
**MULTISERVICE
HELICOPTER SLING LOAD:

BASIC OPERATIONS
AND EQUIPMENT**

DISTRIBUTION RESTRICTION: APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED

**HEADQUARTERS
DEPARTMENT OF THE ARMY
DEPARTMENT OF THE AIR FORCE
DEPARTMENT OF THE NAVY
DEPARTMENT OF TRANSPORTATION**

HEADQUARTERS
DEPARTMENT OF THE ARMY
DEPARTMENT OF THE AIR FORCE
DEPARTMENT OF THE NAVY
DEPARTMENT OF TRANSPORTATION
Washington, DC, 10 April 1997

MULTISERVICE HELICOPTER SLING LOAD: BASIC OPERATIONS AND EQUIPMENT

PREFACE

Note: Effective 1 October 1997 all Army loads will require an inspection by a qualified Sling Load Inspector. See Appendix I.

This manual is one of a series of manuals for aviation and ground personnel who perform helicopter sling load missions ashore or aboard ship. Other manuals in this series are FM 55-450-4/FMFRP 5-31, VOL II/NWP 42-1, VOL II/AFR 50-16, VOL II/COMDTINST M13482.3 and FM 55-450-5/FMFRP 5-31, VOL III/NWP 42-1, VOL III/AFR 50-16, VOL III/COMDTINST M13482.4.

These manuals are a coordinated effort of the US Army, US Marine Corps, US Navy, US Air Force, and US Coast Guard. All services participate in the sling load certification program begun by the Army in 1984. These manuals include standardized rigging procedures and other information from that program.

Efforts were made to standardize ground crew and hookup procedures and terminology. The terms "helicopter" and "aircraft" refer to vertical lift aircraft that participate in sling load operations. Where service-unique requirements apply to an entire chapter or body of text, the service initials are at the beginning of the chapter or text. Otherwise the initials are at the end of the applicable sentence.

The information in this manual will familiarize personnel with the sling sets, cargo nets, and other sling load equipment in the DOD inventory. It will also acquaint them with the helicopters used for sling load and provide basic procedures for rigging and hooking up loads. Rigging equipment and procedures described in this manual may not be authorized for all aircraft or services because of equipment or service restrictions. This manual does not provide details on aviation operations nor does it present detailed data that is normally contained in unit standing operating procedures (SOPs).

DISTRIBUTION RESTRICTION: Approved for public release; distribution is unlimited.

*This publication supersedes FM 55-450-3/FMFRP 5-31, VOL I/NWP 42-1, VOL I/AFR 50-16, VOL I, COMDTINST M13482.2, 11 February 1991.

**FM 10-450-3/MCRP 4-23E, VOL I/NWP 3-04.11/AFJMAN 11-223, VOL I/
COMDTINST M13482.2A**

This manual implements the following International Standardization Agreements (STANAGs):

2949 - Technical Criteria for External Cargo Carrying Slings

2950 - Technical Criteria for External Cargo Carrying Nets

3117 - Aircraft Marshalling Signals

3542 - Technical Criteria for the Transport of Cargo by Helicopter

The proponent of this publication is HQ TRADOC. Recommendations for changes or improvement to the manual are requested.

Army personnel submit DA Form 2028 (Recommended Changes to Publications and Blank Forms) to:

Aerial Delivery and Field Services Department
USA Quartermaster Center and School
ATTN: ADMMO
1010 Shop Road
Fort Lee, VA 23801-1502

Navy personnel submit recommended changes to:

Chief of Naval Operations
Code OP 506
Washington, DC 20350-2000

Marine Corps personnel submit user suggestion form to:

Commanding General
Marine Corps Combat Development Command
Doctrine Division C42
Quantico, VA 22134-5021

With a copy to:

Commanding General
Marine Corps Systems Command (PSE)
Quantico, VA 22134-5021

Air Force personnel submit AF Form 847 (Recommendation for Change of Publication) to:

HQ AFSOC/DOXT
Hurlburt Field, FL 32544-5273

Coast Guard personnel submit rapidraft letter (CG-3883) or AF Form 847 to:

Commandant (G-OAV)
US Coast Guard
2100 2nd Street SW
Washington, DC 20593

With a copy to:

Commander
Aviation Training Center (TRADIV)
Mobile, AL 36117

TABLE OF CONTENTS

		Paragraph	Page
PREFACE			i
CHAPTER 1	FUNDAMENTAL PRINCIPLES OF SLING LOAD		
	Introduction	1-1	1-1
	Employment Considerations	1-2	1-1
	Factors Affecting Helicopter Lift Performance	1-3	1-1
	Request Procedures	1-4	1-2
	Responsibilities	1-5	1-2
	Safety	1-6	1-4
	Planning	1-7	1-4
	Coordination	1-8	1-5
	Training	1-9	1-5
	Operational Risk Management	1-10	1-6
CHAPTER 2	AIRCRAFT CARGO HOOK SYSTEMS		
	Introduction	2-1	2-1
	Defining Cargo Hook Systems	2-2	2-1
	Cargo Hook Cross Designation	2-3	2-1
	Helicopter Pendant Systems (USMC, USN)	2-4	2-1
	Releasable Swivel Hook Pendant Sling	2-5	2-1
	Helicopter Cargo Hook Systems	2-6	2-2
CHAPTER 3	PERSONNEL, SUPPORT EQUIPMENT, AND PROTECTION PROCEDURES		
	Introduction	3-1	3-1
	Ground Crew	3-2	3-1
	Preparing For The Operation	3-3	3-3
	Hookup Team Responsibilities	3-4	3-3
	Personnel Briefing	3-5	3-4
	Receiving Team Responsibilities	3-6	3-4
	Personal Protective Equipment	3-7	3-5
	Discharging Static Electricity	3-8	3-5
	Ground Crew Rendezvous Point (USA)	3-9	3-8
	Hand And Arm Signals	3-10	3-9
CHAPTER 4	LANDING SITE SELECTION AND PREPARATION		
	Introduction	4-1	4-1
	Landing Zone Designation	4-2	4-1
	Landing Site Selection	4-3	4-1
	Clearing Obstacles	4-4	4-2

	Paragraph	Page
Slope of Surface	4-5	4-2
Approaches to Landing Site	4-6	4-3
Aircraft Formation Approach (USA)	4-7	4-6
Marking Landing Points	4-8	4-11
Marking Obstacles	4-9	4-11
CHAPTER 5	HOOKUP AND RELEASE PROCEDURES AND RELATED OPERATIONS	
Introduction	5-1	5-1
General Hookup Procedures	5-2	5-1
Safety Precautions for Hookup Personnel	5-3	5-6
Load Release Procedures	5-4	5-6
Dual-Point Hookup Procedures	5-5	5-6
Multiple Single-Point Load Preparation	5-6	5-7
Piggyback/Accompanying Loads	5-7	5-7
Extended Sling System	5-8	5-7
Cargo Hook Loading Pole	5-9	5-9
Cold Weather Operations	5-10	5-10
Desert Operations	5-11	5-11
Night Operations	5-12	5-12
Shipboard Operations and Safety Procedures	5-13	5-12
CHAPTER 6	CARGO SLINGS	
Introduction	6-1	6-1
Request for Waivers	6-2	6-1
10,000- and 25,000-Pound Capacity Sling Sets	6-3	6-1
15,000-Pound Capacity Nylon and Chain Multileg Sling Set	6-4	6-10
40,000-Pound Capacity Sling Set	6-5	6-18
Nylon Flat-Web Slings	6-6	6-21
CHAPTER 7	CARGO NETS	
Introduction	7-1	7-1
Flat-Web Nylon Cargo Net	7-2	7-1
5,000- and 10,000-Pound Capacity Knotless Nylon Cord Cargo Nets ...	7-3	7-2
Placing All Netted Loads for Pickup	7-4	7-6
CHAPTER 8	A-22 CARGO BAG, PALLET SLINGS, PENDANTS, AND SUPPLEMENTAL EQUIPMENT	
Introduction	8-1	8-1
A-22 Cargo Bag	8-2	8-1
Pallet Slings	8-3	8-3
Reach Pendants	8-4	8-6
Vertical Pendants	8-5	8-7
Supplemental Equipment	8-6	8-9

