INCH-POUND

MIL-STD-913A
3 February 1997
SUPERSEDING
MIL-STD-913
3 January 1991
(see 6.5)

DEPARTMENT OF DEFENSE
DESIGN CRITERIA STANDARD

REQUIREMENTS FOR THE CERTIFICATION OF SLING LOADED MILITARY EQUIPMENT FOR EXTERNAL TRANSPORTATION BY DEPARTMENT OF DEFENSE HELICOPTERS

AMSC N/A

AREA 1670

FOREWARD

1. This standard is approved for use by all Departments and Agencies of the Department of Defense.

2. This military standard delineates the requirements and procedures for the certification of sling loaded military equipment for external transportation by Department of Defense (DoD) helicopters. Per the Joint Logistics Commanders Memorandum of Agreement on External Helicopter Transported Loads, dated 23 September 1987, the engineering agency assigned responsibility for certifying all DoD external loads to the U.S. Army Natick Research, Development, and Engineering Center, ATTN: SSCNC-UTE, Natick, MA 01760-5017.

3. Helicopter sling loading (HSL) is a mode of transportation by which an item(s) is suspended beneath a rotary wing aircraft for the purpose of transporting the item(s). The primary application of HSL by helicopter is short range, tactical transport missions. The deployment of equipment by HSL offers many advantages which include:

a. The ability to handle heavy, oversized or bulky cargo.
b. The ability to reach areas inaccessible by ground transportation.
c. Faster transit times than conventional ground transportation.
d. Independence from ground transportation conditions (i.e., congestion, battle damage, terrain, size restrictions).
e. Unrestricted flight routes allowing use of diversionary tactics to enhance ground unit security.
f. Relatively fast rigging and derigging times of most items allowing for immediate use upon delivery.

4. The requirements of this military standard are intended to be consistent with the requirements of MIL-STD-209, Interface Standard for Slinging and Tiedown Provisions for Lifting and Tying Down Military Equipment, with regard to HSL. The design and testing of lifting points should attempt to envelope the requirements of both military standards.

5. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: U.S. Army Natick Research, Development, and Engineering Center, Natick, MA 01760-5017 by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

CONTENTS

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1. SCOPE

* 1.1 Scope. This standard covers design, testing and performance requirements of military equipment for Helicopter Sling Loading (HSL) by Army, Navy, Marine Corps, and Coast Guard rotary wing aircraft. The complete air transportability requirements for an item of equipment not specified herein shall be specified in the individual equipment specification.

* 1.2 HSL certification. Although lifting and tie-down point design criteria for military equipment are specified in MIL-STD-209 and MIL-STD-814, as well as in documents pertaining to specific types of items (i.e., shelters and other containers), items to be certified for sling loading by rotary wing aircraft must meet the requirements of this standard. Since items of equipment will also be transported via modes other than rotary wing aircraft, lifting and tie-down provisions for such equipment shall also meet the requirements of any other applicable standards pertaining to lifting and/or tiedown.

1.3 Applicability. This standard applies to the following:

* a. All new developmental, non-developmental, and military-adapted commercial items with HSL requirements.

* b. Modified equipment with HSL requirements, when modifications result in changes to the following:

(1) Item weight.
(2) Center of Gravity (CG) location.
(3) Lift provisions.
(4) Projected frontal area.

1.4 Metric equivalents. Metric equivalents shall conform to FED-STD-376.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in section 4 of this standard. This section does not include documents cited in other sections of this standard or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections 3, 4 and 5 of this standard, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation (see 6.2).

STANDARDS

MILITARY

MIL-STD-209 - Interface Standard for Slinging and Tiedown Provisions for Lifting and Tying Down Military Equipment.

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

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. DEFINITIONS

3.1 Design limit load. The applied force (the static load times the load factor) which a slinging provision, including its supporting structure, can withstand without set. The design limit load is to be used in proof-load testing.

