

CHAPTER 11: CARGO TRANSPORT.

I. Introduction.

The safe and efficient transport of cargo utilizing helicopters is a high priority. If performed incorrectly, there is the potential for dropped external loads, spillage of hazardous materials in the helicopter, overgrossed weight condition, cargo interference with the rotor systems, and other serious safety hazards. Incorrect methods of rigging and transporting cargo can result, and have resulted in catastrophic accidents.

Use of the standard procedures for transport outlined in this chapter will ensure, to the extent possible, that agencies meet the above objective of transporting cargo safely and efficiently.

Refer to the glossary for definitions of internal load, external load, and hazardous materials.

A. Longline Operations

1. Risk: The first thing to consider prior to any mission.

Complete risk analysis is a must prior to deciding how a mission is to be accomplished, what equipment is to be used, and if the pilot and helicopter are correct for the job.

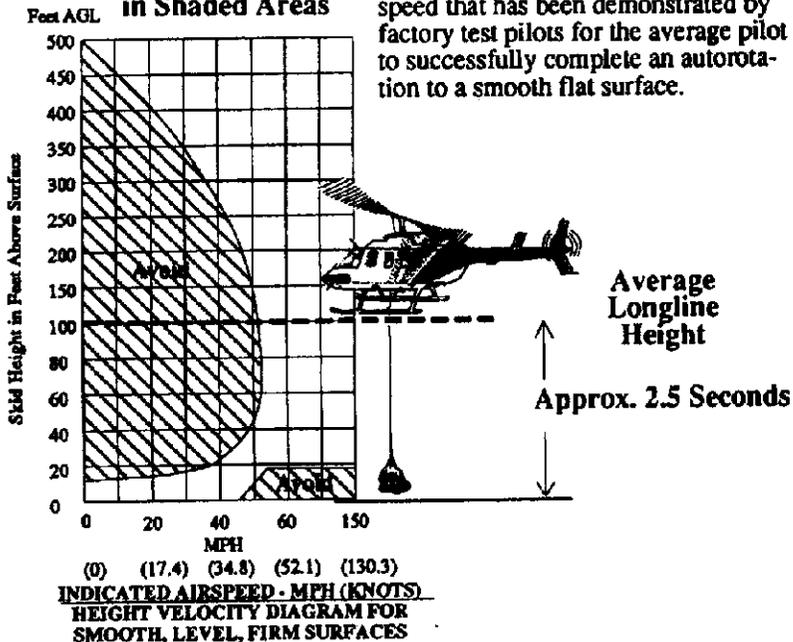
2. HV Curve: What it means to the pilot, ground crew and management.

If a helicopter has a catastrophic failure such as an engine failure while hovering at 100 feet AGL, it will contact the ground in approximately 2.5 seconds reaching approximately 50 miles per hour or 67 feet per second. Keep alert while working under a helicopter doing longline work!

Height-Velocity Diagram
Do not use Illustration only!
Consult your Aircraft Operators Manual

**Avoid Operation
in Shaded Areas**

This is minimum height at "0" air-speed that has been demonstrated by factory test pilots for the average pilot to successfully complete an autorotation to a smooth flat surface.



II. Qualified Personnel.

A. Ground Personnel.

Helicopter and helibase management personnel must be trained and qualified to supervise and coordinate cargo transport activities on incidents or projects per the requirements found in Chapter II, Chart 2-3.

Trained personnel should be provided at all loading and unloading sites. Any exceptions to this requirement (for example, longline with remote electric hook transport) are noted in this chapter.

The following minimums are recommended for handling cargo transport (note that these are not related to the minimum fire helicopter staffing level requirements in Chapter 2):

- Four persons for Type 1 and 2 helicopters
- Three persons per Type 3 helicopter

These minimums provide for a Parking Tender, Loadmaster(s), and hook-up person.

B. Pilot Qualification.

The Pilot must be qualified for carriage of external loads and, if applicable, for longline with remote electric hook operation.

III. Load Calculations and Manifesting.

During cargo transport operations, load calculations shall be performed prior to any flight activity. Weight of cargo is usually indicated either on the load calculation form or, if manifesting multiple trips under one load calculation, on the manifest form. Refer to Chapter 7 and to Appendix A for detailed information and instructions.

IV. Air Crew Member on Board During External Load Missions.

An air crew member (for example, the Helicopter Manager) is allowed on board during external load operations, provided certain conditions exist or are met. See Chapter 10, Section IV for further information.

V. Hazardous Materials Transport and Handling.

A complete list of hazardous materials is contained in 49 CFR 172.101, Department of Transportation, Hazardous Materials Table. Some hazardous cargo may be transported via helicopters under special conditions, as outlined in Title 49, Code of Federal Regulations (CFR).

A list of commonly-transported hazardous materials, along with the correct transportation procedure for each, can be found in the Aviation Transport of Hazardous Materials Guide or Handbook (for USDA-FS and USDI), or in local or state agency policy.

A. Exemptions.

USDA-FS and USDI both have an exemption granted by the United States Department of Transportation (DOT). It exempts USDA-FS and USDI from certain hazardous materials

regulations, provided that the materials are transported in conformance with the agency's Aviation Transport of Hazardous Materials Guide or Handbook.¹ If an agency does not have an exemption from DOT, then all materials must be transported in accordance with 49 CFR Parts 171-175.

B. Requirements.

- Aviation transport of hazardous materials must conform to procedures contained in the agency's Aviation Transport of Hazardous Materials Guide or Handbook.
- Personnel who engage in the transport of hazardous materials via aircraft must have been trained in Hazmat, have a current exemption and a Hazmat Response Guide on board. This includes vendors whose helicopters carry hazardous materials. The guide or handbook must be on board the aircraft at all times.

C. Transport and Handling During Law Enforcement or Search and Rescue Operations.

See Chapters 16 and 17, respectively.

VI. Cargo Transport with Military Aircraft.

External (sling load) missions may not be possible or practical for all military helicopters for the following reasons:

- Military helicopters may not be equipped with cargo hooks.
- The sling equipment currently used by civilian fire agencies may not be readily adaptable for use on military equipment.

If military helicopters are tasked to perform external cargo transport, use military sling equipment and qualified military personnel. Military personnel engaged in external load operations must be furnished with and wear personal protective equipment according to the requirements found in Chapter 9, Chart 9-2.

For aviation operations utilizing Active Duty/Reserve Military helicopters, and National Guard units officially "federalized" by DoD, refer to Chapter 70 of the Military Use Handbook for specific policy and procedural information.

The use of National Guard units for federal firefighting purposes within their state must be outlined in national, regional, state or local agreements and Memorandums of Understanding (MOUs) between federal agencies and the specific National Guard units.

VII. Cargo Preparation.

Correct cargo preparation is essential to safe completion of the mission.

¹USDA-FS and USDI publish aviation hazardous materials transport directives. However, with the exception of references to the agency name, language and procedures are exactly the same. The directives are also based upon the same exemption granted these agencies by the United States Department of Transportation. Local and state agencies may have similar direction.

A. Pilot Approval.

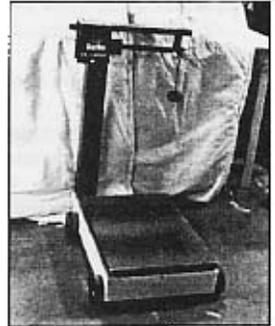
Obtain Pilot approval of all cargo to be transported. Loadmasters and other personnel loading cargo must always inform the Pilot of:

- Hazardous material(s) being transported;
- Packaging of the hazardous material (that is, has it been correctly packaged and placed in the helicopter in conformance with the agency hazardous materials handbook or guide or 49 CFR Parts 171-175?)

