

DEPARTMENT OF THE NAVY
PROGRAM EXECUTIVE OFFICE PMA260
NAVAL AIR SYSTEMS COMMAND
PATUXENT RIVER, MARYLAND 20670-1161

**PERFORMANCE SPECIFICATION
FOR THE
A/E32K-11 MUNITIONS LIFTING ASSEMBLY
(MLA)**



DISTRIBUTION STATEMENT A: APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED

Approved: _____ Date: _____
Title: Logistics Integration Management (AIR 6.6.4.9)

Approved: _____ Date: 10/27/09
Title: Systems Engineering Department (AIR 4.8.1)

Approved: David G. Sutheland Date: 11/13/09
Title: Program Manager (PMA260)

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1.0 SCOPE

This specification establishes the performance and validation requirements for a Munitions Lifting Assembly (MLA), A/E32K-11. The MLA shall be used to lift and assemble munitions.

2.0 APPLICABLE DOCUMENTS

2.1 Government Documents

The following documents of the issue in effect on date of request for proposals shall form a part of this specification to the extent specified herein. In the event of conflict between the documents referenced herein and the contents of this specification, this specification shall be considered a superseding requirement. 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 131821B, Building 562-1, Highway 547, Lakehurst NJ 08733.

2.1.1 Specifications

2.1.1.1 Military

DoD 6055.9-STD DoD Ammunition and Explosives Safety Standards
MIL-C-10578 Corrosion Removing and Metal Conditioning Compound
MIL-P-53022 Primer, Epoxy Coating, Corrosion Inhibiting, Lead and Chromate Free

2.1.1.2 Federal

W-C-596G Connector, Plug, Receptacle and Cable Outlet, Electrical Power
A-A-59553 Coupling, Hose (Half), Pneumatic, Universal Type
29/40/49 CFR Administration of the Clean Air Act and Clean Water Act

2.2 Standards

2.2.1 Federal

FED-STD-595B Color

2.2.2 Military Publications

MIL-STD-129 Marking for Shipment and Storage
MIL-STD-130 Identification Marking of US Military Property
MIL-STD-2073/1 Part and Equipment, Procedures for Packaging and Packing

MIL-HDBK-470	Designing & Developing Maintainable Products and Systems
MIL-STD-810	Environmental Test Procedures
MIL-STD-882	System Safety
MIL-STD-1365	General Design Criteria for Handling Equipment Associated with Weapons and Related Items
MIL-STD-1472	Human Engineering
MIL-HDBK-1791	Air Transportability Requirements, General Specification For
MIL-STD-1366	Interface Stand, Transport Criteria
MIL-PRF-24712	Coating, Powder
MIL-STD-889	Dissimilar Metals
MIL-PRF-85285	Coating, Polyurethane, Aircraft and Support Equipment
MIL-DTL-81706	Chemical Conversion Materials for Coating Aluminum and Aluminum Alloys

2.3 Other Publications

2.3.1 Other Government Publications

NAVSEA OP5	Ammunition and Safety Standards Ashore
3909AS999	Identification Plate Support Equipment
5SE00363	Modification Plate Support Equipment
ASIM Version 3.1.1	Aircraft Stores Interface Manual
(may be ordered at afseo@eglin.af.mil / internet: http://www.eglin.af.mil/afseo)	

2.4 Non-Government Documents

ANSI B30	Material Handling Equipment Safety Standard
ASTM B117	Salt Spray (Fog) Apparatus, Operating
AWS D1.1/D1.1M-2002	Welding Code, Structural, Steel
AWS D1.2-1997	Welding Code, Structural, Aluminum
AWS D1.301998	Welding Code, Sheet Steel
NFPA 70	National Electrical Code
SAE AS8090	Mobility, Towed Aerospace Ground Equipment, General Requirements for
SAE JA1000	Reliability Program Standard

(Copies of specifications, standards, drawings, and publications, required by suppliers in connection with specified procurement functions should be obtained from the procuring activity or as directed by the Contracting Officer.)