* 3.2 Helicopter sling loading (HSL). A mode of transportation by which an item(s) is suspended beneath a rotary wing aircraft for the purpose of transporting the item(s).

* 3.3 Helicopter sling load weight (HSLWT). The specified weight of the item to be transported. HSLWT is used to calculate the HSLWT to Maximum Protected Frontal Area (MPFA) ratio and the corresponding materiel lift point load factor (see 5.2.1). The current maximum allowable HSLWT is 36,000 pounds.

* 3.4 Flight test. A test in which the item is rigged in its HSL configuration and flown through specific maneuvers by military rotary wing aircraft.

3.5 Slinging provision. A point of attachment used for lifting the item. It is typically a padeye, lug, or ring.

* 3.6 Materiel lift point load factor. A multiplier of the static load used to calculate the design limit load. This load factor is a function of the HSLWT and the HSLWT/MPFA ratio.

3.7 Maximum projected frontal area (MPFA). For a single point load, the maximum area projected on a vertical plane as the item is rotated about a vertical axis through the aircraft hook; for a dual point load, the maximum projected area on a vertical plane in the direction of flight (see Figure 1).

3.8 Non-standard lifting component. Any non-type classified load bearing equipment that is required for rigging and lifting.

3.9 Proof-load test. A test in which the slinging provision and item is subjected to the design limit load.

3.10 Sling loads.

* 3.10.1 Accompanying sling load. A load which is suspended beneath a primary item, for the purpose of being transported with the primary item via HSL (such as a cargo bag, or ammunition container) or stored/attached on the item.

3.10.2 Dual point sling load. Item(s) which is/are suspended from two single hooks on the aircraft.

3.10.3 Multiple sling loads. Two or more single point loads, suspended from separate hooks, transported simultaneously by a single aircraft.

3.10.4 Single point sling load. Item(s) which is/are suspended from a single hook on the aircraft.

3.10.5 Tandem sling load. A load consisting of two separate items of equipment, which are connected in tandem. An example of a tandem load is a prime mover and trailer combination.

* 3.11 Static lift test. A test in which the item is suspended in the proposed HSL rigged configuration without movement.

* 3.12 Static load. The resultant load imposed on a lifting provision under static lift test conditions with the item at its maximum HSLWT.

3.13 Ultimate load. The maximum force that a lifting provision, including its connecting structural members, can sustain without total failure.

4. GENERAL REQUIREMENTS

4.1 Slinging provisions.

* 4.1.1 Number. The number of slinging provisions shall conform to the requirements as specified in MIL-STD-209.

4.1.2 Location of lift provisions. The location of slinging provisions shall conform to the requirements as specified in MIL-STD-209.

* 4.1.3 Dimensions. Slinging provisions shall conform to the dimensions as specified in MIL-STD-209.

* 4.1.4 Frame attachments. Frame members shall not be used as lifting points, unless specifically designated for that purpose. Frame members designated for lifting shall meet the requirements of the proof-load testing in 5.2 and shall provide a means of restricting movement of the sling legs along the frame member.

* 4.1.5 Spreader bars. Spreader bars shall be certified for use in HSL by the U.S. Army Natick Research, Development and Engineering Center. Spreader bars shall meet the following requirements:

* a. Spreader bars or other load spreading equipment shall be specified in the new equipment specification.

* b. Stowage provisions shall be provided on the item by the contractor to ensure such devices remain with the item.

c. Wooden spreader bars and/or other devices which are to be locally fabricated shall not be permitted under any circumstances.

* d. All devices shall meet the requirements in 5.2.4.

