

## APPENDIX I

### HELICOPTER OPERATIONS

**Helicopters can rapidly move mortar squads and ammunition directly to where they are needed. In emergency situations, helicopters can move large amounts of mortar ammunition across terrain unsuitable for trucks.**

#### I-1. UTILITY HELICOPTERS

Utility helicopters are general-purpose aircraft that have limited carrying capability.

a. **UH-1 Iroquis (Huey).** The UH-1 Iroquois (Huey) cargo hook can handle up to 4,000 pounds. A ground guide is needed for a hovering pickup, since the air crew cannot see the cargo hook from inside. A typical external ammunition load for the UH-1 would be 100 to 110 rounds for the heavy mortar, about 350 rounds for the medium mortar, or 750 rounds for the light mortar.

b. **UH-60 Blackhawk.** The UH-60 Blackhawk can carry up to 14 combat-equipped troops internally or up to 8,000 pounds externally on the fixed-cargo hook. Although the crew chief can observe the load through a hatch and direct the pilot over the intercomm, a ground guide helps the pilot position the aircraft over the load. A typical external ammunition load for the UH-60 would be 200 to 220 rounds for the heavy mortar, 700 to 800 rounds for the medium mortar, or 1,500 rounds for the light mortar.

#### I-2. CARGO HELICOPTERS

Cargo helicopters can carry greater weights than utility helicopters. Because of their capacity, cargo helicopters often carry mixed loads of internal and external cargo.

a. **CH-47 Chinook.** The CH-47 Chinook "*C*" model has a maximum cargo hook capacity of 20,000 pounds; the "*D*" model can carry up to 26,000 pounds externally. The amount of load a cargo helicopter can carry depends on the model, the fuel on board, the distance to be flown, and atmospheric conditions.

(1) The CH-47C has only a single cargo hook below the center of the aircraft.

(2) The CH-47D has three cargo hooks: a center (main) hook and two additional hooks fore and aft of the main hook. When hooking a single load, soldiers use the main hook. They must coordinate closely with the aircrew as to which hooks to use when carrying multiple loads. The planning figure for the fore and aft hooks is 10,000 pounds each.

b. **CH-54 Sky Crane.** The CH-54 Sky Crane is flown by Reserve Component units. There are two models of the CH-54: the “A” model can lift about 20,000 pounds; the “B” model can lift about 25,000 pounds.

### **I-3. RESPONSIBILITIES**

Four different elements are normally involved in a mortar sling load mission: the maneuver unit headquarters requests the mission, the aviation unit provides the aircraft, the support platoon loads the cargo, and the mortar platoon receives the cargo. Sometimes, as during a unit relocation, the mortar platoon may prepare the loads itself. The responsibilities and functions of each element are discussed below.

a. The battalion, squadron, or company requesting the mission is responsible for—

(1) Selecting, preparing, and controlling the landing site. (Pathfinders can be of great assistance in this area.)

(2) Requisitioning all the equipment needed for sling-load operations, including slings, cargo bags, nets, and containers.

(3) Storing, inspecting, and maintaining all sling-load equipment.

(4) Providing enough trained ground crews for rigging and inspecting all the loads, guiding the helicopters, hooking up the loads, and clearing the aircraft for departure.

(5) Securing and protecting sensitive items of supply and equipment.

(6) Providing load derigging and disposition instructions to the mortar platoon.

(7) Providing disposition instructions to the mortar platoon and aviation units for the return of slings, bags, cargo nets, and containers.

b. The aviation unit is responsible for—

(1) Coordinating with the battalion and appointing a liaison officer who is familiar with the abilities and limitations of helicopters.

(2) Advising the battalion of the limitations on the size and weight of acceptable loads before they are rigged.

(3) Advising on the suitability of the selected pickup and landing sites.

(4) Assisting in the recovery and return of the slings, cargo bags, nets, and containers.

(5) Arranging for the aircraft to be at the landing site on schedule.

(6) Establishing safety procedures to ensure uniformity and understanding of duties and responsibilities between the ground crew and flight crew.

c. The battalion support platoon is normally responsible for all operations at the pickup site. These include marking, loading, rigging, and hooking up cargo.

d. The mortar platoon is responsible for--

(1) Selecting, preparing, marking, and controlling the landing site.

(2) Ensuring trained ground crews are available to guide the aircraft in and derig the load.

(3) Coordinating with the battalion S4 for the control and return of all air items.

(4) Preparing, coordinating, and inspecting backloads, such as slings and cargo bags, and having them ready for hookup or loading.

#### I-4. SITE SELECTION AND PREPARATION

Logistics and tactical considerations must be analyzed to ensure that the landing site is in the proper location to support the mission and that the area is accessible to the aircraft.

a. The size of the landing site depends on the number of landing points within it, the size of the landing points, and the dispersion required between the landing points as the tactical situation dictates. The minimum size of a landing point for each size helicopter is shown in Table I-1.