B. Weighing.

Weigh cargo and inform the Pilot of actual weights. Portable scales can be easily set up at remote helibases and helispots. Exhibit 11-1 shows various methods of weighing cargo. DO NOT EXCEED ALLOWABLE PAYLOAD. If possible, have the cargo weighed, packaged, and marked for destination prior to the arrival of the helicopter.

Exhibit 11-1: Different Types of Scales For Weighing Cargo



C. Methods of Identifying Cargo Destinations.

When multiple destinations are involved in a cargo transport operation, the destination of a cargo load must be adequately identified in order for it to be transported to the correct location. This is particularly important when many pieces of cargo destined for various destinations is being delivered from a supply unit.

The following are suggested methods:

- Lay out separate cargo areas for each helispot. Identify these areas with markers: "H1", "H2", etc. Note that these do not have to be separate cargo pads.
- At the minimum, have the Loadmaster or Supply Unit mark destination clearly on the cargo using a heavy marker, or tag each piece.

- The Supply Unit may color-code cargo with spray paint on each box or attach a painted tag to the cargo identifying the helispot. Ensure that all personnel are aware of the coding system. Example: H1 = Blue, H2 = Red, etc.

VIII. Equipment Inspection.

Prior to commencing the operation, the Helicopter Manager, Loadmaster, or other person responsible for the cargo transport should inspect all equipment (for example, leadlines, swivels, nets, cargo racks, tie-down straps) in accordance with the procedures found in Chapter 9.

IX. Cargo Inspection.

Prior to commencing the operation, the Helicopter Manager, Loadmaster, or other person responsible for the cargo transport should inspect all cargo. Inspection should include, as applicable, the following:

- Liquid containers should be boxed or secured in an upright position;
- Boxes should be taped shut and all items tied down or secured, including sigg and other fuel holding containers;
- All backhaul garbage should be double bagged in plastic garbage bags to prevent leaks inside the aircraft. External garbage is best moved in cargo lift bags.
- Cargo should be secured by restraining straps or nets constructed of synthetic webbing; straps or nets should be attached to cargo rings or attachments points specifically designed for restraining purposes;
- Hazardous materials should be marked and the Pilot aware of items being transported (transportation of these materials must comply with agency handbook or guide or 49 CFR Parts 171-175);
- Do not transport liquid hazardous materials (for example, gas) with food or personal gear;
- Put personal gear and packs in plastic bags if transporting with other non-hazardous liquid containers; tape the neck of the plastic bags to prevent the plastic from ripping in transit;
- Sharp edges of tools should be protected by tool guards or tape to protect the cargo net or other containers;
- If multiple loads are to be transported, separate cargo by weight and destination;
- If using the carousel hook system (see Chapter 9), ensure the Pilot is aware of the destination sequence; write it down, or relay verbally to avoid loads being dropped at the wrong sites.

X. Establishing the Loading Area.

Chapter 8 provides some general guidance on establishing loading areas. Refer to Chapter 15 for more detailed information.

XI. Loading and Rigging Procedures.

A. Internal Cargo.

- All internal cargo shall be properly stored and secured, regardless of whether passengers are being transported with the cargo.

CAUTION: All packs must be secured if carried in the passenger compartment. Packs shall not be carried unsecured in a passenger's lap or on the floor. Packs can be stored separately in the cargo compartment, in external cargo racks or transported in an external sling.

- Do not exceed the weight limit of the cargo compartment or racks. This weight should be placarded within or outside the compartment, usually on the door. If in doubt, ask the Pilot.

B. External Cargo Racks.

- Do not exceed the weight limit for a cargo rack or basket. This weight should be placarded on the rack. With certain makes and models of helicopters with racks on either side, the weight limitation for one may differ from that on the opposite side in order to conform to center-of-gravity limits.
- Cargo should be loaded within the center of gravity (CG) of the aircraft as computed by the Pilot. Unless cargo rack limitations differ from one side of the helicopter to the other, weight in cargo baskets should be evenly distributed on each side of the helicopter.
- Inspect tie-down devices for rips, tears or cracks.
- When securing cargo in the racks, start at the front of the rack and lace the tie-down strap or bungee cord through pack straps or handles on containers or equipment toward the rear. This will eliminate the possibility of items coming loose from the rack and potentially interfering with the tail or main rotor.

CAUTION: When securing and applying tension to bungee cords, be sure to have a tight grip on the cord and secure it firmly to the rack. Otherwise the cord may suddenly come loose, snap back, and cause serious injury.

C. Proper Rigging Methods for External Cargo.

The importance of inspecting equipment prior to rigging cannot be over-emphasized. Chapter 9 contains information on both commonly-used and specialized external load equipment.

Look, check, and double-check for damage. If in doubt as to the equipment's integrity, tag it as unusable or inoperable. On the tag, state the reason for the equipment being declared inoperable or unusable so that another individual, mistakenly observing nothing wrong with it, will not use it.

Ground personnel and Pilots should be thoroughly trained and briefed on rigging, hook-up, hand signals, and safety before any operation is commenced.

The aerodynamic configuration of a load may cause it to spin and oscillate, which in turn may cause the Pilot to experience control problems with the helicopter. The degree of the control problem may be small, easily handled by minor control inputs. On the other hand, the Pilot may experience extreme difficulty in controlling the helicopter, usually caused by a badly-rigged load coupled with winds and turbulence. Such difficulty may cause the Pilot to return with the load for re-rigging, or, in extreme cases, to release the load, either intentionally or inadvertently.

Unfortunately, there is no sure way to predict how each load will fly. This is especially true of "non-standard" loads such as large water guzzlers, cement mixers, long loads of pipe, lumber or logs, etc.

COMMENT: If a load does not fly well, rig the next load differently and try again, provided the previous experience has not indicated safety problems that cannot be overcome by the re-rigging. If this is the case, find other means of transportation (ground vehicle, pack train, paracargo).

The next section of this chapter is devoted to a discussion of standard or suggested rigging for a number of different load configurations. As mentioned, there is no guarantee that the suggested methods will fly well, given even minor aerodynamic peculiarities in loads, changing winds and terrain, etc.

REMEMBER: The Pilot always has the final decision regarding whether or not to conduct the mission. Do not pressure the Pilot, either implicitly or explicitly, into flying a load with which he or she does not feel comfortable.

When confronted with a specialized load for which there is no apparent rigging solution, consult with the helicopter vendor or Pilot, who may be able to supply the necessary expertise and/or equipment.

Some general rigging tips for external cargo transport include:

- On onlonge jobs, EVERY load gets a swivel to avoid line twisting. Multiple loads on the same onlonge require multiple swivels. One net/bag may revolve faster than the other.

