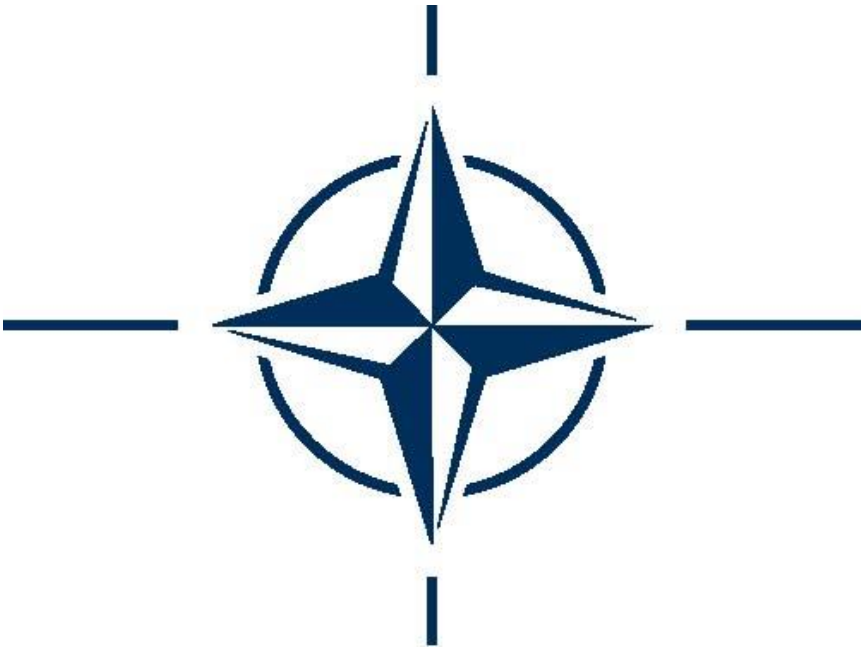
NATO STANDARD

ATP 3.2.49.2.3.

TECHNICAL CRITERIA FOR EXTERNAL CARGO CARRYING SLINGS, NETS AND STROPS/PENDANTS

Edition A, Version 1

RATIFICATION DRAFT 1
Date



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NATO LETTER OF PROMULGATION

[Date]

1. The enclosed Allied Technical Publication ATP 3.2.49.2.3. Edition A, Version 1, TECHNICAL CRITERIA FOR EXTERNAL CARGO CARRYING SLINGS, NETS AND STROPS/PENDANTS, which has been approved by the nations in the Military Committee Land Standardization Board (MCLSB), is promulgated herewith. The agreement of nations to use this publication is recorded in STANAG 2286

2. ATP 3.2.49.2.3. Edition A, Version 1, is effective upon receipt.

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4. This publication shall be handled in accordance with C-M(2002)60.

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RECORD OF RESERVATIONS

CHAPTER	RECORD OF RESERVATION BY NATIONS
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RECORD OF SPECIFIC RESERVATIONS

[nation]	[detail of reservation]
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CHAPTER 1 INTRODUCTION

1.1. TECHNICAL CRITERIA FOR EXTERNAL CARGO CARRYING SLINGS, NETS AND STROPS/PENDANTS

1.1.1. AIM

The aim of this document is to provide standardized technical criteria for the design of a family of external cargo carrying slings, nets and strops/ pendants.

This applies to slings and strops/pendants with capacities up to 20,000 kg (44,000 lbs) and nets with capacities up to 10,000 kg (22,000 lbs).

1.1.2. AGREEMENT

Participating nations agree that the criteria established by the following paragraphs will apply in the design of future external cargo carrying slings, nets and strops/pendants.

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CHAPTER 2 REQUIREMENT DETAILS

2.1. General Requirements

2.1.1. Description

Helicopter external cargo carrying slings and nets shall consist of multiple tension members. The slings when suitably arranged shall enable cargo to be externally suspended under cargo helicopters and transported from place to place. The lifting legs of the nets support a mesh assembly on which the load can be placed. Helicopters shall require a cargo hook to engage and lift the sling or the net assembly at an interface point (apex). The loads carried shall need suitable cargo attachment points. Generally, the number of suspension members making up the sling assembly shall be apex components joining four sling legs which connect to four suspension points on the load. In the case of multi-hook helicopters, more than one apex component may be utilized with four or more sling legs connecting to the load. The apex also collects and connects the lifting legs for interface with the helicopter. Strops/pendants cover various configurations of a single leg lifting lines installed between the helicopter primary cargo hook and sling apex fitting so as to increase the distance between the helicopter and the external load, either in flight or during hook-up operations and to allow the load to swivel.

