MILITARY STANDARD

LAUNCHER, RAIL, GUIDED MISSILE
AIRCRAFT, GENERAL DESIGN CRITERIA FOR

TO ALL HOLDERS OF MIL-STD-2156(AS):

1. THE FOLLOWING PAGES OF MIL-STD-2156(AS) HAVE BEEN REVISED AND SUERPSEDE THE PAGES LISTED:

NEW PAGE	DATE	SUPERSEDED PAGE	DATE
iii	20 December 1985	iii	4 April 1983
iv	4 April 1983	iv	REPRINTED WITHOUT CHANGE
1	4 April 1983	1	REPRINTED WITHOUT CHANGE
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2. RETAIN THIS NOTICE AND INSERT BEFORE TABLE OF CONTENTS.

3. Holders of MIL-STD-2156(AS) will verify that page changes and additions indicated above have been entered. This notice page will be retained as a check sheet. This issuance, together with appended pages, is a separate publication. Each notice is to be retained by stocking points until the military standard is completely revised or canceled.

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Supersedes page iv of 4 April 1983.

1. SCOPE

1.1 Scope. The purpose of this document is to provide guidelines for establishing general criteria for the design, development, construction, maintenance and testing of a rail launcher. This standard applies to all rail launchers including those which mount directly to the aircraft structure and those supported by a 14-inch or 30-inch suspension system per MIL-A-8591.

Supersedes page 1 of 4 April 1983.

2. REFERENCED DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. Unless otherwise specified, the following specifications, standards, and handbooks of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation form a part of this standard to the extent specified herein.

SPECIFICATIONS

FEDERAL

L-P-383	Plastic Material, Polyester Resin, Glass Fiber Base, Low Pressure Laminated.
QQ-A-367	Aluminum Alloy Forgings.
QQ-P-416	Plating, Cadmium (electrodeposited).

MILITARY

DoD-D-1000	Drawings, Engineering and Associated Lists.
MIL-S-5002	Surface Treatments and Metallic Coatings for Metal Surfaces of Weapons Systems.
MIL-B-5087	Bonding, Electrical, and Lightning Protection, for Aerospace Systems.
MIL-W-5088	Wiring, Aircraft, Selection and Installation of.
MIL-C-5541	Chemical Films and Chemical Film Materials for Aluminum and Aluminum Alloys.
MIL-H-5606	Hydraulic Fluid, Petroleum Base, Aircraft, Missile and Ordnance.
MIL-C-6021	Casting, Classification and Inspection of.
MIL-E-6051	Electromagnetic Compatibility Requirements, Systems.
MIL-H-6088	Heat Treatment, Aluminum Alloys.
MIL-H-6875	Heat Treatment of Steels (Aircraft Practice) Process for.
MIL-F-7179	Finishes and Coatings, General Specification for Protection of Aerospace Weapons, Structures and Parts.
MIL-F-7190	Forgings, Steel, for Aircraft and Special Ordnance Applications.

2.1.2 Other Government publications. The following other Government publications form a part of this standard to the extent specified herein.

PUBLICATIONS

MILITARY

MIL-BUL-147	Specifications and Standards of Non-Government Organizations Released for Flight Vehicle Construction.

NAVAL AIR SYSTEMS COMMAND (NAVAIR)

AR-43	Electromagnetic Compatibility Advisory Board; Requirement for.
SD-24	General Specification for Design and Construction of Aircraft Weapons Systems.
WR-62	Naval Weapons Requirements, Specifications and Standards; Use of.
00-35-QG-016	Consumable Common GSE for all Types, Classes and Models of Aircraft.
19-1-127	Non Avionics Preferred Common Support Equipment.
19-15BD-6	Technical Manual, "Description, Operation, and Maintenance Instruction with Illustrated Parts Breakdown for Single Hoist Ordnance Loading System (SHOLS)."
19-100-1.1 19-100-1.2	Approved Handling Equipment for Weapons and Explosives, Volumes 1 and 2.
19-100-2	Airborne Weapons Handling Equipment (Shipboard).