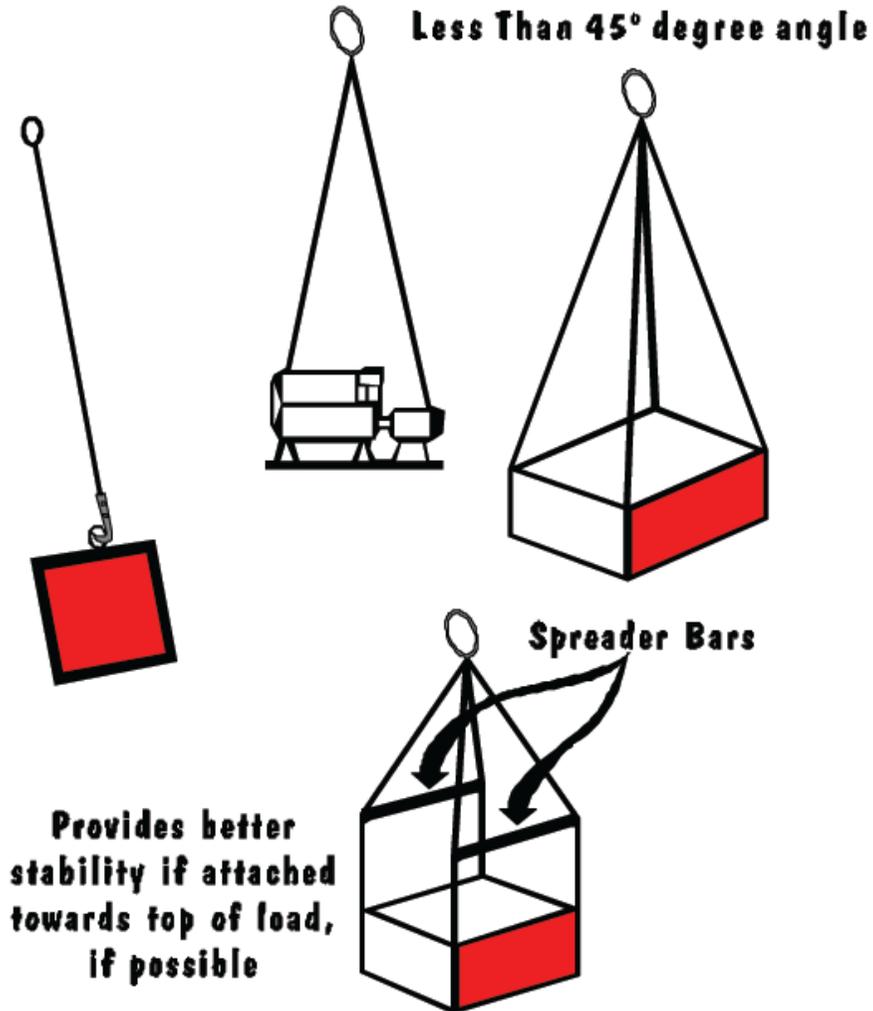
CAUTION: The primary reason to use swivels is to prevent line twisting. Swivels allow multiple net loads to rotate independently in flight without twisting the leadline or onlonge. When using multiple nets loads, a swivel must be placed between the leadlines and the remote or belly hook. A swivel should also be in place for each net. Some specialized loads, such as a helitorch may be flown without the need for swivels.

- An acceptable practice is a onlonge without a remote. A swivel is still required at the bottom of a onlonge and is the cargo attachment source. This may be used as a standard practice if personnel are available at both ends of the operation.

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- The loading area and approach-departure paths should be cleared of any debris or objects that could fly up and strike personnel or the helicopter.
- Ground personnel involved in rigging cargo shall wear personal protective equipment identified on Chart 9-2 in Chapter 9.
- On multiple longline loads, the fragile or lighter loads should be rigged above the heavier loads. Remember each load gets a swivel.
- Never stand under a load, or between the load and an immovable object when working around operating helicopters.
- While the security and alignment of the rigging must be checked as the load is pulled taut by the helicopter, never place one's hand(s) in an area where it could be caught or pinched by the rigging. The Parking Tender should direct the Pilot to release tension on the load and land while the load is re-rigged.
- Fiber taping or securely tying rigid water tanks into the closed position will prevent them from opening in flight.
- A single-point sling is normally not the best method to carry a load, except for items such as logs or cargo nets. When single-point is necessary, use a swivel. See Exhibit 11-2.
- A two-point sling with less than a 45 degree angle to the hook or longline is usually the common method for most loads that will not fit into a cargo net. See Exhibit 11-2.
- Use a four-point sling for box-like loads. See Exhibit 11-2.
- A spreader bar is useful for stabilizing a load, or where the sling may catch or damage the load if attached conventionally. Four cables with two bars are used for a 4-point hook-up. See Exhibit 11-2.
- Use longlines to avoid having to get the helicopter close to obstacles on the ground. The hook should have a safety latch and weigh at least 15 pounds to allow safe flight with an empty sling. Use of longlines is a high risk mission that prolongs operation outside the safe zone of the Height Velocity diagram for aircraft.
- Never fly with an unweighted sling or net. The forward motion of the helicopter will cause the sling to trail and drift up toward the tail, with potential to become caught in the tail rotor. Leadlines and longlines should be shorter or much longer than the distance between the hook and the tail rotor. Properly rolled and secured empty cargo nets may be flown on the cargo hook, lead line, or on a longline provided the hook has a safety latch and weighs at least 15 pounds to allow safe flight with an empty sling.
- Certain loads such as vehicles, crashed aircraft, and other irregular loads may require special rigging utilizing drogue chutes or spoilers. Never attempt to perform such loads without prior training and/or experience.

Exhibit 11-2: Single-, Two-, and Four-Point Loads



USE SWIVEL AT ALL TIMES BETWEEN THE LOAD'S LINE(S) AND THE CARGO HOOK

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1. Cargo Net. Some considerations when working with cargo nets include:
 - Center the weight and make the load as symmetrical as possible. Heavy items should be set in the center of the net first, with light items on top.
 - Do not weave purse strings through the net. The net will not cinch properly and the net will be exposed to excessive wear.
 - Pull tension on the “purse string(s)”. (The purse strings are the lines that encircle the top or outside perimeter of the net.) If the net has a double encircling line, both should be even in length to attach leadline or swivel.
 - ➔ After the net is secured, look for holes or openings in the net where items could slip through.
 - Attach a swivel between steel ring(s) on the “purse string(s)” and the cargo hook if no leadline is being utilized.
 - If a leadline is necessary, attach a swivel between the leadline and the cargo hook.
 - Check the net, swivel, and leadline for damage as described in Chapter 9.
 - A swiveling Cargo hook may be used in place of a separate swivel on some missions such as Bale Bombing, when a swivel can't be used since a lead line is usually hooked to the cage on the longline.
 - When carrying multiple nets on one load, it is recommended to have one lower than the other by using a leadline on one net but not on the other.
 - Tag the load with destination and total weight of load, including net, swivel and other accessories.

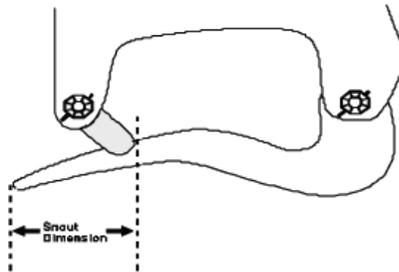
CAUTION: Use of a net with a tarpaulin spread inside, while it might be useful for carrying many small items that could slip out, is prohibited due to the potential for the tarpaulin or other covering to slip out and become entangled in the rotor systems or airframe.

2. Cargo Hook/Ring Interface. (See Exhibits 11-3 and 11-4.) The link between the cargo hook and the cargo net ring(s) or leadline ring is a critical interface. Loads can be inadvertently dropped, or be unable to be released (“hung load”), due to incorrect connections at this point.

The size or shape of the ring is not a significant factor in inadvertently-released loads. Personnel should be aware of the following:

- When the ring maximum inside diameter is greater than the “snout” dimension on the cargo hook (see Exhibit 11-3), there exists a small potential for the ring to ride over the load beam and inadvertently release from the cargo hook.
- Ring shapes other than a circle (for example, oval- or pear-shape) pose the greatest chance of inadvertent release. However, such release is rare for oval- or pear-shaped rings properly placed on cargo hooks.
- Use of a swivel reduces the chances of a “hung load” by limiting the torsional load that can be applied to the ring. A torsional load, although sometimes required, can result in hung loads, or non-release, when the Pilot commands release. Refer to Exhibit 11-4 for incorrect methods of hooking loads.
- Training for crews should include presentation of the possibility of inadvertent release of loads due to ring size, and the necessity for re-emphasizing careful hookup.

**Exhibit 11-3: Snout Dimension
On a Cargo Hook**



3. Box-Like Loads. (See Exhibit 11-4.) Box-like loads usually fly very poorly, as they tend to spin. Use a tree branch as a “tail” as shown in the exhibit. Ensure that the tree branch is well-secured with rope or cord to the bottom of the load.

