000
Skid	MHU-125A/E	1330AS100	6.25	18.0	64.0	60/3000

### 3.1.4 Tandem Tow Capability

The trailer shall have the capability to be coupled with at least two other trailers for tandem towing. The linkage shall be accomplished at the organizational level. Tandem towing of three trailers shall only apply to empty (no payload) trailers. Tandem towing of two trailers shall have a payload maximum of 6,000 lbs per trailer.

### 3.1.5 Grade Operation

The trailer, at full payload, when coupled to the MTRV at CCGVW, shall be capable of ascending and descending a reinforced surface with a 20 degrees longitudinal slope.

### 3.1.6 Side Slope Operation

The trailer when coupled to the MTRV at CCGVW shall be capable of traversing a 20 percent reinforced surface side slope while executing a sinusoidal maneuver around obstacles with no tire lift.

### 3.1.7 Speed

The trailer, empty and at maximum payload, with the MTRV at its designated payload, shall demonstrate the capability to maintain the speeds listed in Table 3-2 for terrain conditions and roughness (root mean square (RMS)) values. The defined speeds shall be sustained without slipping, upsetting, or damage to vehicular components.

**Table 3-2 Speed**

Road Surface	MTRV Payload Classification	Grade (%)	RMS (in)	Speed (MPH)
Primary Single Tandem	HGVW	0	NA	50 40
Secondary Single Tandem	HGVW	NA	0.7	30 20
Trail Single Tandem	CCGVW	NA	1.0	10 5
Cross-country Single Tandem	CCGVW	NA	2.0	10 5

### 3.1.8 Terrain Operation

The trailer when towed by the MTRV shall be capable of operating over the mission profile of 70 percent hard-surface highway and 30 percent off-road defined in Table 3-3. Off road is further defined as sand, swamp, muskeg, bog, tundra, grasslands, forests, tropical jungles, mountains, desert, & salt water.

**Table 3-3 Mission Profile**

Terrain	Percent Operation	Roughness
Hard Surface	70	0.1" - 0.3" RMS
Gravel	10	0.3" - 1.0" RMS
Trails	10	1.0" – 3.4" RMS
Cross-country	10	1.5" – 4.8" RMS

### 3.1.9 Fording

The trailer when towed by the MTRV shall be capable of fording hard-bottomed crossings of fresh or salt water at not less than 30 inches including wave height, without requiring the addition of special equipment or adjustments and without damage to the vehicle. At the conclusion of such operation, no water contamination in any sealed component is permissible.

### 3.1.10 Shock

The trailer when towed by the MTRV, at maximum payload, shall attain no more than 8.0 Gs vertical acceleration in the center of the cargo bed while negotiating half round obstacles of 10 inch heights at speeds up to 20 MPH and 12 inch heights at speeds up to 10 MPH.

### 3.1.11 Fork Lift Provisions

The trailer shall be provided with forklift provisions, full width of the trailer, to enable stacking/un-stacking empty trailers with a forklift. The provisions are to be located below the trailer bed, provide equilibrium when the trailer is lifted and deter interference with or damage to the trailer components located in those areas. The provisions shall be compatible with the TRAM 644E model forklift tines. "C" channel if used shall have an interior dimension of 10.00 inches.

### 3.1.12 Environmental Operation

The trailer shall be capable of successfully performing all operations in arctic, tropical, temperate, and desert climates and in geographical areas that include sand, swamp, tundra, grassland, forest, jungle, urban areas, snow and ice, mountain, and salt water. All trailers shall be capable of successfully performing all operations without failure or additional maintenance. Refer to Table 3-4 for environmental condition requirements.

**Table 3-4 Environmental Condition Requirements**

<b>Environmental Condition</b>	<b>Requirement</b>
Low Temperature	Operating: -50 degrees F Storage: -65 degrees F
High Temperature	Operating: +140 degrees F with solar load* Storage: +180 degrees F
Humidity	Relative Humidity 3% to 100%
Salt Fog	See ASTM B117 96 Hours
Blowing Rain	Rainfall Rate: 4 inches per hour Wind: 40 miles per hour
Blowing Dust	Dust Concentration: 0.06 +/- 0.2g/cuft Wind: 20 miles per hour
Blowing Sand	Sand Concentration: 0.06 +/- 0.015g/cuft Wind: 35 miles per hour
Ice/Freezing Rain	Water Delivery Rate: 25mm/hour Droplet Size: 1.0 mm to 1.5 mm

\* Solar load will apply to any trailer design that may be affected by solar loads.

### 3.1.13 Mobility

The trailer shall meet the requirements of SAE AS8090, Type V, Group C.

### 3.1.13.1 Handling

The trailer shall exhibit lateral and longitudinal stability throughout all mission operations. At maximum payload, with a payload center of gravity centered, the trailer shall perform on hard surface roads at speeds of at least 50 MPH and on gravel surfaces at speeds of 30 MPH. At maximum payload, the trailer shall maintain 0.4g lateral acceleration while turning left or right for a sustained period without tire lift.

### 3.1.13.2 Turning Radius

While coupled to the MTRV, the trailer shall not cause an increase in the turning radius of the MTRV. The trailer during full steering lock shall track behind the MTRV to preclude the possibility of a trailer roll over.

### 3.1.13.3 Braking

The trailer shall be equipped with a brake system that is controlled by the MTRV's air brake system and the capability of hydraulic surge brake actuation when coupled to the A/S32A-45. The brakes shall be self-adjusting disc type with stainless steel rotors and shall comply with SAE AS8090. Brake fluid shall be in accordance with SAE J1703.

#### 3.1.13.3.1 Service Brakes

The trailer shall be equipped with service brakes that are supplied with air by the MTRV's air system. With the MTRV at CCGVW, the combined MTRV/trailer service brakes shall control and hold the vehicle combination on a dry hard surfaced 20 percent longitudinal slope in both ascending and descending orientations. No permanent deformation of any component, other than shoes/pads, is allowed.

#### 3.1.13.3.2 Surge Brakes

Surge brake system shall be provided and use when the trailer is towed by the A/S32A-45. The surge brake system shall be actuated when the draw bar is coupled to the A/S32A-45. The combined A/S32A-45/trailer service brakes shall control and hold the vehicle combination on a dry hard surfaced 20 percent longitudinal slope in both ascending and descending orientations. No permanent deformation of any component, other than shoes/pads, is allowed. The surge brake shall permit backing with not more than a 1-second delay after application of backing force.

#### 3.1.13.3.3 Parking Brakes

Parking brakes shall be in accordance with SAE AS8090. The parking brake shall not be dependent on maintenance of air or hydraulic pressure or electrical energy, and shall automatically engage in the event of loss of air or surge brake to the service brakes. Parking brake handle placement shall be such that it will prevent inadvertent actuation.

#### 3.1.13.3.4 Emergency Brakes

The trailer shall have emergency brakes that apply automatically in the event of air pressure loss (air system) or trailer / tow vehicle separation (surge system) and are equipped with a manual override that will allow the vehicle to move. The override shall be operable by the operator without the use of any tools.

### 3.1.13.4 Wheel Bearings

The wheel bearings shall be permanently lubricated and sealed.

### 3.1.13.5 Towing System

The trailer shall be equipped with a removable drawbar. The drawbar shall be fabricated from material of sufficient strength to resist permanent deformation under all types of operation specified herein. A positive type latch shall be provided to hold the drawbar in the up (vertical) position at a zero degree cramping angle of the front wheels. The drawbar shall also have a stop in the up position to prevent contact with the trailer.

#### 3.1.13.5.1 Towing Force

The towing force required to move the trailer from rest on a smooth, dry, level, paved surface, such as brushed concrete or macadam, free of loose material, shall not exceed 75 pounds per ton of maximum gross weight. The towing force shall be measured at the drawbar and shall be considered as acting parallel to the operating surface of the vehicle.

#### 3.1.13.5.2 Drawbar

The weight of the trailer drawbar shall meet the requirements of MIL-STD-1472F, Table XVII, using one person, male or female. This weight limitation shall apply only when connecting or disconnecting the drawbar from the tow vehicle while the drawbar is connected to the trailer. The weight of the drawbar shall be measured at the intended lifting point and shall have lifting handles at this point. The drawbar shall have a skid plate to prevent the lunette from touching the ground. The skid plate design shall resist bending when the drawbar is dropped from the height of 36 inches.

##### 3.1.13.5.2.1 Drawbar Positioning

The trailer shall have provisions for positioning and holding the drawbar lunette at the MTRV pintle heights ranging from 27 to 41 inches, unaided by personnel, during hitching the trailer to the MTRV.

##### 3.1.13.5.2.2 Drawbar Stowage

The trailer shall have provisions for stowing the drawbar with the trailer during shipment or storage of the trailer. Stowage provisions shall be adequate for securing the drawbar when shipped as per provisions of paragraph 3.1.16. The drawbar lift/stowage shall be such that it can be performed by two persons.