	Paragraph	Page
CHAPTER 9 VERTICAL REPLENISHMENT (USN, USMC, USCG)		
	Introduction	9-1 9-1
	Vertical Replenishment Aircraft	9-2 9-1
	Coast Guard Dangerous Cargo Vertrep	9-3 9-1
	Factors Affecting VERTREP	9-4 9-1
	Vertical Replenishment Equipment	9-5 9-2
	Load Preparation	9-6 9-4
	Weight and Identification of Loads	9-7 9-6
	Attaching Slings to Loads	9-8 9-7
	Cargo Staging	9-9 9-9
	Static Electricity Discharge Wand	9-10 9-10
	Load Transfer Procedures	9-11 9-10
	Load Delivery	9-12 9-11
	Clearing the VERTREP Area	9-13 9-11
	Safety	9-14 9-12
	Night VERTREP	9-15 9-13
	Night VERTREP Procedures	9-16 9-13
APPENDIX A	HAND-AND-ARM SIGNALS	A-1
APPENDIX B	NATIONAL STOCK NUMBERS FOR SLINGS, NETS, AND SPARE PARTS	B-1
APPENDIX C	SLING CONVERSION CHARTS	C-1
APPENDIX D	FABRICATION OF A FIELD EXPEDIENT STATIC DISCHARGE WAND	D-1
APPENDIX E	SLING LOAD OPERATION CHECKLIST (USMC HELICOPTER SUPPORT TEAM)	E-1
APPENDIX F	ZONE INSPECTION, PLANNING, PREPARATION, AND OPERATION (ZIPPO) EVALUATION BRIEF FORMAT (NWP 55-9-ASH)	F-1
APPENDIX G	MC-140 HELMET, COMPONENT LISTING (USMC HST) TAMCN C4992	G-1
APPENDIX H	AIR FORCE (TAC) UNIT EQUIPMENT REQUIREMENTS	H-1
APPENDIX I	SLING LOAD INSPECTION RECORD	I-1
APPENDIX J	RECOMMENDED SLING LOAD TRAINING	J-1
GLOSSARY	Section 1. Acronyms and Abbreviations Section 2. Terms	Glossary-1 Glossary-2
REFERENCES		References-1

CHAPTER 1

FUNDAMENTAL PRINCIPLES OF SLING LOAD

1-1. INTRODUCTION

The helicopter sling load method of carrying cargo and equipment overcomes many of the obstacles that hinder other modes of movement. Helicopter sling load operations are used extensively in the ship-to-shore movement of cargo and equipment during amphibious operations, movement of supplies and equipment over the battlefield, vertical replenishment of ships, and firepower emplacement. The purpose of this chapter is to discuss helicopter employment considerations, request procedures, responsibilities, safety, and planning for sling load missions.

1-2. EMPLOYMENT CONSIDERATIONS

a. Advantages of Sling Load. The sling load method of moving cargo and equipment has some advantages over other methods. These advantages are:

- (1) The rapid movement of heavy, outsized equipment, or emergency supplies directly to the user.
 - (a) The ability to bypass surface obstacles.
 - (b) The rapid relocation of supplies and equipment.
- (2) The use of multiple flight routes and landing sites to enhance sustainability and security of ground units.
- (3) The establishment of multiple landing sites to support the maneuvering unit requirements.
- (4) Greater movement flexibility for the ground commander to accomplish the tactical mission.