TYPE HELICOPTER	MINIMUM DIAMETER OF LANDING POINT
OH-6 OH-58	80 FEET (25 METERS)
UH-1	125 FEET (35 METERS)
UH-60	160 FEET (50 METERS)
CH-47 CH-53 CH-54	264 FEET (80 METERS)

**Table I-1. Minimum landing point sizes.**

b. Many considerations, such as helicopter type, unit proficiency, nature of loads, climatic conditions, and day or night operations, may apply to the size of the landing points used. With this information from the aviation unit, an 80-meter landing point should be prepared. The minimum recommended distance between landing points within the landing site, where no consideration is given in dispersion, is the same as the helicopter's minimum diameter. It is measured only from the center of one landing point to the center of the other.

c. The surface of the center of the landing point should be firm enough to allow a fully loaded vehicle to stop and start without sinking. All trees, brushes, stumps, or other obstacles that could cause damage to the main or tail rotor blades or to the underside of the aircraft must be cleared or marked. Any snow on a landing should be packed or removed to reveal any obstacles and to reduce the amount of loose snow blown over the area. A marker panel is essential to provide a visual reference for the pilot's depth perception in a snow-covered landing site and to reduce the effect of whiteout.

d. Ideally, the ground at the landing point should be level. Where a slope is present, it should be uniform. If the following criteria cannot be met, the use of the landing point must be confirmed by the aviation unit:

(1) During a daylight approach, the slope should not exceed 7 degrees (1 in 8) if the helicopter is to land. A greater slope may be acceptable for hover operations.

(2) During a night approach, a reverse slope as viewed from the approach path is not normally acceptable. Forward or lateral slopes should not exceed 3 degrees (1 in 19).

e. Often large helicopters do not fly in standard flight formations and are received one or two at a time. In such cases, the configuration in Figure I-1 is suggested. Each aircraft initially approaches and hovers, and is then guided to its cargo pickup point by the signalman.

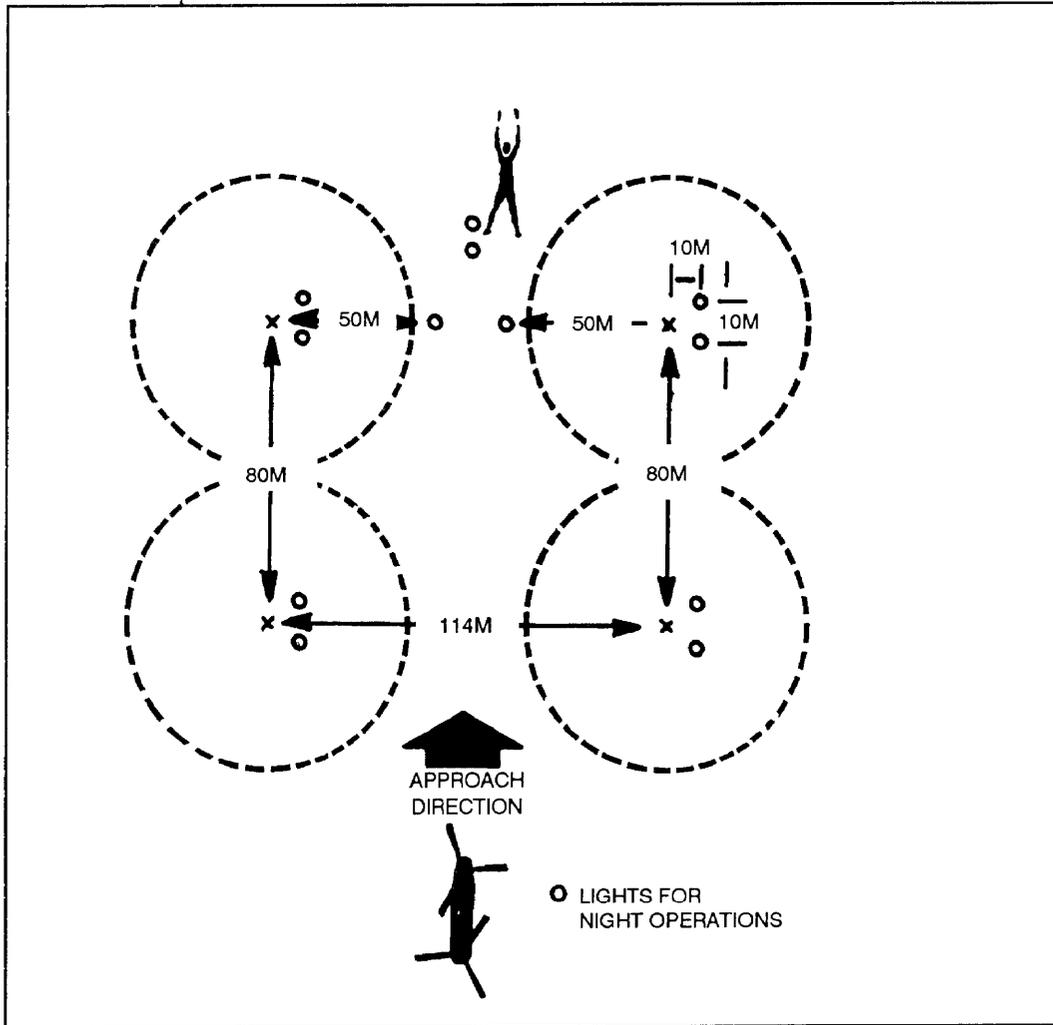


Figure I-1. Landing formation for large helicopters.