### 3.1.13.6 Pintle Interface

The trailer shall comply with SAE AS8090. The trailer pintle mounting area shall be reinforced to prevent damage during tandem trailer towing.

### 3.1.13.7 Lunette

The lunette shall comply with STANAG 4101.

### 3.1.13.8 Safety Chains

Two safety chains shall be provided integral to the front of the trailer to prevent breakaway from the prime mover. The chain connections on the trailer shall be reinforced to retain a fully loaded trailer, with adequate length to allow for motion of the MTRV and with safety hooks and latches for connection to the MTRV.

### 3.1.14 Stability

The trailer shall not tip over in any direction when weapons/stores are being loaded or unloaded.

### 3.1.15 Reliability & Maintainability

The trailer shall meet specified R&M requirements when operated over the mission profile as defined in 0

#### 3.1.15.1 Reliability

The trailer shall have a minimum Mean Time Between Failure (MTBF) of 2,000 hours.

#### 3.1.15.2. Service Life

The trailer shall have a minimum service life of 20 years.

#### 3.1.15.3. Maintainability

The Mean Time to Repair (MTTR) shall not exceed 60 minutes for organizational maintenance and two man-hours for intermediate maintenance. Periodic maintenance shall not be required sooner than every five years and shall involve minimal checkpoints and replacement parts. Maintenance includes but is not limited to the brake system, electrical system, wheels and trailer surface inspection.

### 3.1.16 Transportability

The trailer shall meet the criteria in MIL-STD-1366 except as noted below. Military Traffic Management Command Transportation Engineering Agency (MTMCTEA) Pamphlet 70-1 may be used as a guide.

#### 3.1.16.1. Highway

The trailer shall be transportable by commercial over the road carrier. The trailer shall be capable of unrestricted operation, both empty and loaded up to the legal weight limit, on all U.S. and State highways, shall meet Department of Transportation and STANAG regulations at contract award, and shall meet the American Trucking Association's size and weight limits with the exception of vehicle width (98 inches allowed). A maximum payload allowing for unrestricted and un-permitted operation shall be calculated as per the appropriate Federal Bridge restrictions using the final A/M32K-10 configuration and the MTRV prime mover. This calculation will be classified as the maximum allowable payload for unrestricted and non-permitted CONUS operation and annotated on the trailers data plate.

#### 3.1.16.2. Rail

The trailer, at maximum payload, separately and while coupled to the MTRV, shall be capable of railroad transportation using cushioned coupler, chain tie-down flat cars. The trailer shall be tied down in accordance with the MTMCTEA Pamphlet 55-19 and the Association of American Railroads (AAR) TM 55-2200-001-12 Section 1, General Rules Governing the Loading of Commodities on Open Top Cars and Section 6, General Rules Governing the Loading of DOD Materiel on Open Top Cars. The vehicle shall comply with the requirements of the Gabarit International de Chargement when loaded on 50 inch high European flatcars. The trailer shall be rail-transportable at CW, stacked two high.

#### 3.1.16.3. Marine

The trailer shall be transportable by LCAC, LCU, Landing Craft Medium (LCM), LHA-1, LHD-1, LPD-4, LSD-36, LSD-41, LSD-49, LPD-17 amphibious shipping, TAKR (Fast Sealift Ships) and all Maritime Pre-positioning Force (MPF) vessels, and commercial shipping. The trailer shall be capable of being driven between decks (weather decks, tank decks, and to and from piers) on all vessel ramps without "bottoming out" or causing damage to the vehicle or ship. The trailer shall be capable of traversing Joint Logistics Over-the-Shore (JLOTS) systems and

elevated causeways without causing damage to either system. The trailer shall be capable of all commercially available loading methods to include, Roll On/Roll Off and Lift On/Lift Off. MTMCTEA PAM 700-4 and amphibious Ship Loading Characteristics Pamphlets (SLCPs) can be used as guide.

#### 3.1.16.4. Maritime Pre-positioned Force (MPF) Storage

The trailer shall accommodate a 36-month MPF storage and maintenance schedule. The trailer shall be capable of being stored, while stacked two high, in the Dry Cargo ISO Containers.

#### 3.1.16.5. Aircraft

The trailer shall be internally transportable by Air Force and Navy/Marine C130, C5, and C17 aircraft using MIL-HDBK-1791 as a guide. Trailer loading shall be commensurate with aircraft capabilities and shall be included in transportability data. The trailer shall be transportable at CW, stacked two high, by C-5 and C-17 aircraft.

#### 3.1.16.6. Helicopter Lift

The trailer at CW shall be transportable externally by CH53 and/or by MV-22 aircraft.

#### 3.1.16.7. Lifting and Tie-down Provisions

The trailer at ½ of maximum payload shall meet lifting and tie-down provision requirements of MIL-STD-913 and MIL-STD-209, except the highest value calculated for any one tie-down provision shall be applied to all tie-down provisions. Lift provisions shall not use shackles and shall be integral, not removable, and allow lift at ½ of maximum payload by crane and externally by CH53 and at CW by MV-22. Structures that extend beyond the cargo bed frame and are not part of the frame structure or not permanently attached to the frame shall have provisions to prevent movement during the helo and crane lift operations. Stencil markings shall be applied to the vehicle at each lifting and tie-down point conforming to MIL-STD-209.

### 3.2 Physical Characteristics

The following paragraphs define the physical characteristics of the trailer when uncoupled from the MTRV or A/S32A-45.

#### 3.2.1 Commonality

To accomplish the required missions, the trailer shall be configured on two axles as follows. The trailer shall also maximize commonality with other tactical vehicles by using parts assemblies that have a national Stock Number (NSN) to the maximum extent possible.

#### 3.2.2 Weight

The Gross Vehicle Weight (GVW) of the trailer shall not exceed 19,500 lbs. The Curb Weight (CW) of the trailer shall not exceed 5,200 lbs.

#### 3.2.3 Length

The length of the trailer deck shall not exceed 16.0 feet.

#### 3.2.4. Width

The overall width of the trailer shall not exceed 90 inches and the wheel track shall not exceed the overall width.

### 3.2.5. Height

The height of the trailer deck shall not exceed 38 inches. With maximum load and side stake racks installed, the height shall not exceed 74 inches.

### 3.2.6 Electrical System

The trailer electrical system shall be 24-volt, shall conform to FMCSR 393.29 and FMCSR 393.31 and shall be compatible with 24-volt tactical vehicle systems. It shall be capable of handling three trailers in tandem. The electrical power source shall be the MTVR. The trailer shall be equipped with a connector that interfaces with the MTVR's MS75021, 24-volt electrical power receptacle. The trailer shall also be compatible with the 12-volt electrical system of the A/S32A-45 for service, turn and brake lighting. The trailer shall be equipped with a "pigtail" adapter for interface with the A/S32A-45 12-volt receptacle. The A/S32A-45 has a female receptacle that conforms to SAE J560.

### 3.2.7 Wiring

Wiring and connectors shall be sealed, and shall meet the requirements per SAE J1292, J163, FMCSR 393.27, FMCSR 393.28, FMCSR 393.32, and FMCSR 393.33. Multi-pin connectors shall be furnished to provide ease of maintenance. Connectors shall be sealed, waterproof or military standard type connectors. All wiring to components shall have disconnects facilitating component replacement. Wiring shall be labeled to facilitate maintenance and replacement.

### 3.2.8 Lighting

The lighting and reflector requirements shall be in accordance with SAE AS8090. The use of Light Emitting Diode (LED) technology shall be used. All light fixtures and reflectors shall be recessed and not protrude beyond the trailer deck.

### 3.2.9 Blackout Lighting

The trailer shall be equipped with blackout lighting. The trailer blackout lighting shall interface with the MTVR blackout lighting and controls. Blackout lights shall have spectral emission characteristics, which prevent emitting more than 10 percent energy within the 700-1100 nanometer wavelength region (near infrared). The 10 percent energy of the 700-1100 nanometer wavelength region refers to Peak Energy.

### 3.2.10 Wheels and Tires

All wheels and tires shall be identical. Tires shall be of tubeless radial design and have a minimum tread life of 12,000 miles for highway use. A tire "run flat" feature shall be considered. Rims and tires shall conform to FMVSS 119, 120, FMCSR 393.75 and SAE J2014, and applicable Tire and Rim Association, or European Tire and Rim Technical Organization (ETRTO) Standards. Tires shall be military pneumatic type with cross-country tread and foreign object (FOD) free or no foreign object retention that is necessary for flight line access. Tires shall be of rated capacity at least equal to the load imposed on each tire measured on the ground at maximum payload. Tires shall be capable of continuous operation across the trailer's mission profile. The trailer shall include suitable lift provisions for an automotive jack per A-A-59545, Type II or Type III. Lug nuts on all wheels shall be accessible without removal of other items. Tires size shall be appropriate for the mission profiles specified with a tread design as shown on drawing 1541AS356.