4.2 Rigging Procedures.

4.2.1 Sling Sets. The following standard military sling sets and components shall be used for rigging:

TABLE I. Military sling sets

SERVICE TYPE	SLING SET CAPACITY, LB	NSN	SLING LEG CHARACTERISTICS LIMIT LOAD, LB	LENGTH, FT.
ARMY ROPE	10,000	1670-01-027-2902	11,300	12-16
ARMY ROPE	25,000	1670-01-027-2900	22,500	12-16
MARINE CORPS WEB	15,000	1670-00-902-3080	26,700	15-18
MARINE CORPS ROPE	40,000	3940-01-183-2118	39,800	12-16

* 4.2.2 Minimum sling leg clearance. The following clearances are required between sling legs and the item of equipment. If minimum clearances cannot be met, padding of the sling legs and/or proof-load testing of potential contact area will be required, in accordance with the proof-load testing of 5.2.

4.2.2.1 Rope type sling legs. A minimum clearance of 1 inch shall be maintained between rope type (round cross-section) sling legs and the load.

4.2.2.2 Webbing type sling legs. A minimum clearance of 8 inches shall be maintained between webbing type (flat cross-section) sling legs and the load.

4.2.3 Non-standard lifting components. Non-standard (non-type classified) lifting components are not permitted unless approved by the U.S. Army Natick Research, Development, and Engineering Center and specified in the new equipment specification.

4.2.4 Drag inducing devices. Drag inducing devices such as drogue chutes are not permitted unless approved by the U.S. Army Natick Research, Development, and Engineering Center.

4.2.5 Tandem sling loads. The following requirements shall apply to all items of equipment rigged as tandem sling loads:

a. Each item of equipment shall meet the requirements of this standard.

b. All devices required and used for attaching tandem sling loads together shall meet the requirements of this standard and shall be proofload tested in accordance with the requirements in 5.2.

c. All tandem sling loads require flight testing in the tandem rigged configuration.

* 4.3 Static lift testing. Static lift testing for each proposed lifting configuration shall be conducted in accordance with 5.1. Static lift testing consists of lifting the item in the proposed rigging configuration to verify sling leg clearances and to determine sling leg angles and lift point loading.

* 4.4 Proof-load testing. Proof-load testing for all slinging provisions, interference points, and load bearing components required for lifting, shall be conducted in accordance with 5.2. Proof- load testing consists of a static pull test or compression test of each slinging provision or component to verify structural adequacy.

* 4.5 Flight testing. Flight testing for each item while in its proposed lifting configuration and by each specified aircraft shall be conducted in accordance with 5.3. Flight maneuvers shall be performed and test results documented in accordance with the Multi-Service Flight Data Collection Sheet (MSFDCS).

5. DETAILED REQUIREMENTS

5.1 Static lift testing. The following requirements shall apply to all static lift testing:

a. The item shall maintain stability while suspended in the rigged configuration.

b. The maximum sling leg tension (static load times the materiel lift point load factor) shall not exceed the sling leg design limit load as specified in table I for the proposed sling set. The static load is determined by the static lift test or by mathematical analysis. All load calculations shall be performed using the sling

leg angles of the proposed rigging configuration.

* c. The sling legs shall meet the clearance requirements of 4.2.2. Structural members which contact a sling leg in the rigged configuration shall be proof-load tested, in accordance with 5.2.

d. For dual point configurations, the weight distribution of the item shall meet the dual point weight balance requirements of the specified lifting aircraft (e.g., no more than 60 percent of the total load on either hook for the CH-53E helicopter).

5.2 Proof-load testing.

* 5.2.1 Materiel lift point load factor. The materiel lift point load factor shall be calculated using table II and is a function of the HSLWT and the HSLWT/MPFA ratio. For items of equipment with cargo carrying capability, the materiel lift point load factor shall be calculated for the minimum and maximum possible HSLWT (e.g., curb weight and gross vehicle weight).

* a. For a HSLWT/MPFA ratio greater than or equal to 60 pounds per square foot, the materiel lift point load factor is a function of HSLWT in accordance with table II.

* b. For an HSLWT/MPFA ratio between 45 and 60 pounds per square foot, the materiel lift point load factor of table II shall be increased by [0.16 (60-(HSLWT/MPFA))].

