

CHAPTER 11

USE OF THE HIGH PERFORMANCE HOIST IN MEDICAL EVACUATION OPERATIONS

Section I. CREW RESPONSIBILITIES

11-1. General

a. The minimum number of crew members to execute a hoist rescue operation is four. This includes the PC, PI, crew chief (hoist operator), and medic. As crew coordination is the key to successful hoist operations, each crew member must thoroughly understand the duties of all persons involved in the effort. If the patient is disabled, the PC designates a crew member to descend on the hoist to assist the patient.

b. Throughout this chapter and Appendix I, the term "patient" denotes medical patient, casualty, or survivor.

11-2. Primary Crew Responsibilities

a. The PC has overall command and control of the operation. He supervises planning and pre-flight procedures as well as briefing the crew on all mission details. He coordinates crew activities and is responsible for their proficiency and performance. Although his primary duty is to fly the helicopter,

the situation may require him to operate the hoist by using the cockpit controls.

b. The PI has the responsibility throughout the operation to remain oriented with the horizon and to assist both the PC and the hoist operator, if needed. If an emergency condition arises he will be directed by the PC to employ the hoist cable cutter. He must be familiar with all crew member tasks and be able to perform them. If the hoist operator is directed to leave the helicopter to aid a patient, the PI may be required to operate the hoist.

c. The hoist operator inspects the hoist and all other mission-essential equipment prior to take-off. His most crucial task is to guide the PC over the patient. The hoist operator is responsible for deploying smoke and flare devices. He operates the hoist and assists in lifting the patient into the helicopter.

d. The medic provides medical treatment to the patient. He may be required to leave the helicopter to assist the patient. The medic should also be proficient in operating the hoist.

Section II. INTERCREW COMMUNICATIONS

11-3. General

To successfully accomplish hoist rescue operations, all members of the rescue team must be able to communicate accurately and concisely. All crew members must be able to communicate the necessary information even if voice communications are impossible or impractical.

11-4. Intercrew Communications

The primary means of communicating throughout the hoist operations is voice communications over the helicopter interphone system (hot mike);

however, the PC or PI may elect to remain on the command radio and depress the interphone switch. If the interphone fails, hand signals are used.

a. *Operational terminology.* During the operation, communications between PC and hoist operator should be clear and concise. To avoid confusion, no more than one direction should be given at a time. The PC acknowledges each direction. The following terminology is recommended for use by the hoist operator and should be standardized in the unit SOP.

(1) Area is in sight.

(2) Patient is in sight _____ feet ahead—correct right (or left, as applicable).

(3) On course, patient is straight ahead—on course.

(4) Back _____ feet.

(5) Forward _____ feet.

(6) Up _____ feet.

(7) Down _____ feet.

(8) Left _____ feet.

(9) Right _____ feet.

(10) Hold. (Used when in position and centered over patient.)

NOTE

The word *STOP* should never be used.

(11) Hoist is halfway down.

(12) Hoist is on the ground (in the water, as applicable).

(13) Aircraft is clear of all obstacles.

(14) Patient is on hoist, ready for pickup.

(15) Ground personnel are clear.

(16) Cable is tight/slack is out.

(17) Pilot, lift the load.

(18) Load is off the ground.

(19) Give load height in 1-foot increments until the load is stabilized and at 10 feet.

(20) Load is clear of barriers.

(21) Load is 20 feet below the aircraft.

(22) Give load height in 5-foot increments until the load is stabilized 5 feet below the aircraft.

(23) Load is even with the skid tubes or wheels.

(24) Load is secure in the aircraft.

(25) Rear is ready and secure.

b. Hand signals.

(1) Hand signals should be preplanned and practiced before the operation. It is important that the hand signals not impair the crew's ability to fly the aircraft. When using hand signals, the PC and hoist operator should be positioned on opposite sides of the helicopter, or the PI can relay these signals to the PC.

(2) The following are examples of hand signals used during hoist operations to direct the PC:

(a) Movement of the helicopter can be indicated by moving the open hand in the desired direction with the palm facing in that direction.

(b) Hold in present position is indicated by a clenched fist.

(c) Movement of the hoist is indicated by extending the thumb either up or down from a clenched fist.

(d) Fingers are used to indicate numbers of feet.

Section III. EMPLOYMENT

11-5. General

Hoist rescue operations must be conducted in a systematic manner to ensure that the operation is handled in the safest possible way. All crew members must be aware of what phase the operation is in at any given time.

11-6. Hoist Rescue Operational Phases

Once the patient has been located, hoist rescue operations can be divided into four distinct phases. These phases are—

a. Visual Preparation. Upon sighting the patient, smoke is dropped to mark his position and to determine wind direction. If radio communications with the patient has been established, position marking may not be necessary. If the wind direction is known, other marking devices such as lights and panel markers, may be used.

b. Pattern Phase. A flight pattern is established during the second phase of the operation to bring the helicopter into position. The type of pattern to be flown is determined by the PC and is influenced by the PC's position in the cockpit. The left seat provides a greater field of vision. However, control of the hoist in the UH-1 cockpit is available in the right seat only. The unit SOP designates the seat for the PC.

c. Recovery Phase. This is the most critical phase of the operation and requires the highest degree of crew coordination. Recovery techniques vary depending upon the environmental factors in the AO.

d. Departure Phase. In this phase, the patient is secured in the aircraft and the equipment is positioned for departure from the hoist site. The aircraft is then prepared for departure.

Section IV. ENVIRONMENTAL FACTORS

11-7. General

Hoist operations are conducted over both water and land and in varying degrees of illumination such as daylight, overcast conditions, and at night. The crew must train in all types of environmental conditions to ensure they are able to accomplish their stated mission.

11-8. Water Recovery Operations

a. Visual Preparation.

(1) Upon the initial sighting of the patient, a marine locator marker is deployed in the immediate vicinity to mark the position and to determine the wind direction. The patient must be kept in sight until the initial smoke is dropped. The PC flies into the wind maneuvering over the patient so that the hoist operator can drop the smoke in the

vicinity of the patient. If a marine locator marker is not available, fluorescein sea markers from the water survival kit are effective.

(2) Once the wind direction is determined, additional smoke may be employed to aid in spatial orientation. Smoke should be dropped at the lowest possible altitude and airspeed. The smoke must land in a spot close enough to the patient to provide adequate wind information, but should not obscure his position when approaching into the wind. The PC must keep the hoist operator continuously informed of their position in the pattern during the approach (on the downwind leg, on the base leg, and on the final approach). The hoist operator advises the PC when the smoke has been released.

b. Pattern Phase. Once the smoke is employed, the PC plans and establishes a flight

pattern that places the helicopter in the position for the recovery.

(1) If the PC is in the right seat, a right-hand pattern should be flown so that the PC can keep the patient in sight.

(2) The final approach should permit the helicopter to arrive at a hover far enough from the patient so that the—

- Waves and rotor wash are not a hazard to the patient.
- Rescue device can be lowered into the water well clear of the patient.

(3) The PC advises the hoist operator of their position throughout the approach and advises when he has the patient in sight.

(4) The hoist operator acknowledges all calls and informs the PC when he has the patient in sight on the final approach.

(5) The PC and PI maintain the proper altitude and position once the final approach has been completed.

c. Recovery Phase.

(1) Once the hover has been established, the PI makes a *power-available* check to ensure that the helicopter has sufficient power to continue the operation. The check should be performed at the lowest altitude possible. When the PC is ready to continue with the recovery, he advises the hoist operator to lower the rescue device and directs the helicopter to the patient. The hoist operator then lowers the rescue device and gives directional instructions to the PC to move the helicopter on a straight course to the patient. Before he loses sight of the patient, the PC should transfer his hover reference to the smoke markers that have been placed upwind. He should not attempt to watch the pickup, as spatial disorientation may result. As the helicopter moves slowly toward the patient, the rescue device should be lowered. He ensures that the rescue device enters the water at least 20 to 30 feet before reaching the patient. This assures that the device does not strike and injure the patient. Flotation gear is provided for the patient at this time.

CAUTION

Static electricity built up on the hoist cable and the rescue device must be discharged by touching the device to the water before attempting the pickup.

(2) When the rescue device is in the water and easily accessible to the patient, the hoist operator directs the PC to hover to that position. When the patient is observed to be secure and ready for hoisting, the—

- Hoist operator takes up any slack in the cable and notifies the PC that the pickup is ready to proceed.

- Copilot makes a final power check to ensure that sufficient power is available for recovery.

- Pilot-in-command applies sufficient power to lift the patient clear of the water (approximately 10 feet).

- Hoist operator begins hoisting until the patient is in the helicopter cabin.

(3) During the pickup, the PC devotes his full attention to maintaining a steady hover using all available reference points and the hoist operator's instructions. The PI monitors the instruments and remains oriented with the horizon throughout the operation to assist the PC. The hoist operator's instructions to the PC must be clear and concise (refer to paragraph 11-4).

(4) The hoist operator advises the PC when the patient is safely inside the helicopter and secured in the cabin. The PC then transitions from a hover to forward flight.

CAUTION

The lateral center of gravity (CG) limits may be exceeded if all crew members and passengers are positioned on the same side of the helicopter.

11-9. Land Operations

a. Visual Preparation. Determining wind velocity and approximate distance is important to successful hoist operations. Although smoke may be used as a means for determining the approximate wind velocity and direction, observing vegetation in the area may be easily employed as an alternate means. If smoke is used, it should be deployed in an area that is open enough to be seen from anywhere in the hoist pattern. Care should be taken to select a nonflammable target area.

b. Pattern Phase.

(1) As in water operations, the pattern flown should allow the PC to maintain visual contact with the patient. Terrain factors and conditions encountered at the rescue site must be evaluated to determine the best approach to be used. The PC must keep the hoist operator informed at all times as to the type of pattern to be flown and the position of the helicopter in the pattern.

(2) The PC devotes his full attention to maintaining a steady hover by using all available references and the hoist operator's instructions. The PI monitors the engine instruments and remains oriented with the horizon. The presence of trees, wires, or other obstacles require extreme caution in approaching the patient. Since all crew members must aid the PC in rotor-tip clearance, all doors and ramps are open for maximum visibility. The hoist operator must give clear and concise instructions to the PC. He must also supply continual commentary on the progress of the pickup throughout the pattern phase.

CAUTION

Static electricity built up on the hoist cable and rescue device must be discharged by touching the device to the ground before attempting the pickup.

c. Recovery Phase. Prior to hoisting the patient, the hoist operator takes up any slack in the

cable and notifies the PC that the patient is ready for pickup. The PC then makes a final determination that sufficient power is available to safely accomplish the recovery. The PC applies sufficient power to lift the patient clear of the ground (approximately 10 feet) or if the tactical situation requires, the hoist operator raises the patient while the helicopter remains in a stationary hover. Both techniques have proven acceptable; however, the aircraft lift is preferred. The PC decides which technique to apply depending on the given situation. The first procedure provides the PC better control of the aircraft as the patient is lifted off the ground which may be needed in confined areas. In tactical situations, however, the second method may be used to avoid unmasking the aircraft. The hoist operator advises the PC when the patient is safely inside the helicopter and secured in the cabin. The PC then transitions from a hover to forward flight.

11-10. Night Recovery Operations

Flying, especially hovering, at night is difficult because visual ground references are not easily distinguishable. When hovering over water or dense vegetation, ground contrast and reference points are virtually nonexistent. Without visual clues, the PC's ability to judge movement is severely impaired. Constant head movement and scanning are essential throughout the maneuver to maintain altitude and position. Because of this increased work load, it is recommended that the crew chief (hoist operator) operate the hoist rather than the PC.

a. Illumination.

(1) Chemical lights may be attached to rescue equipment to provide illumination. The lights aid the hoist operator, as well as the personnel on the surface, to determine the position of the equipment during the operation. To activate the chemical light, remove it from the foil package and bend the light stick until a pop is heard. Shake the chemical light stick vigorously to facilitate the chemical reaction.

(2) Due to spatial disorientation at night while flying or hovering over water, continuous flare illumination should be used whenever

possible. Flares improve depth perception and reference to the water. Multiple smoke or marking devices deployed on the water during water recoveries assists in determining wind direction and provides a visual reference for hovering. Caution must be used to prevent smoke from restricting visibility in the immediate recovery area.

(3) As in night water recoveries, flare illumination provides the best possible conditions for conducting land pickups at night. Flare illumination, however, is not absolutely necessary. Helicopter lights normally provide adequate lighting to safely accomplish the recovery.

b. Night Vision Goggles.

(1) In a tactical environment, the amount of illumination which can be used during the recovery operation should be considered. It may be necessary to use NVG in order to maintain adequate concealment.

(2) Infrared (IR) chemical lights, designed for use with the NVG, may be attached to rescue equipment to provide the hoist operator with visual clues during hoisting procedures. A 30-minute high-intensity light stick and a 12-hour low-intensity light stick are also available.

Section V. INERT PATIENT RECOVERIES

11-11. General

If it is determined that the patient is unconscious or unable to board the rescue device, the PC directs one of the crew members to prepare to exit the helicopter and another to act as the hoist operator. If the hoist operator is directed to leave the helicopter, the PI moves to operate the hoist. If a medic is available, he may exit the helicopter while the other crew members maintain their positions.

11-12. Procedural Guidance

a. The crew member performing the duties of hoist operator dons the safety harness over the hoist operator vest. He ensures that the crew member preparing to leave the helicopter is secured in the rescue device or hoisting vest. Flotation gear must be worn during all water recoveries, and if necessary, be provided to the patient. The PC is notified when the preparations are completed.

b. Once the crew member is ready to exit the helicopter, he is lowered to the surface where he leaves the rescue device and secures the patient for hoisting. The hoist operator then notifies the PC when ready to begin hoisting. The PC determines if adequate power is available to accomplish the recovery.

c. The PC applies sufficient power to lift the patient off the ground (approximately 10 feet) or the hoist operator raises the patient while the helicopter remains at a stationary hover. The hoist operator then hoists the patient, pulls him into the cabin, and removes the patient from the device. The crew member is then retrieved from the surface. The hoist operator must keep the PC informed of the progress of the recovery. When all personnel are safely inside the cabin, the PC is notified. The PC then transitions from a hover to forward flight. If the PI has served as hoist operator, he returns to his position in the cockpit.