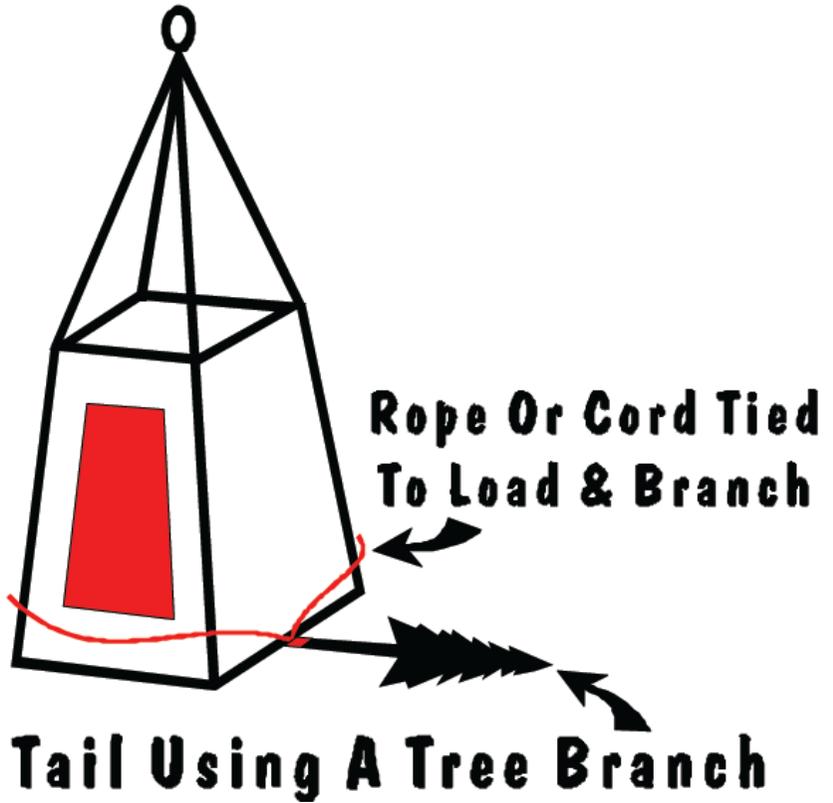
➔ **CAUTION:** Use of drogue chutes as a “tail” is prohibited except by trained, experienced personnel. Drogue chutes or tails will only be used on longline loads.

4. Pipe. (See Exhibit 11-5.) Pipe shackles or hooks allow a number of pipes to be carried.

Use of chains as the connecting lines will work well for the weights of loads that can be commonly carried by Type 3 helicopters. They also store in a smaller area than cables. However, with loads over 1,000 pounds, chains are not advisable as they can bind where they cross and not tighten up, allowing pipes to slip out. This is especially true if the load spins.

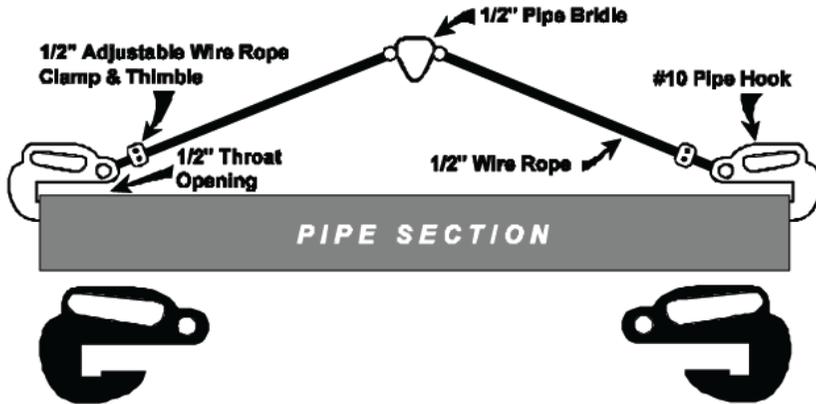
Cables are better, although they have to be replaced when they become kinked. Using a leader will require replacement of only a short length rather than the entire cable.

Exhibit 11-4: Rigging A Box-like Load with a Tree Branch as a Tail



CAUTION: Ensure the shackles are hooked on opposite ends of the same pipe.

Exhibit 11-5: Rigging Loads of Pipe

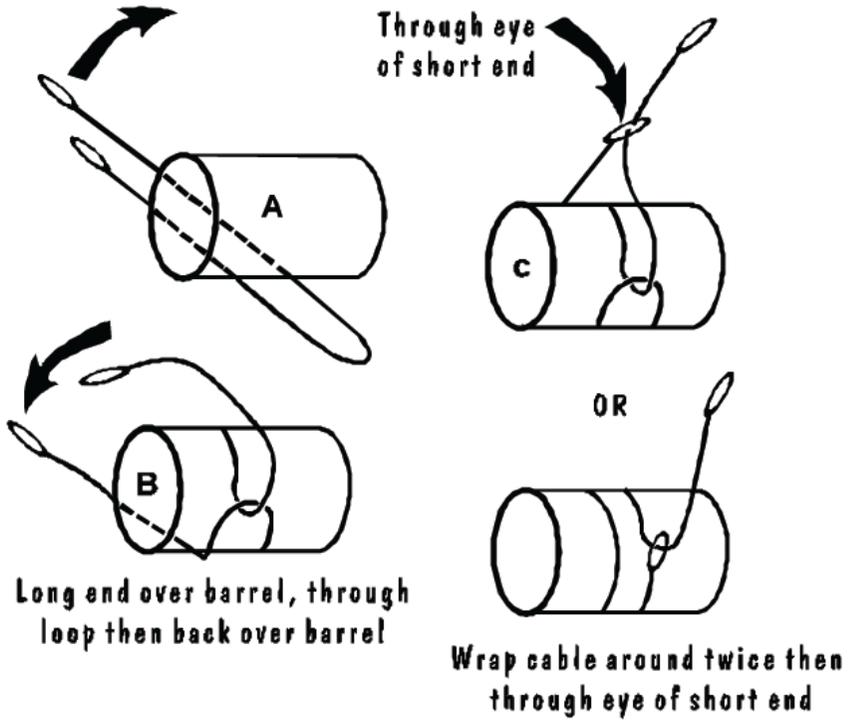


5. Barrels. (See Exhibits 11-6.) Barrels may be rigged by utilizing a choker as depicted in Exhibit 11-6 or by utilizing barrel hooks or clamps designed specifically for that purpose.

Utilize the method shown below if barrel hooks are not available or are not preferred.

Barrel hooks are made of chain or cable. Two sets are usually used together. A bungee cord with a clip on one end allows the hooks to be dropped off the barrels on touchdown at an unattended landing site.

Exhibit 11-6: Rigging Barrels Without Barrel Hooks

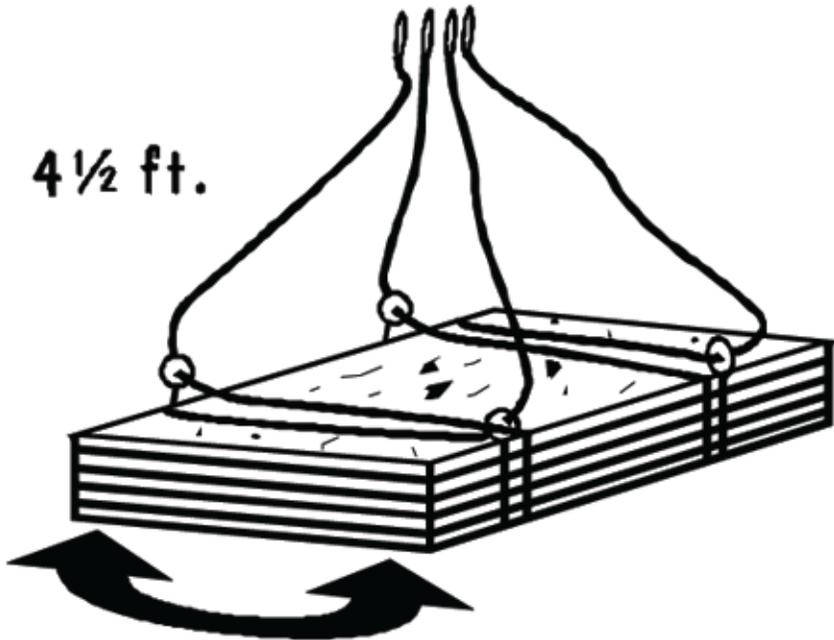


- Plywood or Lumber. (See Exhibit 11-7.) Plywood and lumber are one of the hardest loads to fly because of the load's wing-like shape. Its aerodynamic characteristics often causes the load to fly, unfortunately often in a direction independent of the helicopter's intended flight.