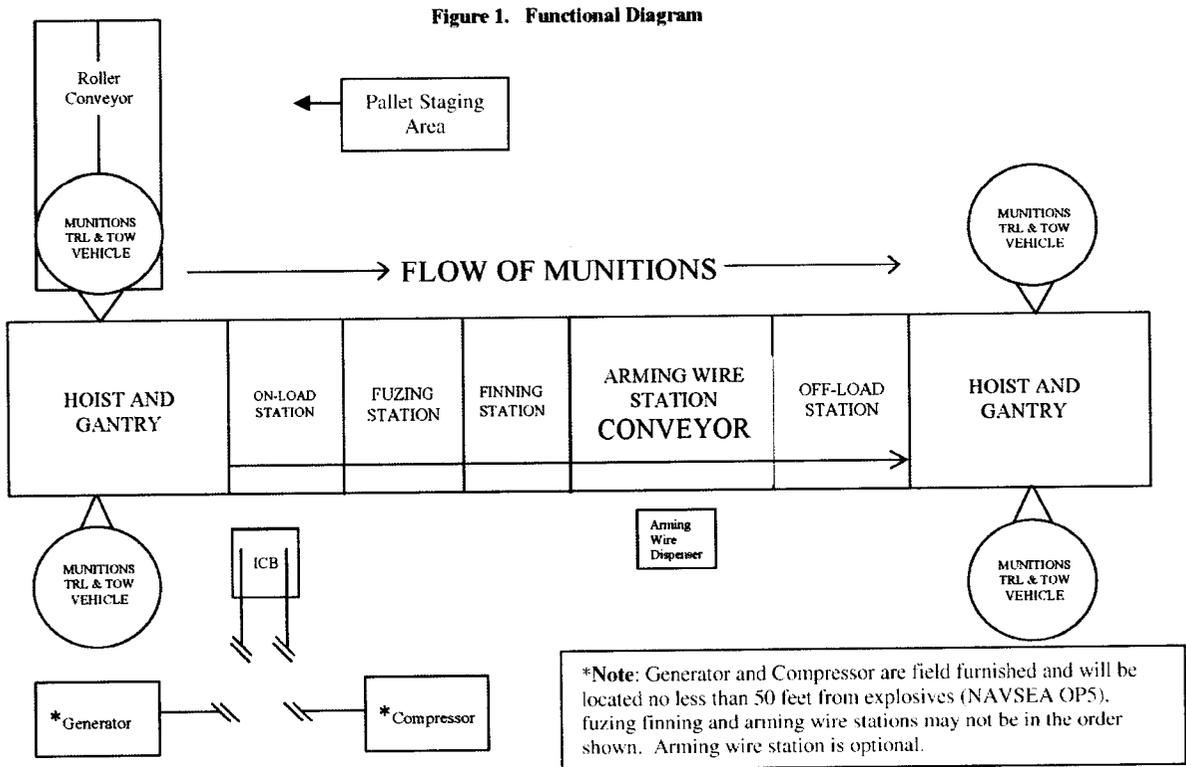
3.0 REQUIREMENTS

3.1 MLA Item Definition

The MLA shall allow personnel to load and unload unassembled and assembled munitions from trailers onto temporary storage or directly for assembly or disassembly in a continuous process. A portable compressor and electrical power source shall provide power for the MLA. The compressor and electrical power sources are current inventory items provided on the A/M32U-13B Maintenance Trailer and/or A/M32U-21 Maintenance Trailers.

3.1.1 MLA Item Diagram

Figure 1 is a notional functional diagram of the original Munitions Assembly Conveyor (MAC) system. This is provided as information only. The MLA system shall contain improvements that result in faster set-up and breakdown of the unit.



3.1.2 Interface Definition

The MLA shall have an Interface Control Board (ICB). The ICB routes electrical and pneumatic power to the MLA. The electrical portion has a safety disconnect switch for the lighting. An electrical generator is connected as a source of 115 VAC power. The air supply portion allows an air compressor to be connected. Air filters, pressure regulators and oil lubricators are included. Air pressure is used for the pneumatic hoists and air driven tools. The ICB may also aid in setting up the system. It may be used as a fork lift adapter to raise the gantry to full height. The MLA shall be capable of interfacing with the following:

3.1.2.1 Stores

The MLA shall be capable of handling, assembling, and disassembling the munitions listed in Table 3.1.2.a. Munitions information can be obtained from the Aircraft Stores Interface Manual (ASIM) (AOP-11 and AOP-12) Version 3.1.1.

TABLE 3.1.2a Intended Munitions

USMC Munitions	Description
All MK-80 series bombs with all applicable fin configurations	General Purpose Bomb
GBU-10, 12, 16, 24, 51, 52	Guided bombs
GBU-31, 32, 35, 38 Series, 54 Series	Joint Direct Attack Munitions (JDAM)
Air Force Weapons	Description
Mk-82 w/MAU-93, BSU-49, and MK-15 Fins	General Purpose Bomb
MK-83	General Purpose Bomb
MK-84 w/BSU-50 or Conical Fins	General Purpose Bomb
GBU-10, 12, 15, 24, 27	Guided Bombs
GBU-31, 32, 38	JDAM Series
SUU-64, 65, 66	Dispensers
CBU-87, 89, 97, 103, 105	Cluster Bombs
MK-129	Leaflet Bombs
M36E2 750 lb.	Clusters

3.1.2.2 Transport Trailers/Tow Vehicles

The MLA shall allow the transport trailers or tow vehicles in Table 3.1.2b easy access to load and unload munitions. The MTRV series tactical vehicles shall be able to pass through either on-load or offload gantry systems. A minimum clearance of 18 inches is required between gantry with hoist and any point on the MTRV.

TABLE 3.1.2b Transport Trailer and Tow Vehicles

Munitions Trailers	Triple Stacked Height	Triple Stacked Width
A/M32K-10 Munitions Trailer P/N 3847AS100-1, NIIN 01-518-4037	8.0* ft.	7.5 ft
Tow Vehicle	Vehicle Height	Vehicle Width
Medium Tactical Vehicle Replacement (MTVR) Series Tactical Vehicles (MK 23, 25)	12.0 ft.	8.5 ft.

*NOTE: Highest non-munitions loading/unloading configuration.

3.1.2.3 Facilities

The MLA shall be capable of operating in the Expeditionary Air Field (EAF) environment as described in NAVSEA OP 5, paragraph 4-2.

3.1.2.4 Electrical Power Source

The MLA shall provide for control and distribution of electrical power. In addition, it shall have four 110VAC, 15 AMP receptacles to power miscellaneous electrical devices not listed in this document. The MLA electrical system shall conform to applicable industry standard requirements. The MLA shall interface with the MEPP-803 Generator Set using electrical connector (W-C-596G designation). The generator set shall be located a minimum of 50 feet from explosives (NAVSEA OP5). Only one power line shall be used between the generator and ICB (Interface Control Board). Electrical connectors must be suitable for use in inclement weather.