Section VI. METEOROLOGICAL AND TERRAIN FACTORS

11-13. General

Hoist rescue operations are conducted over various types of terrain and in a number of weather condi-

tions. The aircraft crew must be familiar with the unique requirements within their mission area and must train in these conditions to ensure the safety of the hoist operation.

11-14. Performance Planning

a. Prior to hoist operations, the PC must consult the appropriate operator's manual, specifically the performance charts. These charts correlate the effects of altitude, temperature, and gross weight on aircraft performance. Data is available for virtually all environmental conditions.

b. The performance planning card (PPC) enables the PC to determine if the aircraft can perform the mission under the current meteorological conditions. It is critical that the PC assess environmental conditions which can be expected at the rescue site, especially if they differ from those at the departure point. During high altitude missions, it is recommended that the PI continually update the PPC to compensate for gross weight changes and CG shifts.

(1) Under adverse conditions, the amount of weight that can be carried may be limited and the aircraft may be unable to sustain the high hover necessary for hoist operations. Wind direction and velocity must also be considered. For maximum control of the aircraft, the PC should avoid excessive tailwinds and right crosswinds. (Refer to the aircraft operator's manual for wind limitations.)

(2) The PC must manage fuel consumption to ensure sufficient fuel is available to complete the mission. Aircraft can be equipped to carry auxiliary fuel tanks to extend the range. However, these tanks reduce the cabin area (particularly in the UH-60A) and the added weight will limit the size of the load. The auxiliary tanks also affect the aircraft's CG.

11-15. Mountain Operations

The rugged terrain and dense forest characteristics of mountain environments often necessitates the use of hoists to extract personnel. Variable weather, wind, icing, and altitude adversely affect aircraft performance. These factors require precise aircraft control and detailed flight planning to prevent interruptions and delays.

a. Altitude.

(1) Density altitude is the most important meteorological factor affecting aircraft

performance over mountainous terrain. Density altitude is dependent upon temperature, relative humidity, and pressure altitude. It provides the basis for determining lift capability. An increase in any of the three basic elements increases density altitude and decreases lift capability. As density altitude increases, increased torque or power is required.

(2) In the mountains, density altitude can vary significantly depending upon the time of day. Furthermore, the density altitude at the point of departure may be quite different from that at the pickup site. For example, density altitude normally peaks in the late afternoon and reaches its low point at dawn. The power available/power required margin must be large enough to absorb transient power requirements caused by turbulence, wind shifts, and patient weight. In a high-density altitude environment, power checks are critical. *Maintaining a minimum of 10 percent above required power is recommended.*

b. *Wind.* Wind is the principal weather hazard experienced in the mountains. Even moderate winds (11 to 20 knots) can produce significant turbulence as they pass over mountain ridges. Predicting wind conditions can be difficult due to the multitude of terrain variations. Each type has an effect on the flow of air. On the windward side of mountains, the direction of airflow is normally steady even though its strength may vary. On the leeward side of crests, wind is turbulent with strong vertical currents. The effects of turbulence may be alleviated by flying above terrain features and avoiding the lee side of all peaks and ridges. Ridges and saddles should be approached at the highest altitude possible and crossed at a 45 degree angle. Training and flying experience in these conditions minimize the hazards produced by wind and turbulence.

c. *Icing.* Icing can occur on aircraft in weather conditions such as low clouds and fog. In mountainous terrain, icing occurs when moist air is lifted over high peaks. Ice-producing areas are usually on the windward side of peaks to about 4,000 feet above the peak, and possibly higher when the air is unstable. Army helicopters are not capable of flight in severe icing conditions. As ice forms on rotor blades, it results in a significant decrease in lift and autorotational capabilities. Asymmetrical

shedding can occur which causes a severe rotor blade imbalance.

d. Additional Information. For additional information on medical evacuation operations in mountainous terrain, refer to paragraphs 5-2 and 9-12 through 9-14.

11-16. Jungle Operations

Jungle terrain is often rugged and swampy with dense towering trees. Some jungles are composed of several canopies with trees more than 100-feet tall. There are few suitable LZs and thick jungle foliage complicates communications between ground and air resources.

a. Density Altitude. Jungle weather is generally hot, humid, and very unstable. In this environment, density altitude becomes an overriding consideration. As density altitude increases, engine efficiency decreases and the power required can become critical under high gross weight conditions.

b. Signals. Signals are difficult to see or hear from under dense tropical growth. In order to locate personnel on the ground, it may be necessary to use emergency signaling devices. A wide stream bed is a good place to signal from, especially where there are sandbars. Other open areas may also be used; however, caution must be exercised due to the increased vulnerability to sniper and small arms fire.

c. Additional information. For additional information on medical evacuation operations in jungle environments, refer to paragraph 5-3.

11-17. Extreme Cold Weather Operations

Cold weather flying conditions may be encountered in many parts of the world and severity varies with latitude and season. In this harsh environment, rapidly changing weather poses the greatest hazard to the flight crew. Terrain in the arctic and antarctic regions ranges from mountain peaks and glaciers, to flat plains. Although open areas are available, the surface may not be desirable for landing. It may be necessary to use the high performance hoist to extract the patient.

a. Environmental Considerations.

- Navigation in arctic regions may be hampered by the rapidly shifting landscape, snow-covered landmarks, and the lack of NAVAIDS. In addition, magnetic compasses become unreliable in the northern- and southern-most latitudes. Under these conditions, a combination of radio navigation, dead reckoning, and pilotage may have to be used to locate the patient.

- Radio communications are generally good, but may be temporarily disrupted by electrical disturbances (auroras). Some frequencies may be blocked for weeks.

- Static electricity creates a serious problem in cold weather. It can be generated by the movement of an aircraft through the air, by brushing snow or ice from the aircraft, or by dragging the steel cables over the ground. During hoist operations, pilots should key the mike immediately before load pickup. However, the charge will buildup again rapidly.

CAUTION

Before touching rescue equipment, ground personnel must either allow the equipment to hit the ground or use a grounding device to avoid an electrical shock.

b. Ambient Light Conditions.

- Summer in the polar regions produces almost continuous daylight. Conversely, during winter there are only 3 to 4 hours of daylight. During night operations, a solid snow cover reflects available light, making it much brighter than without snow. It may still be necessary to use aircraft lighting, NVG, or emergency lighting in order to complete a hoist mission.

- Lighting conditions in mountainous terrain can create hazards. Flight through mountain passes during overcast conditions, and combined with a solid snow cover, can be difficult. Visual

references are easily lost and can result in vertigo. The PC should constantly check visual references with the aircraft altitude instruments.

c. Temperature. In polar regions, summer temperatures above 65°F are common except on glaciers and frozen seas. Winter temperatures sometimes drop to -70°F. Similar temperature extremes are experienced in subpolar regions.

d. Structural Icing. Aircraft performance is highly dependent upon temperature. Generally it improves as the temperature drops; that is, until icing becomes a factor. The most hazardous condition associated with the cold is aircraft structural icing. Army Regulation 95-1 prohibits Army aircraft from flying into known or forecasted severe icing conditions. Icing is most common when the temperature is between 32°F (0°C) and -4°F (-20°C) and when visible moisture such as clouds, drizzle, rain, or wet snow are present. Icing is rarely experienced in those areas which maintain temperatures of below -20°C.

e. Safety Considerations.

- Fly at altitudes below the freezing level, or clear of any visible moisture. Remain in visual meteorological conditions, and stay clear of clouds.

- Rotor-blade icing begins near the blade root. Ice buildup can cause loss of lift,

resulting in an increase in power to maintain lift, and ultimately, an increase in engine temperature.

- Ice on the wire windscreen prevention device or wipers of the aircraft is the first sign of icing. The windows in the aircraft, even in the worst icing conditions, normally will not ice over.

- Asymmetrical ice shedding occurs when one rotor blade sheds ice, leaving the rotor out of balance. This condition of disequilibrium can lead to severe vibration. Ice shedding can also cause foreign object damage from ice ingested into the engine. When icing is encountered, descend to an altitude clear of clouds. Autorotational capability can be lost in a matter of minutes if ice is allowed to form on the rotor blades.

CAUTION

Shedding ice can be a hazard to ground personnel during start-up, hover, and shutdown.

f. Additional information. For additional information on medical evacuation operations in extreme cold conditions, refer to paragraph 5-5.

Section VII. SAFETY AND EMERGENCY PROCEDURES FOR HOIST MISSIONS

11-18. General

a. The information contained in this section is intended to supplement unit SOPs and operator manuals. The primary importance of this section is to ensure that rescue equipment can be safely used for the tasks for which it was developed.

b. Safety officers are responsible for—

- Ensuring that safety and rescue equipment is periodically tested.

- Determining the serviceability of the equipment in accordance with applicable technical manuals.

c. All unit-level maintenance will be completed including required testing, inspection, and maintenance.

11-19. Safety Factors

Only equipment tested and approved for use in military aircraft will be used during hoist rescue operations.

a. *Hoist Cable.*

- The hoist operator must ensure that the cable does not become tangled in objects on the ground or in the water. The entire length of the cable should be kept in view at all times. If the cable does become tangled, an attempt should be made to free it by letting out more slack and manipulating it.

- Extreme care should be used when applying tension to the cable.

★ **WARNING**

If the cable should break the whip-lash action could cause injury to personnel, or damage the helicopter.

b. *Pendulum Action.* Extreme care should be taken when hoisting the patient. If the pendulum action and rotation of the patient are not stopped immediately, the movement may become uncontrollable. Pendulum action may be dampened by moving the cable in a 1- or 2-foot circle in the opposite direction of the patient's movement.

★ **WARNING**

If the pendulum action is not stopped, do not continue to raise the patient. Continuing to raise the patient while experiencing pendulum action will only worsen the effect.

c. *Protective Gloves.* These gloves should be worn by the hoist operator over the nomex flight gloves. The gloves should be made of heavy-duty leather and should prevent injury to the operator when manipulating the cable.

d. *Vest, Hoist Operator, and Lifeline.* The hoist operator vest, connected to the aircraft with a

lifeline, is used both by the hoist operator and the medic during rescue operations. The vest and lifeline must be inspected regularly to ensure serviceability. While wearing the vest, avoid contact with moisture, hydraulic fluid, oil, grease, fuel, or acidic material.

WARNING

Always wear the safety harness on top of the hoist operator vest. This allows the crew member to quickly release the safety harness and exit the aircraft during emergency egress.

The hoist operator vest (Figure 11-1) consists of a Rachel Knit Vest with straps which crisscross the shoulders, waist, and hips. A D-ring, located at the center back of the vest, attaches the lifeline to the vest.

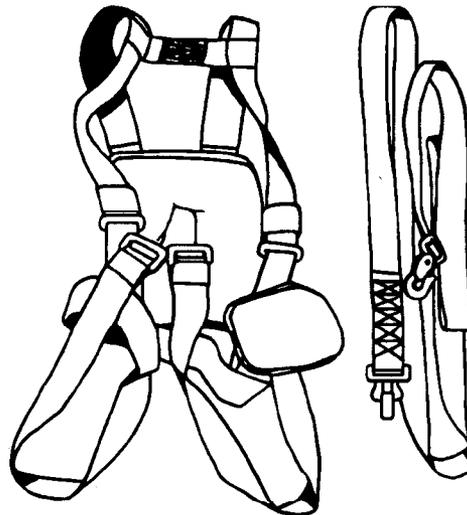


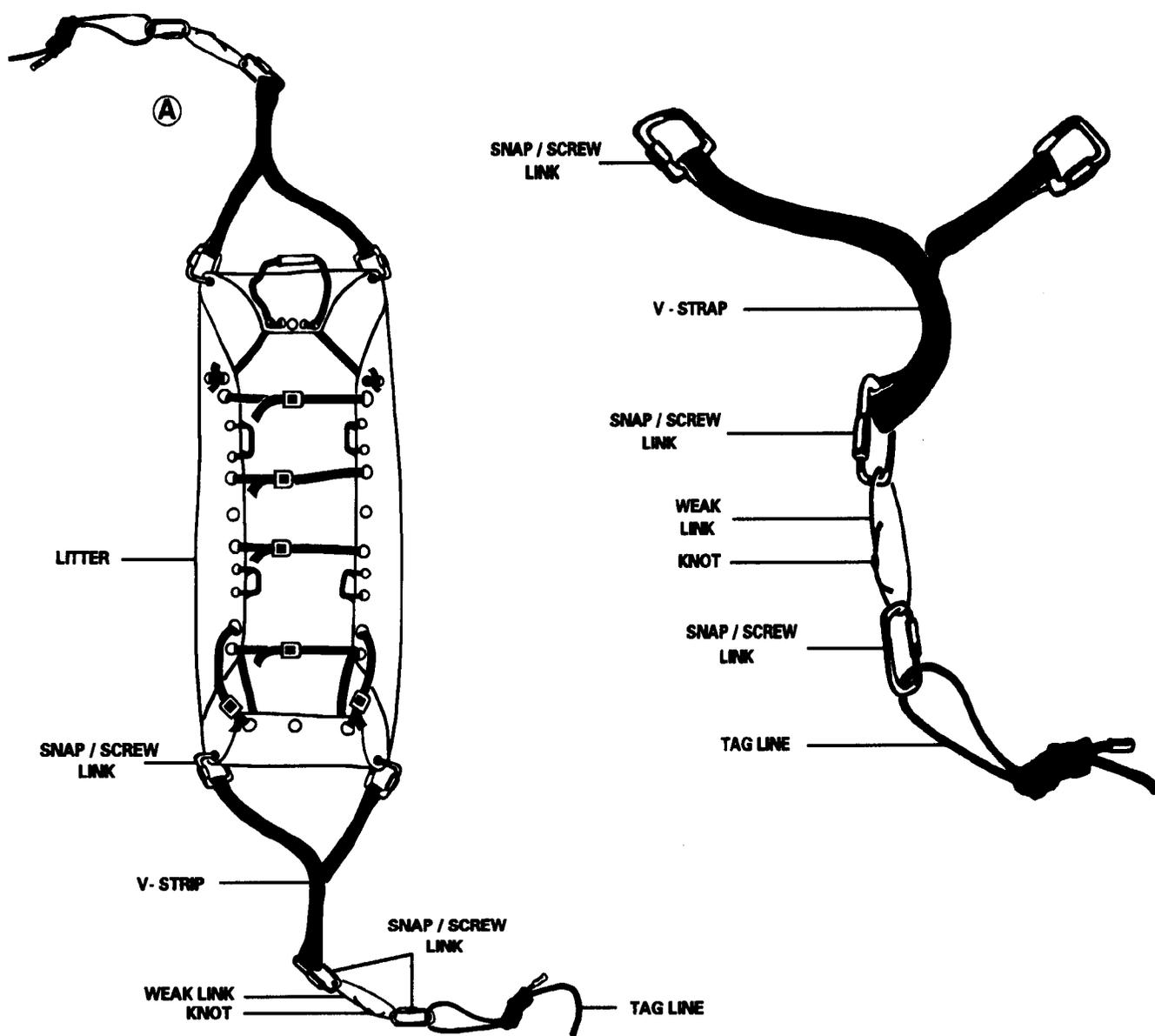
Figure 11-1. Vest, hoist operator, and lifeline.