### 3.2.11 Air Supply System

The air system shall meet FMVSS 121 and SAE J318. The air tank(s) on the trailer shall be capable of being drained from one central location. The drain valve for tank(s) shall be hand operable and easily accessible without the operator crawling under the vehicle or being exposed to hazards. All component parts of the air supply system shall be positioned on the vehicle to prevent damage from hazards expected to be encountered in the operational environment.

### 3.2.12 Coating

The use of powder coating is required. The following specifications conform to typical Navy/USMC powder coating operations and are provided for guidance only:

Recommended pretreatment of abrasive blasting with reusable or recycled material. Recommended coating is MIL-PRF-24712 Type IV Triglycidyl Isocyanurate (TGIC) resin, with finished color meeting the characteristics of Color No. 24052 (green) of FED-STD-595. Coating thickness is in accordance with manufacturer's direction, consistent with providing adequate protection from corrosion and damage. In general, 2 mils (minimum) for thin-gauge parts used in dry service applications and 4 mils (minimum) for thick parts used in wet space applications.

On components where powder coating cannot be employed, the coating shall consist of an epoxy primer and polyurethane topcoat. The color of the topcoat shall be green, Color No. 24052 (green) per FED-STD-595. Coatings shall contain no pigments in concentrations that will render the coating residues toxic during application or removal. The primer shall have a maximum organic compound (VOC) content of 420 grams/liter (3.5 pounds/gallon). The topcoat shall have a maximum VOC content of 340 grams/liter (2.8 pounds/gallon).

Surface preparation shall be adequate to ensure proper adhesion of the coatings, and shall be by abrasive blasting wherever possible. Additional pretreatment coatings may be applied as necessary where abrasive blasting is impractical.

The finished, cured coatings shall exhibit adequate corrosion protection to protect the equipment against general corrosion during exposure to a marine environment, and shall be resistant to under-film corrosion and other defects such as blistering caused by this exposure. Coatings shall be resistant to color change from exposure to ultraviolet light or sunlight. The cured coatings shall be resistant to abrasion, impact, and degradation from fluids and lubricants likely to be encountered with the equipment.

Note: Primer in accordance with MIL-P-53022 Type II and topcoat in accordance with MIL-PRF-85285 Type II have been found to meet the requirements stated above. Pre-treatments in accordance with MIL-C-10578 for steel and MIL-DTL-81706 for aluminum surfaces are also acceptable to the above requirements.

### 3.2.13 Wood Components/Treatment

If wood components are used, all wood components shall be treated to prevent degradation.

### 3.2.14 Materials

Dissimilar metals shall be electrically insulated from one another to minimize or prevent galvanic corrosion. All materials shall be free of cadmium plating, asbestos, and radioactive materials.

#### 3.2.14.1 Hazardous Material

The use of hazardous material shall be avoided when a non-hazardous alternative is available which meets the performance requirements and the EPA 17 list. The following is the EPA 17 list: Benzene, Methyl Ethyl Ketone, Cadmium (and compounds), Methyl Isobutyl Ketone, Carbon Tetrachloride, Nickel (and compounds), Chloroform, Toluene, Chromium ( and compounds ), Trichloroethane, Cyanides, Trichloroethylene, Dichloromethane or

Methylene Dichloride, Xylene, Lead ( and compounds ), Tetrachloroethylene or Perchloroethylene, Mercury (and compounds ).

### 3.2.14.2 Ozone Depleting Substances

All materials and components shall be free of ozone depleting substances per applicable Federal regulations in effect on the date of manufacture.

### 3.2.14.3 Ozone Resistant Products

All rubber products shall meet the requirements of ASTM D2000 and be ozone resistant consistent with best commercial practice.

### 3.2.15 Corrosion Prevention

The trailer shall be constructed of corrosion resistant materials to the maximum extent possible. Components shall be anodized, powder coated, painted, or treated to resist corrosion likely to be met in storage or service. Electronics or sensitive components shall be enclosed or protected to resist the effects of water intrusion, salt water and salt fog corrosion. Use of cadmium plating is prohibited

#### 3.2.15.1 Water Collection and Entrapment

The trailer shall be designed to avoid water collection and entrapment in operational, storage, and transportation orientations. The system shall be designed to minimize cavities and crevices where water may collect. Where cavities are unavoidable, drain holes of adequate number, size, and shape shall be provided. Drain holes shall be located in the lowest possible locations with the trailer oriented in its normal operational configuration. If the orientation of the trailer is substantially different in its storage configuration, additional drain holes of adequate number, size, and location are required. Drainage of a cavity shall not adversely affect the corrosion performance of other components or items. Drain holes shall not interfere with the structural integrity of the trailer.

#### 3.2.15.2 Debris Collection

The trailer shall be designed to avoid the collection of debris, dirt, grime, and other matter to which the trailer may be exposed during normal operations. Where collection points are unavoidable due to other design considerations, access shall be provided for cleaning and removal of debris.

#### 3.2.15.3 Cleaning and Maintenance

The trailer shall provide access for corrosion-related cleaning and maintenance. Access is defined as a position and orientation which provides the space to reach, and perform cleaning and maintenance that does not require removal of equipment or machinery or require personnel to assume an unsafe position or posture. If voids or cavities, which are not accessible for cleaning and maintenance, are required due to other design considerations, special attention to corrosion resistance in these areas is required.

#### 3.2.15.4 Dissimilar Metal Contact

The trailer shall be designed to avoid the potential for galvanic corrosion. Unless protected against electrolytic corrosion, dissimilar metals shall not be used in direct contact with each other as defined in MIL-STD-889.

#### 3.2.15.5 Fasteners and Hardware

The trailer shall use fasteners that are galvanically compatible with the materials being joined. Where galvanic compatibility is not possible, the fasteners shall be installed in a manner that provides electrical isolation.

### 3.2.16 Welding

All welding shall meet the design and fabrication requirements for cyclically or statically loaded weldments, as supplied by the American Welding Society (AWS) D1.1 for steel, D1.2 for aluminum, D1.3 for sheet steel and B2.1 for stainless steel. Welding requirements also apply to subcontractors and shall be incorporated in the Contractor vendor quality control program and purchase orders. It is the responsibility of the Contractor to insure strict compliance to the required welding standards and qualifications. Welding procedures shall be in place prior to the start of the production of the prototype vehicles and shall be available for audit/review by the Government. Alternate standards or codes may be utilized if the Contractor can demonstrate that equivalent or better quality can be obtained. The demonstrated equivalent shall be verified to the Government prior to fabrication of prototype weldment. AWS Standards will be used as the basis for Government welding reviews. The Government reserves the right to approve or disapprove the use of any alternative weld standards. All welders and welding equipment shall pass qualifications tests as prescribed by the above AWS Standards.

### 3.2.17 Identification and Marking

The following paragraphs define the trailer identification and marking requirements. All data plates shall be permanently affixed with rivets or drive screws.

#### 3.2.17.1 Service/Information Labels

Service/Information data labels shall be permanently marked and securely attached to the trailer adjacent to the pertinent servicing/information point. The trailer shall have markings in accordance with SAE AS8090 section 3.19. Letters and numbers shall be black. Additional warning or precautionary data labels shall be provided, where necessary, to protect personnel or equipment. Labels shall be printed on 3M Scotchcal cast vinyl film, series 220, 2 mil thickness, pressure sensitive material.

#### 3.2.17.2 Identification Plates

The trailer, the test box and the stake racks shall have an identification plate conforming to NAVAIR drawing 3909AS999, find number 6, notes 4, 7 and 9 do not apply. Unique Identification (UID) requirements shall be in accordance with MIL-STD-130M.

#### 3.2.17.3 Modification Plates

The trailer and test box shall have a modification plate conforming to Naval Air Engineering Center drawing 5SE00363. Plates shall be located so that they are clearly visible. Plate shall be physically stamped with the unit's serial number.

#### 3.2.17.4 Shipping Plates

The trailer shall have a permanently marked shipping data plate in accordance with SAE AS8090 section 3.19. The shipping plate shall be securely attached to the trailer adjacent to the identification plate.

#### 3.2.17.5 Hazardous Placards

The trailer shall have a set of placards that meet the provisions of NAVSEA OP5, Chapter 12. Each set shall indicate the type of hazardous material associated with the munitions/payloads for the trailer. The placards shall be mounted on a metal plate to provide durability.

### 3.3 Test, Measurement, and Diagnostic Equipment (TMDE)

The trailer shall be supported by use of Marine Corps common tools and general support test equipment. The requirement for special tools shall be minimized.

### 3.3.1 Electrical Test Box

A portable test box with cables, independent of the trailer, capable of testing the continuity of the electrical system (24V and 12V) of the trailer without a prime mover connected shall be developed for the trailer. The system shall include provisions for testing 12 pin (24V) rear receptacles and 7 pin (12V) rear receptacles. The test box shall be self contained and weigh no greater than 20 30 pounds. The test box shall be appropriate for use outside in dust, sand and rain. The test box shall withstand/operate when dropped from the height of the trailers bed.