3.1.2.5 Compressed Air Source

The MLA shall have a ¾ inch pneumatic hose coupling, (A-A-59553 designation) to interface with the P185WJDU Air Compressor furnished on either the A/M32U-13B or A/M32U-21 Armament Maintenance Trailers and located a minimum of 50 feet from the explosives (NAVSEA OP5). Only one pneumatic line shall be used to interconnect the ICB and the compressor. The MLA system shall have the capability of simultaneously powering four pneumatic tools and two pneumatic hoists used for assembling munitions. MLA air flow requirements are 175 CFM at 100 psi.

3.1.2.6 Aircraft Internal Transport

The MLA transported on the A/M32K-10 Munitions Trailer shall be capable of transport within C-5, C-17 and C-130 aircraft. The MLA shall also be capable of being transported separately from the A/M32K-10 Munitions Trailer within the C-5, C-17 and C-130 aircraft. MIL-HDBK-1791 will be used as guidance for evaluating MLA compatibility. The contractor is required to ensure the MLA meets the requirements for Air Transportability Certification. Certification requirements can be found at <http://engineering.wpafb.af.mil/attla/attla-transport.asp>. The MLA design shall account for approach, departure and cresting angles/ clearances to allow the trailer to roll on and off without the need for ramp shoring.

3.1.2.7 Shipping and Storage

The MLA system shall be capable of being shipped and stored using long-life reusable storage and shipping containers. The system of containers shall contain one MLA on one A/M32K-10 Munitions Trailer. The maximum height of the system of containers on the A/M32K-10 shall be 74 inches from the ground. The containers shall be breathable and if necessary, be supplied with an appropriate desiccant system. The containers are an integral part of the entire MLA system and shall be provided at the time of delivery. Each container shall have fork-lifting provisions. MIL-STD-2073 may be used as guidance in developing shipping/storage containers. See paragraph 3.2.1.3.

3.2 Characteristics

3.2.1 Performance

3.2.1.1 Loading & Unloading System

The MLA shall be capable of simultaneously loading and unloading bomb bodies and fully assembled munitions listed in Table 3.1.2a from and onto the trailer and tow vehicle listed in Table 3.1.2.b. by means of pneumatic hoists. The pneumatic hoists shall have a 6,000 lb. capacity. Load and unload stations shall be of the same configuration and interchangeable. Two bomb bars shall be provided with each MLA. Each bomb bar is a light weight lift bar with 3 sets of bomb slings capable of supporting three munitions including all types listed in Table 3.1.2a. The bomb bars provide the interface between the hoists and the bombs. Safety features shall be included to preclude accidental dropping of the munitions. All movement of munitions during lifting and lowering shall be powered. The MLA must have the capability of supplying required lubrication to air tools/ hoists without operator assistance. Two manual hoists shall be supplied as backups in the case of loss of air pressure. This is an emergency backup system to replace the pneumatic hoists.

3.2.1.1.1 Pneumatic Hoist Brake Release

The pneumatic hoist shall have a manual brake release mechanism. In the event of pneumatic hoist failure, loads shall be lowered to the ground by activating the brake release mechanism.

3.2.1.2 Munitions Assembly/Disassembly

The MLA shall accommodate twenty-five cradles containing 500-pound class munitions at one time. The system shall facilitate the assembly/disassembly of the munitions listed in Table 3.1.2a. Munitions flow from loading to unloading shall be manually controlled and without binding. The MLA shall have an internal rail system for returning empty cradles from the offload end to the on load end. Cradle stops at the offload end of the MLA shall be capable of stopping all munitions/cradles as listed in Table 3.1.2.a. from a speed of 2.93 ft per second. Cradle stops shall have a dampening feature to minimize the impact between cradle and stop. The MLA shall preclude munitions from interfering with or impacting each other. The MLA shall also allow munitions assemblies to be torqued up to 625+/-25 ft-lb. Securing the weapon for applying torque should be applicable regardless of the orientation of the weapons on the cradle. This will ensure that operators can disassemble/assemble weapons. The MLA shall have a minimum working strength of 12,000 lbs per 10-foot length.

3.2.1.3 MLA Assembly/Disassembly

The MLA shall be capable of being unloaded, assembled or disassembled, repackaged and loaded from transport trailers in Table 3.1.2b with a maximum of 10 Marine Corps Aviation Ordnancemen, Occupation Field 65XX, within 120 minutes using only a 6,000 lbs forklift, minimum common hand tools, and no stand alone special tools. Any required special tooling for assembly or disassembly shall be integrated into the MLA system. Clearly visible identification to facilitate assembly and repacking shall be provided. Disassembly and repackaging of MLA shall use long-life reusable containers that meet the mobility requirements stated in 3.1.2.6. Hardware shall have identified storage locations in the containers. All parts/components shall be secured and restrained in reusable containers.

3.2.1.4 Unimproved Surfaces & Leveling Devices

The MLA system, when loaded to its peak capacity shall not impose a pressure on any portion of the bearing surface upon which it is assembled, greater than 5,430 pounds per square foot. The MLA shall be capable of being safely assembled and used on improved as well as unimproved terrain consisting of a variation in surface height up to 5.25 inches. The MLA shall not require anchors for stability. However, gantry legs shall be capable of being anchored. Double headed stakes (or equivalent) and stake puller shall be supplied.