b. Limitations of Sling Load. The sling load method of Aerial Delivery includes the following drawbacks:

- (1) The weight of the load is restricted to the aircraft's operating capability.
- (2) Load instability during flight may restrict aircraft airspeed or maneuvering capabilities.
- (3) Adverse weather and darkness (low visibility) may limit sling load operations.
- (4) Atmospheric conditions (pressure, altitude, temperature, and winds) affect the helicopter's lift capacity.
- (5) A limited number of helicopters are available for sling load missions.
- (6) Landing site surface conditions may restrict helicopter operation. Loose debris, dust, and snow are safety hazards that also limit pilot visibility.
- (7) Landing site size must be increased during the hours of darkness or reduced visibility to allow the pilot more room to maneuver.

1-3. FACTORS AFFECTING HELICOPTER LIFT PERFORMANCE

The supported unit should coordinate with the aviation unit prior to any sling load mission to determine the accurate lifting capability of the helicopter. Several factors affect how much weight a helicopter can carry.

a. Altitude. The helicopter loses rotor efficiency at higher altitudes and requires more power to hover than at lower altitudes. This means less capability to lift cargo.

b. Temperature. High air temperature has an adverse effect on the power output of helicopter engines. An increase in temperature decreases engine performance. This means decreased lift capability.

c. Humidity. As the relative humidity increases, the helicopter's lift performance decreases.

d. Wind. Wind affects helicopter performance by increasing rotor lift without an increase in engine power. Therefore, less power is required to hover into the wind than when no wind conditions exist; also, with constant power, the helicopter can hover into the wind with higher payloads. This is why wind conditions and direction are important to the performance of the helicopter.

1-4. REQUEST PROCEDURES

Aerial support request procedures depend on whether the request is a preplanned mission or an immediate mission.

a. Preplanned Missions. Aerial resupply missions that are based on known or projected requirements and are programmed in advance are preplanned requests. The force commander establishes the amount of time required to coordinate preplanned support. These requests are submitted through the S4/G4 logistical channels. Once validated, the request is passed by the S3/G3 to the aviation operations.

b. Immediate Missions. Immediate requests are for unanticipated, urgent, or priority missions. In order to reduce delays, immediate requests are submitted through the S3/G3 operational channels to aviation operations.

c. Request Forms. Support requests should be processed using DD Form 1974 (Joint Tactical Airlift Request) or in an appropriate format in accordance with standing operating procedures (SOP). Marine Corps mission requests are also submitted to the appropriate command using the Assault Support Request Form. This form may be obtained from each service's respective operations section.

1-5. RESPONSIBILITIES

There are normally three elements involved in sling load

operations: the supported unit that requests the mission, the aviation unit that provides the aircraft, and the receiving unit that receives the cargo. Sometimes, as during a unit relocation, the supported and receiving unit are the same. The responsibilities and functions of each element are discussed below.

a. Supported Unit. The supported unit is responsible for the following sling load applications:

(1) Landing site selection and control (including communications). The flight deck is the landing site during shipboard operations and will be controlled by ship personnel.

(2) Rigging the cargo using procedures in the appropriate rigging manual.

(3) Providing qualified inspectors and inspection forms (Appendix I) to inspect the rigged load.

(4) Distributing completed copies of the Sling Load Inspection Record prior to the time of the sling load mission according to Appendix I.

(5) Connecting the rigged load to the aircraft cargo hook unless that responsibility has been assigned to another unit.

(6) Verifying the total weight of the load (including rigging equipment). The supported unit relays the load weight along with any other information that may affect the load's flight stability to the pilot.

WARNING

Make sure you accurately determine and report the load's weight to the aircrew. Loads that you report inaccurately could cause the pilot to lose control of the aircraft.

(7) Providing instructions, as required, to the aviation unit on the location of the delivery point landing site.

(8) Providing disposition instructions to both the aviation and receiving units for return of cargo slings, A-22 cargo bags, cargo nets, containers, and other rig-