CHIEF OF NAVAL OPERATIONS

OPNAVINST 4790.2	Naval Aviation Maintenance Program.

AIR STANDARDIZATION COORDINATING COMMITTEE - AIR STANDARDS

AIR STD 20/16	Design Guide to Preclude Hazards of Electromagnetic Radiation to Airborne Weapon Systems.
AIR STD 20/18	Laboratory Tests for Stores Suspension Equipment.

(Copies of specifications, standards, handbooks, drawings, and publications required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

2.2 Order of precedence. In the event of a conflict between the text of this standard and the references cited herein, the text of this standard shall take precedence.

3. DEFINITIONS

3.1 Missile launcher. An item rigidly attached to an aircraft to carry, service, launch and jettison air-launched missiles.

3.2 Air-launched missile. A guided, self-propelled store designed to be launched from an airborne vehicle and whose target is either airborne, on the ground or under the water surface.

3.3 Rail launcher. A launcher containing rails on which the missile is carried, and along which the missile travels after initiation of the missile's self-propulsion system.

3.4 Ejection launcher. A launcher which provides an initial source of energy to adequately displace the missile from the aircraft prior to the initiation of the missile's self-propulsion system.

3.5 Launch. The intentional separation of the missile from the aircraft for normal employment of the missile.

3.6 Jettison. The intentional separation of the launcher or the launcher/missile from the aircraft in a safed/unarmed condition.

3.7 Arming. The process of removing the safety devices and closing the signal paths necessary to allow firing of the missile motor or detonation of the missile warhead.

3.8 Safe separation. The parting of a missile from an aircraft without damage to, contact with or adverse effects on the aircraft, its launchers and other weapons.

3.9 Acceptable separation. Acceptable store separations satisfy not only safe separation criteria but also pertinent operational criteria to meet guidance control and trajectory requirements.

3.10 Hung Missile. A missile which does not separate from the launcher when the launch cycle is initiated.

3.11 Loading. The operation of installing missiles on the launcher and aircraft.

3.12 Suspension system. Launcher elements which engage the missile to react missile triaxial forces and moments, and generally consist of a launcher rail, support structure, snubbing provisions and longitudinal restraint device.

3.13 Missile snubbing device. A device for maintaining rigidity between the missile and the launcher rail.

3.14 Release system. The release system normally consists of the missile propulsion system and a launcher detent mechanism.

3.15 Detent mechanism. A launcher mechanism for providing longitudinal restraint to the missile.

Supersedes page 6 of 4 April 1983.

All loading and off-loading or related equipment attachment or installation points must be clearly marked and identified as to proper usage. For Navy aircraft applications, any launcher loading attachments or hoisting components shall be capable of withstanding a vertical limit loading of 2.67 g and carrier roll rates of ±20 degrees with a 17-second period and pitch of ±3 degrees with an 8-second period. The launcher/missile interface shall be compatible with the controls, load application range, and operational requirements of current applicable U.S. inventory support equipment including the Single Hoist Ordnance Loading System (SHOLS).

5.1.1 Support Equipment. The launcher shall be designed so as to be capable of being installed, tested, serviced and maintained using standard support equipment (SE) and hand tools. Use of common hand tools shall be maximized. Special SE may be identified for the above functions only when required and approved by NAVAIR. All standard and special SE shall be identified and grouped by maintenance level (Organizational and Intermediate) according to the recommended maintenance actions. Common tools and support equipment are specified in NAVAIR 00-35-QG-016 and NAVAIR 19-1-127. Common Navy support equipment for the transporting of empty and full launchers is illustrated in NAVAIR 19-100-1.1 and NAVAIR 19-100-2.

5.2 Launcher structure. The launcher shall be capable of withstanding missile captive flight, launch and jettison loads and moments and shall transmit these from missile attach points to the aircraft through the shortest possible load paths. The launcher shall provide restraint to the captive missile against aerodynamic and inertia loads produced in the vertical, lateral and longitudinal axes and shall, if required, incorporate simplified anti-sway devices to prevent relative motion between the missile and the launcher. The structure shall be rigid enough to maintain the alignment requirements of 5.5.