2.1.2. Load Limits

The families of external cargo carrying slings, nets and strops/pendants as defined herein comprise different capabilities to transport cargo by helicopter with externally slung loads or nets. Individual design of sling components or different nets categories are necessary to allow optimization between sling or net size, type or weight of load and helicopter capability.

2.1.3. Sling Leg Length

Definition: The leg length shall be considered to be from the attachment point at the bottom of the apex component to the attachment point of the end of the leg.

2.2. Design of slings

The slings shall be designed with four major components areas: Apex, Sling Legs, Length Adjustment and Load Attachment. Length adjustment and load attachment components may be combined into one component or subassembly. The design shall be such that sling legs may be varied in number for special cargo or helicopter situations.

2.2.1. Apex

Apex components shall gather the sling legs and interface with the helicopter hook / secondary hook. The design shall allow easy removal and reassembly of sling legs. The static weight of the apex, with a minimum of one leg used as ballast shall be capable of pulling free from the helicopter hook / secondary hook when pilot / crew releases the sling with the load resting on the ground. However, the apex shall be lightweight to aid in manual hook-up effort and also to minimize damage to loads when pilot releases the sling. Proper orientation of apex to helicopter hook/secondary hook shall be marked on the apex or completely addressed in field manuals.

2.2.2. Sling Legs

Normally, these are lightweight tension members of fixed length and easily varied in number in the sling assembly. Ends shall be designed for easy removal and re-assembly to apex and adjustment and / or load interface components. Legs shall be easily folded or coiled for compact storage. Tension versus elongation (hereafter called stiffness) characteristics shall be compatible for aircraft and load applications.

2.2.3. Length Adjustment Component / Assembly

This component / assembly shall be along or normally located at the bottom end of each sling leg. The design may be such as a chain and may also serve as the load attachment interface point. Increments of adjustment shall be not greater than 10 cm (4 in). Each leg shall have a minimum adjustment of 91 cm (36 in). Adjustment shall be easily locked for non-slippage.

2.2.4. Load Attachment

The design shall provide easy removal and reattachment to the load. Once attached, latches shall ensure no accidental release. All interface requirements shall be met. Abrasion between this component and load attachment point shall be minimized.

2.3. Design of nets

The nets shall be designed with three major component areas:

- Apex
- Lifting legs
- Mesh

2.3.1. Apex

Apex requirements are identical to para. 2.2.1.

2.3.2. Lifting Legs

Normally, these are lightweight tension members of nonadjustable length fixed between the mesh and the apex. Number of legs will vary from a minimum of four to as many as twenty-four around the periphery of the net mesh. Design of the leg cross-section shall be such that flutter and vibration is minimized to realize full speed capacity of the helicopter.

2.3.2. Mesh

The mesh assembly platform may be square, octagonal or circular. Individual mesh size should not exceed 20 cm in size. Intersection design shall be such that tension forces are passed through the joint with minimum loss of strength and without intersection protrusions or bulky reinforcements. Folding for storage shall be achieved by no more than two personnel. A load centering zone shall be highly visible by perimeter or area marking.

2.4. Design of strops/pendants

The strops/pendants shall normally be designed with three major component areas: Attachment Ring, Leg and Secondary Hook/Swivel. However, where distance between the helicopter and the load is not required but swivel is required it shall be acceptable to connect the attachment ring directly to the secondary hook/swivel assembly.

2.4.1. Attachment Ring

The design shall provide easy removal and reattachment to the primary hook/secondary hook. The attachment ring shall be lightweight for ease of handling and manual hook-up/release.

2.4.2. Strops/Pendants Legs

The legs shall be of lightweight material with the ends designed for easy removal and reassembly to the attachment ring and secondary hook. The legs, whether rigid or flexible, should be designed for compact storage. Length attachment shall be attaching two or more strops/pendants in series. The stiffness characteristics shall be such that at the maximum authorized number of strops the possibility of rebound damage to the helicopter is minimized in the event of the load becoming detached.

2.4.3. Secondary Hook/Swivel

The design shall provide easy removal and reattachment of the sling apex. Once attached, safety latches shall ensure no accidental release. An automatic release system may be fitted.

2.5. Materials

Lightweight materials shall be utilized where possible. Normally, the sling legs are candidates for lightweight synthetic materials such as nylon or other pliable textiles. The lifting legs and the mesh are candidates for synthetic fibers such as nylon.

The materials used should have minimum rebound characteristics so as to minimize the possibility of rebound damage to the aircraft should a sling leg become detached from a load at maximum tension.

Apex components may be metal to enable a reliable means of easy interface between the cargo hook and the lifting legs.
Apex and load attachment components must not be cause for interface damage. Stiffness should be adjusted or designed so as to minimize the effects of Pilot Induced Oscillation (PIO) and natural resonance (where known). Additionally high stiffness is not desirable because of storage problems.