CAUTION: Use an end stop to prevent pieces on the interior of the load from slipping out. However, ensure the material utilized is well-secured to the stack itself.

Exhibit 11-7: Rigging Plywood or Lumber Slings

4 Cable Plywood Sling



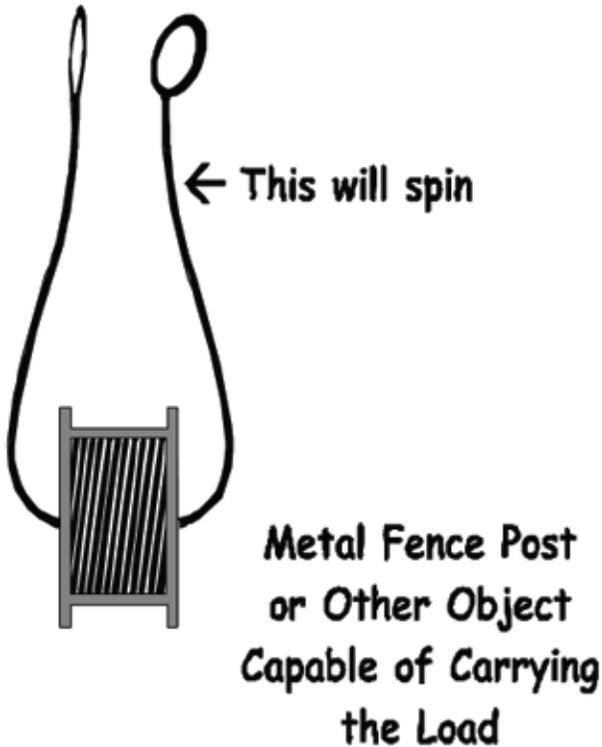
**Ends Must Be Secured To Prevent
Slippage Of Middle Portion Of Load.
Use Strapping, Cargo Net, etc.**

7. Wire Spools. (See Exhibit 11-8.) The material shown in the illustration below must be fastened securely to the bottom of the spool, but still allowing room through which to loop the choker. It should be dimensionally strong enough to bear the weight of the spool itself when tension is applied during the lifting of the load.

Exhibit 11-8: Rigging Wire Spools

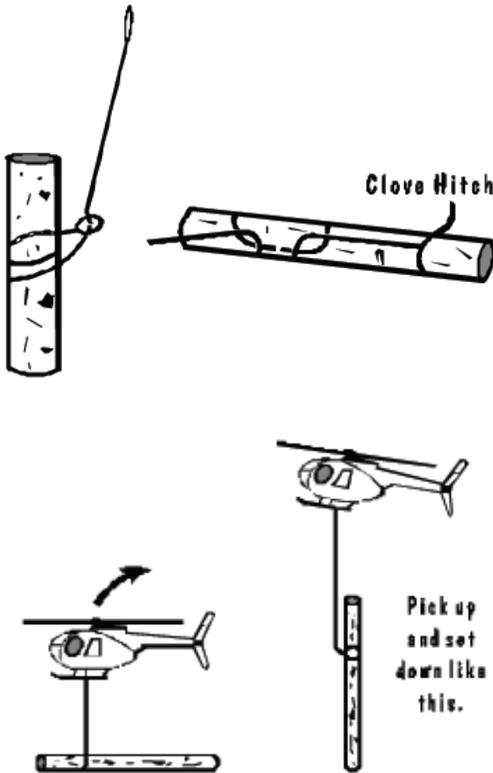
INCORRECT

CORRECT



8. Poles and Logs. (See Exhibits 11-9 and 11-10.) Logging operations use a cable choker where a ball on the end clips into a sliding catch further up the cable. The cable then “chokes” down on the log when it is under tension. If this equipment is available, use it.

Exhibit 11-9: Rigging A Single Pole or Log For Flight



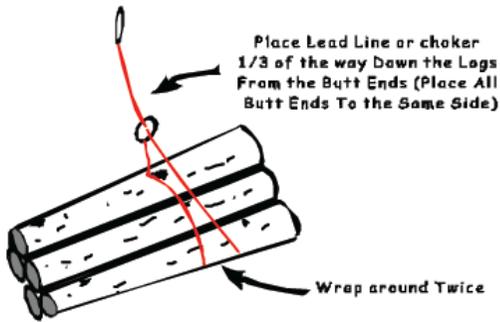
CAUTION: Use of a single choker vertically in a straight line (that is, without one end being looped through the other end), or in a “basket,” U-shaped configuration, is not approved.

For pole setting, one can also use a clove hitch (two half-hitches back to back) at the bottom of the pole and run the rope up to the top and make a half-hitch.

When the load is placed on the ground, the sling will loosen and can be easily removed by ground crew. A remote hook can be useful for releasing chokers, or when you want to retain the lead or longline.

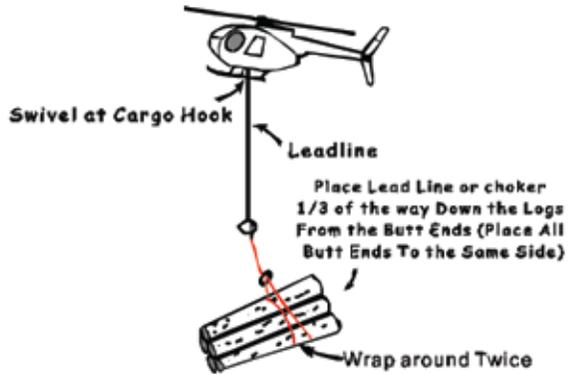
To keep the load from slipping out, wrap the rope or chain twice around the end of the pole when carrying a single pole or log, as shown in the illustration in the exhibit above.

Exhibit 11-10: Rigging Multiple Poles or Logs For Flight



→ Multiple poles or logs can be wrapped with heavy wire. Attach the wire to each log with fencing staple, then use a choker 1/3 of the way from the end of the logs.

CAUTION: With multiple-log loads, use an end stop to prevent pieces on the interior of the load from slipping out. However, ensure the material utilized is well-secured to the stack itself.



XII. Hookup Methods.

There are four methods of hooking up loads to the helicopter for transport. These are:

- Hookup while the aircraft is on the ground;
- Hover hookup attaching the rigged load directly to the cargo hook (no leadline);
- Hover hookup utilizing a leadline; or,
- Hover hookup using a longline with a remote electric hook or carousel.

A. Preparation for the Hookup.

Basic tasks that should be performed prior to performing any external load operation include:

- Prepare by removing any items from the helicopter that are not essential;
- If requested, assist the Pilot with the removal of all or any doors and store in a safe location at the Pilot's direction;
- Check both the rigging of the load and the external load equipment according to the requirements and guidelines discussed previously in this chapter and in Chapter 9;
- Attach the load to a swivel (the swivel must have a rating equal to or greater than the load to be carried, with an ultimate strength of three times the weight of the load). Use of a swivel is required in most cases. Always attach the swivel to the cargo hook, or, if using the longline with remote electric hook configuration, to the remote electric hook.