3.2.1.5 Lighting

The MLA system shall operate and maintain sufficient light to accomplish munitions loading, assembly, and unloading. A lighting level of at least 75 foot-candles shall be maintained over the center of the munitions assembly/disassembly area at 3 feet above the ground. The lighting level at the center of the loading and off-loading areas shall be a minimum of 50 foot-candles 3 feet above the ground. The color of the light furnished shall be as near to the natural light as possible after warm-up. The fixtures furnished shall not require more than 5 minutes of restart time above freezing temperatures and not more than 15 minutes below freezing temperatures when the light is turned off and back on again. Only one power line shall be used to interconnect the ICB and the MLA light system.

3.2.1.6 Pallet and Munitions Staging Area

The MLA shall have a munitions staging area consisting of a system of roller conveyors that allow easy manual movement of pallets to the loading area. The roller conveyor assemblies shall consist of 4 lengths of rollers each being 10 feet long and attachable to each other both side by side and lengthwise. The roller conveyors shall incorporate pallet stops. This provision prevents pallets from travelling off the ends of the conveyors. The weapons in the staging area shall be able to be moved manually and positioned beneath the gantry for transfer onto the MLA on-load station. It shall be capable of storing six 2,000-pound class munitions pallets double-stacked at one time. Each 2,000-pound class munitions pallet contains two bomb bodies. It shall also be capable of storing nine 500-pound class munitions pallets triple-stacked at one time. Each 500-pound class munitions pallet contains six bomb bodies. Refer to ASIM manual for dimensions of munitions.

3.2.1.7 Arming Wire Assembly (optional)

The MLA shall have an arming wire dispenser to allow for easy dispensing. The dispenser accepts spools of arming wire and has a gripping mechanism to prevent unwinding of the wire spool. The holder also shall have a feed tube that aids in keeping the wire from curling.

3.2.1.8 Tool Trays

The MLA shall incorporate at least four repositionable tool trays located to allow technicians to efficiently retrieve and store hand and air tools. The tray size shall be approximately 12 inches wide by 24 inches long and 6 inches high. Hand and air tools shall consist of standard impact wrenches, torque wrenches, ratchets, speed handles, arming wire pliers, screwdrivers, and ratchet extensions. The tool tray placement and size shall not interfere with the technicians work environment and be of sufficient capacity to accommodate all tools.

3.2.1.9 Component Covers

The ICB and pneumatic hoists shall have easily removable covers to provide protection from blowing sand and the environment. The covers shall be designed to be removed during MLA operation. Storage locations or boxes shall be provided to preclude loss of covers while not in use.

3.2.1.10 Sun Shade Cover

The MLA shall be provided with a sun shade cover to provide protection from the sun and environment. It should protect equipment and operators working in the rail conveyor area, be attached to the MLA and be easily removable for storage. It shall block at least 70% of solar radiation and be able to withstand all environmental conditions specified in 3.2.4. A storage location or box shall be provided for the cover while not in use.

3.2.1.11 Stability

The MLA shall be stable under all operating conditions. There shall be no separating, walking or creeping of components during operation. This especially applies to

movement of the gantry systems and the rail conveyor system. The gantries shall be attached to the rail conveyor by mechanical means to preclude relative movement.

3.2.2 Physical Characteristics

3.2.2.1 Weight

The MLA components shall meet the human engineering lifting requirements of MIL-STD-1472 for manually handled features up to 5 feet above the ground. The weight of the system including the containers shall not exceed 12,000 lbs to minimize the mobility footprint.

3.2.3 Service Life

All structural and support members of the MLA shall have an expected service life of not less than 30 years. The service life of commercial off the shelf items shall conform to industry standards. The MLA shall be capable of being stored outside in operational condition for a minimum of five years.

3.2.3.1 Maintainability & Reliability

The MLA shall be capable of continuous operation for 1,000 hours or more with no unscheduled maintenance required, when verified in accordance with the requirements and provisions of Section 4 of this Performance Specification. Maintenance on the MLA shall be limited to field level. Preventive maintenance for commercial off the shelf items shall be in accordance with industry standards. The corrective maintenance task mean time to repair (MTTR) shall be no more than 1.5 hours using the technical manual. Corrective maintenance task mean-time-to-repair shall include, but not be limited to, the summation of the following corrective maintenance task time elements: fault/failure detection, localization, isolation, disassembly, interchange (remove and replace), reassembly, alignment, check-out, start-up and calibration.

3.2.4 Environmental Operational Conditions

The MLA shall be capable of operation and storage throughout its service life without damage when exposed to the environmental conditions listed per MIL-STD-810 in Table 3.2.4.

TABLE 3.2.4 Environmental Condition Requirements

Environmental Condition	Requirements	
Low Temperature	Operating	-25 F
	Storage	-65 F
High Temperature	Operating	+140 F with solar load
	Storage	+180 F
Humidity	Relative Humidity	3% to 95%
Salt Fog	See Doc. ASTM B117, 96 hours	
Blowing Rain	Rainfall Rate	2 inches per hour

	Wind	40 miles per hour
Blowing Dust	Dust Concentration	0.3 +/- 0.2 g/cu.ft
	Wind	35 miles per hour
Blowing Sand	Sand Concentration	0.0623+/-0.015 g/cu ft
	Wind	35 miles per hour
Ice/Freezing Rain	Water Delivery Rate	25 mm/hour
	Droplet Size	1.0 mm to 1.5 mm

3.2.5 Safety Factors and Design Proof Loads

The MLA's safety factor and design proof load requirements shall meet MIL-STD-1365, Table I, Acceptable Safety factors and design proof loads for Navy applications except as follows. Metallic lifting devices shall be designed with a 5:1 (yield) safety factor and tested with a design proof load of 3:1. Metallic stands, cradles and adapters, etc. shall be designed with a 3:1 (yield) safety factor and tested with a design proof load of 2:1.