★ e. *Tag Line and Weight Bag.*

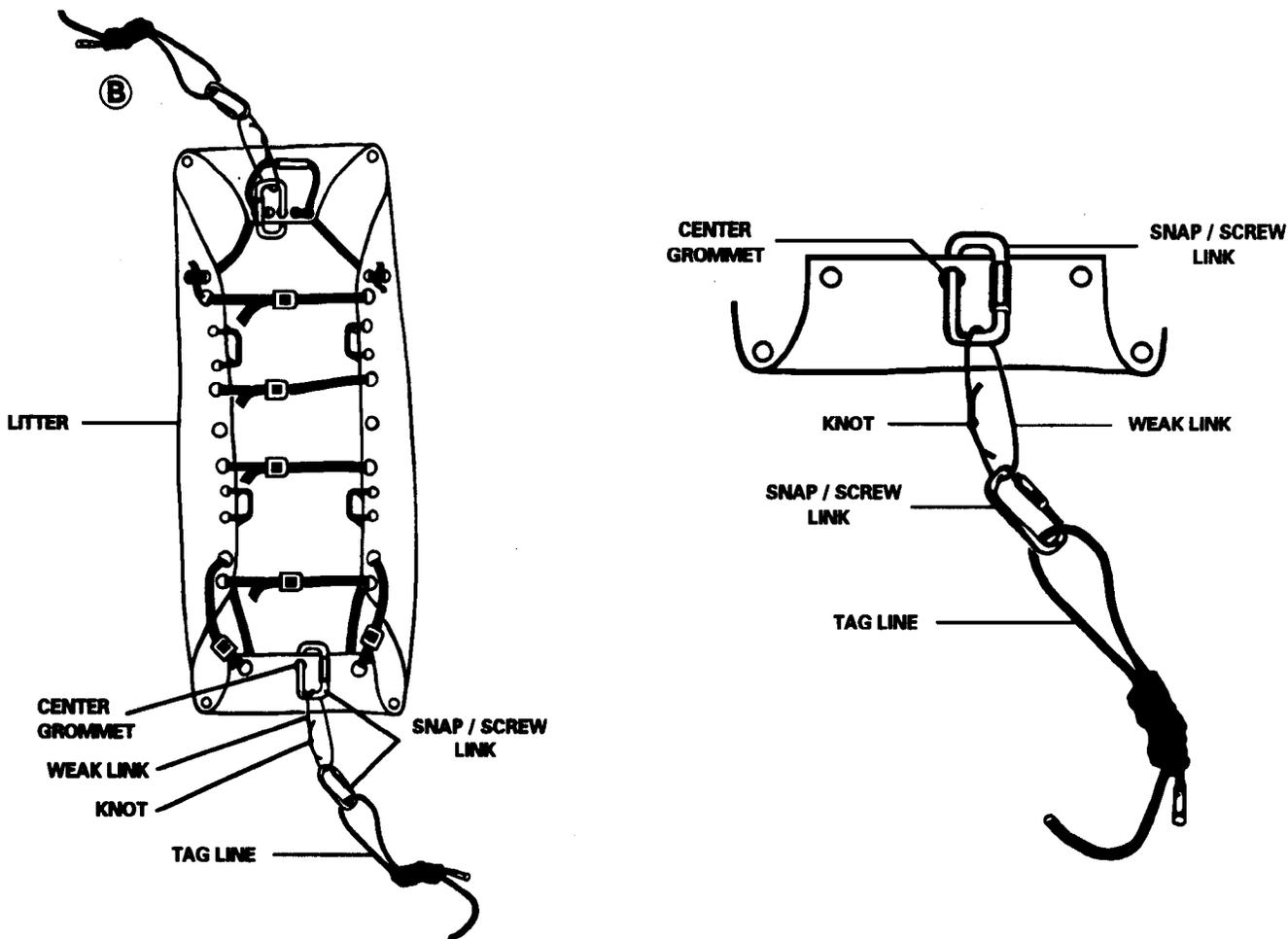
- The use of a tag line and weak link is mandatory when hoisting patients in a horizontal or vertical position. If used properly, the tag line keeps the litter from spinning or swinging and provides positive control over the litter during hoisting

operations. The tag line should be at least 250 feet in length and made of 3/8-inch diameter kernmantle style nylon rope with a polypropylene core and nylon sheath. See Figure 11-2 for proper connection of tag line. It is important that the tag line be equipped with a weight at the loose end. This weight prevents the tag line from being blown back up into the helicopter rotor system and provides a

weight for lowering the rope back to the ground if necessary. A locally fabricated weight bag may be used to store the rope when not in use. The weight of a separate weight or weight and bag together should be at least 5 pounds. The weight bag may be manufactured of canvas or nylon and should have a weight securely fastened into the bottom of the bag.



★ Figure 11-2. Connection of the weak link to SKED litter and tag line.
(A—Method using V-strap.)



★ *Figure 11-2. Connection of the weak link to SKED litter and tag line (continued).
(B—Alternate method using center grommet.)*

WARNING

Do not allow a spin to start when using any flat surface litter system.

screw link attached to the V-strap which is attached to the litter (see Figure 11-2 A). An alternate method is to connect the weak link to a snap link or screw link which is attached to the center grommet of the SKED litter (see Figure 11-2 B).

WARNING

A new weak link must be used for each live hoist mission.

- The weak link is a device used to break away the tag line from the litter being hoisted. If the tag line should become entangled with an object, it will break away at the weak link when enough pull is asserted by ground personnel or the helicopter.

- To use the weak link, attach the tag line with a snap link or screw link to one end of the weak link an inch or more away from the weak link knot. Attach the other end of the weak link one inch away from the knot to another snap link or

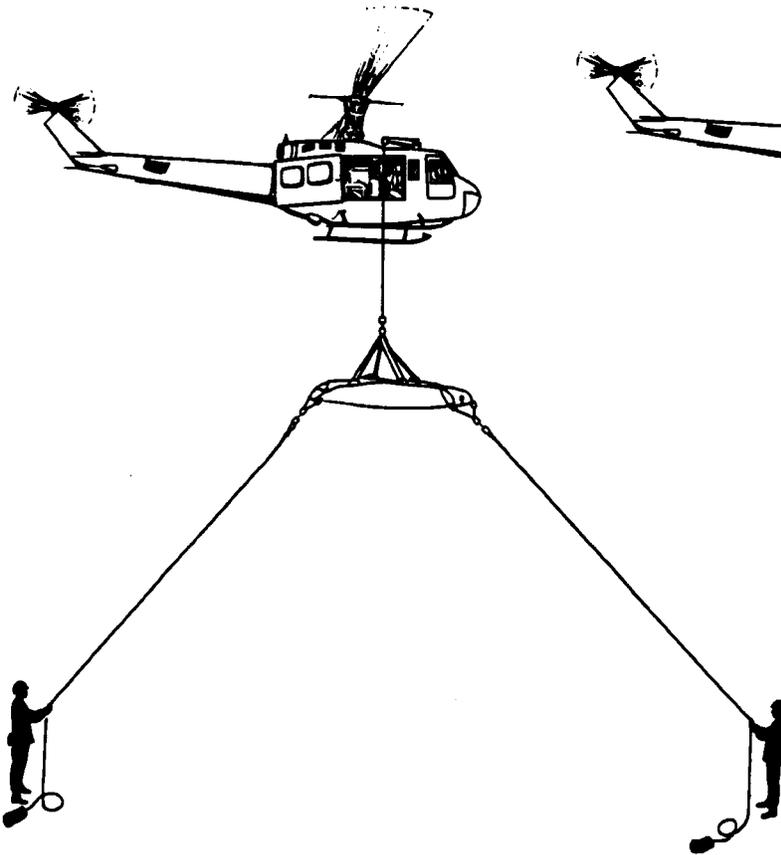
NOTE

During hoist training, multiple unmanned lifts may be made using the same weak link. The weak link should be disposed of properly.

- Proper placement for personnel during hoisting operations with any flat surface litter

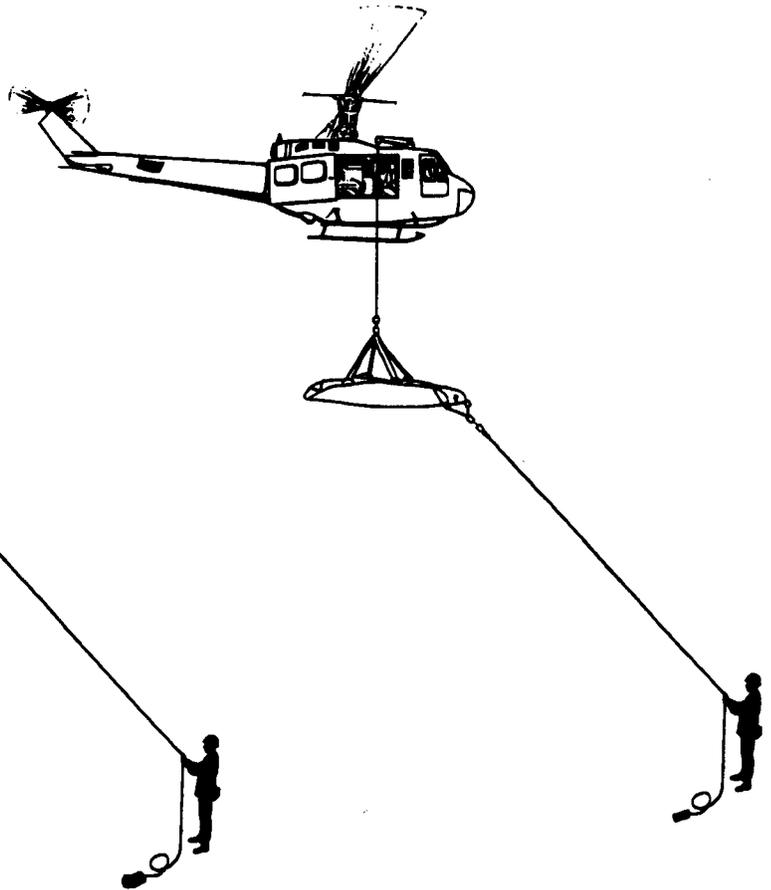
system is essential for prevention of litter spin. See Figure 11-3 for proper placement of tag line personnel.

(A) PREFERRED PLACEMENT



USE OF TWO TAG LINES IS THE SAFEST WAY TO PREVENT A LITTER FROM SPINNING. TWO TAG LINES SHOULD ALWAYS BE USED IN TRAINING AND NONHOSTILE SITUATIONS FOR BETTER CONTROL OF THE LITTER. THIS POSITIONING AFFORDS MAXIMUM VISIBILITY FOR THE PILOT AND BOTH AIR AND GROUND CREWS.

(B) ACCEPTABLE PLACEMENT

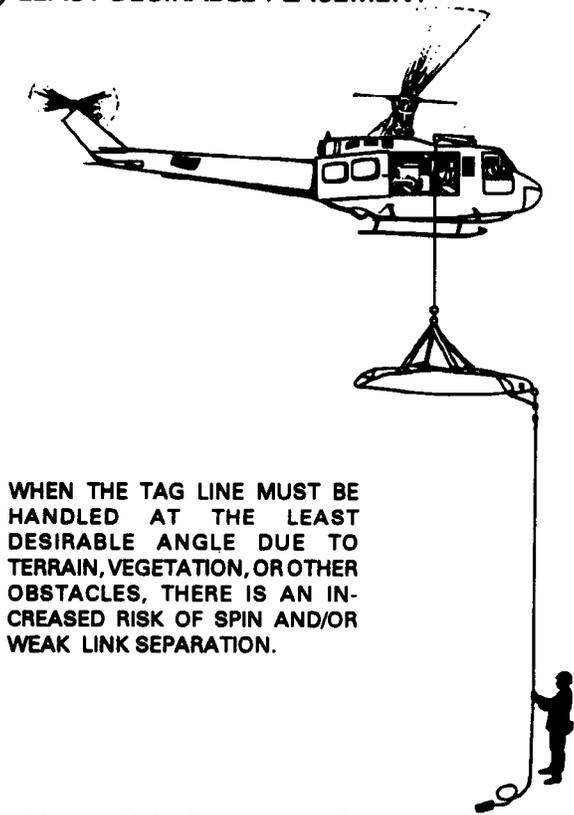


IF THERE IS ONLY ONE SOLDIER AVAILABLE ON THE GROUND TO ASSIST IN THE HOIST OPERATION, ONE TAG LINE MAY BE USED. TO OBTAIN ADEQUATE CONTROL OF THE LITTER, THE SOLDIER ON THE GROUND SHOULD BE POSITIONED TO AFFORD MAXIMUM VISIBILITY FOR THE PILOT AND AIRCREW.