### 3.3.2 Adjustment Fixture

An adjustment fixture shall be provided in order to properly adjust toe-in. The fixture shall be used in lieu of the tire/wheel assembly during this adjustment. The fixture shall have a length equal to the tire diameter and be capable of bolting onto the front axle assembly using the wheel studs in lieu of the tire/wheel assembly.

### 3.4 Storage

On-board, unimpeded storage shall be provided for the drawbar, cables, tie-down straps, clamps, and wheel chocks which should be readily accessible without activation or movement of ancillary systems. All storage shall be designed to prohibit damage from road/terrain shock and vibration to all contents and to the storage device itself. Storage shall be accessible from the ground to the maximum extent possible. Any enclosed compartments shall be rainproof, equipped with drain holes, and have a latching device lockable with a standard padlock per (CID) A-A-1927D, Type II, Fig. A.

### 3.5 Safety

The trailer and furnished accessories, shall comply with all applicable Society of Automotive Engineers (SAE) safety standards and federal safety regulations, standards, and requirements for a vehicle of this class. The safety characteristics shall satisfy these requirements:

1. For exposed components and systems which are subject to high temperatures and high pressures, or which are electrically actuated or inherently hazardous, safeguarding and insulating features shall be provided.
2. The trailer deck surface shall be provided with nonskid coating in accordance with MIL-D-23003 or equivalent.
3. The trailer shall have static discharge provisions to diffuse static electricity buildup.
4. The trailer shall be marked with reflective tape in accordance with ASTM D4956, Type II, width 2 inches, class 1, color white. The tape shall be applied along the extreme perimeter of the trailer to reflect its general outline configuration.

### 3.6. Human Factors Engineering

Vehicle design shall comply with established practices described in MIL-STD-1472. The vehicle shall be operable and maintainable by the full range of military ground personnel (5th percentile female through 95th percentile male) wearing the full range of clothing, to include combat, Arctic cold weather, and NBC Mission Oriented Protective Posture (MOPP) IV gear. The vehicle design shall ensure physical accommodation by the user population. Physical accommodation is defined as having adequate reach, strength, and endurance necessary to perform all physical tasks; adequate clearance for movement, to ingress/egress work area, and perform all required tasks; and adequate internal and external visibility to perform all required operations. All handholds and steps necessary for the operator and maintenance personnel to gain access to various locations on the vehicle, including access for assembly and disassembly of the cargo protection, shall be integral to the vehicle.

### 3.7 Manpower

The following paragraphs define the trailer manpower requirements.

#### 3.7.1 Operators

The trailer shall require no additional skills to operate beyond those required for Marine Corps Aviation Ordnancemen / Occupational Field 65XX.

#### 3.7.2 Maintainers

The trailer shall require no additional skills to maintain beyond those required for Marine Corps Aviation Ordnance having Occupational Field 65XX.

## 4.0 QUALITY ASSURANCE PROVISIONS

The following paragraphs define the quality assurance provisions requirements. The quality assurance provisions in this section and other documents referenced herein shall be in accordance with ANSI/ASQC-Q9002-1994. The contractor shall develop, implement and maintain a quality assurance inspection system covering the items in this specification. The system will provide the quality assurance required by this document and other applicable documents reference herein.

### 4.1 Break-In/Run-In

All trailers and components shall have the minimum required break-in/run-in performed by the Contractor prior to offering trailers for Government acceptance. All components or parts incorporated into the final end items shall have the Contractor's recommended break-in/run-in requirements prior to offering the final end item for Government acceptance. The Contractor, when requested, shall make available to the Government at the time of any Government inspection, documentation delineating the Contractor's recommended break-in/run-in for component parts or final end item. A procedure for brake burnishing shall be developed by the Contractor and shall be provided as part of the Pilot-production Test Report.

### 4.2 Classification of Inspections and Tests

The verification, inspection and test requirements specified herein are classified as Pilot-Production Verification Inspection (PVI), Pilot-Production Qualification Test (PQT) AND Production Testing (PT). The inspections / tests referenced in Table 4-1 may be modified at the discretion of the Government by the deletion or addition of inspections to assure adherence to specifications and contractual requirements.

#### 4.2.1 General Quality Assurance Provisions

A = Analysis – May consist of comparison to existing designs or test data on components or systems.

C = Certification - A formal confirmation that a particular quality, feature, or characteristic meets a specific standard or that the results provided are true and accurate.

D = Demonstration – An activity showing that a particular capability or function exists.

I = Inspection – Careful and critical examination, including measurements, where appropriate. Usually an unaided visual examination.

T = Testing – Accomplish test as defined in Sections 3 and Section 4.

NA = not applicable

Pilot-Production Verification Inspection (PVI) - Place of Manufacture - Contractor Testing  
Pilot-Production Qualification Test (PQT) - Government Designated Test Site - Government Testing  
Production Testing (PT) - Place of Manufacture - Contractor Testing

**Table 4-1 Requirements and Verification Cross Reference**

Requirement	Title	Method	Section 4 Para.	PVI	PQT	PT
3.1	Performance	NA	4.5			
3.1.1	MTVR Prime Mover Interface	D,I	4.5.1		X	
3.1.1.1	A/S32A-45 Interface	D,I	4.5.1.1		X	
3.1.2	Payload Capacity	A,C	4.5.2	X		
3.1.2.1	Proof Load	T	4.5.2.1	X		
3.1.2.2	Safety Factor	A	4.5.2.2	X		
3.1.3	Cargo Transport	I,T	4.5.3	X	X	
3.1.3.1	Cargo Containment – General	I	4.5.3.1	X		
3.1.3.2	Stake Racks	D,I	4.5.3.2	X	X	
3.1.3.3	Cargo Tie-downs	D,I	4.5.3.3	X	X	
3.1.3.4	(reserved)					
3.1.3.5	Tie Down Channels	D,I	4.5.3.5	X	X	
3.1.3.6	Transport Equipment and Loads	C,D,I,T	4.5.3.6	X	X	
3.1.4	Tandem Tow Capability	D,I,T	4.5.4	X	X	
3.1.5	Grade Operation	T	4.5.5		X	
3.1.6	Side Slope Operation	T	4.5.6		X	
3.1.7	Speed	T	4.5.7		X	
3.1.8	Terrain Operation	T	4.5.8		X	
3.1.9	Fording	T	4.5.9		X	
3.1.10	Shock	T	4.5.10		X	
3.1.11	Fork Lift Provisions	D,I,T	4.5.11	X	X	
3.1.12	Environmental Operation	I,T	4.5.12	X		
3.1.13	Mobility	T	4.5.13		X	
3.1.13.1	Handling	T	4.5.13.1		X	
3.1.13.2	Turning Radius	T	4.5.13.2		X	

Requirement	Title	Method	Section 4 Para.	PVI	PQT	PT
3.1.13.3	Braking	C	4.5.13.3	X		
3.1.13.3.1	Service Brakes	T	4.5.13.3.1		X	X
3.1.13.3.2	Surge Brakes	T	4.5.13.3.2		X	
3.1.13.3.3	Parking Brakes	T	4.5.13.3.3		X	
3.1.13.3.4	Emergency Brakes	T	4.5.13.3.4		X	
3.1.13.4	Wheel Bearings	C,I	4.5.13.4	X		
3.1.13.5	Towing System	A,D,I	4.5.13.5	X		
3.1.13.5.1	Towing Force	D,T	4.5.13.5.1	X		
3.1.13.5.2	Drawbar	D,I,T	4.5.13.5.2	X		
3.1.13.5.3	Drawbar Positioning	D,I,T	4.5.13.5.3	X	X	
3.1.13.5.4	Drawbar Stowage	D,I	4.5.13.5.4	X		
3.1.13.6	Pintle Interface	C,D,I	4.5.13.6	X		
3.1.13.7	Lunette	C,I	4.5.13.7	X		
3.1.13.8	Safety Chains	D,I	4.5.13.8	X	X	
3.1.14	Stability	A,D,T	4.5.14	X	X	
3.1.15	Reliability & Maintainability	T	4.5.15		X	
3.1.15.1	Reliability	T	4.5.15.1		X	
3.1.15.2	Service Life	A	4.5.15.2	X		
3.1.15.3	Maintainability	D	4.5.15.3	X		
3.1.16	Transportability	T	4.5.16		X	
3.1.16.1	Highway	C,D	4.5.16.1	X	X	
3.1.16.2	Rail	C,D	4.5.16.2	X	X	
3.1.16.3	Marine	C,D	4.5.16.3	X	X	
3.1.16.4	Maritime Prepositioned Force (MPF) Storage	C,D	4.5.16.4	X	X	
3.1.16.5	Aircraft	C,D	4.5.16.5	X	X	
3.1.16.6	Helicopter Lift	C,D	4.5.16.6	X	X	
3.1.16.7	Lifting and Tiedown Provisions	C,D	4.5.16.7	X	X	
3.2	Physical Characteristics	NA	4.6			