5.3 Launcher to aircraft interfaces. When the launcher is hard-mounted to the aircraft structure, the launcher support bolt pattern shall conform to that of the LAU-7 launcher unit, and the electrical connectors shall be in compliance with MIL-STD-1760. Design loading requirements shall be in accordance with MIL-A-8591. For all rack mounted launchers, the physical interfaces shall comply with MIL-STD-2088, design loading requirements shall be in accordance with MIL-A-8591, and the electrical interfaces shall comply with MIL-STD-1760.

5.4 Launcher-to-missile physical interfaces. The launcher-to-missile electrical interfaces shall comply with MIL-STD-1760. Design loading requirements shall comply with MIL-A-8591.

5.5 Launcher interface alignment. The launcher shall provide boresight alignment of the missile consistent with aircraft/missile guidance requirements and as specified in the detailed specification. As a guideline, the misalignment of the missile and aircraft reference lines for each of the pitch, roll and yaw axes shall not exceed ±0.002 radian maximum (3σ).

5.6 Suspension and release system. The launcher suspension and release system shall provide positive, locked retention of the missile and shall release the missile only upon deliberate launch command or by proper manual release procedures. The launcher suspension system shall be designed to mate with available missile support hooks/hangers and to satisfy installation geometry requirements imposed by the aircraft weapon station.

5.6.1 Suspension rail. The basic launcher structure shall consist of a rail beam that engages the missile hooks/hangers and allows for free longitudinal motion of the missile and restrains it against all other forces and moments.

5.6.2 Restraint system. The restraint system shall consist of a detent assembly which prevents longitudinal motion of the missile. The detent assembly shall include an electromechanical locking device to prevent motion of the detent latch and inadvertent release of the missile. Missile motion occurs when the locking device is removed, permitting detent latch override when the missile motor thrust reaches a prescribed level. Upon command from the aircraft, the interlock system shall be capable of unlocking the detent latch and completing the motor firing circuit. In the event of an abortive missile release, the interlock system shall provide automatic relocking of the detent latch and interruption of the motor firing circuit. In addition, if the motor inadvertently fires, the launcher may fail or be damaged, but shall retain the missile. The probability of inadvertent motor fire signal while in a locked condition shall be less than 1×10^{-6}. Also, the launcher restraint system shall be designed for crash safety conditions. During a normal launch, the detent latch mechanism shall be designed to return to its locked position after the missile has left the launcher. The restraint system shall be designed to permit quick and easy loading and downloading of the missile and to facilitate on-aircraft serviceability checks during ground operation.

5.6.3 Missile snubbing. Snubbers are used to eliminate all sway of the missile in the launcher during captive flight. Snubbers shall be designed so that this rigidity is removed by first missile motion during launch to allow free motion of the missile along the rail. Snubbers shall be easily releaseable during downloading.

5.7 Umbilical system. The launcher shall have provisions for an integral electrical umbilical system which mates with the missile and aircraft electrical connectors and transmits electrical signals to and from the aircraft and missile. Mating of the missile/launcher electrical connectors shall be manually or automatically accomplished, but either shall be possible after and while the missile is latched to the launcher. Connectors are to comply with applicable portions of 4.2.1.9. The launcher half of the electrical umbilical at the launcher/missile interface shall be protected so that when the launcher is not loaded with a missile, foreign substance contamination and possible electric shock to personnel are prevented.

5.8 Signal management system. The signal management system shall be capable of modifying all signals from external sources to supply the type and quantity required by the applicable missiles during ground operation and checkout, captive flight, and launching sequence. The system shall have appropriate short circuit and overload protection, and shall meet performance requirements under all applicable environments.

5.9 Fuzing and arming control. The launcher shall contain provision for mechanically or electrically initiating the missile's electromechanical arming system for arming the missile motor and missile warhead.