**I-5. MARKING THE LANDING SITE**

During daylight operations, the landing site can be marked with signal panels. Because the rotor wash from the helicopter might tear them from the ground and cause a hazard, they must be securely staked down. During daylight operations, the landing site can be marked with colored smoke or by the ground guide. The guide holds both arms straight up over his head or holds a folded VS-17 signal panel chest high.

a. During night operations, the landing point for the lead aircraft is normally marked by amber beacon lights. The landing point for the lead aircraft, if aircraft are in formation, is marked with either an inverted "Y" or a "T" (Figure I-2). The aircraft touches down or hovers on the midpoint of the legs of the "Y" and to the left of the stem of the "T".

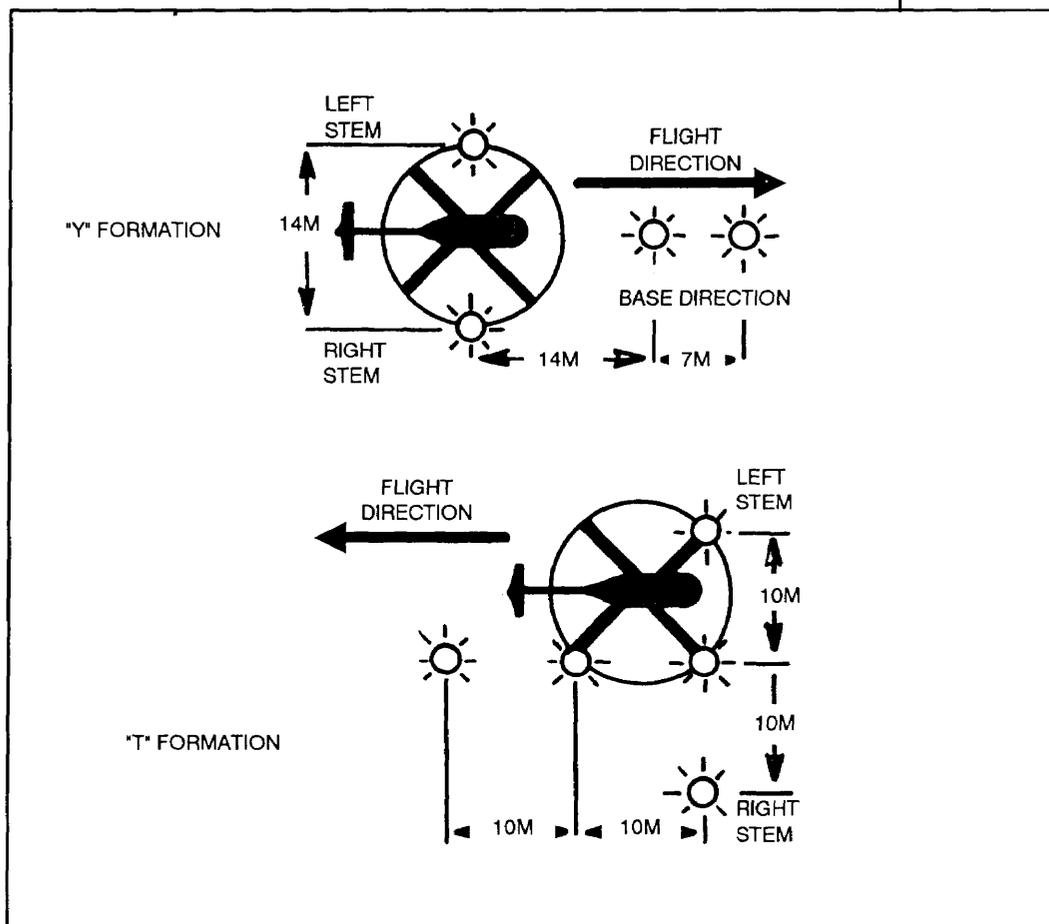


Figure I-2. The "Y" and "T" formation for single landing site.

b. Chemical lights can also be used to mark the landing site. Depending on the size of the tube, the glow can last from 30 minutes to 12 hours. The chemical lights can be taped or tied into bundles on stakes and can be placed the same as the beacon lights. The chemical light comes in various sizes, intensity, and duration. Some chemical lights are infrared only. The various colors of chemical lights cannot be determined by pilots using night vision goggles.

c. During daylight helicopter operations, obstacles may be difficult to detect or impossible to remove. Wires, holes, stumps, or rocks should be marked with red panels or other clearly identifiable means. During night operations, red chemical lights can be used to mark all obstacles that cannot

be removed. The mortar leader must exercise light discipline and not activate more lights than are needed. Excess lights can cause confusion. They should be buried or covered securely once they are no longer needed.