3.3 Design and Construction

3.3.1 Materials, Processes, and Corrosion Resistance - Coating

The MLA 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 in service or storage. Electronics or sensitive components shall be enclosed or protected to resist the effects of water intrusion, salt water and salt fog corrosion. The use of powder coating is required. The following specifications conform to typical Navy/USMC powder coating operations and are provided for guidance only:

Recommend pre-treatment 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 topcoat color shall be green, Color No. 24052 per FED-STD-595. Coatings shall have 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 420 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 marine environment,

and shall be resistant to under-film corrosion and other defects such as blistering caused by 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.

3.3.1.1 Metals

All non-coated metallic surfaces and joints shall be treated to resist corrosion due to fuels, salt fog, or atmospheric conditions likely to be met in storage or normal service.

3.3.1.2 Dissimilar Metal

Unless protected against corrosion, dissimilar metals shall not be used in direct contact with each other.

3.3.1.3. Standard and Commercial Parts

The MLA shall use commercial off-the-shelf (COTS) parts to the maximum extent practical.

3.3.1.4 Identification and Marking

The following paragraphs define the identification and marking requirements. All data plates shall be permanently affixed with rivets or drive screws and in accordance with MIL-STD-130.

All system units and SRAs (Shop Repairable Assemblies) shall have unique serial numbers and shall be clearly marked and identified for all potential hazards and any parts or assemblies requiring special care during handling, shipping, and installation or testing in accordance with commercial practices. All serial numbers shall not be more than 6 characters in length including dashes, spaces, and special characters.

3.3.1.4.1 Service/Information Labels

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

3.3.1.4.2 Identification Plates

The MLA shall have identification plates conforming to NAVAIR drawing 3909AS999, find no. 6, notes 4, 7 and 9 do not apply. Unique Identification (UID) requirements shall be in accordance with MIL-STD-130.

3.3.1.4.3 Modification Plates

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

3.3.1.4.4 Shipping Plates

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

3.3.1.5 Hardware Protection

All electrical wires, cables, hoses and hydraulic lines shall be positioned and protected to prevent damage such as cuts, abrasions and chafing.

3.3.1.6 Electrical Shock

The MLA shall be equipped with suitable interlocks, grounding means, enclosures or protective devices conforming to NFPA No. 70 or equivalent industry standard means so that danger from electrical shock is avoided.

3.3.2 Workmanship

The MLA shall be fabricated in a manner that will ensure high quality appearance, fit, interchangeability and assembly. Particular attention shall be given to neatness and thoroughness of marking of parts and assemblies, plating, printing, riveting, machine screw assemblage and welding. The MLA design shall not permit water accumulation in pockets, creases, fissures, or depressions, which could cause structural damage and or operational impairment upon freezing. Welding shall be IAW ANSI /AWS D1.2 and or ANSI AWS D1.1.

3.3.3 Interchangeability

The MLA shall be constructed using standard hardware such as MS, AN, NAS or SAE, etc. types to the greatest extent possible. Use of non-standard or proprietary hardware shall require prior government approval. All parts having the same manufacturer's part number shall be directly and completely interchangeable with each other with respect to installation and performance. All components and assemblies incorporated in the equipment shall be designed and manufactured to dimensional tolerances, which will permit future interchangeability and facilitate replacement of parts.

3.3.4 Safety

The MLA shall allow effective operations and maintenance without injury or damage to personnel and equipment with emphasis on MIL-STD-882 requirements. To

assure safe operation, the MLA shall implement durable effective hose trolleys that keep overhead compressed air lines and wires safely out of danger and prevent tangling. The hose trolleys shall capture and hold any air lines and wires firmly and resist pulling and tugging.

3.4 Personnel

The MLA shall not require additional skills to operate and maintain beyond those required for Marine Corps Aviation Ordnance having Occupational Field 65XX. The level of training required shall not exceed that which can be provided by on-the-job training on site.

3.5 Human Factors Engineering

The MLA design shall comply with established practices described in MIL-STD-1472. The MLA 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 Nuclear, Biological, Chemical (NBC) Mission Oriented Protective Posture (MOPP) IV gear. The MLA 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 MLA shall be integral to the vehicle.

3.6 Hazardous Materials

In fabricating, manufacturing, testing, operating, maintaining and disposing of the unit, all forms of pollution shall be prevented whenever feasible. The emphasis shall be on eliminating or reducing hazardous materials early in the design and properly controlling hazardous materials, which are not eliminated, throughout, the life cycle. Major components that are commercial or non-developmental may be excluded from the hazardous materials design restrictions, however proper control and thereby mitigation of the hazardous material shall be required. A Hazardous Material (HM) is any material that: is regulated as a HM per 49CFR 173.2, or requires a Material Safety Data Sheet per 29 CFR 261 Subparts A, B, C, or D, is regulated as a Hazardous Air Pollutant per 40 CFR Part 63, or is regulated as an Ozone Depleting Substances (ODS) per 40 CFR 82 Subpart A, Appendices A and B.