NOTE: THE POSITIONING OF THE GROUND CREW AS SHOWN ABOVE IS AN IMPORTANT FACTOR IN MAINTAINING CONTROL OF THE LITTER. THIS POSITIONING PROVIDES THE PILOT AND AIRCREW MAXIMUM VISIBILITY AND THE ANGLE OF THE TAG LINE AFFORDS MAXIMUM CONTROL OF THE LITTER.

★ *Figure 11-3. Placement of personnel for hoisting flat surface litter systems.*

© LEAST DESIRABLE PLACEMENT



WHEN THE TAG LINE MUST BE HANDLED AT THE LEAST DESIRABLE ANGLE DUE TO TERRAIN, VEGETATION, OR OTHER OBSTACLES, THERE IS AN INCREASED RISK OF SPIN AND/OR WEAK LINK SEPARATION.

★ *Figure 11-3. Placement of personnel for hoisting flat surface litter systems (continued).*

11-20. Emergency Procedures

If a partial loss of power occurs while hoisting and the altitude cannot be maintained, the patient should be immediately lowered to the surface to lighten the helicopter. If the situation deteriorates to the point where further action is required to prevent settling to the surface, the following action must be taken:

a. If hoisting over land, the patient should first be lowered to the ground and freed from the hoist. It may be necessary to cut the cables as soon as the survivor is safely on the ground. Initiate the emergency procedures described in the applicable operator's manual. Should inadvertent landing occur, the PC attempts to maneuver away from ground personnel. The preflight briefing should cover the direction that ground personnel and crew members move in the event of such an emergency. All nonessential personnel on the ground should remain a safe distance from the operation.

b. If hoisting over water, the patient should be lowered into the water and the cable cut to avoid dragging him in the water as described above. Emergency actions are initiated according to the applicable technical manual. Should an inadvertent landing occur, the aircraft should be maneuvered clear of the patient in the water, if at all possible.

c. In the event of a sudden and complete loss of power, the PC performs an emergency auto-rotation maneuvering away from the patient, if possible.

d. A recovery may be continued if the hoist mechanism fails to raise or lower from the cable extended position. The patient should be advised of the problem by hand and arm signals and instructed to remain firmly attached to the recovery device. Before transitioning to forward flight, the helicopter should climb to an altitude which affords the patient clearance from all obstacles. With the patient suspended from the helicopter, the PC proceeds at a slow speed to a safe landing area.

WARNING

As pendulum action and rotation may become uncontrollable if air-speed is too great, care must be used when attempting forward flight with the hoist cable extended and a patient attached.

e. During landings, with the patient still suspended, care is exercised to prevent dragging the patient and tangling the cable in the tail rotor. The hoist operator or PC must maintain light tension on the cable during landing. After the patient has been gently lowered to the ground, the emergency cable cutter may be used to free the cable from the helicopter to permit landing. The helicopter may be hovered to the side of the patient and landed with the cable attached. After landing, the cable is detached from the patient and stored in the helicopter.

11-21. Tactical Considerations

a. The focus of a hoist operation must change drastically in a combat rescue mission as opposed to a peacetime recovery. In a peacetime recovery, emphasis is on slow, decisive movements. The flight crew takes as much time as is necessary to effect the hoist operation giving priority to the safety of all concerned and patient comfort. Under combat conditions, the speed of the operation must be the primary focus to reduce exposure time. The following should be considered:

- Do not overfly pickup site.
- Look for the best hover location that offers cover and concealment.
- Prepare the aircraft for hoist operations prior to reaching the pickup site.
- Do not put aircrew members on the ground unless absolutely necessary for patient survival.
- Do not loiter near or circle the pickup site while awaiting patient preparation.

- Keep all aircraft active emitters turned off while on station, if possible.

- Use the forest penetrator or hoisting vest to hoist patients whenever conditions permit.

- Keep time on station to a minimum.

- Use all available passive aircraft survivability equipment (ASE).

b. The success of a combat hoist operation is dependent on—

- Undetected entry into the pickup area.

- Rapid completion of the hoist operation.

- Protected departure from the rescue site.

c. Hoist rescue operations are high-risk missions. Actions which support the safety and principles of hoist operations will reduce the risk and enhance the success of these missions.

Section VIII. FOREST PENETRATOR

11-22. General

The forest penetrator is a folding rescue seat designed for both land and water rescue operations. The forest penetrator is designed to penetrate thick foliage when lowered to the ground. This piece of equipment can accommodate up to three patients in a single lift. The flotation collar, when fastened around the forest penetrator, allows flotation of the complete assembly during water rescue operations.

11-23. Configuration of the Forest Penetrator

a. The forest penetrator (Figure 11-4) is a compact device weighing about 21 ½ pounds. The forest penetrator is 34-inches long and 8 inches in diameter when extended. Each seat is 4 ¾-inches wide and 11 ½-inches long. The seats on the forest penetrator are spring-loaded in the retracted position (flush against the shaft of the penetrator). A spring-loaded retaining latch is provided under each

seat to secure the seat in the extended position. To release the seat, push down on the seat and pull down on the latch. The seat will snap back into the retracted position.

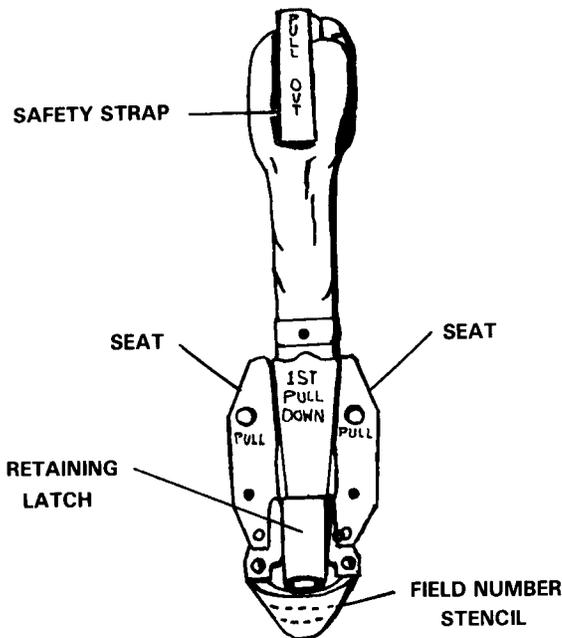


Figure 11-4. Forest penetrator.

b. Three webbed safety straps are provided to secure patients. Each strap extends 4 feet 9 ¼ inches, with an adjustable quick ejection snap hook attached to the upper section of the penetrator. The straps terminate with a yellow fabric, marked *TIGHTENED*. Yellow webbing tabs (with hook tape) marked *PULL OUT* are sewn to the safety straps for attachment to fabric cover storage openings. The yellow fabric cover has a 17-inch slide fastener and three storage openings (with pile tape) for securing safety straps.

c. The flotation collar (Figure 11-5) is made of bright orange foam rubber for high visibility and weighs 2.6 pounds. It is 20 ¼-inches long, with 7 ¾ inches in diameter at the top and a 4-inch diameter at the bottom. The flotation collar is 9 inches in diameter when installed on the forest penetrator and the seats are in the stowed position. In this configuration, the penetrator will float with its top approximately 6 inches above the water.

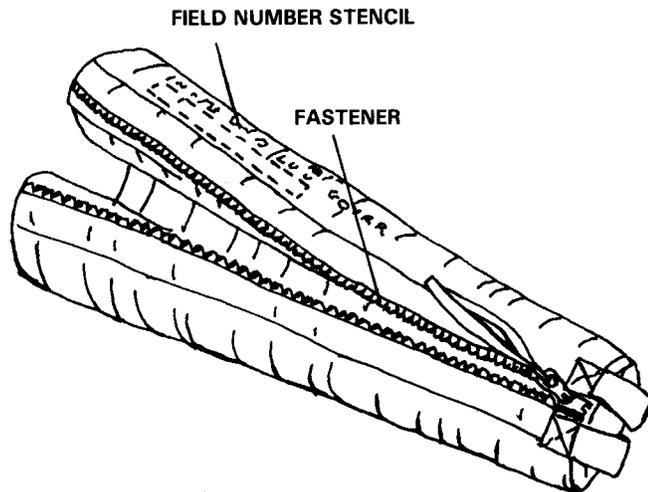


Figure 11-5. Flotation collar.

11-24. Application

When an LZ is unavailable, the forest penetrator can be attached to the rescue hoist to lift patients not requiring a hoisting litter. As many as three patients can be lifted at one time when conditions permit. The PC decides the number of patients to be lifted. The forest penetrator can be used with a hoist on the UH-1H/V, UH-60A, or the CH-47.

CAUTION

Patients with spinal, pelvic, or neck injuries, or who are unconscious will not be hoisted on the forest penetrator.

11-25. Employment of the Forest Penetrator

a. The hoist operator connects the forest penetrator to the hoist hook. He coordinates with the PC and proceeds to lower the assembly to the ground personnel.

b. Before handling the device, ground personnel allow the forest penetrator to touch the ground to discharge static electricity.

c. The necessary number of wing seats are extended.

d. Safety straps are removed from their protective cover. The straps are placed under the patient's arms, around his back, and fastened to the hook of the penetrator.

e. Once the hoist operator has been signaled that the patient is secure, the PC is notified and the patient is lifted into the helicopter.

f. Once the hoist has reached the fully raised position, the crew member, placing an arm around the patient and the forest penetrator, rotates the patient so he is facing away from the aircraft.

g. The crew member simultaneously pulls the patient into the aircraft and lowers him onto the deck (Figure 11-6).

h. The crew member continues to lower the penetrator until the edge of the support fluke is resting on the aircraft deck (Figure 11-7).

i. The crew member continues to lower the penetrator until the patient is lying on his back on the aircraft deck.

j. Once the patient is lying on his back with the penetrator on top of him, the crew member releases the safety straps and raises penetrator off the patient (Figure 11-8), secures the patient, and reports to the PC when ready for forward flight.

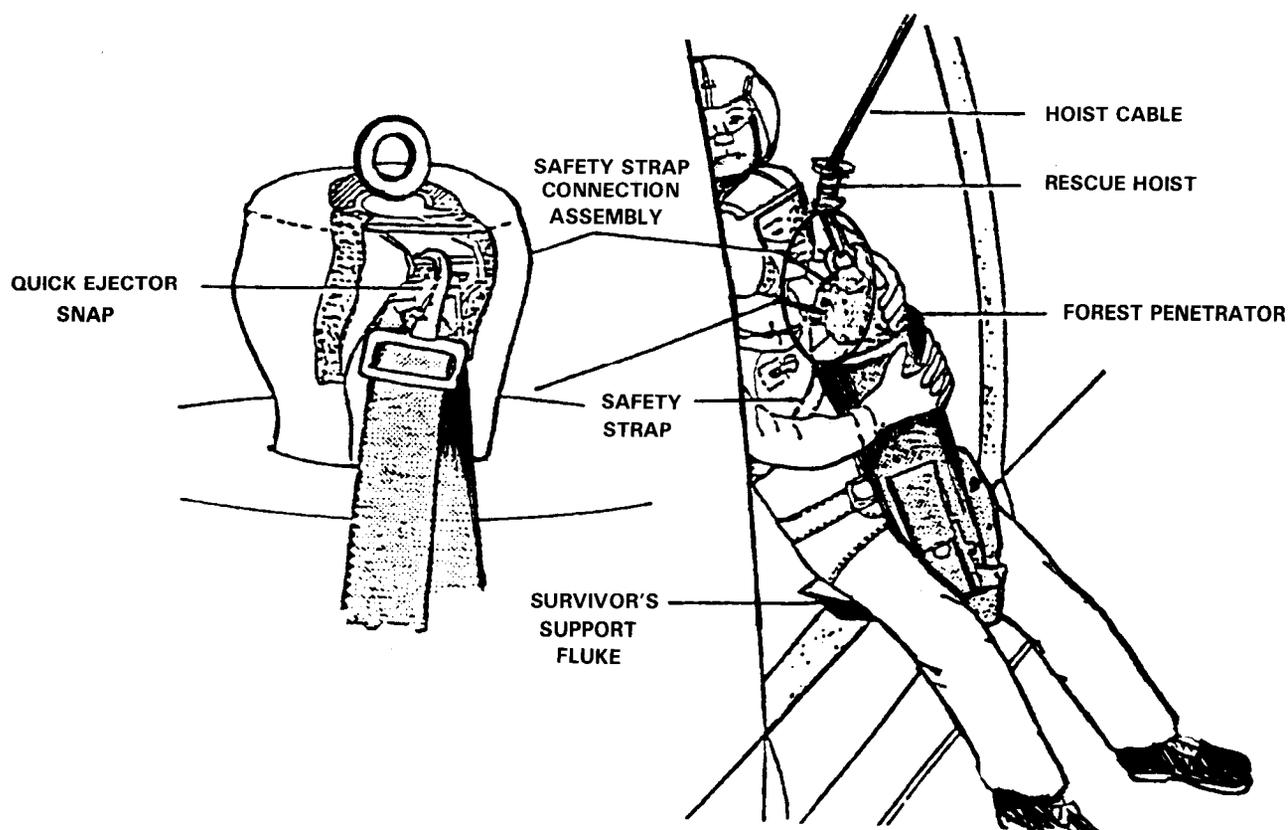


Figure 11-6. Crew member continues to lower

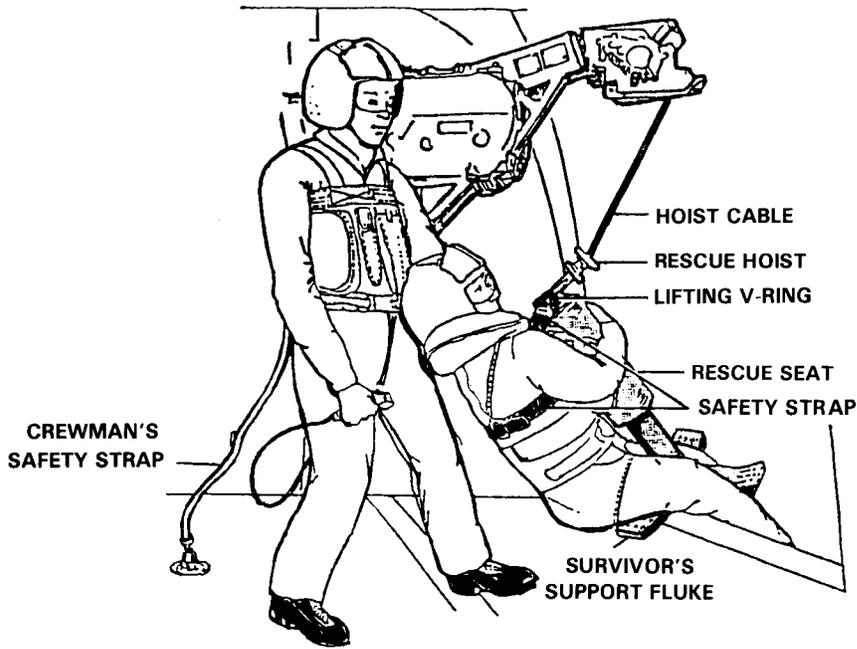


Figure 11-7. Crew member lowers the rescue seat until the edge of the patient's support fluke is resting on the aircraft deck.