**I-6. EXTERNAL CARGO CARRYING DEVICES**

The mortar platoon must be able to rig and derig all of the common helicopter sling-load carrying devices. (See FM 55-450-1.)

a. **Sling Sets.** The two standard helicopter sling sets are the 10,000-pound and 25,000-pound capacity (Table I-2). The sling sets are similar. Each sling set comes in its own aviator kit bag. A complete 10,000- or 25,000-pound capacity sling set comes with four legs, which can be added or removed to modify the sling set. Some loads may have more or less than four hookup points. Adding legs does not increase the capacity. Removing legs does reduce the sling set’s capacity by 25 percent for each leg removed.

ITEM	10,000-LB CAPACITY	25,000-LB CAPACITY
SLING ROPE COLOR	OLIVE DRAB	BLACK
SLING ROPE DIAMETER	7/8-INCH	1 1/4 INCHES
CLEVIS COLOR	DULL GRAY ALUMINUM	GOLD STEEL
NUMBER CHAIN LINKS	111 (APPROXIMATE)	88
WEIGHT	52 POUNDS	114 POUNDS

**Table I-2. Visible differences between the 10,000- and 25,000-pound capacity sling set.**

b. **Pallets and Pallet Slings.** One of the most efficient ways to deliver heavy or bulky supplies is by loading them securely to standard 40- x 48-inch pallets. Ammunition is often delivered from rear storage areas on pallets. Table I-3 shows examples of common mortar platoon ammunition loaded onto standard pallets. By using a pallet sling, palletized cargo can be moved directly to the mortar platoon by helicopter without having to reconfigure the load. The pallet sling used by the Army has a 4,000-pound carrying capacity and carries a standard 40- by 48-inch pallet (Figure I-3). The two models of the pallet sling are the MK 100 and MK 86. The major difference between the two models is that cargo on the MK 100 can be stacked from 48 to 70 inches; the MK 86 can be stacked from 29 to 40 inches (Figure I-3). Table I-4 shows the difference between the two models of pallet slings.

c. **A-22 Cargo Bag.** An A-22 cargo bag is used to transport any standard palletized load or loose cargo up to 2,200 pounds (Figure I-4). A-22 cargo bags can be rigged in multiples for moving large amounts of ammunition. The CH-47D can lift about 10 to 12 pallet-loaded A-22 cargo

AMMO	TYPE	WT	RDS/PLT	SIZE OF PALLET L W H
81-mm	CTG, HE (MORTAR)	2,008	108	42 × 53 × 45
107-mm (4.2)	CTG, HE (MORTAR)	2,048	48	44 × 32 × 49
60-mm	CTG, HE (MORTAR)	1,350	250	43 × 48 × 42
5.56-mm	CTG, BALL (RIFLE)	3,556	80,640	43 × 50 × 38
7.62-mm	CTG, LINKED (M60)	2,260	21,000	43 × 50 × 30
caliber .50	CTG, LINKED	3,700/	9,600	40 × 50 × 39
		3,068	8,064	42 × 52 × 39

Table I-3. Example of ammunition pallet loads.

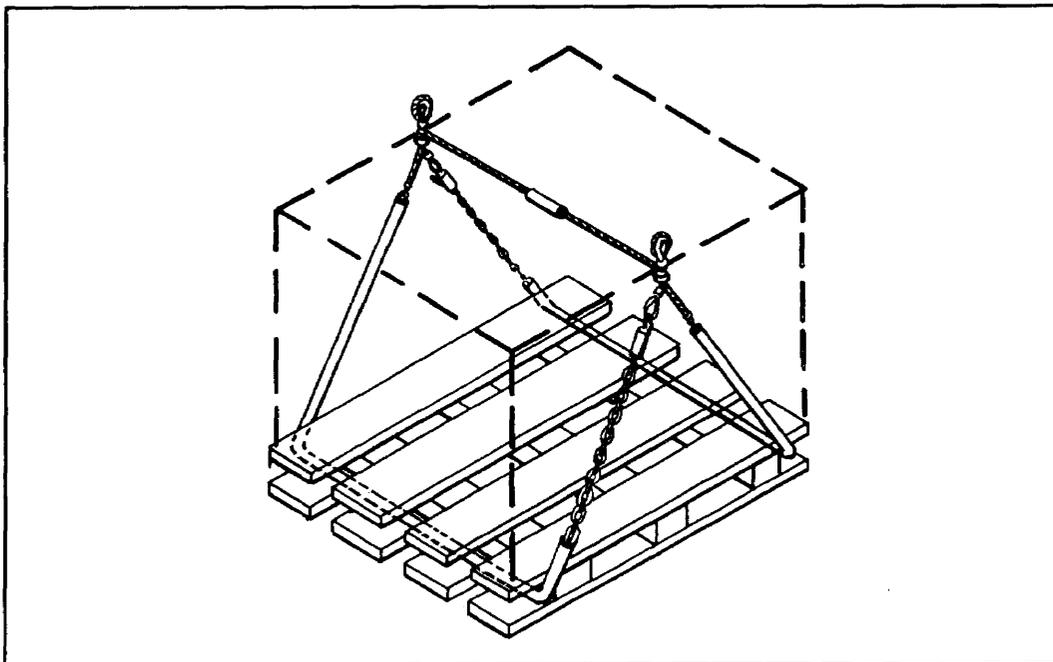


Figure I-3. Pallet sling.