B. Hookup with Helicopter on the Ground.

(See Exhibit 11-11.) This method is usually utilized with the helicopter shut down, and involves the least amount of risk to those involved. It should be used when the considerations outlined for the other two methods (hover hookup with leadline or hover hookup with longline and remote electric hook) do not apply.

The Pilot should be present when hooking the load to the aircraft. Once the load is ready, perform a three-point check:

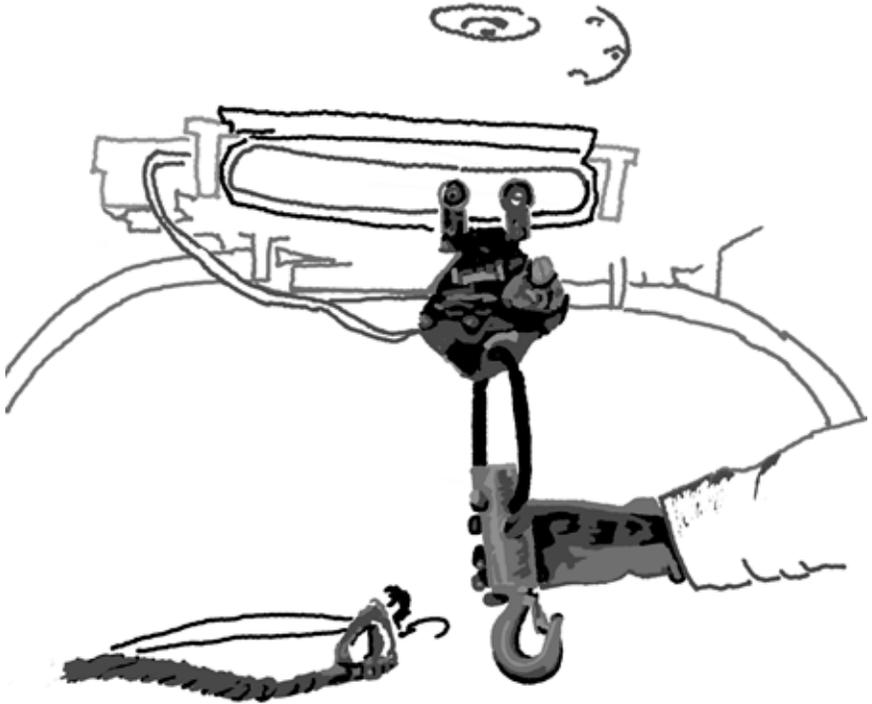
- Pilot checks manual release on the cargo hook.
- Pilot checks the electrical release on the cargo hook.
- Check the electrical function of the mission equipment (for example, water bucket release, remote electric hook release, helitorch pump, etc.).
- Run the leadline and swivel from the load to the cargo hook, ensuring that the line is not near or looped over any skid.

CAUTION: It is extremely important to test the manual release first, then test the electrical release. This sequence is necessary because the manual release is usually a cable release susceptible to snagging or incorrect rigging.

Some operators want to test the manual release only once per day as more checks may put undue wear on the release. If this is the case, those manual releases may be checked one time per day.

NOTE: After all checks have been performed, visually inspect the cargo hook to ensure the release arm or knob is fully reset.

Exhibit 11-11: Attaching Cargo To The Hook With Helicopter On The Ground



C. Hover Hookup with No Leadline.

This method involves attaching the load (for example, a cargo net with swivel) directly to the cargo hook.

The method of hookup without leadline has disadvantages. There may not be enough slack in the net's perimeter lines to allow the hookup person to attach the load on the cargo hook. In extreme cases, the helicopter may have to descend almost on top of the load itself.

This procedure is not recommended unless there is enough line for the hookup person to stand almost upright below the helicopter.

NOTE: Performing a hover hookup is a combination of the pilot maneuvering the helicopter slightly toward the upraised swivel ring held by the hookup person. The hookup person is able to move somewhat toward the hook, provided there is enough line to do so.

D. Hover Hookup with Leadline.

(See Exhibit 11-12.) Hover hookups with leadline are effective:

- When multiple loads need to be transported in a short time frame;
- When the load destination involves terrain on which the helicopter is unable to land.

To determine when and how to use a lead line, consider:

- Pilot preference (both length of individual line and number of increments);
- Cargo to be transported;
- Terrain and surrounding vegetation at the destination or takeoff point.

Additional leadline lengths may be necessary for bulky loads, when doing special projects, or when the hook-up person underneath the helicopter may need additional length(s) to perform the hook-up.

NOTE: Remember to place the swivel at the end of the leadline that will be attached to the cargo hook.

Exhibit 11-12: Performing A Hover Hookup With Leadline



E. Hover Hookup with Longline and Remote Electric Hook.

(See Exhibit 11-13.) Hover hookups with longline and remote electric hook are effective:

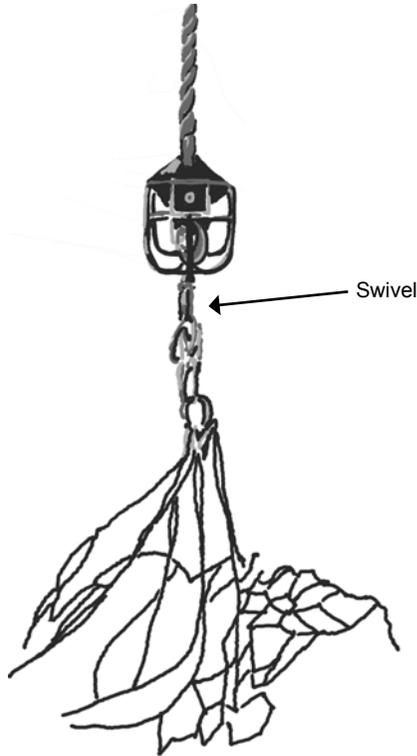
- When multiple loads need to be transported within short time frames, and when the load is on terrain on which the helicopter is unable to land or takeoff, and the surrounding vegetation and/or terrain is such that the helicopter is unable to perform a hover hookup with a standard length of leadline;
- When ground personnel are not at the site;

NOTE: If the above criteria are not met, then use of the simple leadline configuration should be considered.

REMEMBER: On single net loads, place the swivel at the end of the leadline that will be attached to the remote hook.

Use of a longline with remote electric hook carousel also allows the Pilot to place loads at different locations during the same mission.

Exhibit 11-13: Performing A Hover Hookup With Longline and Remote Hook



XIII. General Requirements for External Load Missions.

A. Required Personnel.

1. Hookup with Helicopter on the Ground. Only one person is necessary for this type of operation, since the Parking Tender can accomplish the hookup, then exit and perform marshalling duties.
2. Hover Hookup. Only qualified and trained personnel shall perform hover hookup operations. It is recommended that two individuals perform the operation: a Parking Tender, and the individual performing the hookup.

On longline with remote electric hook operations only if circumstances dictate one person may perform the hookup, provided there is positive air-to-ground radio communication between the Pilot and the individual performing the hookup.

Individuals are qualified to perform hover hookups by completing the necessary training² required for hover hookups as specified in Chapter II, and being knowledgeable of the operating characteristics of the cargo hook, including both manual and emergency release.

B. Radio Communications.

For operations where radio communication is recommended or required, a secure or discrete operating frequency should be established, radios checked during the briefing, and ground contacts identified. Pilot shall receive radio communications from only one person.

1. Hover Hookup with or without Leadline. For hover hookup operations with or without leadline, it is recommended that the Parking Tender be equipped with a radio. Use of the flight helmet adapter to a handheld radio is optimal, though a headset worn beneath the hard hat, with adapter to a handheld, will work.
2. Hover Hookup with Longline and Remote Electric Hook. Radio communications between the Pilot and Parking Tender or hookup person is required.