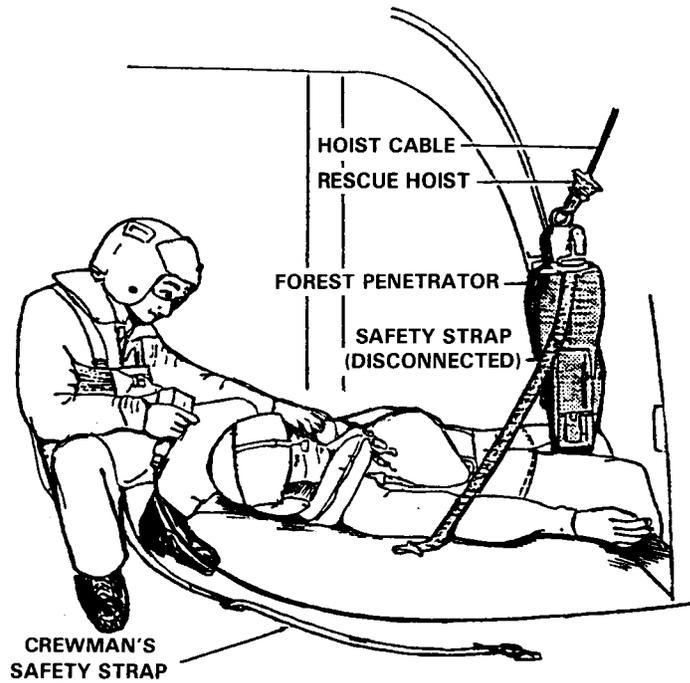


Figure 11-8. Crew member raises the forest penetrator off of the patient with the hoist.

11-26. Preventive Maintenance of the Forest Penetrator and Flotation Collar

Serviceability inspections and cleaning of the forest penetrator and flotation collar are performed at the unit level. All repairs or modifications are performed at the intermediate level or above.

a. Calendar Inspections.

(1) All forest penetrators and flotation collars are required to have calendar inspections (at the unit level) upon issue and each subsequent year. The calendar inspection consists of a visual inspection of the components and markings.

(2) The forest penetrator inspection proceeds in the following manner:

(a) Separate the flotation collar from the forest penetrator.

(b) Examine the fabric of the forest penetrator for cuts, tears, deterioration, and abrasions.

(c) Inspect the seams for broken stitching.

(d) Inspect the straps for security of the attachments and wear.

(e) Check the seat locking and retraction mechanism.

(f) Check all hardware for security of the attachment, corrosion, damage, wear, and ease of operation.

(g) Examine the cover for stains, dirt, and general condition.

(h) Inspect the seats and hooks for freedom of movement to all positions.

(3) The flotation collar inspection proceeds in the following manner:

(a) Check its floatability by installing the flotation collar on the seat and placing it in fresh water deep enough to support seat.

(b) Inspect the fabric for cuts, tears, deterioration, and abrasions.

b. Marking Inspection.

(1) Inspect all materials for faded markings.

(2) Restore or correct any faded markings. Use the information contained in Tables 11-1 and 11-2 to update markings.

Table 11-1. Flotation Collar Markings

MARKING	LOCATION	LETTER HEIGHT
STOCK NUMBER 4240-00-936-2795	Top of Flotation Collar	1/2 Inch
SAFETY STRAPS INSIDE YELLOW COVER	Right Side of Flotation Collar	1/2 Inch
REMOVE CHUTE	Left Side of Flotation Collar	1/2 Inch
(Field Number)	Side of Flotation Collar	1/2 Inch

Table 11-2. Forest Penetrator Markings

MARKING	LOCATION	LETTER HEIGHT
PULL OUT	End of Forest Penetrator Safety Strap	1/2 Inch
1ST PULL	Bottom of Forest Penetrator Seats	1/2 Inch
PULL	Sides of Forest Penetrator Seats	1/2 Inch
(Field Number)	Bottom of Forest Penetrator	1/2 Inch

c. *Storage.*

(1) If the flotation collar is to be packed with the forest penetrator, place the collar on the

penetrator and close the slide fastener.

(2) Place seat in the retracted position.

Section IX. SKED RESCUE SYSTEM

11-27. General

The SKED litter is a compact and lightweight patient transport system designed to evacuate one patient at a time. It is used for both land and water rescue. The SKED litter provides the patient with support and protection, but it is not designed as a spinal immobilization device. If a spinal injury is suspected, the patient is to be secured using a spinal backboard prior to being placed on the litter (paragraph 9-6). A backboard must be used in conjunction with the SKED litter on patients who have sustained shoulder injuries. When the SKED litter is used with the hoist operator vest, the medic can be hoisted simultaneously with the patient. This allows the medic to continue resuscitation or oxygen therapy during the hoist rescue operation.

11-28. Configuration

a. The SKED litter (Figure 9-18) is olive drab (OD) green and weighs approximately 16

pounds with accessories. It consists of a 3-foot by 8-foot sheet of low-density polyethylene plastic with rows of grommets along its edges. The patient is secured by enveloping him in the litter and securing him with lashing straps threaded through the grommets. Four nylon straps are used in hand-carrying the litter.

b. The SKED carrying case is used to transport the litter, spinal immobilize device, lift slings, tow straps, and the vertical lift rope.

c. For high-angle operations, the litter is used in a vertical configuration with two lift slings and a 3/8-inch static kernmantle rope as a bridle.

d. The SKED basic rescue system (Figure 11-9) includes the following:

- Litter.
- Backpack.

- Towing harness.
- Horizontal lift sling.
- Vertical lift sling.
- Large carabiner.
- Tow strap.

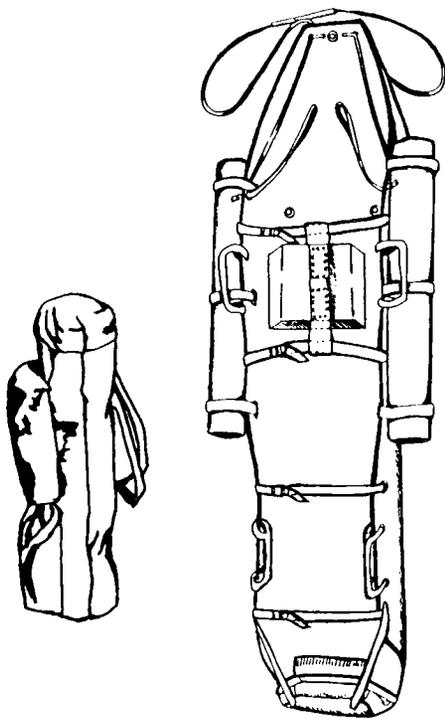


Figure 11-9. Components of the SKED litter.

e. For water operations the SKED litter can also be used with a flotation kit. The flotation system enables the SKED litter to float horizontally in the water providing enough positive flotation to support the patient and two rescuers. The inflatable logs are made of a nylon outer shell. They are equipped with a carbon dioxide (CO₂) rapid inflator, an oral inflator, and a quick dump valve which allows the float logs to deflate in seconds for rapid

breakdown and storage. The quick dump valve also acts as an overpressure valve to prevent over-inflation.

11-29. Operation of the SKED Litter

a. Preparing the SKED Litter.

(1) Remove the litter from the carrying case and place it on the ground.

(2) Unfasten the chest strap, place one foot on the SKED, and unroll it completely.

(3) Bend the SKED litter in half (opposite way of curl) and back roll. Repeat with the opposite end of the litter. This will allow the SKED litter to lay flat.

b. Placing the Patient on the SKED Litter Using the Log Roll Method.

(1) Place the SKED litter next to the patient. Ensure that the head end of the litter is adjacent to the head of the patient. Place cross-straps under SKED.

(2) Log roll the patient away from the litter and slide the SKED litter as far under the patient as possible. Gently roll patient down onto the SKED litter.

(3) Slide the patient to the center of the litter. Be sure to keep the patient's spinal column as straight as possible.

(4) Pull straps out from under the SKED litter and fasten to the buckles.

c. Placing the Patient on the Litter Using the Slide Method.

(1) Position the foot end of the SKED litter at the head of the patient.

(2) Straddle the litter and support the patient's head, neck, and shoulders.

(3) Grasp the foot straps of the SKED litter and slide it under the patient.

(4) Center the patient on the SKED litter and fasten the straps with the buckles.

d. Positioning and Fastening the Straps with the Buckles.

(1) Lift the sides of the SKED litter and fasten the four cross-straps with the buckles directly opposite the straps.

(2) Feed the foot straps through the unused grommets at the foot end of the SKED litter and fasten with the buckles.

e. Lifting and Descending (Horizontal).

(1) Insert one end of the head strap through the lift slot at the head end of the litter.

NOTE

Two nylon webbing straps rated at 3,800 pounds each are used for horizontal lift or descent. The head strap is 4-inches shorter than the foot strap and is used at the head end of the litter only.

(2) Bring the strap under the SKED litter and through the lift slot on the opposite side.

(3) Equalize the strap and repeat the procedure with the other strap at the foot end of the litter.

(4) Equalize all four straps and secure them to the large steel locking carabiner.

(5) Before hoisting, hoist operator ensures that ground personnel have a tag line attached to the foot end of the litter and are ready for hoisting.

(6) While the litter is being lowered, or hoisted back up into the aircraft, ground personnel use the tag line to prevent the litter from swinging or spinning. The tag line is also used to keep the

litter parallel to the aircraft and the patient's head toward the tail rotor.

f. Lifting or Descending (Vertical).

(1) Pass each end of the rope through the grommets at the head end of the litter. Leave approximately 1 to 2 feet between the knot and the litter.

NOTE

A 30-foot length of 3/8-inch static kernmantle rope with a figure eight knot tied in the center is used to configure the SKED litter for vertical lift or descent.

(2) Continue feeding the rope through all available grommets and carrying handles all the way to the foot end of the SKED litter. Ensure both ends of the rope are even.

(3) Pass the ends of the rope through the grommets at the foot end of the SKED litter. Tie the ends of the rope together with a square knot.

(4) Bring the ends of the rope up and over the end of the SKED. Pass the rope through the carrying handles and secure it with a square knot. For safety, add a half hitch knot.

g. Conducting Water Operations (Figure 11-10).

(1) Unroll the SKED litter and lay it flat.

(2) Fasten the two lower cross-straps and tighten them enough to pull the sides up and prevent the SKED litter from bending. Fasten the two foot straps bringing the foot end up to form a toboggan-like shape.

(3) Attach the ballast (lead weight) inside the foot end of the SKED litter by placing it between the two grommets at the foot end. Pass the

straps through the grommets from the inside out, and lay them across the Velcro on the ballast bag.

(4) Attach the two long webbing handles by passing them, from the outside in, through the unused grommets in the shoulder area.

(5) Attach the flotation logs to the SKED litter by passing one end of the retaining straps through the proper slots in the SKED litter and fasten them to their opposite ends using the buckles. It is critical that the straps go all the way around the logs and through the slots on the SKED litter.

(6) The SKED logs can be inflated either before or after attachment.

(7) Upper cross-straps pass through the loops on the chest pad. Cross-straps should then be fastened and left in a loose position.