MK	COLOR OF CODED TUBING	LOAD HEIGHT ON 40-×48-INCH PALLET (INCHES)	CAPACITY (POUNDS)	WEIGHT (POUNDS)
86	BLACK	29 TO 40	4,000	13
100	YELLOW	48 TO 70	4,000	15

Table I-4. Pallet sling models.

bags of medium or heavy mortar ammunition. It can carry about 15 pallet-loaded A-22 cargo bags of light mortar ammunition (Figure I-5).

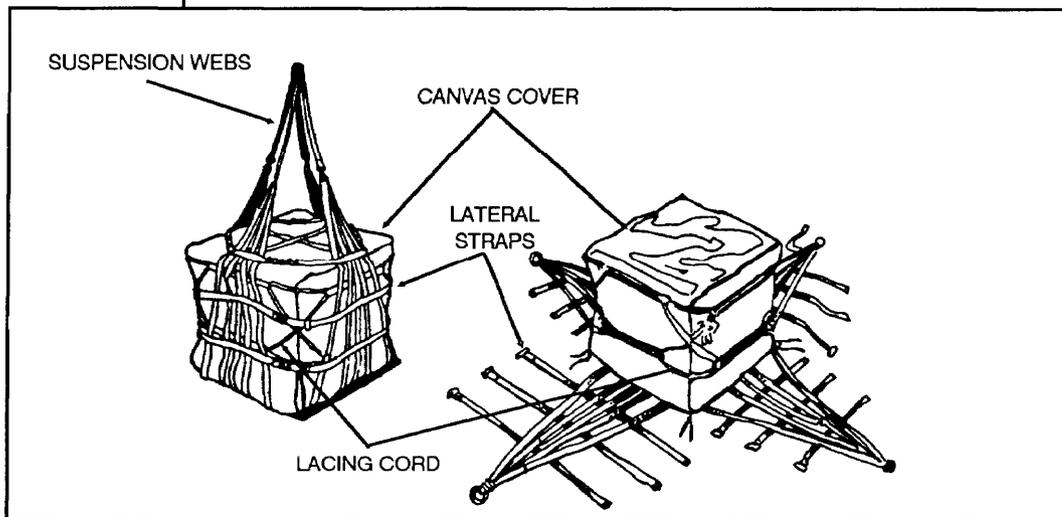


Figure I-4. Parts of the A-22 cargo bag.

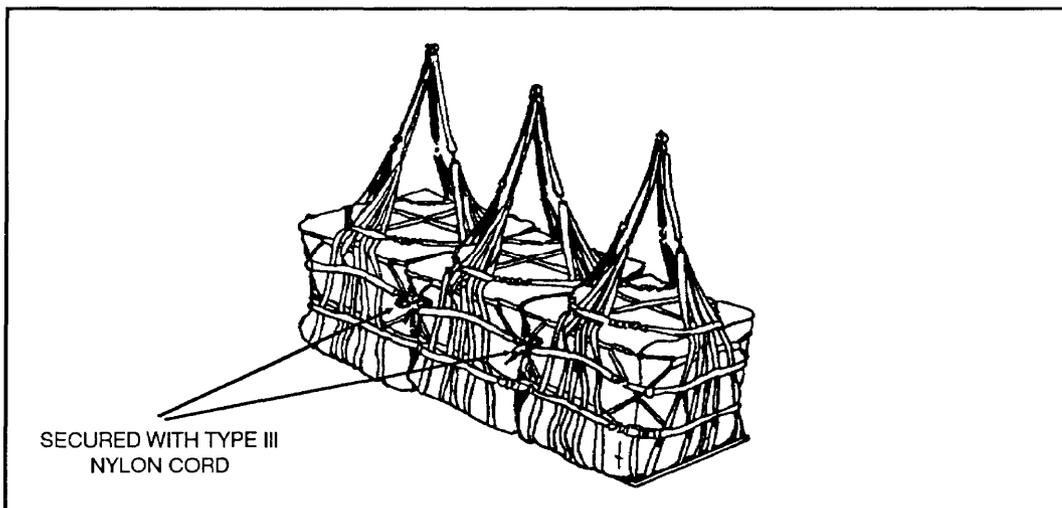


Figure I-5. Example of a load of Multiple A-22 cargo bags.

d. **Cargo Nets.** Two sizes of cargo nets are currently in the Army system—the 5,000- and 10,000-pound capacity cargo nets. These nets provide a means to externally transport ammunition or general cargo. The 5,000- and 10,000-pound nets are used in the same manner. Four sets of lifting legs are used with each net.