Requirement	Title	Method	Section 4 Para.	PVI	PQT	PT
3.2.1	Commonality	C	-----	X		
3.2.2	Weight	I	4.6.1	X		
3.2.3	Length	I	4.6.2	X		
3.2.4	Width	I	4.6.3	X		
3.2.5	Height	I	4.6.4	X		
3.2.6	Electrical System	C,I,T	4.6.5	X	X	X
3.2.7	Wiring	C,I	4.6.6	X		
3.2.8	Lighting	C,I,T	4.6.7	X		
3.2.9	Blackout Lighting	C,I,T	4.6.8	X		
3.2.10	Wheels and Tires	C,I	4.6.9	X		
3.2.11	Air supply System	C,T	4.6.10	X	X	
3.2.12	Coating	A,C,I	4.6.11	X	X	X
3.2.13	Wood Components/Treatment	C,I	4.6.12	X		
3.2.14	Materials	A,C,I	4.6.13	X		
3.2.14.1	Hazardous Material	C	4.6.13.1	X		
3.2.14.2	Ozone Depleting Substances	C	4.6.13.2	X		
3.2.14.3	Ozone Resistant Products	C	4.6.13.3	X		
3.2.15	Corrosion Prevention	C,I	4.6.14	X	X	
3.2.15.1	Water Collection and Entrapment	D,I	4.6.14.1	X		
3.2.15.2	Debris Collection	A,C,I	4.6.14.2	X	X	
3.2.15.3	Cleaning and Maintenance	D	4.6.14.3	X		
3.2.15.4	Dissimilar Metal Contact	C,I	4.6.14.4	X		
3.2.15.5	Fasteners and Hardware	C,I	4.6.14.5	X		
3.2.16	Welding	C	4.6.15	X		
3.2.17	Identification and Markings	I	4.6.16	X	X	X
3.3	Test, Measurement and Diagnostics Equipment	D,I,T	4.7	X	X	
3.3.1	Electrical Test Box	I,D,T	4.7.1	X		
3.4	Storage	D,I	4.8	X	X	
3.5	Safety	I	4.9	X	X	

Requirement	Title	Method	Section 4 Para.	PVI	PQT	PT
3.6	Human Factors Engineering	C,D	4.10	X	X	
3.7	Manpower	D,T	4.11	X	X	

### 4.3 Pilot-Production Verification Inspection

Each trailer shall be inspected and road tested by the Contractor at or near the place of manufacture. Trailer inspections shall include, as a minimum, the inspections and tests referenced in Table 4.1 (Section 4.2). The road test shall be conducted with simulated payload and towed load as applicable, on a smooth relatively level hard surfaced road for a distance of not less than 50 and nor more than 100 miles. Upon completion of road testing and the correction of all deficiencies identified, the Contractor shall submit the trailer and make available all inspection records and certifications to the responsible Government element at the Contractor's facility for preliminary inspection. The Government, at its option may elect to witness and participate in the Contractor inspections and road tests.

#### 4.3.1 Provisional Inspection

Representatives of the Government shall subject each trailer to a provisional inspection at the Contractor's facilities. The inspection shall be conducted to determine conformance to contractual requirements. The Contractor shall provide any inspection assistance as may be required. During this inspection, the Contractor shall make available his quality assurance plan, inspection records and certifications pertinent to the vehicle and components. This inspection shall include a road test of 15 miles with payload and towed load as applicable. No configuration changes shall be implemented on the pilot-production vehicles after provisional inspection without written authorization from the procuring activity.

#### 4.3.2 Repair of Defects

Defects found as a result of the above identified inspections shall be corrected by the Contractor on all pilot-production trailers. The Government has the right to immediately stop acceptance of any additional trailers until satisfactory corrective action has taken place to repair deficiencies and preclude recurrence.

#### 4.3.3 Trailer Disposition

After completion of inspection and correction of all deficiencies, and conditional acceptance for Government testing, each pilot-production vehicle shall be shipped to the Government designated test sites.

### 4.4 Pilot-Production Qualification Test

To determine conformance to section 3 (see paragraph 4.2) trailers shall be subjected to testing as contained in Tables 4-1 and 4-3 as a minimum. The Pilot-production Qualification Test will be conducted by the Government at Government selected proving grounds.

#### 4.4.1 Transportability Tests.

The trailer may be subject to the following transportability tests:

<u>Transportability Test</u>	<u>Procedure</u>
Rail Impact	MIL-STD-810
Lifting and Tiedown	MIL-STD-209
Aircraft Loading	TOP 1-2-500

#### 4.4.2 Method of Inspection.

The inspections and tests depicted in 4.5 are the minimums necessary to determine conformance to the requirements in Section 3 of this specification. Additional inspections and testing by the Contractor may be necessary to determine conformance to requirements (Certifications). The Government reserves the right to conduct any additional inspections/tests necessary to determine conformance of the vehicle or components to requirements.

#### 4.5 Performance

The trailer will be tested to meet the specified requirements in section 3 at curb weight (CW) through maximum payload while being towed by the MTRV prime mover at weights ranging from CW through Highway Gross Vehicle Weight (HGVW) unless otherwise noted.

##### 4.5.1 MTRV Prime Mover and A/S32A-45 Interface

The trailer will be tested to ensure that it is capable of being towed by the MTRV series of tactical vehicles (MK23, 25, 27, and 28), and that it is compatible with, and within the performance limits of the MTRV.

###### 4.5.1.11 A/S32A-45 Interface

The trailer shall be tested to ensure that it is capable of being towed by the Tow Tractor.

##### 4.5.2 Payload Capacity

The contractor shall certify that the trailer is capable of being loaded with a payload of 15,000 lbs.

###### 4.5.2.1 Proof Load

Place a 30,000 (+100/-0) pound test load on the trailer for not less than ten minutes. At completion of the test, there shall be no evidence of permanent distortion such as warpage of the trailer deck, damage such as dents or breakage of components parts, misalignment of wheels, or other defects detrimental to the intended use.

###### 4.5.2.2 Safety Factor

The contractor shall certify by analysis that the trailer is designed with a 3:1 safety factor.

##### 4.5.3 Cargo Transport

The trailer will be tested to ensure that it is capable of transporting various types of cargo to include armament, AWSE related equipment, configured weapons and compatibility with the A/S32K-1 series Air Launched Weapons Loader.

###### 4.5.3.1 Cargo Containment - General

The trailer shall be inspected to ensure that it is equipped with stake racks to contain break-bulk cargo as required in section 3.1.3.1 of this specification.

#### 4.5.3.2 Stake Racks

The trailer shall be inspected for proper fit, function and interlock of the side and end stake racks conforming to the requirements of section 3.1.3.2.

#### 4.5.3.3 Cargo Tie-downs

The contractor shall certify that the cargo tie-downs on the trailer meet the requirements specified in section 3.1.3.3 in this specification. The trailer will be tested to verify that it meets the specified requirements in section 3 of this specification.

#### 4.5.3.4 (reserved)

#### 4.5.3.5 Tie Down Channels

The trailer shall be inspected for installation, proper fit, and function of the channels and associated locks. Four ADU-876/E adapters loaded with three MK-83's each, shall be used to verify for securing the adapters to the trailer deck and for safe transport of the weapons.

#### 4.5.3.6 Transport Equipment and Load

The contractor shall certify that the trailer will accept the integration of the equipment outlined in table 3-1, section 3 of this specification. The trailer will be tested to ensure that it meets the specified requirements in section 3.1.3.6 of this specification.

#### 4.5.4 Tandem Tow Capability

The trailer will be tested to ensure that it has the capability to be coupled with at least one other trailer for tandem towing, and that the linkage, drawbar, safety chain and hoses are of proper length. Tandem towing of three trailers shall be with no payload. Tandem towing of two trailers shall be with a payload of 6,000 lbs per trailer.

#### 4.5.5 Grade Operation

The trailer, at full payload, when coupled to the MTRV at CCGVW will be tested in accordance with TOP 2-2-610 to verify the capability of ascending and descending a reinforced surface with a 20 degree longitudinal slope.

#### 4.5.6 Side Slope Operation

The trailer when coupled to the MTRV at CCGVW will be tested in accordance with TOP 2-2-610 to verify the capability of traversing a 20 percent reinforced surface side slope while executing a sinusoidal maneuver around obstacles with no tire lift.

#### 4.5.7 Speed

To determine conformance to section 3.1.7, the trailers will be tested to meet the RMS values and secondary road requirements as specified in Table 3-2.

#### 4.5.8 Terrain Operation

To determine conformance to section 3.1.8, the trailer will be capable of operating over the MTRV mission profile of 70 percent hard-surface highway and 30 percent off-road defined in Table 3-3.

#### 4.5.9 Fording

To determine conformance to 3.1.9, the trailer shall be tested in accordance with TOP 2-2-612 to ensure its capability of fording hard-bottomed crossings of fresh or salt water at not less than 30 inches including wave height, without requiring the addition of special equipment or adjustments and without damage to the vehicle. At the conclusion of testing, no water contamination in any sealed component is permissible.