3.6.1 Prohibited Materials

Banned: Asbestos, Poly-Chlorinated Bi-Phenyls, Ozone Depleting Substances (Halons, Chlorofluorocarbons, Carbon Tetrachloride, Methyl Chloroform, and Methyl Bromide), Hydrazine and any material that produces toxic fumes or dense smoke when burned. Reduced Usage: These materials shall be used only with Navy approval (note that approval will not be given unless the application can be documented as having no suitable alternative): Chlorinated Hydrocarbons (Trichloroethylene, Chloroform, Perchloroethylene, Methylene chloride); Volatile

Organic Compounds (MEK, MIBK, Benzene, Toluene, Xylene); Heavy Metals and Compounds (Cadmium, Chromium, Nickel, Lead, Beryllium, Mercury, Cyanides); Sensitizers (Isocyanates, Formaldehyde); Carbon Disulfide; Ethylene Glycol Monoethyl Ether; Ethylene Glycol Monomethyl Ether; Ethylene Glycol Monomethyl Ether Acetate, Advance Composite Material Components (Methylene Dianiline), Magnesium alloys, Wood products, PVC, polyester, RTV, and PCB.

3.6.2 Ozone Depleting Substances (ODS)

Class I and Class II ODS(s) are identified in Title VI, Section 602 of the Clean Air Act. Title VI, Sections 604 and 605 provide the Phase-out of production of Class I and Class II substances. Therefore no ODS(s) or materials containing ODS(s) as an ingredient may be used or specified for any phase of this contract by contractor personnel that violate the Phase-out schedule. Any ODS(s) that are due for phase-out within the next ten (10) years shall be identified as required and justified for use and require government approval prior to usage.

4.0 QUALITY ASSURANCE PROVISIONS

4.1 General

This section defines the inspections, certifications, demonstrations, tests, and analyses necessary to verify the ability of the MLA to meet the requirements prescribed in Section 3. These inspections, certifications, demonstrations, tests, and analyses will be performed on the prototype MLA's.

The MLA Pilot Production Test Plan contains the detailed procedures for the inspections, demonstrations, and tests required by this section.

Table 4.1 provides a cross-index of the Section 3 requirements, the Section 4 quality assurance provisions, and the associated organizational responsibilities. The verification methods listed in Table 4.1 are defined as follows:

- I – Inspection. Careful and critical examination including measurements, where appropriate. Usually an unaided visual examination
- C – Certification. A formal confirmation that a particular quality, feature, or characteristic meets a specified standard or that the results provided are true and accurate.
- D – Demonstration. An activity showing that a particular capability or function exists.
- T – Testing. Accomplish tests as defined in Section 3 and Section 4.
- A – Analysis. Perform analysis as defined in Section 3 and Section 4. This may consist of comparison to existing designs.
- NA – Not Applicable.
- G – Government.
- CONTR – Contractor.

The government reserves the right to witness and perform any of the tests or demonstrations required by this specification where the government deems such tests necessary to assure that the MLA conforms to the specified requirements.

The government reserves the right to verify contractor certifications by independent analyses or testing.

4.1.1 Special Tests or Inspections

When inspections or tests not described or referenced herein are required, they shall be conducted in accordance with industry-approved standards acceptable to the government.

TABLE 4.1 Requirements and Verifications Cross-Reference Index

REQUIREMENTS	DESCRIPTION	METHOD	VERIFICATION	RESPONSIBILITY
3.	Requirements		N/A	N/A
3.1	MLA Item Definition		N/A	N/A
3.1.1	MLA Item Diagram		N/A	N/A
3.1.2	Item Definition		N/A	N/A
3.1.2.1	Stores	I, A	4.1.2.1	CONTR
3.1.2.2	Transport trailers/Tow Vehicle	I, A	4.1.2.2	CONTR
3.1.2.3	Facilities	I	4.1.2.3	CONTR
3.1.2.4	Electrical Power Source	I, D	4.1.2.4	CONTR
3.1.2.5	Compressed Air Source	T	4.1.2.5	CONTR
3.1.2.6	Mobility	A	4.1.2.6	CONTR
3.1.2.7	Shipping & Storage	A, D	4.1.2.7	CONTR
3.2	Characteristics		N/A	N/A
3.2.1	Performance		N/A	N/A
3.2.1.1	Loading & Unloading System	T	4.2.1.1	CONTR
3.2.1.1.1	Pneumatic Hoist Brake Release	D	4.2.1.1.1	CONTR
3.2.1.2	Munitions Assy / Disassembly	I, A, D, T	4.2.1.2	CONTR
3.2.1.3	MLA Assembly/Disassembly	D, T	4.2.1.3	CONTR
3.2.1.4	Unimproved Surfaces & Leveling Devices	T	4.2.1.4	CONTR
3.2.1.5	Lighting	C, T	4.2.1.5	CONTR
3.2.1.6	Pallet and Munitions Staging Area	I, C, D	4.2.1.6	CONTR
3.2.1.7	Arming Wire Dispenser (optional)	I, D	4.2.1.7	CONTR
3.2.1.8	Tool Trays	I, D	4.2.1.8	CONTR
3.2.1.9	Component Covers	I,D	4.2.1.9	CONTR
3.2.1.10	Sun Shade Cover	I,D	4.2.1.10	CONTR
3.2.1.11	Stability	I,D	4.2.1.11	CONTR
3.2.2	Physical Characteristics		N/A	N/A
3.2.2.1	Weight	I	4.2.2.1	CONTR
3.2.3	Service Life	A, C	4.2.3	CONTR
3.2.3.1	Maintainability & Reliability	A, C,D	4.2.3.1	CONTR
3.2.4	Environmental Operational Conditions	I, A, T	4.2.4	CONTR
3.2.5	Safety Factor & Design Proof Load	C, T, A	4.2.5	CONTR
3.3	Design & Construction		N/A	N/A
3.3.1	Materials, Processes & Corrosion Resistance	I, C	4.3.1	CONTR
3.3.1.1	Metals	I, A, C	4.3.1.1	CONTR
3.3.1.2	Dissimilar Metals	I, C	4.3.1.2	CONTR
3.3.1.3	Standard & Commercial Parts	I	4.3.1.3	CONTR
3.3.1.4 and 3.3.1.4 .1 thru 4	Identification and Marking	I,C	4.3.1.4	CONTR
3.3.1.5	Hardware Protection	I,D	4.3.1.5	CONTR
3.3.1.6	Electrical Shock	I,D	4.3.1.6	CONTR
3.3.2	Workmanship	I	4.3.2	CONTR
3.3.3	Interchangeability	I, D	4.3.3	CONTR
3.3.4	Safety	I, A	4.3.4	CONTR
3.4	Personnel		4.4	
3.5	Human Factors Engineering	I, C	4.5	CONTR
3.6, 3.6.1, 3.6.2	Hazardous Materials	I, C	4.6	CONTR