(1) *The 5,000-pound capacity net.* The 5,000-pound cargo net (Figure I-6) is octagon-shaped and measures 15 feet across the flat sides. The net is made of olive-drab nylon cord. The four hooks attach to the apex fitting. The apex fitting is then attached to the helicopter cargo hook.

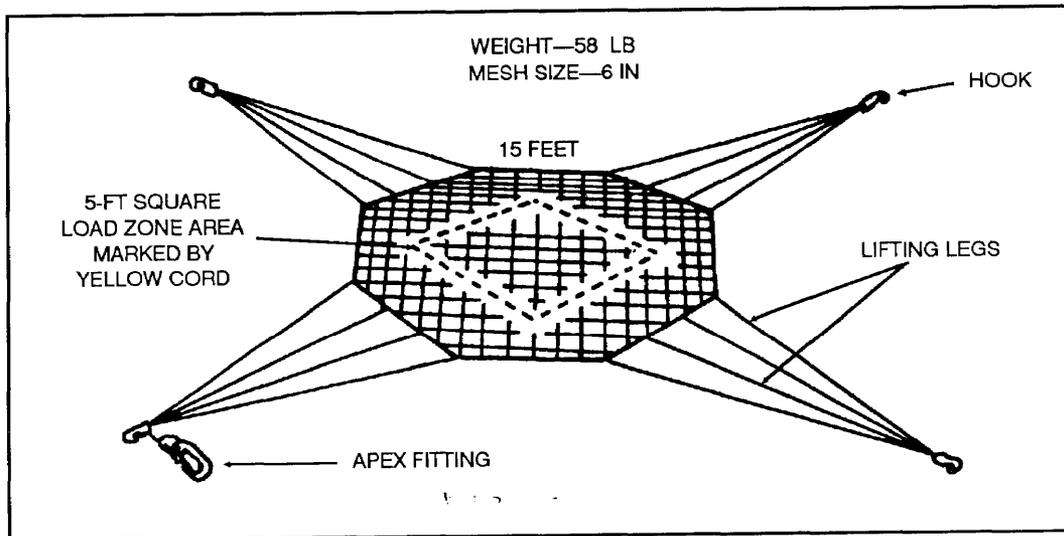


Figure I-6. The 5,000-pound capacity cargo net.

(2) *The 10,000-pound capacity net.* The 10,000-pound capacity net (Figure I-7) is made of black nylon cord. It is octagon-shaped, and it measures 18 feet across the flat sides. The load area is used as a guide to center the load on the net.

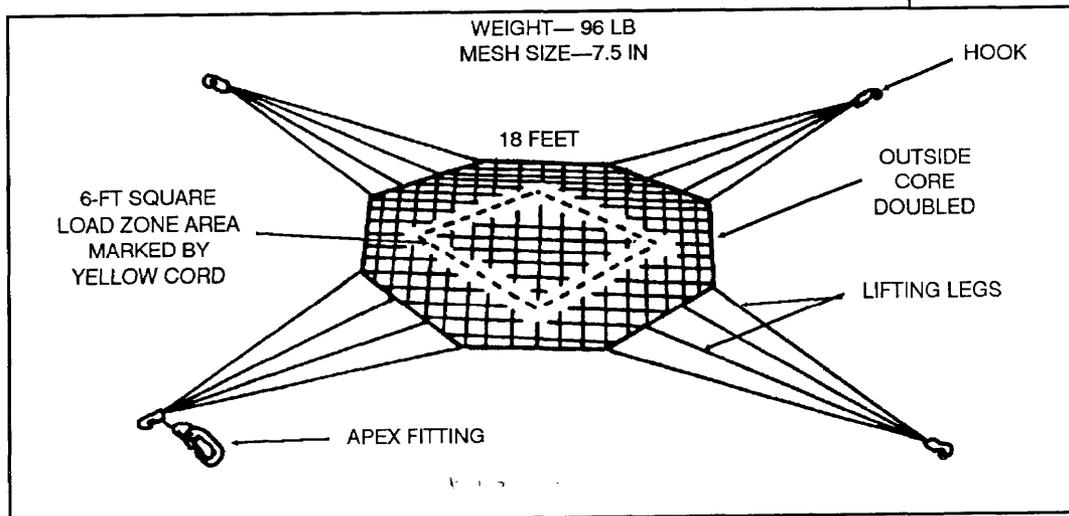
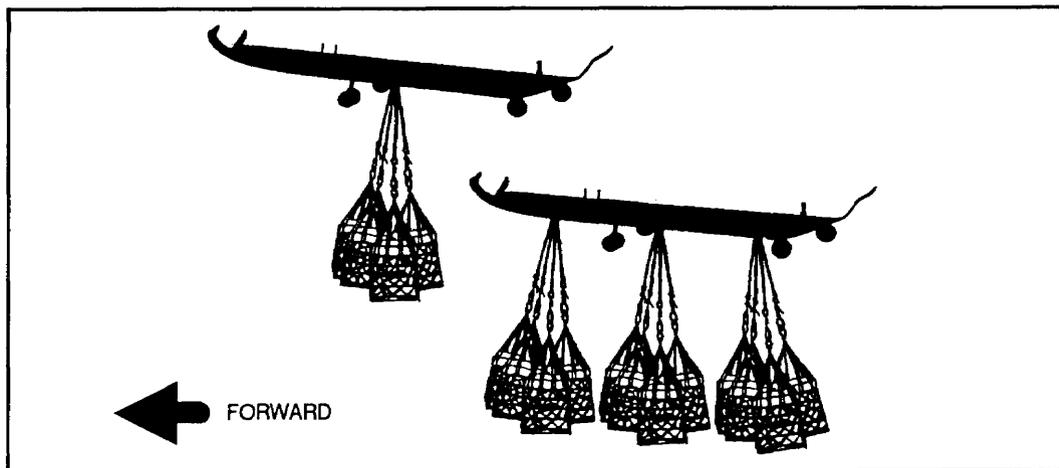