#### 4.5.10 Shock

To determine the conformance to 3.1.10, the trailer, at maximum payload, shall be tested to ensure that it will attain no more than 8.0 Gs vertical acceleration in the center of the cargo bed while negotiating half round obstacles of 10 inch heights at speeds up to 20 MPH and 12 inch heights at speeds up to 10 MPH.

#### 4.5.11 Fork Lift Provisions

The trailer shall be inspected for proper fit and function conforming to the requirements of section 3.1.11.

#### 4.5.12 Environmental Operation

The trailer will be tested to ensure successful performance all operations in arctic, tropical, temperate, and desert climates and in geographical areas that include sand, swamp, tundra, grassland, forest, jungle, urban areas, snow and ice, mountain, and salt water. One preproduction trailer shall be used for all environmental tests. All tests shall be conducted in accordance with the test procedures of MIL-STD-810 as noted below. Any evidence of degradation in performance or corrosion shall be considered a failure.

**Table 4-2 Environmental Test methods, Procedures and parameters**

Condition	Method	Procedure	Parameter(s)
Low Temperature (storage)	502.4	I (Storage)	-65° F minimum
Low Temperature (operational)	502.4	II (Operational)	-50° F minimum
High Temperature (storage)	501.4	I (Storage)	+180° F maximum
High Temperature (operational)	505.4 Solar Radiation	I (Cycling Heating Effects)	+140° F
Humidity	507.4	NA	
Salt Fog	ASTM	117	96 hours
Rain	506.4	I (Rain and Blowing Rain)	
Sand & Dust	510.4	I (Blowing Dust) and II (Blowing Sand)	Air Velocity = 20 mph Air Velocity = 35 mph

Condition	Method	Procedure	Parameter(s)
Ice/Freezing Rain	521.2	I	Glaze Ice, 13 mm (thickness)

#### 4.5.13 Mobility

The Trailer shall be subjected to the terrain, mileage, payload, and towed loads identified in Table 4-3 below.

**Table 4-3. Road Test**

COURSE/ROAD	MILEAGE AND SPEEDS	PAYLOAD
Primary Road	(600 Miles) at 50 to 40 mph*	GVW
Secondary Road	(100 Miles) at 30 to 20 mph*	GVW
Trails	(100 Miles) at 10 mph*	GVW
Cross Country	(100 Miles) at 10 mph*	GVW
Belgian Block	(100 Miles) at 10 mph	GVW
Coarse Washboard (6-inch waves, 72 inches apart)	5 laps	GVW
Radial Washboard (2- to 4-inch waves)	5 laps	GVW
Two-inch Washboard	5 laps	GVW

- (1) 80 percent of Mileage shall be with rated payload..
- (2) 20 percent of Mileage shall be without rated payload (empty).

\*Average speeds (Actual speed may vary as much as +/- 10 MPH in order to achieve the identified average speed)

##### 4.5.13.1 Handling

To determine conformance to 3.1.13.1, the trailer will be tested to ensure that it will exhibit lateral and longitudinal stability throughout all mission operations. At maximum payload, with a payload center of gravity centered, the trailer will complete AVTP 03-160W on hard surface roads at speeds of at least 50 mph and on a gravel surface at speeds of 30 mph. At maximum payload, the trailer will maintain 0.4g lateral acceleration while turning left or right for a sustained period without tire lift.

##### 4.5.13.2 Turning Radius

The trailer will be tested for conformance to 3.1.13.2, while coupled to the MTRV, the trailer will not cause an increase in the turning radius of the MTRV.

### 4.5.13.3 Braking

To determine conformance to 3.1.13.3, the contractor shall certify that the trailer is equipped with an air brake system that is controlled by the MTRV's brake system. The Brakes will be self-adjusting and tested to ensure that they comply with SAE AS8090.

#### 4.5.13.3.1 Service Brakes

The trailer shall be equipped with service brakes that are supplied with air by the MTRV's air system. With the MTRV at CCGVW, the combined MTRV/trailer service brakes will be tested to ensure that they control and hold the vehicle combination on a dry hard surfaced 20 percent longitudinal slope in both ascending and descending orientations. Upon completion of TOP 2-2-608 testing, no further servicing of the brake system will be required to return the brake system to a fully operational capability, other than adjustment/replacement of brake shoes/pads. No permanent deformation of any component, other than shoes/pads during testing is allowed.

#### 4.5.13.3.2 Surge Brakes

The trailer shall be tested at maximum load on a level, dry hard surface coupled to the A/S32A-45. The trailer test brakes shall then be tested as specified in 4.5.13.3.2.1 and 4.5.13.3.2.2.

##### 4.5.13.3.2.1 Brake Stopping Capability Test

Tow the trailer at a speed of 20 MPH on a level, dry concrete surface. Stop by applying the brakes to the towing vehicle thus actuating the trailer inertia brake. The trailer shall stop within 30 feet or less of the point where brakes were first applied. The trailer shall not jackknife. At the end of five test cycles, inspect the service brakes and actuating mechanism. Failure to operate satisfactory or evidence of excessive heating or distortion shall be cause for rejection.

##### 4.5.13.3.2.2 Back-up Test

After passing the brake stopping capability test, the trailer shall be subjected to a back-up force. The service brakes shall hold momentarily, but with continued force, shall release and allow unrestricted rearward travel. The test shall be performed five times.

#### 4.5.13.3.3 Parking Brakes

Parking brakes will be tested to conform to SAE AS8090. The parking brake will not be dependent on maintenance of air or hydraulic pressure or electrical energy, and will automatically engage in the event of loss of air to the service brakes.

#### 4.5.13.3.4 Emergency Brakes

To determine conformance to 3.1.13.3.4, the trailer emergency brakes will be tested to ensure that they apply automatically in the event of air pressure loss and are equipped with a manual override that will allow the vehicle to move, and the override will be operable by the operator using common hand tools.

### 4.5.13.4 Wheel Bearings

The contractor shall certify that the wheel bearings are permanently sealed in accordance with 3.1.13.4.

### 4.5.13.5 Towing System

The trailer shall be inspected to meet requirements of 3.1.13.5.

#### 4.5.13.5.1 Towing Force

Place a scale between the prime mover and the drawbar of the fully loaded trailer. The prime mover shall apply a gradual towing force through the scale to the loaded trailer, with its brakes released and with the trailer on level concrete. The trailer shall roll before the scale registers 75 pounds per ton of maximum gross weight

#### 4.5.13.5.2 Drawbar

With the drawbar connected to the trailer the force required to lift the drawbar at the lifting handles shall be measured for compliance with MIL-STD-1472F, table XVII. With the drawbar connected to the trailer the drawbar shall be dropped on to a concrete surface from a height of 36 inches. Failure of permanent deformation of any part or component shall be considered a failure.

#### 4.5.13.5.3 Drawbar Positioning

The trailer shall be tested for conformance to 3.1.13.5.3.

#### 4.5.13.5.4 Drawbar Stowage

The trailer shall be tested to meet the requirements of 3.1.13.5.4.

#### 4.5.13.6 Pintle Interface

The trailer shall be inspected to meet the requirements of 3.1.13.6.

#### 4.5.13.7 Lunette

The contractor shall certify that the lunette complies with STANAG 4101.

#### 4.5.13.8 Safety Chains

The safety chains shall be tested to conform to 3.1.13.8.

#### 4.5.14 Stability

The government will inspect/test the trailer to ensure that it will not tip over in any direction when uncoupled from a towing vehicle.

#### 4.5.15 Reliability & Maintainability

The trailer will be tested to meet the requirements of 3.1.15.

##### 4.5.15.1 Reliability

The trailer will be tested to demonstrate a minimum Mean Time Between Failure (MTBF) of 2,000 hours.

##### 4.5.15.2 Service Life

Verification of the requirements of section 3.1.15.2 shall be by analysis.

##### 4.5.15.3 Maintainability

The trailer shall be tested to ensure that the Mean Time to Repair (MTTR) will not exceed 60 minutes for organizational maintenance and two man-hours for intermediate maintenance.

## 4.5.16 Transportability

The trailer will be tested to meet the criteria in MIL-STD-1366 except as noted below. Military Traffic Management Command Transportation Engineering Agency (MTMCTEA) Pamphlet 70-1 may be used as a guide.

### 4.5.16.1 Highway

The contractor shall certify that the STANAG requirements specified in section 3.1.16.1 have been met. The trailer will be tested to ensure that it is transportable by commercial over the road carrier, that it is capable of unrestricted operation, both empty and loaded up to the legal weight limit, on all U.S. and State highways, that it will meet Department of Transportation and STANAG regulations at contract award, and will meet the American Trucking Association's size and weight limits.

### 4.5.16.2 Rail

To determine conformance to 3.1.16.2, the contractor shall certify that the trailer meets the requirements specified. The trailer, at maximum payload, will also be rail impact tested per MIL-STD-810, 514.5 to meet the requirements specified.