*NOTE: The government will perform additional inspections, demonstrations, tests, and analyses set forth in the specification where such inspections, demonstrations, tests, and analyses are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.2 Interfaces

4.1.2.1 Stores

Verification that the MLA is capable of handling, assembling, and disassembling the munitions listed in Table 3.1.2a shall be by inspection and analysis. The contractor will inspect the MLA to determine if the required functions for each of the intended munitions can be accomplished. All of the munitions will be analyzed for capability to be handled, assembled, and disassembled on the MLA.

4.1.2.2 Transport Trailers/Tow Vehicles

Verification that the off-load and the on-load features of the MLA allow all of the transport trailers and tow vehicles listed in Table 3.1.2b easy access and passage with required clearance shall be accomplished by inspection and analysis.

4.1.2.3 Facilities

Verification that the MLA is capable of operation shall be by inspection of the fully assembled MLA and comparison with the maximum dimensions listed in 3.1.2.3.

4.1.2.4 Electrical Power Source

Verification that the MLA is capable of interfacing with the power source listed in 3.1.2.4 while having means with which to collect electrical power with the specified plug and providing a control and distribution source shall be by inspection and demonstration. This power source may be used to demonstrate the required interface capability.

4.1.2.5 Compressed Air Source

Verify that the MLA is capable of interfacing with and being powered by compressors installed on either the A/M32U-13B or A/M32U-21 Maintenance Trailers and using the specified pneumatic hose coupling. This test shall include connecting pneumatic tools to at least four MLA fittings and operating the tools simultaneously with the pneumatic hoists while lifting MK-84 bombs or equivalent on each hoist.

4.1.2.6 Mobility

Verification that the MLA meets the mobility requirements shall be by analysis. An analytical assessment will be made of the MLA when placed on the A/M32K-10 munitions trailer to verify that the combined cubic dimensions, weight and trailer axle loadings of the MLA and trailer can be certified per MIL-HDBK-1791 to meet the requirements for air transport on C-130, C-5, and C-17 aircraft in accordance with 3.1.2.6.

4.1.2.7 Shipping and Storage

Verification that the MLA is capable of being shipped and stored using the long-life reusable containers shall be by analysis and demonstration.

4.2 Characteristics

4.2.1 Performance

4.2.1.1 Loading & Unloading System

The ability of the MLA to simultaneously load and unload the munitions listed in Table 3.1.2a from the trailers listed in Table 3.1.2b shall be verified by testing. Any or all of the munitions listed in Table 3.1.2.1 may be used in this test. Verification that the MLA meets the requirements of 3.2.1.1 for capability, strength, and safety shall be by contractor testing.

4.2.1.1.1 Pneumatic Hoist Brake Release

The required operation of the manual brake release shall be demonstrated.

4.2.1.1.2 Munitions Assembly/Disassembly

Verification that the MLA meets the requirements of 3.2.1.2 for strength, munitions accommodation, torquing, and strength of cradle stops shall be by inspection, analysis, demonstration, and testing.

4.2.1.1.3 MLA Assembly/Disassembly

Verify that the MLA meets the assembly, disassembly, and repackaging requirements of 3.2.1.3 by contractor testing and demonstration.

4.2.1.1.4 Unimproved Surfaces and Leveling Devices

Verification that the MLA, when loaded to its peak capacity, meets the bearing surface pressure requirements and can be safely assembled on unimproved surfaces with a variation in surface height as specified in 3.2.1.4 shall be by contractor testing. At least 50 % of the gantry and rail conveyor legs shall require adjustment by not less than 5.00 inches.

4.2.1.1.5 Lighting

The lighting levels and restart time required by 3.2.1.5 shall be verified by contractor testing while the MLA is being powered by the power source listed in 3.1.2.d. and under the ambient temperature conditions existing at the time and location of the test. Restart time at low temperatures and color temperature of the lighting shall be determined by contractor certification.

4.2.1.1.6 Pallet and Munitions Staging Area

The presence of the required pallet storage area shall be verified by inspection. The capacity of the storage area shall be verified by contractor demonstration and certification.

4.2.1.1.7 Arming Wire Dispenser (Optional)

The presence and operation of the arming wire dispenser shall be inspected and demonstrated by the contractor.

4.2.1.8 Tool Trays

The presence and capacity of the required tool trays shall be verified by inspection. The effect of the placement and size of the tool trays on the technicians' work environment shall be evaluated during operational demonstrations.

4.2.1.9 Component Covers

The presence and functionality of the component covers shall be inspected and demonstrated by the contractor. See 4.2.4 for additional demonstrations.