Figure I-7. The 10,000-pound capacity cargo net.

(3) *Typical sling combinations.* A typical mixed load can be rigged using more than one 5,000-pound capacity net. Each 5,000-pound cargo net apex ring is connected to one leg of the 25,000-pound cargo sling to make up a mixed sling load. If a 10,000-pound cargo net is used, two sling legs from a 25,000-pound sling set may need to be used. When using an aircraft equipped with multiple cargo hooks, several combinations of slings and nets can be used depending on the situation (Figure I-8).



**Figure I-8. Typical sling combinations.**

e. **Extended Sling System.** The extended sling system improves the tactical efficiency and integrity of sling loads and the crew such as mortars, ammunition loads, and mortar crewmen.

(1) The extended sling system consists of one 6,250-pound capacity sling leg, from a 25,000-pound capacity sling set. The leg is connected to the apex fitting of a normally rigged cargo net.

(2) Using the extended sling, the aircraft lands next to the rigged load. A ground crewman crawls under the helicopter and connects the apex fitting to the aircraft cargo hook. The entire mortar crew boards the aircraft to include the hookup person. As the aircraft lifts off the ground, the aircrew member observes the load and directs the pilot over the top of the load. This system allows 100 percent of the equipment, crew, and accompanying ammunition to be transported in one lift. Also, all ground personnel can load onto the aircraft leaving no one on the ground. This system reduces aircraft lift requirements and ensures mortar crew integrity.

#### **I-7. PLACEMENT OF LOADS FOR PICKUP**

Loads for external pickup should be arranged for ease of pickup (Figure I-9). Loads should be placed on level ground away from obstacles and should be prearranged for the type of aircraft being used. When triple-hook nets or cargo loads are to be used, the loads must fit under the aircraft. The distance from one apex to the next should be less than 6½ feet. It allows the loads to have some movement and not bind on each other when they are released separately (Figure I-10).

**CAUTION**  
**SEE FM 55-450-1 FOR SAFETY CONSIDERATIONS,**  
**INCLUDING STATIC ELECTRICITY DISCHARGE**  
**DURING PICKUP OPERATIONS.**

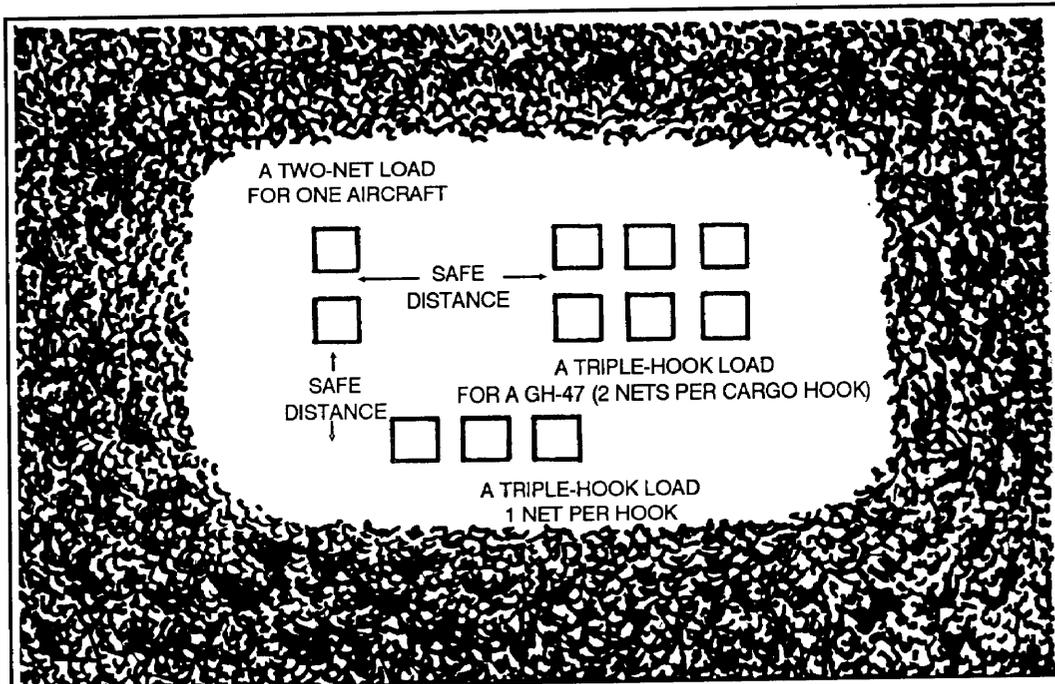


Figure I-9. Suggested multiple pallet lift arrangement.