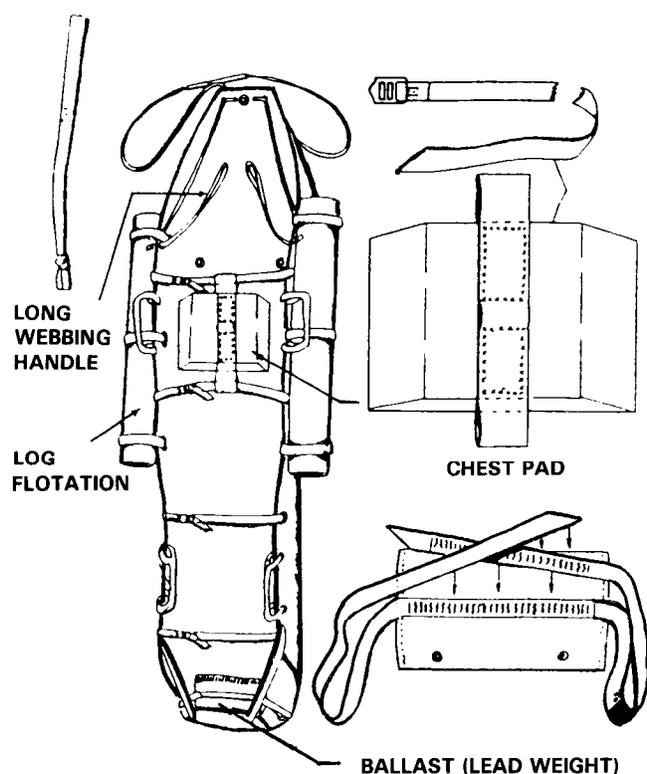


Figure 11-10. SKED litter configured for water operations.

h. Inflating the Flotation Log (Figure 11-11).

(1) Pull on the inflator tab to activate the CO₂. Do not remove the CO₂ cylinder from the detonator until you have a replacement cylinder. Removing the CO₂ cylinder allows the float to deflate.

(2) To use the oral inflator, turn the locking ring to allow the end to be depressed. Press the rubber tip against your teeth to open the valve and blow into it. When the desired amount of air is inside the float, release the inflator and secure the locking ring. The oral inflator has a spring-loaded safety valve which must be depressed to add or release air. The locking ring prevents the accidental release of air.

(3) To deflate the flotation log, pull the ball attached to the dump valve and squeeze the float until deflated.

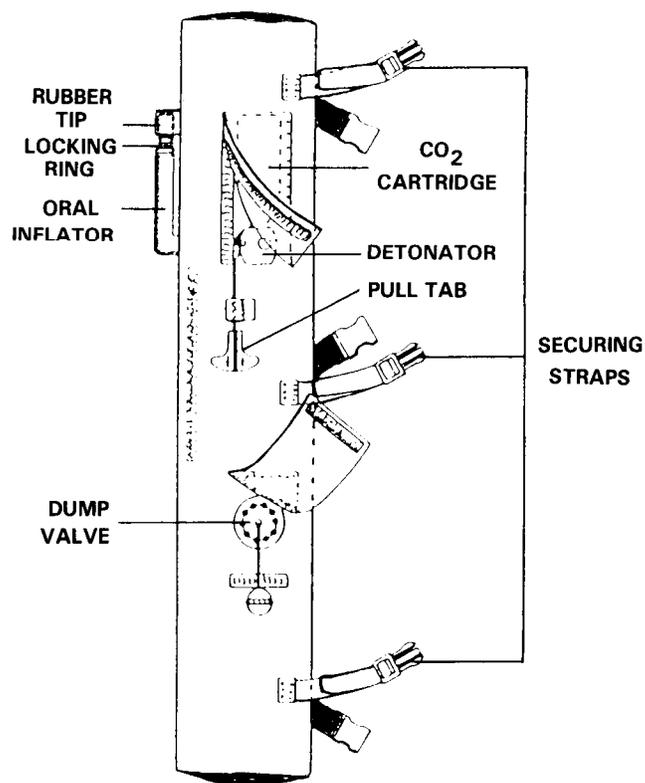


Figure 11-11. Inflating the flotation log.

11-30. Maintenance of the SKED Litter

a. All cleaning and preventive maintenance performed on the SKED litter and its components takes place at the unit level.

b. All SKED litters and accessories are subject to an inspection upon issue and a calendar inspection in each subsequent year. The SKED litter should also be inspected after every vertical or horizontal ascent or descent. All components used in saltwater rescue operations must be rinsed in fresh water as soon as possible.

(1) To perform a serviceability inspection on the SKED litter, complete the following steps:

(a) Remove all equipment from carrying case.

(b) Unroll the SKED litter and remove all ropes and straps.

(c) Inspect all ropes and straps for cuts, tears, and abrasions.

(d) Check all hardware for security of attachment, condition, and ease of operation.

(e) Check the litter for cuts, tears, and holes.

(f) Examine the carrying case for stains, dirt, and general condition.

(2) To repack the SKED litter, complete the following steps:

NOTE

When not in use, the SKED litter is stored in the carrying case.

(a) Lay the litter out and place the chest strap, buckle side down, under the foot end of the SKED.

(b) Starting at the head end, roll the SKED up as tight as possible.

(c) Continue to roll the SKED up using the knee to keep the litter from unrolling.

(d) Fasten the chest strap to the buckle and place the SKED litter in the backpack.

Section X. RESCUE (STOKES) LITTER

11-31. General

The Stokes litter and flotation kit are designed to perform helicopter rescue operations in areas not suitable for landing and where other evacuation means are not available or practical.

a. The Stokes litter carries one patient and can be used with the high performance hoist over land or water. The Stokes litter, when fitted with a backboard, can be used to immobilize a patient who has suffered a back injury.

b. For use overwater, a flotation kit must be installed in order to keep the litter upright and stable. This kit consists of flotation logs, lift inserts,

ballast bar, and a two-piece rescue litter hoisting sling.

11-32. Configuration

The Stokes litter is a metal litter with wire mesh netting for the bed (paragraph 9-2 (a) (6)). The flotation kit for the Stokes litter is designed to support the upper half of the litter, keeping that portion of the litter high in the water while the chest pad keeps the patient's face out of the water and prevents the litter from overturning. A ballast bar is placed on the foot of the litter to assist in keeping the litter floating at the proper angle. Retaining straps are used to secure the patient to the litter.

Once secured to the Stokes litter, the patient requires no additional flotation devices.

11-33. Function

a. Once the aircraft has arrived at the rescue site, the hoist operator prepares the litter for hoisting and notifies the PC when ready to lower the litter. The PC then directs the hoist operator to begin lowering the litter, along with the tag line. Figure 11-12 depicts the proper attachment of the tag line. Before hoisting, the hoist operator ensures that ground personnel have the tag line and are ready for the litter to be raised.

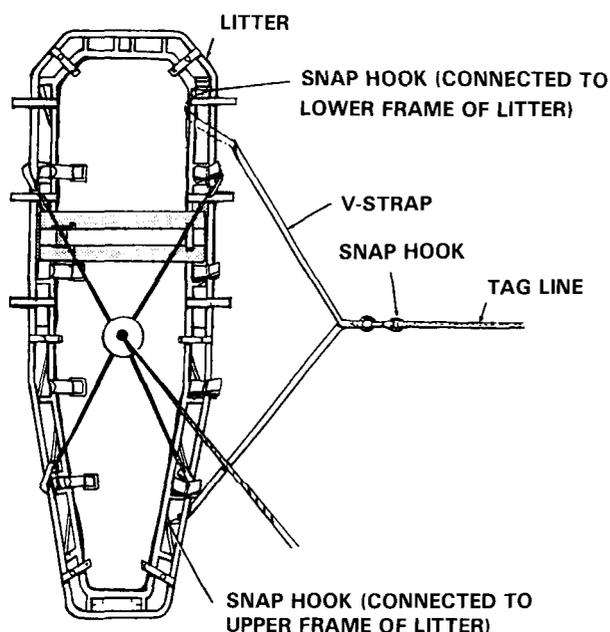


Figure 11-12. Tag line attached to Stokes litter.

b. While the litter is being lowered, or hoisted back up into the aircraft, the ground personnel use the tag line to prevent the litter from swinging. The tag line is also used to keep the litter parallel to the skids of the aircraft and the patient's head toward the tail rotor.

WARNING

Do not touch the litter until it contacts the ground and discharges the built-up static electricity.

c. The ground personnel disconnect the litter and signal to the hoist operator.

d. The hoist operator notifies the PC that the litter has been disconnected. Once the litter is disconnected, the PC repositions his aircraft to a tactically safe area to await instructions. Aircrews should never loiter in or circle around the pickup area while waiting.

CAUTION

Rifles, grenades, and radios must be removed from the patient before placing him in the litter.

e. Once the ground personnel have the patient secured in the litter, they signal for the helicopter to move into position and lower the rescue hook.

f. The ground personnel then connect the hoisting sling to the rescue hook and signal to the hoist operator that the litter is ready to be hoisted (Figure 11-13).

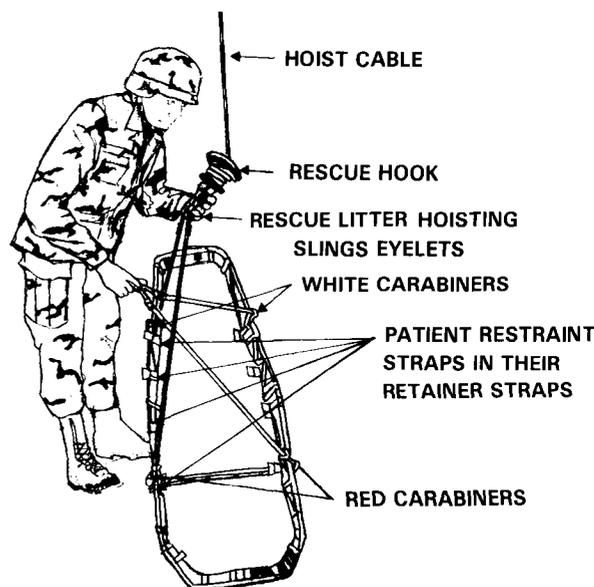


Figure 11-13. Attaching hoisting slings to the rescue hooks.

NOTE

Red carabiners and white carabiners can be used to distinguish the head and foot ends of the Stokes litter for attaching the hoisting cables. The Stokes litter should be marked with colored paint corresponding to the carabiners.

11-34. Maintenance

All serviceability inspections and cleaning of the Stokes litter are accomplished at the unit level.

a. Calendar Inspection. The calendar inspection includes a visual inspection for cracked welds and tubes, pinholes, security of mesh, and evidence of wear at the hoisting cable attaching points. The cables, carabiners, and hardware are visually inspected for wear and corrosion, and for signs of breakage, slippage, and fatigue.

b. Preflight Inspection. A preflight check is completed prior to each deployment of the Stokes litter to ensure safety. This visual inspection is done as a part of the overall preflight checks.

Section XI. POLELESS SEMIRIGID LITTER**11-35. General**

a. The poleless semirigid litter is constructed of canvas reinforced by wood. It can easily be stored aboard the aircraft because it is lightweight. It can also be folded longitudinally into a manageable size.

b. The patient is secured on the litter by canvas flaps that are laid over the patient from either side with his arms outside. The flaps and, subsequently, the patient are secured by five seat belt-like straps. The patient's head is secured by a heavy canvas hood immobilize. The hood holds the head in place with two straps: one across the forehead, and one across the chin.

c. This litter is also discussed in paragraph 9-2 (a) (4).

11-36. Employment of the Poleless Semirigid Litter

To use the poleless semirigid litter, the following steps should be followed:

a. The patient is placed on the litter using the log roll method, if necessary.

b. The patient is secured to the litter using the straps across the body and head. The flaps are folded over the patient with arms on the outside,

and the straps are firmly tightened, except in areas where serious injuries exist. The top four straps are routed over the body, and the bottom strap is routed under the feet for added support of the body weight.

c. Avoid strapping over or around injured extremities. For example, in the case of a fractured leg, the bottom strap would be routed under the foot of the uninjured leg to avoid worsening the injury.

d. The patient's head is secured by two straps (one under the chin and one over the forehead). The chin strap must be routed over the chin to avoid choking should the patient slide down in the litter slightly during hoisting. In the event of a serious head injury, the hood assembly is easily removed from the litter. This allows the medic to attend to the injury even after the patient has been secured to the litter. The hood can then be reattached to the litter and to the patient prior to hoisting.

e. The litter is hoisted in the upright position using the large ring at the head of the litter. The ring at the bottom of the litter is used for the tag line. The litter has a carrying handle at each corner of the litter for maneuvering the litter on the ground.

11-37. Function

a. Once the aircraft has arrived at the rescue site, the hoist operator prepares the litter for hoisting and notifies the PC when he is ready to lower the litter. The PC then directs the hoist operator to begin lowering the litter, along with the tag line. Before hoisting, the hoist operator ensures that the ground personnel have the tag line and are ready for the litter to be lowered.

b. As the litter is being lowered, or hoisted back to the aircraft, the ground personnel use the tag line to keep the litter from swinging.

<p>WARNING</p> <p>To avoid serious shock, do not touch the litter until the hoist hook touches the ground and discharges the static electricity.</p>
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To avoid serious shock, do not touch the litter until the hoist hook touches the ground and discharges the static electricity.

c. The ground personnel disconnect the litter and signal to the hoist operator.

d. Once the hoist operator has notified the PC that the litter has been disconnected, the PC then repositions the aircraft to a tactically safe area to await instructions to return to complete the hoist operation. Aircrews should never loiter in or circle the pickup area.

e. All equipment, such as weapons, grenades, or radios, must be removed from the patient prior to placing him on the litter.

f. Once the ground personnel have the patient secured in the litter, they signal the helicopter to move into position and lower the rescue hook.

g. The ground personnel then hook the ring at the head of the litter.

h. The hoist operator guides the litter into the door.

i. Once the patient is secure in the aircraft, the hoist operator recovers the tag line.

j. The hoist operator readies the cabin for forward flight and reports to the PC.

11-38. Maintenance

Cleaning and serviceability inspections are to be accomplished at the unit level.

a. *Inspection.* The litter is inspected in a systematic method starting at the top lifting ring, moving downward and finishing with the bottom lifting ring.

(1) The top lifting ring is carefully inspected for any sign of corrosion, cracks, wear, or burrs. If any of these conditions are found, the litter is unserviceable until repaired.

(2) The lifting ring attachment straps are inspected for sign of any rips, tears, rotting, or loose stitching.

(3) On the head harness assembly, the inspection includes determining if all attachment clips are present and serviceable. The fabric portion of the harness is inspected for rips, tears, and rotting.