C. Briefing.

A pre-mission safety briefing must be conducted with the Pilot, the Parking Tender, and the hookup person. Hand signals and emergency procedures are an integral part of this briefing.

1. Helicopter Hand Signals. (See Exhibit 11-14.) Standard hand signals shall be used. Although there are rare instances where terrain dictates the need for two individuals to give hand signals (that is, one from the front and one from the side), the Pilot usually should receive hand signals from only one person (for example, the Parking Tender). Ensure that both ground crew and Pilot are thoroughly familiar with standard signals. For hover hookups, these should include:

² Longline training is covered in either of the following courses: S-271 or A-219.

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- The helicopter's height above the hookup person (accomplished by using the Move Downward signal with decreasing length of arm motion);
- Indication that the helicopter should hold while the hookup person leaves the area (Hold Hover signal);
- Indication of load clearance (accomplished by using the Move Upward signal with increasing length of arm motion);
- Clearance to take off (Clear To Take Off signal);

Exhibit 11-14: Standard Helicopter Hand Signals

HELICOPTER HAND SIGNALS



CLEAR TO START ENGINE
make a circular motion above head with right arm.



HOLD ON GROUND
extend arms out at 45 thumbs pointing down.



MOVE UPWARD
arms extended swooping up.



MOVE DOWNWARD
arms extended swooping down.



HOLD HOVER
arms extended with clenched fists.



CLEAR TO TAKE-OFF
extend both arms above head in direction of take-off.



LAND HERE, MY BACK IS INTO THE WIND
extend arms toward landing area with wind at your back.



MOVE FORWARD
extend arms forward and wave helicopter toward you.



MOVE REARWARD
arms extended downward using shoving motion.



MOVE LEFT
right arm horizontal, left arm sweeps over head.



MOVE RIGHT
left arm horizontal, right arm sweeps over head.



MOVE TAIL ROTOR
rotate body with one arm extended.



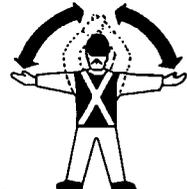
SHUT OFF ENGINE
cross neck with right hand, palm down.



FIXED TANK DOORS
open arms outward, close arms inward.



RELEASE SLING LOAD
contact left forearm with right hand.



WAVE OFF DO NOT LAND
wave arms from horizontal to crossed overhead.

2. Emergency Procedures. Prior to hover hookup operations, emergency procedures must be established between the Pilot and ground crew. The emergency briefing is usually presented by the Pilot and addresses procedures in the event of a mechanical failure.
 - The Pilot should indicate that the intent will be to move the helicopter away from the hook-up person underneath the aircraft. Generally, this will be to the Pilot's side of the helicopter, but confirm this with each Pilot.
 - The hook-up person should move in the opposite direction from that of the helicopter, or fall flat next to the load and attempt to gain as much protection as possible.

D. External Load Operations.

Landing zone rotor clearance standards for external load operations where aircraft must descend below any obstacles/barriers.

1. The performance of external load missions must be contingent upon proper assessment and preparation of the delivery site by first removing and mitigating hazards.
2. The selection of dip/snorkel sites may require concurrence of agency personnel such as resource advisors. While it may not be feasible to approve every dipsite, check first.
3. In areas of sloping terrain or with obstacles rising to one or more sides of the cargo pickup/delivery area, or dipsite, the pilot shall maintain rotor clearance from all obstacles equivalent to the IHOG Chart 8-1 landing area safety circle requirements. When specified clearance cannot be maintained, the pilot shall decline the mission until hazards are removed, additional line can be added or a better location can be identified.
 - The safety circle is generally recognized as 1 ½ times the rotor diameter.
4. When obstacles present a risk of contact with aircraft or rotor blades, the pilot should decline the mission until hazards are removed, additional line can be added, or a better location can be identified. Pilots have the final say in accepting and/or denying any mission.
5. If the helicopter is within ½ rotor diameter of the highest obstacle, the pilot should consider adding another length of line.

E. Personal Protective Equipment.

See Chapter 9, Chart 9-2.

F. Equipment.

Check equipment according to procedures in Chapter 9. Check serviceability or general condition of equipment. Pay particular attention to the recommendations and conclusions in this chapter regarding the proper method of attaching the cargo ring to the hook.

Check the load-carrying capabilities of net, leadlines, swivels, etc. Equipment must have a working load (that is, the "test" rating) equal to or greater than the load. Equipment must have an ultimate strength that is three times the load weight.

NOTE: Do not confuse the working load test rating with the safety factor.

G. Grounding.

Static electricity may present a problem to ground crews when hooking up sling loads to hovering helicopters.

Grounding techniques include use of rubber gloves, grounding the load to the helicopter skid prior to attaching to the cargo hook (never touch the skids or any other part of the helicopter without the Pilot's permission), Pilot keying the radio prior to the hookup person attaching the load, etc.

Unfortunately, there is no method of grounding that ensures that the hookup person will not receive some amount of electrical shock when the load touches the hook.

XIV. Procedures for Hover Hookups.

A. General.

There are standard procedures for any hover hookup, regardless of whether or not a leadline or longline is used. These include:

- The cargo load itself should be placed in front of the helicopter skids, with no potential for lines to become snagged over the skids;
- The cargo net's perimeter lines should be drawn over the top of the load and laid so that the lines and leadline are prevented from becoming entangled in the net during liftoff;
- The Parking Tender should direct the Pilot by radio or standard hand signals. Placement of loads carried by longline and remote electric hook may be done independently by the Pilot if no ground personnel are available;
- The Parking Tender should be far enough back of the load to remain visible to the Pilot at all times; the Parking Tender should establish this position by anticipating the length of the leadline or longline attached to the load or helicopter; the longer the line, the farther back from the load the Parking Tender must be.
- This position should also be slightly to the side of the load so that the Parking Tender can also maintain visual contact with the Pilot from the Pilot's position in the cockpit; for helicopters that are flown from the right seat, the Parking Tender should

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be approximately at the Pilot's "2 o'clock" position. This position is reversed for helicopters flown from the left seat;

- The Parking Tender should wear a non-flammable high-visibility vest to distinguish him or her from other personnel on the deck;
- Mutually-agreeable measures to prevent static electrical shock may be taken by the hookup person and the Pilot;
- After the hookup is completed, the hookup person should exit from underneath the helicopter to the front and in full view of the Pilot; the hookup person should then proceed to a position that is not underneath the departure path of the helicopter.

CAUTION: When exiting, the hookup person should take care not to become entangled in either the line or the load. WALK; DO NOT RUN.

- When the hookup person is clear of the helicopter, the Parking Tender may signal the Pilot to begin movement of the load;

The Parking Tender must pay close attention as the helicopter lifts up and tension is applied to the line; an improperly-rigged or placed load can become snagged at any time;

If the load becomes snagged, is improperly rigged or hooked, etc., then the Parking Tender should give an appropriate hand signal or radio message;

- The hookup person, having exited, should remain ready to take direction from the Parking Tender should the load or line become snagged;
- Always keep the load between you and the helicopter.

CAUTION: The hookup person should never re-enter the load area beneath the hovering helicopter unless the Parking Tender directs the hookup person to do so, and the pilot is aware of the person's movement.

CAUTION: The hookup person should never attempt to re-rig a load when tension is still applied to the load by the helicopter. Hands, arms, or other parts of the body could become snagged in the load, causing serious injury.

NOTE: Water bucket and longlines should be attached to the helicopter while it is on the ground and NOT hover hooked/plugged.

IMPORTANT CAUTION: Hover hookups to connect electrical power accessories should not be performed. If an electrical connection is loose or not functioning, the pilot should land the helicopter to rectify the problem on the ground.