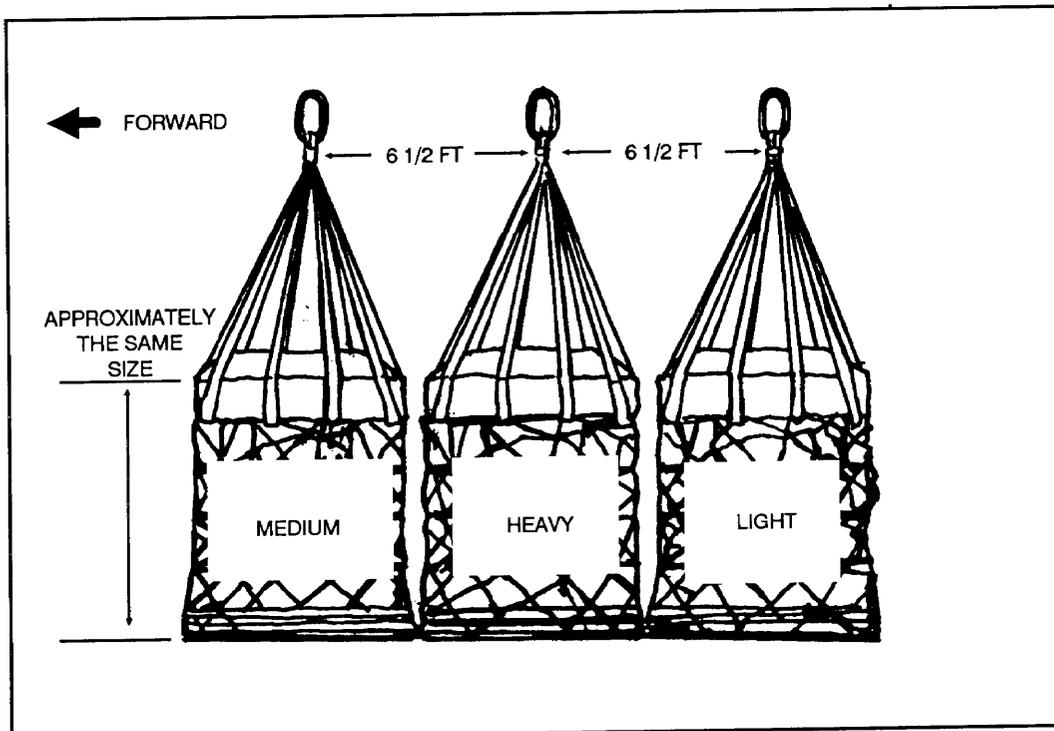


Figure I-10. Distance between triple-hook net for loads.

**I-8. RIGGING SUPPLIES**

Use the following information to order slings, nets, and spare parts for rigging supplies.

NSN	DESCRIPTION
1670-01-027-2902	Sling assembly, 10,000-pound Line No. T79003
8460-00-606-8366	Kit bag, flyer's*
1670-01-027-2900	Sling assembly, 25,000-pound Line No. T79009
1670-01-058-3811	Net, 5,000-pound Line No. N02776
1670-01-058-3810	Net, 10,000-pound Line No. N02708
080-00-108-1155	Transport case **
3990-00-360-0248	Assembly, load binder
4030-00-360-0304	Assembly, small clevis
4030-00-678-8562	Assembly, medium clevis
1670-00-090-5354	Assembly, large clevis
4020-00-240-2146	Cord, nylon, Type III, 550-pound BS
1670-00-360-0340	Fastener, quick-fit strap
8305-00-191-1101	Felt sheet, ½-inch thick and 60 inches wide
8135-00-664-6958	Padding, cellulose
8135-00-808-6446	Padding, cellulose
4020-00-231-2581	Rope, ¾-inch
7510-00-266-5016	Tape, adhesive, 2-inch roll
1670-00-725-1437	Tie-down, strap, 5,000-pound, CGU-1B
8305-00-268-2411	Webbing, cotton, 80-pound, BS, ¼-inch
8305-00-082-5752	Rope, nylon, tubular, ½-inch
4020-00-968-1357	Rope, fibrous, ½-inch
5825-00-917-3738	Light, beacon beanbag
1670-00-587-3421	Bag, cargo, A-22 Line B14181
1450-00-169-6927	Sling, pallet, MK86 Line S80670
1398-00-004-9175	Sling, pallet, MK100 Line S80738

\*Used to store 10,000- and 25,000-pound capacity slings and 5,000-pound capacity cargo nets.

\*\*Used to store 10,000-pound capacity cargo nets.