(4) The main body of the litter is inspected for tears, runs, or rips in the canvas. Ensure that the belt buckles fasten securely and have no rips or tears in the material. There should be no loose stitching or torn seams.

(5) The wood slats on the litter should be removed and visually inspected for cracked, broken, or splintered pieces.

b. *Repairs and Modifications.* Any repairs or modifications to the poleless semirigid litter are to be performed at echelons above the unit level.

Section XII. SURVIVOR'S SLING (HORSE COLLAR) AND CABLE WEIGHT COVER

11-39. General

The survivor's sling (horse collar) and cable weight cover are used in performing helicopter rescue operations where landing is impossible, either over land or water. It can be used to lower a rescuer as well as raise a patient to the helicopter. The cable weight cover is a cushioned cover device that envelopes the metal in the hoist cylinder.

11-40. Configuration

a. The horse collar is a buoyant device consisting of a kapok filling encased in a bright yellow, waterproof cover. Webbing, weaved through the cover with both ends terminating in two V-rings, is used to attach the sling to the helicopter rescue hook. Two retainer straps, one long with a quick-ejector snap and one short with a V-ring, are fastened to the webbing of the sling and are enclosed in slide fastener-secured envelopes (Figures 11-14 and 11-15).

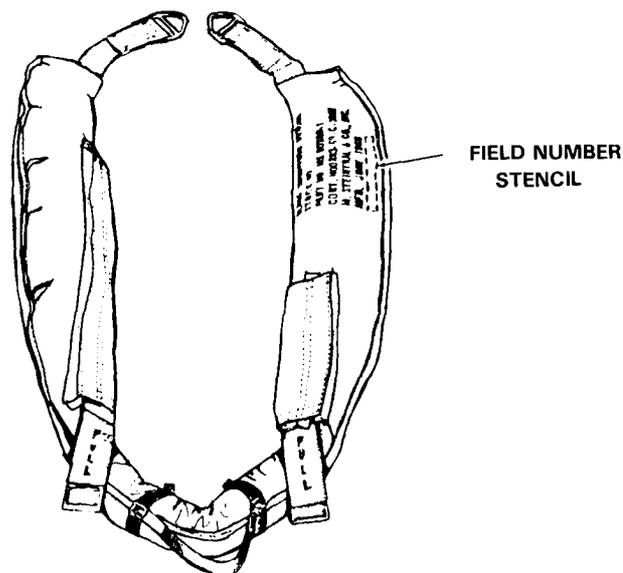


Figure 11-14. Survivor's sling.

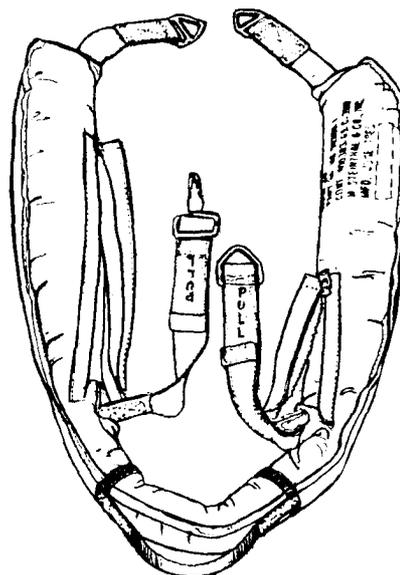


Figure 11-15. Survivor's sling with retainer straps pulled out.

b. The cable weight cover has four snap fasteners and a cord tie that keeps the cover secure around the cable weight. The cable weight cover protects the patient from injury that could result from accidental contact with the metal cable weight (Figure 11-16).

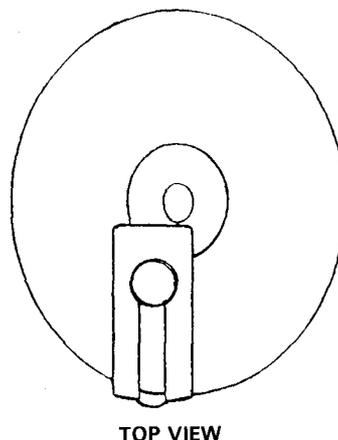


Figure 11-16. Cable weight cover.

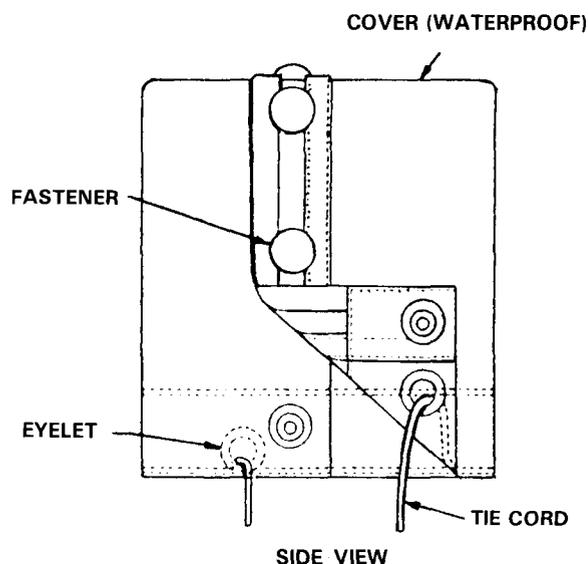


Figure 11-16. Cable weight cover (continued).

11-41. Function

a. A webbing strap running through the cover has a V-ring at both ends and is used for attaching to the double rescue hook on the cable. Two red retainer straps marked *PULL*, one with a quick ejector snap and the other with a V-ring, are provided with the sling and are enclosed in zippered pockets.

b. Once the aircraft is over the patient, the hoist operator readies the survivor's sling for use and advises the PC when the sling is ready to be lowered. The PC then directs the hoist operator to lower the sling to the patient or ground personnel.

WARNING

Do not grab the webbing handle on the survivor's sling. This may raise the patient's arms which could cause the patient to fall from the sling before entry into the aircraft.

c. The medic or ground personnel signal to the hoist operator once they have placed the patient in the survivor's sling and are ready for hoisting.

d. Once the patient has been hoisted to the aircraft door, the hoist operator lowers the patient while simultaneously pulling him into the aircraft.

e. Once inside the aircraft, the hoist operator—

- (1) Releases the safety strap.
- (2) Secures the patient in the aircraft.
- (3) Disconnects the survivor's sling from the hoist.
- (4) Reports to the PC when ready for forward flight.

11-42. Maintenance

Cleaning of the survivor's sling and cable weight cover is performed at the unit level. Component repairs or other maintenance actions required are performed at the intermediate level or higher.

a. Calendar Inspection.

- (1) All survivor's slings and cable weight covers are inspected upon issue and then each subsequent year.
- (2) This inspection consists of a visual inspection, marking inspection, and proof-loading testing.

b. Visual Inspection (Figure 11-17).

- (1) Inspect the fabric for cuts, deterioration, and abrasion.
- (2) Inspect the seams for proper adhesion and stitching.
- (3) Inspect the retainer straps for security of attachment and wear.
- (4) Inspect all hardware for security of attachment and wear.

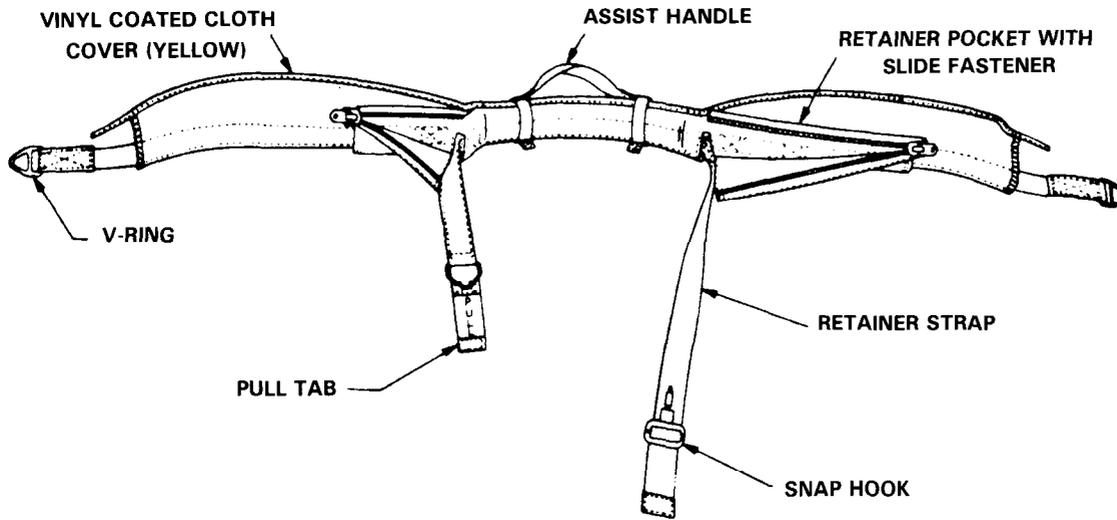


Figure 11-17. Survivor's sling.

c. *Marking Inspection.* Compare markings on sling and cover to markings listed in Tables 11-3 and 11-4. Restore faded markings. Correct any markings which do not agree with the tables.

Table 11-3. Survivor's Sling Markings

MARKING	LOCATION	LETTER HEIGHT
SLING-SURVIVOR'S RESCUE	On vinyl-coated cloth cover	1/2 Inch
STOCK NO	at bottom of slide	
PART NO	fastener	
CONTRACT NO (stencil applicable number)		
MANUFACTURER (stencil name of manufacturer)		
MFD DATE (stencil month and year of manufacture)		
(Field Number)		
PULL	On back of the red tabs	1/2 Inch

NOTE: All markings are to be stamped or stenciled with wash-proof black ink. All words enclosed by parentheses, in the column headed MARKING, are not to be stenciled on the equipment; they are to be regarded as instructions only.

Table 11-4. Cable Weight Cover Markings

MARKING	LOCATION	LETTER HEIGHT
COVER, CABLE WEIGHT, RESCUE EQUIPMENT	Top of cover	1/4 Inch
STOCK NO		
PART NO		
CONTRACT NO (stencil applicable number)		
MANUFACTURER (stencil name of manufacturer)		
MFD DATE (stencil month and year of manufacture)		

NOTE: All markings are to be stamped or stenciled with wash-proof black ink. All words enclosed by parentheses, in the column headed MARKING, are not to be stenciled on the equipment; they are to be regarded as instructions only.

11-43. Modifications

The only authorized modification at the unit level of maintenance is the fabrication of the assist handle.

a. Measure and cut two 9 ¾-inch pieces of nylon webbing for loops. Sear cut ends to prevent raveling.

b. Measure and cut one 19-inch piece of nylon webbing for the handle. Sear cut ends to prevent raveling.

NOTE

The looped webbing should fit snugly against the body of the survivor's sling.

c. Use size E nylon thread for sewing 8 to 10 stitches per inch. Fabricate handle as shown in Figure 11-18.

d. Attach fabricated handle to survivor's sling as shown in Figure 11-19.

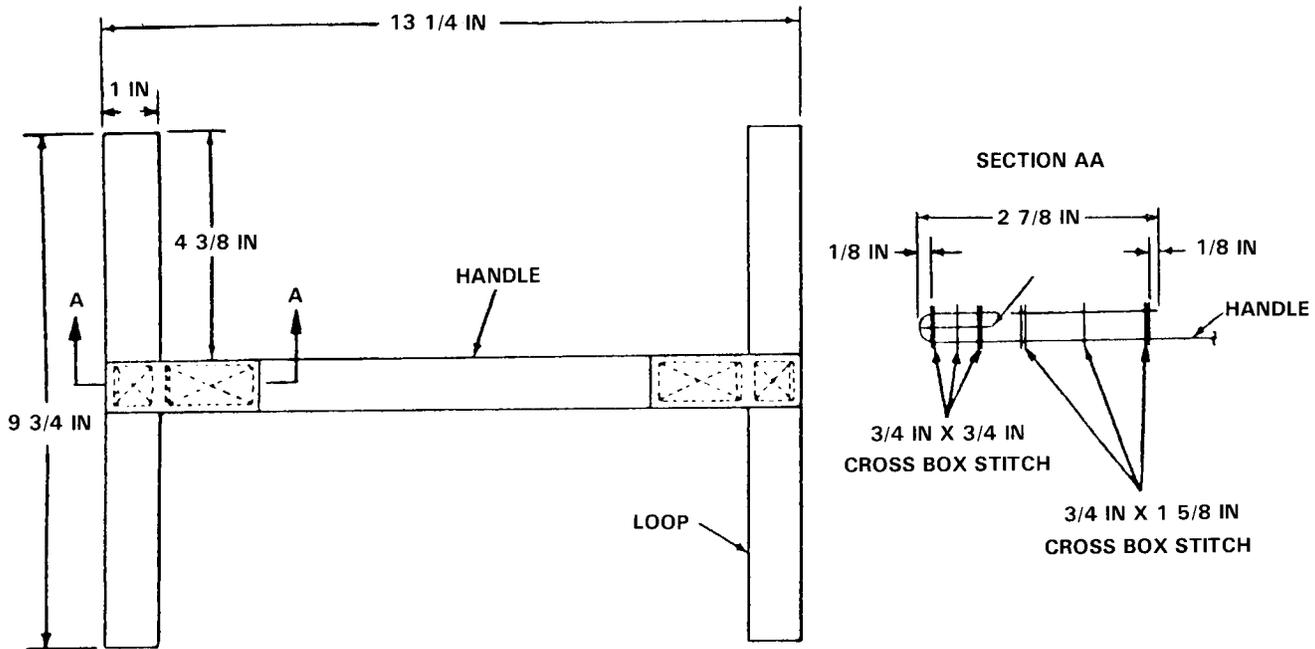


Figure 11-18. Fabrication of handle assembly.