The material of slings, nets and strops/pendants or rather their components must be either resistant to or protected from ultraviolet radiation and also resistant to abrasion and to internal wear from relative strand movement.

2.6. Weights

Slings, nets and strops/pendants must be handled by a minimum of personnel and manually attached to a hovering helicopter. Usually one person holds the apex above head level for quick hook engagement. Maximum allowable sling weights are based on a four legged sling assembly.

These and further data can be found in Annex A.

2.7. Strength Criteria

The sling and net components and the strops/pendants shall be capable of meeting the following conditions:

2.7.1. Static Load

The static load shall be the maximum allowable weight of the suspended cargo at one “g“. All slings, nets and strops/pendants load limits given are based on this value.

2.7.2. Dynamic Load

Cargo will experience “g“ loads in flight. The slings, nets and strops/pendants maximum allowable load factors shall be in accordance with STANAG 3542.

2.7.3. Leg Angles

Sling load limits shall be based on sling legs being rigged at an angle of 30º from the vertical. Apex components should be designed to withstand the loads this will impart upon them, based on the sling leg geometry used.

2.7.4. Load Centre of Gravity

- Single Hook Operations (SHO):
  The sling legs shall allow a minimum of a 12 % CG bias, either fore or aft.

- Tandem Hook Operations (THO):
  Special rigging conditions employing tandem hook operations or redundant sling legs shall be handled on an individual aircraft basis and does not enter into this agreement.

2.7.5. Degradation Factors

Synthetic fiber components shall be capable of meeting all prior strength requirements after degradation due to ultra-violet rays from sunlight, temperature, moisture; fatigue and shock loading throughout the service life of the equipment (see para. 2.12). Each nation shall generate its own criteria for these factors.

2.8. Marking

Slings, nets and strops/pendants shall be marked by permanent lettering and numerals. All major sling components and net metalware shall be marked in either kg or lbs for piece part lifting / safe working load limit. Net assembly load limit (actual) must be clearly marked on the net and/or its approved packaging. In connection with the marking, it should be ensured that the lifting load limit of bearing components is not impaired by affecting the surface protection and reducing the cross-section. The marking must indicate expiry date or inspection due date.

2.9. Interface

The apex components must properly attach to the helicopter hook / secondary hook. Standardized hook dimensions have been published in STANAG 3542. Proper clearance shall be allowed for easy hook-up and release. Materials of aircraft hook load beam and apex must be compatible. Sling load attachment components must properly attach to the load. Load attachment components must be compatible with the cross-sectional dimensions of the standardized slinging provisions as shown at Annex A to STANAG 3542. The slings and nets must be compatible with the strops/pendants according to the design as defined herein. Some loads may require the use of a spreader bar. This device is attached at suitable points along the sling legs and shall

prevent the legs from rubbing against or damaging the load. Swiveling devices may be used on helicopters with a single non-swiveling cargo hook and are also used on multi-hook helicopters.

2.10. Environment

Slings, nets and strops/pendants shall be capable of operating in world-wide environments. Temperature range shall be -40 °C to +66 °C (-40 °F to +150 °F). Operations shall be possible in environments including, but not limited to, the following: snow, rain, high wind (natural and helicopter induced), bright sunlight, sand, dust and salt water conditions.

2.11. Maintainability

It should be easy for qualified personnel to determine the serviceability of slings, nets and strops/pendants. At lowest user level, only replacement of parts will be required. Specialty inspection requirements shall not be necessary. Repair of damaged material must be performed by qualified personnel. The meshes shall be easily repairable at second level maintenance. At any time during use the operator must be able to verify the conditions and lifetime status of slings, nets and strops/pendants.

2.12. Reliability

Slings, nets and strops/pendants should have a life of at least 2 years from the date of assembly with normal inspection and replacement of parts prior to normal discarding and if applicable, the maximum life should be stated.

ANNEX A TO
ATP 3.2.49.2.3.

ANNEX A LOAD LIMITS

Load limits up to		Concerned material			Measurement (size of nets)		Net weight		Minimum sling leg length	Sling weight	
kg	lbs	slings	strops / pendants	nets	m between	in between	kg	lbs	m	kg	lbs
2,500	5,500	X	X	X	4.0 - 5.0	160 - 196	30	65	3.4	15	33
5,000	11,000	X	X	X	5.0 - 6.7	196 - 263	60	130	3.7	30	66
10,000	22,000	X	X	X	6.7 - 7.5	263 - 295	120	265	3.7	60	132
15,000	33,000	X	X						3.7	70	154
20,000	44,000	X	X						3.7	90	198

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