### 4.5.16.3 Marine

To determine conformance to 3.1.16.3, the Contractor shall certify that the vehicle has approach, departure and break over angles, which will allow them to be transported by required ships. The trailer will demonstrate that it can be transportable by LCAC, LCU, Landing Craft Medium (LCM), LHA-1, LHD-1, LPD-4, LSD-36, LSD-41, LSD-49, LPD-17 amphibious shipping, TAKR (Fast Sealift Ships) and all Maritime Pre-positioning Force (MPF) vessels, and commercial shipping. The trailer will demonstrate the capability of being driven between decks (weather decks, tank decks, and to and from piers) on all vessel ramps without "bottoming out" or causing damage to the vehicle or ship. The trailer will demonstrate the capability of traversing Joint Logistics Over-the-Shore (JLOTS) systems and elevated causeways without causing damage to either system. The trailer will demonstrate the capability of all commercially available loading methods to include, Roll On/Roll Off and Lift On/Lift Off. MTMCTEA PAM 700-4 and amphibious Ship Loading Characteristics Pamphlets (SLCPs) can be used as guide.

### 4.5.16.4 Maritime Pre-positioned Force (MPF) Storage

The contractor shall certify that the trailer will accommodate a 36-month MPF storage and maintenance schedule.

### 4.5.16.5 Aircraft

The contractor shall certify, and the government will test that the trailer will be internally transportable by Air Force and Navy/Marine C130, C5, and C17 aircraft using MIL-HDBK-1791 as a guide. The trailer loading tests will be commensurate with aircraft capabilities and will be included in transportability data. If the objective is met, the trailer will demonstrate the capability of being transportable at CW, stacked two high, by C-5 and C-17 aircraft.

### 4.5.16.6 Helicopter Lift

To determine conformance to 3.1.16.6, the trailer will be externally transported as specified, by a CH53E and MV-22 aircraft. The contractor shall certify that the lift provisions are integral, per MIL-STD-209J, and allow a dual sling point lift without the use of spreader bars.

#### 4.5.16.7 Lifting and Tie-down Provisions

To determine conformance to 3.1.16.7, the Contractor shall provide a test certification substantiating that the lifting and tie down provisions meet the requirements of MIL-STD-209J and MIL-STD-913A and that provisions are not removable (per MIL-STD-209J). The trailer will be tested for compliance with MIL-STD-209J and MIL-STD-913A requirements. The vehicle will be inspected for all other requirements as specified.

### 4.6 Physical Characteristics

The following paragraphs define the physical characteristics testing of the trailer when uncoupled from the MTRV.

#### 4.6.1 Weight

The trailer shall be inspected/tested to ensure that the Gross Vehicle Weight (GVW) of the trailer does not exceed 19,500 lbs. and the Curb Weight (CW) of the trailer does not exceed 5,200 lbs.

#### 4.6.2 Length

The trailer shall be inspected/tested to ensure that the deck length of the trailer does not exceed 16 feet.

#### 4.6.3 Width

The trailer shall be inspected/tested to ensure that the overall width of the trailer does not exceed 90 inches.

#### 4.6.4 Height

The trailer shall be inspected/tested to ensure that the height of the trailer deck does not exceed 38 inches. The trailer will be inspected/tested to ensure that the height while loaded and with side racks in place does not exceed 74 inches.

#### 4.6.5 Electrical System

The contractor will certify that the trailers electrical system is 24-volt, and conforms to FMCSR 393.29 and FMCSR 393.31 and will be compatible with 24-volt tactical vehicle systems. The primary electrical power source will be the MTRV. The electrical system shall also be compatible with the 12-volt system of the A/S32A-45 Aircraft Tow Tractor. The trailer will be tested to ensure conformance to section 3.2.6.

#### 4.6.6 Wiring

The contractor shall certify that the trailer meets the FMCSR requirements specified in section 3.2.7. The government will inspect the Wiring and connectors to ensure that multi-pin connectors have been furnished to provide ease of maintenance. Connectors will be sealed, waterproof or military standard type connectors. All wiring to components will have disconnects facilitating component replacement. Wiring shall be labeled to facilitate maintenance and replacement.

#### 4.6.7 Lighting

To determine conformance to 3.2.8, the Contractor shall certify that lighting assemblies, reflectors and associated equipment comply with SAE AS8090. The trailer shall be tested to ensure conformance to section 3.2.8.

#### 4.6.8 Blackout Lighting

To determine conformance to 3.2.9, the Contractor shall certify that the spectral emission characteristics of blackout lights prevent emitting more than 10% energy within the 700 - 1100 nanometer wavelength region (near infrared). The trailer will be tested to verify all requirements as specified.

#### 4.6.9 Wheels and Tires

To determine conformance to 3.2.10, the Contractor shall certify that the wheels and tires conform to FMVSS 119, 120, SAE J2014, FMCSR 393.75, and applicable Tire and Rim Association, or European Tire and Rim Technical Organization (ETRTO) standards. The Contractor shall also provide certification, from the tire manufacturer, of a minimum highway tread life of 12,000 miles. The wheels and tires will be tested for all other requirements including no foreign object retention as specified.

#### 4.6.10 Air Supply System

To determine conformance to 3.2.11, the Contractor shall certify that the air system meets the requirements of FMVSS 121 and SAE J318. The MTVR compressor when tested shall pass no more than 1cc/hr of oil into the air system. The air supply system will be evaluated throughout testing to the requirements specified.

#### 4.6.11 Coating

The contractor shall certify compliance to the requirements in 3.2.12.

#### 4.6.12 Wood Components/Treatment

To determine conformance to 3.2.13, the Contractor shall certify the wood preservation.

#### 4.6.13 Materials

To determine conformance to 3.2.14 the Contractor shall certify that all materials have no cadmium plating, asbestos or radioactive materials.

##### 4.6.13.1 Hazardous Material

To determine conformance to 3.2.14.1, the Contractor shall certify that hazardous materials have not been used or if unavoidable, explanation shall be provided.

##### 4.6.13.2 Ozone Depleting Substances

To determine conformance to 3.2.14.2, the Contractor shall certify that all materials are free of ozone depleting substances.

##### 4.6.13.3 Ozone Resistant Products

To determine conformance to 3.2.14.3, the Contractor shall certify that all materials are free of ozone depleting products.

#### 4.6.14 Corrosion Prevention

To determine conformance to 3.2.15, the Contractor shall certify that the trailer is protected from rust and corrosion as specified and the trailer will be inspected during and at the conclusion of testing. There shall be no evidence corrosion.

##### 4.6.14.1 Water Collection and Entrapment

To determine the conformance to 3.2.15.1, the trailer will demonstrate the ability to avoid water collection and entrapment in operational, storage, and transportation orientations.

#### 4.6.14.2 Debris Collection

To determine the conformance to 3.2.15.2, the trailer will demonstrate the ability to avoid the collection of debris, dirt, grime, and other matter to which the trailer may be exposed during normal operations.

#### 4.6.14.3 Cleaning and Maintenance

To determine the conformance to 3.2.15.3, the trailer will demonstrate the ability to provide access for corrosion-related cleaning and maintenance.

#### 4.6.14.4 Dissimilar Metal Contact

To determine the conformance to 3.2.15.4, the contractor will certify that the trailer has the ability to avoid the potential for galvanic corrosion.

#### 4.6.14.5 Fasteners and Hardware

To determine the conformance to 3.2.15.5, the contractor will certify that the fasteners used are galvanically compatible with the materials being joined.

#### 4.6.15 Welding

To determine conformance to 3.2.16, the Contractor shall provide documentation substantiating the welding program involved with their Quality Program. All welding procedures, repair procedures, training programs and welder certifications will be evaluated per the Contractor provided, Government approved, welding program; sub-Contractor programs shall also be a part of the evaluation.

#### 4.6.16 Identification and Markings

The trailer shall be inspected for compliance with paragraphs 3.2.17 thru 3.2.17.5

#### 4.7 Test, Measurement, and Diagnostic Equipment (TMDE)

To determine conformance to 3.3, the contractor shall certify that the trailer is supported by use of Marine Corps common tools and general support test equipment.

##### 4.7.1 Electrical Test Box

The electrical test box shall be inspected and tested for compliance with paragraphs 3.3.1

#### 4.8 Storage

The trailer shall be inspected for compliance with paragraph with 3.4. All components and associated hardware will be inspected for proper mounting, evidence of leakage, and ease of operation.

#### 4.9 Safety

To determine conformance to 3.5, the trailer will be inspected/tested to verify that it and its accessories comply with all federal safety regulations and standards for vehicles in this class.

#### 4.10 Human Factors Engineering

To determine conformance to 3.6, the trailer will be tested for the requirements as specified and MIL-STD-1472E. The trailer will be examined to verify that all handholds and steps necessary to gain access to various locations on the trailer are integral to the trailer.