B. Longline and Longline with Remote Electric Hook Procedures.

Considerations and requirements for longline with remote electric hook operations include:

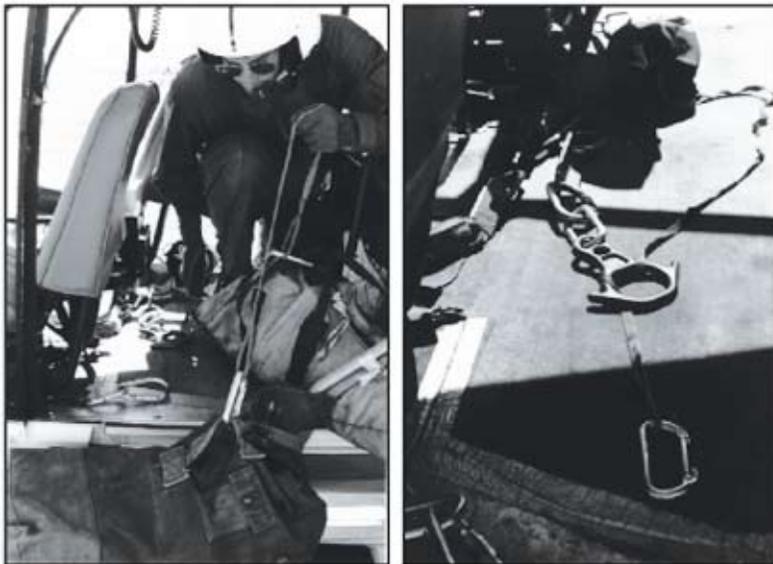
- The sling load should be placed on the ground in the center of the loading area.
- On approach, the signal person should advise the Pilot on load clearance from trees, load height above the ground, and any problems that might arise in the pickup or drop zones.
- For safety purposes, the hook should be landed next to the load. The hookup person should not be in the vicinity of the load at the time the Pilot is placing the hook.
- Once the hook is placed on the ground, the Pilot should then displace the helicopter to the side so the hookup person is not directly beneath the hovering helicopter.
- When attaching a load to the remote electric hook, the hookup person should allow the hook to contact the ground before touching it. This grounds the hook and eliminates the possibility of shock from static electricity.
- The hookup person hooks the load to the remote electric hook and leaves the area. On approach or departure to the remote hook, the hook-up person shall not step over the longline while attaching the load.
- Helicopter is then positioned above the sling load and the load is lifted from the ground, then flown out.
- When receiving a load, stay clear of the landing area. Let the Pilot set the load on the ground, release it from the remote electric hook (if there is an electronic hook) before entering the area. On approach or departure the hook-up person shall not step over the longline while attaching/detaching the load.

XV. Cargo Letdown.

(See Exhibit 11-15.) Cargo letdown is a system that allows the controlled descent of lighter cargo loads (water containers, chain saws, backpack pumps, etc.) from a hovering helicopter into areas that are not conducive to delivery by the internal cargo method or which do not contain enough equipment to make up a slingload for normal external load delivery.

For equipment and training requirements and procedures, refer to the Interagency Helicopter Rappel Guide.

Exhibit 11-15: Cargo Letdown Operation



XVI. Cargo Freefall.

(See Exhibit 11-16.) The free fall of cargo from a helicopter is an additional method of delivering cargo to an area where conventional delivery methods will not work and/or a landing is impossible.

Rations, handtools, cubitainers of water, and other durable items, as well as more fragile items, can be dropped by freefall when properly packaged. Larger loads can be delivered by releasing the cargo net from the cargo hook at a minimum safe altitude and air speed. Drops must be made a safe distance from personnel on the ground.

A. Required Personnel.

1. All Helicopters. Minimum aircrew will consist of pilot and spotter (spotter will conduct dropping operations). The spotter should be a qualified manager for freefall cargo operations. Some missions may require additional personnel with designated droppers, etc.

B. Criteria For and Situations When Cargo Freefall May Be Used.

Free falling of cargo should only be done after the following criteria have been met and in the following situations:

- The helicopter cannot land safely, and the mission has been determined to be tactically essential.
- Other methods of cargo transportation have been considered and free falling from the helicopter has been determined the most efficient and economical method.
- A helicopter load calculation form has been completed using the helicopters hovering out of ground effect chart. Consideration must be given to weight of cargo, and maintaining center-of-gravity limits.
- There is adequate clearance from obstructions in the flight path and at the drop zone.
- All personnel involved have been thoroughly briefed. This will include the Pilot, spotter, dropper, and all ground personnel.
- Positive air-to-ground communications are established.

C. Planning for the Drop.

The operation is conducted in two phases. Planning prior to the drop is the first phase.

1. Compliance with Aircraft Flight Manual. All procedures will comply with the aircraft manual (for example, door removal).
2. Line of Authority. Lines of authority must be established. The Pilot and spotter must know the contact at the drop zone. The person at the drop zone is aware of the mission, has established a drop zone where the cargo is to be dropped, etc.

3. Selection and Packing of Cargo. Refer to Exhibit 11-18. Packing will depend largely on what materials are available. Cargo must be selected and packed to prevent undue damage. This will vary with different types of equipment.
 - a. Little or No Packing Required. Items that require little or no packing are listed below.
 - Fire hose and sleeping bags must be banded with rubber bands, straps, or filament tape. Ends of the hose should be coupled to prevent damage.
 - Hand tools should be taped together with heads protected and appropriately packaged (for example, padded with honeycomb or several layers of cardboard).
 - Rations.
 - b. Packing of Fragile or Semi-Fragile Items. Without access to large quantities of packing material, the only fragile items that are practical to drop are water, batteries, and other inexpensive items. Fragile items will have to be appropriately packaged to prevent damage. It is suggested that bases intending to use the freefall method stock honeycomb, hog hair, or other types of packing material and boxes both at the base and in the helicopter chase truck.
4. Equipment Required. An approved restraint harness fastened to a hard point on the helicopter must be worn by any individual (spotter and or dropper) who will not be normally restrained by seatbelt and/or shoulder harness. This shall be fastened to an "approved" hard point and the tether adjusted so that the individual cannot break the plane of the doorway.
5. Selecting the Drop Site. Fragile and breakable items such as radios, power saws, etc., require special consideration. Look for areas where a lower drop can be accomplished. If available, a patch of brush serves as a good cushion.

When selecting the drop site, consider the items you are delivering and at what height you will have to release them. Site selection is not as critical for items such as tools, sleeping bags, etc., that can withstand more impact.

Exhibit 11-16: Packing Cargo For A Freefall Drop



D. Drop Procedure.

The following procedures must be followed.

- Air-to-ground communications shall be established before drop zone is selected.
- The drop zone shall be identified on the ground (marker, ribbon, flagging).
- Two reconnaissance runs, one high-level and one low-level, shall be made over the drop zone.
- A high-level reconnaissance of the drop zone shall be made to determine:
 - If the drop is feasible at the selected site;
 - That ground personnel have been moved a safe distance out of the drop zone;
 - To determine wind condition and direction;
 - Determine location and nature of ground and aerial hazards.

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- A low-level reconnaissance of the drop zone shall be made. At this time, the Pilot and dropper shall:
 - Reconfirm hazards in the drop zone;
 - Determine approach and departure routes;
 - Check for personnel too near the drop zone and/or approach-departure path;
 - Confirm with the ground contact that the area is clear;
 - Make final check of cargo to be delivered;
 - Pilot and dropper must both agree to proceed.
- On the drop pass, the cargo will be dropped if all conditions remain as planned.
 - Remember to anticipate forward speed of the helicopter;
 - Drop cargo laterally (that is, out and away) from the helicopter (not toward the tail rotor or skid).

CAUTION: Do not hesitate to suspend dropping operations when conditions are marginal or unsafe.