4.2.1.10 Sun Shade Cover

The presence and functionality of the sun shade cover shall be inspected and demonstrated by the contractor. See 4.2.4 for additional demonstrations.

4.2.1.11 Stability

The stability of the MLA shall be inspected and demonstrated by the contractor. Six MK-84 bomb bodies (three per bomb bar) or equivalent shall be consecutively processed through the MLA from on-load gantry to off-load gantry. Gantries shall not be staked down. Any relative movement between gantries and rail conveyor system shall be cause for failure.

4.2.2 Physical Characteristics

4.2.2.1 Weight

The requirements of 3.2.2.1 shall be verified by inspection, including weighing.

4.2.3 Service Life

The service life requirements of 3.2.3 shall be verified by contractor analysis and certification.

4.2.3.1 Maintainability & Reliability

The contractor shall perform Reliability Modeling and Predictions in accordance with SAE JA1000-1, as guidance, to verify the MTBF in Section 3.2.3.1 is met. Modeling and prediction efforts shall assume a basis of a Naval (Sheltered and/or Unsheltered, as applicable) environment. The contractor shall certify, and shall provide the supporting analytical data using MIL-HDBK-470, that the MLA and the lifting sources and their components meet the MTTR requirements of 3.2.3.1. The contractor shall perform all organizational and intermediate level maintenance tasks in accordance with the technical manual. Reliability and Maintainability data will be collected during the testing to augment the certifications.

4.2.4 Environmental Conditions

The ability of the MLA to operate and/or to be stored under the environmental conditions specified in 3.2.4 shall be verified by inspection, analysis, and testing by the contractor in accordance with MIL-STD-810. Testing will be accomplished using the test methods, procedures, and parameters shown in Table 4.2.4. Testing shall be accomplished both with and without component covers and the sun shade cover.

TABLE 4.2.4 Environmental Tests Methods, Procedures and Parameters

Condition	Method	Procedure	Parameter(s)
High Temperature (Operational)	505.4 Solar Radiation	I (Cycling, Heating Effects)	+140 F Ambient Air
High Temperature (Storage)	501.4	I (Storage)	+180 F Maximum
Low Temperature (Operational)	502.4	II (Operational)	-25 F Minimum
Low Temperature (Storage)	502.4	I (Storage)	-65 F Minimum
Rain	506.4	I (Rain and Blowing Rain)	
Icing/Freezing Rain	521.2	I	Glaze Ice, 13mm(Thickness)
Humidity	507.4	N/A	
Sand and Dust	510.4	I (Blowing Dust) and II (Blowing Sand)	Air Velocity of 35 mph
Salt Fog	ASTM B117	ASTM B117	96 Hours

4.2.5 Safety Factors and Design Proof Loads

The safety factor and design proof load requirements of the MLA shall be verified by analysis, certified and tested by the contractor. Testing shall be accomplished using the parameters in MIL-STD-1365 as modified in 3.2.5. Place specified proof load on the lifting device with all adapters including bomb bars installed. Hoist / gantry shall be tested with load at lowest position and at middle of overhead beam. Stands, cradles, adapters etc. shall be loaded as specified in 3.2.5. Loads shall be applied for not less than 10 minutes. At completion of test, there shall be no evidence of distortion, cracks, deformation or other defects.

4.3 Design and Construction

4.3.1 Materials, Processes, and Corrosion Resistance

The corrosion resistance of the materials used shall be evaluated during the testing specified in 4.2.4. Verification that toxic materials and processes have been avoided shall be by contractor certification and inspection.

4.3.1.1 Metals

The presence and adequacy of the required treatment of metallic surfaces and joints shall be determined by inspection, analysis and contractor certification

4.3.1.2 Dissimilar Metals

The requirement of 3.3.1.2 shall be verified by inspection and contractor certification.

4.3.1.3 Standard and Commercial Parts

The extent of the use of COTS parts shall be determined by inspection.

4.3.1.4 Identification and Marking

Verification that the MLA is marked in accordance with MIL-STD-130M shall be determined by inspection.

4.3.1.5 Hardware Protection

Verification of adequate protection of hardware shall be by inspection and demonstration.

4.3.1.6 Electrical Shock

Verification of adequate protection from electrical shock shall be by inspection and demonstration.

4.3.2 Workmanship

Verification that the MLA meets the requirements of 3.3.2 shall be by inspection. Verification that the welding has been performed in accordance with the stated specifications shall be accomplished by an American Welding Society-certified welding inspector.

4.3.3 Interchangeability

Interchangeability of piece parts and major components shall be verified by inspection and demonstration.

4.3.4 Safety

The safety of the MLA shall be verified by an analysis of the design data, a review of the overall test results, and physical inspections to compare with the guidance and requirements in MIL-STD-882 and 3.3.4.

4.4 Personnel

The MLA shall be inspected by experienced government munitions handling equipment personnel who will evaluate the level of difficulty involved in operating the system and who will assess the level of training that would be required for operation and maintenance by personnel with the specified skill codes.

4.5 Human Factors Engineering

Verification of compliance with MIL-STD-1472 shall be determined by inspection and certification.

4.6 Hazardous Materials

Verification of compliance with requirements of 3.6, 3.6.1 and 3.6.2 shall be determined by inspection and certification.

5.0 PREPARATION FOR DELIVERY

5.1 Packaging and Preservation

Packaging and preservation shall be best commercial practice for shipment from the contractor's facility to CONUS and overseas bases.

5.2 Markings

In addition to any special marking required by the contract, the packages and shipping containers shall be marked in accordance with requirements of MIL-STD-129.