* c. For an HSLWT/MPFA ratio of less than or equal to 45 pounds per square foot, the materiel lift point load factor of table II shall be increased by 2.4.

* TABLE II. Calculation of materiel lift point load factor.

HSLWT LB / MPFA, FT^2	HSLWT, LB	MATERIEL LIFT POINT LOAD FACTOR
$\geq$ 60	< 5,000	3.5
$\geq$ 60	5,001 - 15,000	3.2
$\geq$ 60	15,001 - 36,000	3.2- (0.000038 (HSLWT - 15,000))

5.2.2 Calculation of the design limit load. The design limit load is the maximum resultant product of the materiel lift point load factor multiplied by the static load, for the worst case loading condition.

* 5.2.3 Proof-load testing requirements. Proof-load testing consists of a static pull test or compression load test, to the design limit load of 5.2.2, in accordance with the requirements of MIL-STD-209. The following requirements shall also apply to all proofload testing for HSL certification:

a. The application of proof-load shall be in the direction of the sling leg when the item is in its proposed rigged configuration.

* b. All structural members which contact the sling legs shall be compression tested to the actual contact load multiplied by the Materiel Lift Point Load Factor.

* c. Load spreading devices, subject to compressive buckling, shall not fail when compression tested to 1.5 times the design limit load.

5.2.4 Ultimate load verification. Analysis and/or testing shall be performed to verify ultimate load capability.

5.3 Flight testing. The following requirements shall apply to all flight testing:

* a. All maneuvers specified by the Multi-Service Flight Data Collection Sheet (MSFDCS) shall be performed without exceeding flight manual restrictions.

b. The item shall demonstrate stability during all maneuvers performed during the flight test.

* c. The item shall not sustain any damage due to flight and shall be mission capable upon completion of the flight test.

d. The results of the flight test shall be documented on the MSFDCS.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory).

* 6.1 Intended use. This standard covers design, testing and performance requirements of sling loaded military equipment for external transportation by Army, Navy, Marine Corps,

and Coast Guard helicopters.

* 6.2 Issue of the DoDISS. When this standard is used in acquisition, the applicable issue of the DoDISS must be referenced in the solicitation (see 2.2.1.).

* 6.3 Waivers. Waivers to this standard with regard for HSL, shall not be granted except by the U.S. Army Natick Research, Development and Engineering Center.

6.4 International standardization agreements. Certain provisions of this standard are the subject of international standardization agreements (QSTAG-328, AS Air Standard 44/21, and STANAG-3548). When change notice, revision, or cancellation of this standard is proposed that will modify the international agreements concerned, the preparing activity will take appropriate action through international standardization channels, including departmental standardization offices, to change the agreement or make other appropriate accommodations.

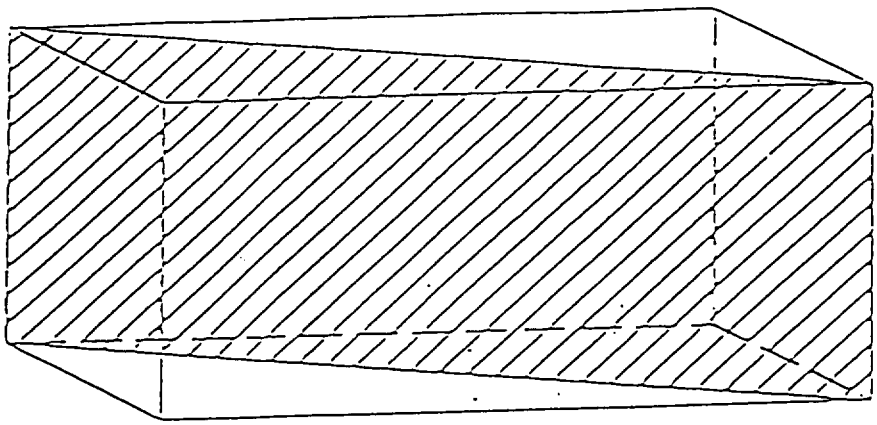
* 6.5 Supersession data. The title of this standard is different from the previous revision. The title of the previous revision is Requirements for the Certification of Externally Transported Military Equipment by Department of Defense Rotary Wing Aircraft.