#### 4.11 Manpower

The trailer will be tested to ensure conformance with paragraphs 3.7.1 and 3.7.2.

### 5.0 PRESERVATION/PACKAGING

#### 5.1 Trailers

Shall be processed per the contract and best commercial practices. Trailers shall be provided for drive-away capability unless otherwise specified. Adequate protection and security shall be given to equipment and components susceptible to loss or damage from pilferage, vandalism, vibration corrosion, or other environmental deterioration, and any other conditions incidental to distribution of the trailers.

#### 5.2 Removed Items

All items removed or loose parts shall be packaged into wood consolidation containers in such a manner that it will protect the contents, with no damage to the items within, during movement and storage.

#### 5.3 Deprocessing

The Contractor shall prepare and provide with each trailer, de-processing instructions as necessary to allow receiving personnel to place the trailer in full operating condition.

#### 5.4 Marking

##### 5.4.1 Vehicles

Trailers shall be marked per ASTM D3951 for shipments to the Department of Defense.

### 6.0 DEFINITIONS

#### 6.1 Curb Weight (CW)

Curb Weight is defined as the vehicle with no payload, either mounted or stowed, on board the vehicle.

#### 6.2 Degradation

The capability that a system has lost its intended function due to an equipment failure.

#### 6.3 Durability Failure

A durability failure is defined as the need for replacement or overhaul of a major component. Major components include the frame, drawbar, lunette, and axle assemblies.

#### 6.4 Gross Vehicle Weight (GVW)

The GVW shall be defined as the vehicle curb weight (CW) plus the maximum payload.

## 6.5 Leaks

The following definitions shall be used for the examination of defects or leaks. Wetness around seals, gaskets, fittings, or connections indicates leakage. A stain also denotes leakage. If a fitting or connector is loose, broken, or defective, use the following as a guide:

Class I	Leakage indicated by wetness or discoloration not great enough to form drops.
Class II	Leakage great enough to form drops but not enough to cause drops to drip from item being checked/inspected.
Class III	Leakage great enough to form drops that fall from the item being checked/inspected.

## 6.6 Maintainability

The ability of an item to be retained in or restored to a specified condition when maintenance is performed by personnel having specific skill levels, using prescribed procedures, resources, and equipment at each prescribed level of maintenance and repair.

## 6.7 MTVR Payload Allowance

The MTVR payload allowance shall be the weight of the vehicle cargo not including the driver and assistant driver and their personal equipment, 14,200-lbs. cross-country and 30,000 lbs. primary and secondary roads.

### 6.7.1 MTVR Cross Country Gross Vehicle Weight (CCGVW)

The MTVR CCGVW is defined as the GVW with a payload allowance of 14,200 lbs.

### 6.7.2 MTVR Cross-Country Gross Combination Weight Rating (CCGCW)

The MTVR CCGCW is defined as the MTVR GCW with a vehicle payload allowance of 14,200 lbs while towing a trailer.

### 6.7.3 MTVR Highway Gross Vehicle Weight (HGVW)

The MTVR HGVW is defined as the MTVR GVW with a payload allowance of 30,000 lbs.

### 6.7.4 MTVR Highway Gross Combination Weight Rating (HGCW)

The MTVR HGCW is defined as the MTVR GCW with a payload allowance of 30,000 lbs while towing a trailer.

## 6.8 Roads

### 6.8.1 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. High quality paved roads have surfaces having an average Root Mean Square (RMS) value of 0.1 inches. 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). Rough pavement consists of two lane roads with degraded shoulders, and marginal sub grades, which produce long wavelength swells and additional degradation of the surface. Rough pavements have an average RMS of .3 inches RMS.

### 6.8.2 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 and gravel) intended for medium-weight, low-density traffic. These roads have no guarantee that the legal maximum GVW/GCW for the county and state is assured for all bridges. These roads have surfaces with a RMS value varying between 0.3 inches and 1.0 inch.

### 6.8.3 Trails

Trails have surfaces with a RMS value varying between 1.0 inches and 3.4 inches. A maximum sustained speed of 32 km/hr (20 mph) is required on trails of 2.0 inches at off road GVW.

### 6.8.4 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.

## 6.9 Road Roughness

Spectral characteristics of road surface measured and analyzed in terms of wave-number spectra.

### 6.10 Root Mean Squared (RMS)

A measurement used to describe the roughness of a terrain.

### 6.11 Washboard Effect

A periodic component in space that appears in the wave-number spectrum as a sharp peak at a wave number corresponding to the reciprocal of the 'washboard' wavelength. Generally, washboard roads occur in operational areas that are dry.

### 6.12 Wave-Number Spectrum

Represents road roughness data as a straight-line relationship on a log-log plot with ft<sup>2</sup>/cycle/ft on the y-axis (wavelength in feet or spatial frequency of the distance between the bumps). Technique for measuring and monitoring long sections of various terrain types, including paved roads and off-highway durability test courses, that can be used to describe all potential deployment areas of a vehicle. Wave-number spectrum provides a vehicle and speed independent measure of the roughness of a road. An example of the equation for wave-number spectrum is as follows:  $G_{xx}(n) = 1.66 \times 10^{-6}(n)^{-2.0}$  Where:  $G_{xx}(n)$ : wave-number spectrum of the road elevation in ft<sup>2</sup>/cycle/ft;  $n$ : wave number in cycle/ft;  $1.66 \times 10^{-6}$ : roughness coefficient (amplitude of spectrum at 1 cycle/ft where the wave-number spectral density of the road roughness is an equivalence among road roughness spectrum with different slopes);  $-2.0$ : Slope of the wave-number spectrum. Paragraph 6.14 provides a listing of all wave spectrum equations.

### 6.13 Mission Profile

The following definition describes the mission profile. Unless otherwise specified, performance shall be demonstrated on surfaces such that 70% is completed on Primary Roads, 10% on Secondary, 10% on Trails, and 10% Cross Country. The Government has defined mission profile percentages and Root Mean Square (RMS) values for surface roughness. The wave number spectrum formulas are based on the following: Example Formula

$G_{xx}(n)$	$= 1.4 \times 10^{-8}(n)^{-2.5}$
Wave Number Spectrum: $G_{xx}(n)$	= spectral of the road elevation in ft <sup>2</sup> /cycle/ft
n	= wave number in cycle / ft
$1.4 \times 10^{-8}$	= roughness coefficient (amplitude of spectrum at 1 cycle/ft)
-2.5	= slope of the wave number spectrum

#### 6.13.1 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.

Surface	Wave Number Spectrum	Percent of total Miles	MTRV Average Speed (mph)
High Quality Paved Road	$G_{xx}(n)=1.4 \times 10^{-8} (n)^{-2.5}$	15%	50
Secondary Pavement (Two Lane Paved Road)	$G_{xx}(n)=1.9 \times 10^{-7} (n)^{-2.5}$	15%	50
Rough Pavement (Degraded Paved Road)	$G_{xx}(n)=8.0 \times 10^{-7} (n)^{-2.5}$	40%	42

- (a) High quality paved roads have surfaces having an average 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 sub grades, which produce long wavelength swells and additional degradation of the surface. Rough pavements have an average RMS of 0.3 to 0.5 inches RMS.

#### 6.13.2 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 and gravel) intended for medium-weight, low-density traffic. These roads have 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 Miles	MTVR Average Speed (mph)
Loose Surface	$G_{xx}(n)=3.0 \times 10^{-5} (n)^{-2.0}$	3%	30
Loose Surface with Washboard and Potholes	$G_{xx}(n)=4.0 \times 10^{-6} (n)^{-2.4}$	5%	30
Belgian Block	$G_{xx}(n)=4.0 \times 10^{-4} (n)^{-1.4}$	2%	20

- (a) Loose surface with washboard roads have peak amplitude of  $5.0 \times 10^{-3}$  ft<sup>2</sup>/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  $9.0 \times 10^{-3}$  ft<sup>2</sup>/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.
- (b) Belgian Block secondary roads have a peak amplitude of  $8.0 \times 10^{-2}$  ft<sup>2</sup>/cycle/ft at 0.083 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.

### 6.13.3 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	Percent of total Miles	MTVR Average Speed (mph)
Trails	$G_{xx}(n)=4.6 \times 10^{-4} (n)^{-1.9}$	10%	10

### 6.13.4 Cross-country Terrain

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	Percent of total Miles	MTVR Average Speed (mph)
Cross-Country	$G_{xx}(n)=9.2 \times 10^{-4} (n)^{-2.1}$	10%	10

- (a) 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)). (6) Roughness Tolerances.

- (b) 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 decibel envelope.

#### 6.14 Mission-Oriented Protective Posture Level 4 (MOPP-4)

Military personnel are completely encapsulated by wearing closed chemical over-garments with chemical undergarments, wearing the chemical mask, rolling down and adjusting the chemical mask hood, and putting on NBC rubber gloves with cotton liners to attain this level. This posture provides the highest degree of chemical protection but also the most negative impact on the individual's performance.