6.6 Subject term (key word) listing.

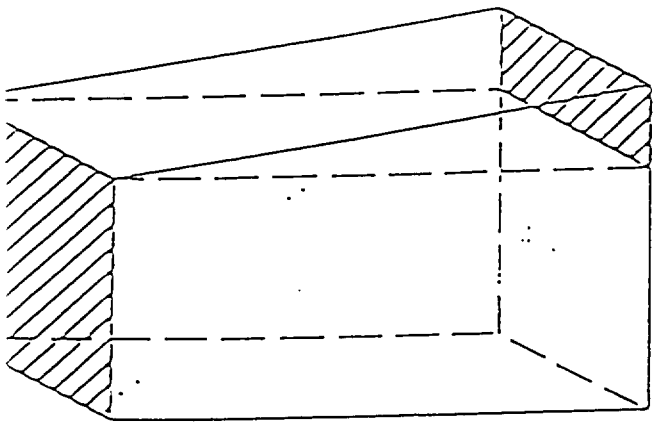
External air transport
Helicopter
Sling loading

* 6.7 Changes from previous issue. The margins of this specification are marked with asterisks to indicate where changes from the previous issue were made. This was done as a convenience only, and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationships to the last previous issue. This standard was revised for the purpose of converting it to an interface standard. No significant changes have been made to requirements.

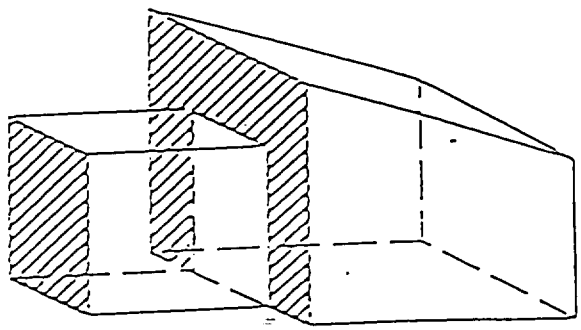
Maximum projected frontal area (MPFA) denoted by shaded areas



Single point lift (all directions of flight)



Dual point lift



Tandem load (dual point lift)

Direction of flight

FIGURE 1. Maximum protected frontal area

Custodians:

Army - GL
Navy - AS

Preparing activity:

Army - GL

(Project 1670- 0870)

Review activities:

Army - AR, AV,AT, CR, SM, TE
Navy - SA, MC

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

I RECOMMEND A CHANGE:	**1. DOCUMENT NUMBER** MIL-STD-913A	**2. DOCUMENT DATE (YYMMDD)** 970203

3. DOCUMENT TITLE Requirements for the Certification of Sling Loaded Military Equipment for External Transportation by Department of Defense Helicopters

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME *(Last, First, Middle Initial)*	b. ORGANIZATION	
c. ADDRESS *(Include Zip Code)*	d. TELEPHONE (Include Area Code) (1) Commercial (2) AUTOVON *(if applicable)*	**7. DATE SUBMITTED** (YYMMDD)

8. PREPARING ACTIVITY

a. NAME U.S. ARMY NATICK RD & E CENTER	b. TELEPHONE *Include Area Code)* (1) Commercial (508) 233-5175 (2) AUTOVON 256-5175
c. ADDRESS *(Include Zip Code)* COMMANDER COMMANDER, U.S. ARMY NATICK RD & E CENTER ATTN: SSCNC-WEF NATICK, MA 01760-5018	**IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT:** DEFENSE QUALITY AND STANDARDIZATION OFFICE 5203 Leesburg Pike, Suite 1403, Falls Church, VA 22401-3466 Telephone (703) 756-2340 AUTOVON 289-2340