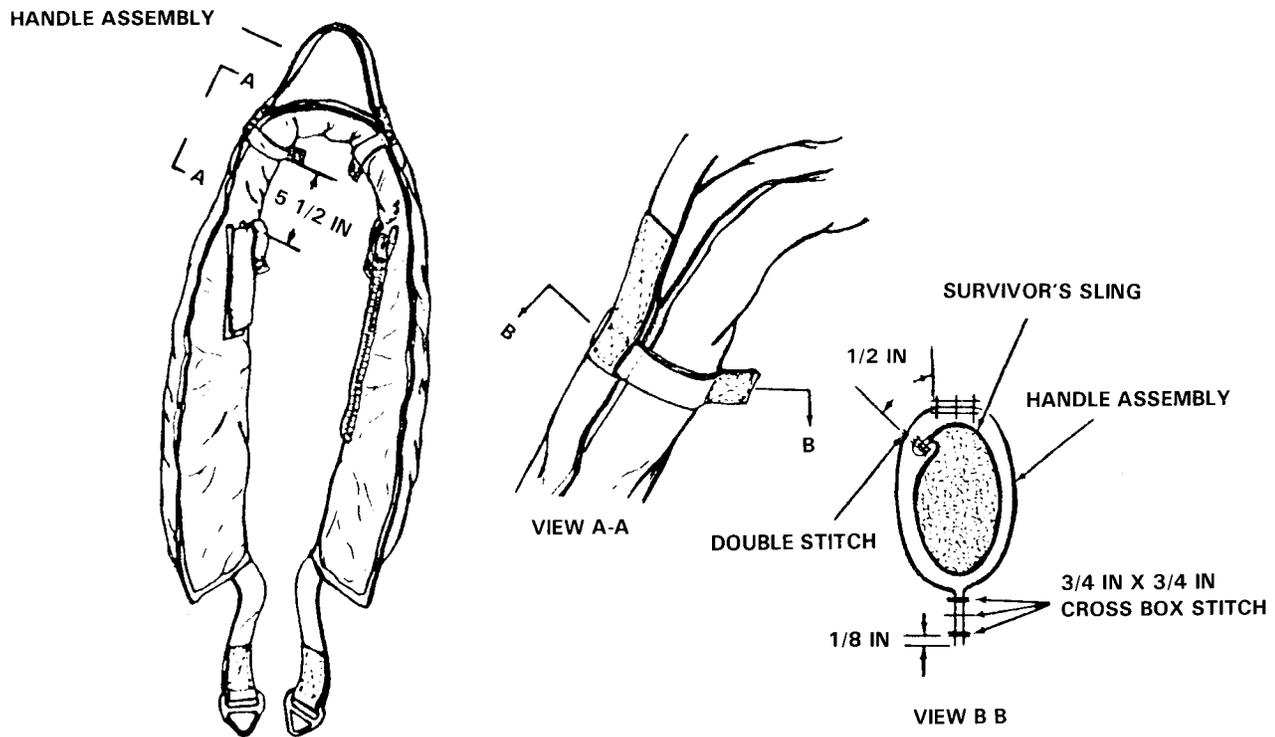


Figure 11-19. Attachment of assist handle to survivor's sling.

Section XIII. HOISTING VEST

11-44. General

The hoisting vest is sometimes referred to as *full body fishnet*. It is designed to evacuate one patient at a time. It is used for overland rescue and ship-board transfer of uninjured or ambulatory patients. If overwater hoisting is expected, a flotation device shall be worn over the hoisting vest.

11-45. Configuration

The hoisting vest is constructed of green light-weight nylon mesh material and is designed to accommodate one person. To facilitate donning and size adjustments of the vest, two rings are provided for each of the four snap hooks. Two adjustable chest straps shall be attached to the lifting V-ring for hoisting (Figure 11-20).

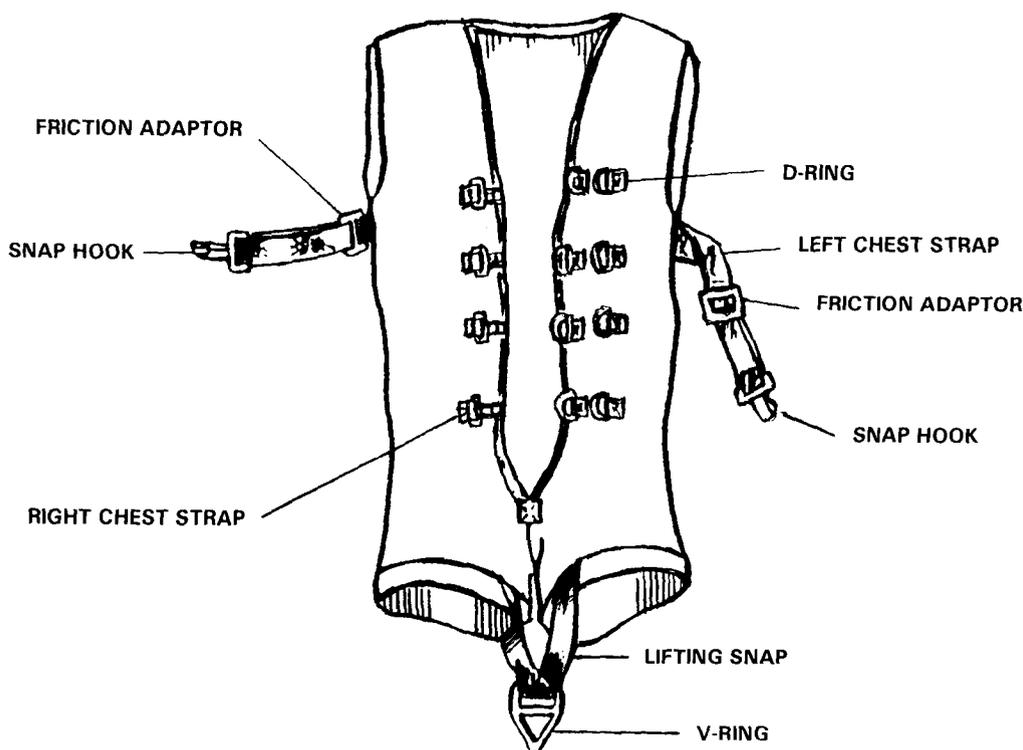


Figure 11-20. Hoisting vest.

11-46. Employment of the Hoisting Vest

a. Should the aircrew elect to use the hoisting vest for a personnel transfer from the aircraft to the ground, the following procedures should be followed:

- (1) The crew member helps the transferee don the hoisting vest.
- (2) The transferee steps through the leg openings and draws up the vest. He then places his

arms through the openings (coat fashion) and pulls the vest over the shoulders with the opening in front.

- (3) The crew member connects the snap hooks to the rings. He then attaches the back support straps with the snap hooks to the lifting V-ring (Figure 11-21). The crew member then connects the lifting V-ring to the rescue hook and signals the hoist operator to transfer the patient.

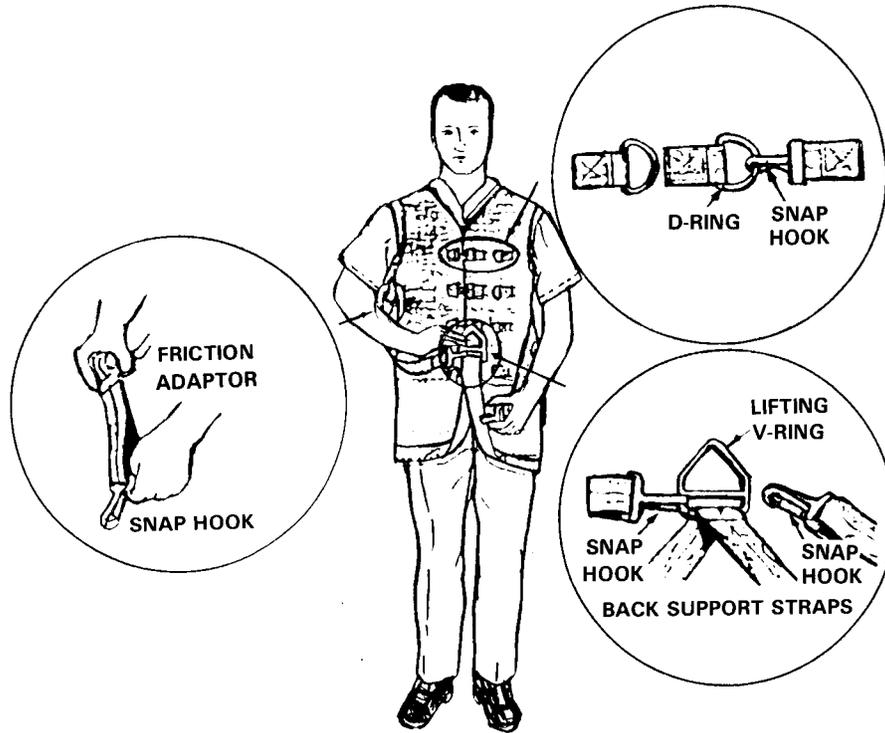


Figure 11-21. Hoisting vest donning procedures.

NOTE

The tag line procedures are used to increase the safety factor of the transfer.

b. When performing the single-man hoist recovery (Figure 11-22), place the patient in the

hoisting vest and fasten the torso snaps. Attach the adjustable chest lifting straps to the lower portion of the V-ring on the leg lifting strap. Attach the rescue hook to the lifting V-ring of the hoisting vest. Adjust the hoisting vest chest straps as necessary to ensure a level or upright position. Ensure the knurled fitting on the locking carabiner is down and locked.

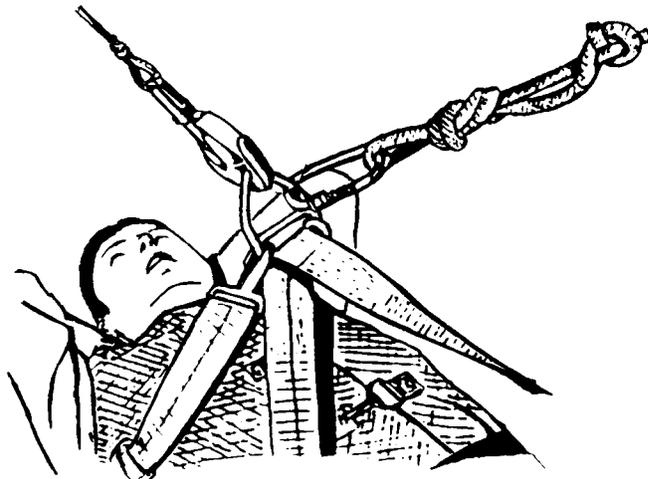


Figure 11-22. Single-man hoist to vest.

c. When performing the dual-man hoist recovery (Figure 11-23), attach the rescue hook to the locking carabiner of the crewman hoisting vest. Attach the locking carabiner of the belay line through the lifting V-ring of the hoisting vest. Route a locking carabiner between the lifting V-ring of the hoisting vest and attach to both locking carabiners. Connect the locking carabiner to the hoisting vest lifting the V-ring of the survivor's vest. Ensure the knurled fittings on the locking carabiners are down and locked.

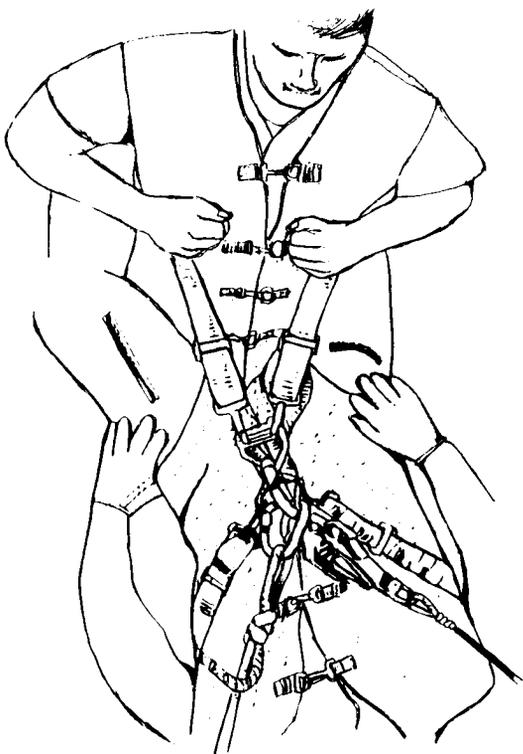


Figure 11-23. Dual-man hoist to vest.

11-47. Maintenance of the Hoisting Vest

a. All cleaning and preventive maintenance performed on the hoisting vest is done at the organizational level.

b. The hoisting vest should also be inspected after every ascent and descent. If the hoisting vest is used during saltwater rescue operations, the vest must be rinsed in fresh water as soon as possible after its use.

(1) A serviceability inspection on the hoisting vest is accomplished by—

- Inspecting the seams for broken stitching.
- Inspecting all straps for cuts, tears, and abrasions.
- Inspecting the nylon mesh material for cuts, tears, dirt, and general condition.
- Checking all hooks, rings, and friction adaptors for the security of attachment, corrosion, damage, wear, and ease of operation.

(2) If faults are found, do not use the hoisting vest until repairs are made.

(3) Any repairs to the hoisting vest are performed at echelons above the organizational level.

Section XIV. PERSONNEL LOCATOR SYSTEM

11-48. General

The Personnel Locator System (PLS) is designed to locate survivors in a combat environment. The system can be used in conjunction with the AN/PRC-

112(V) survival radio, but has the capability to home in on any continuous source of an ultra high frequency (UHF) signal. Other capabilities include two-way voice communications and the ability to locate multiple survivors simultaneously.

11-49. Configuration

The PLS consists of four major components (Figure 11-24). The receiver-transmitter, which is the core of the system, provides direction and distance information to the survivor as well as two-way voice communications. The receiver-transmitter is normally located in the radio racks of the aircraft. The remote display unit (RDU), which is panel mounted,

displays distance in feet or miles and direction in an easy to read bar code (Figure 11-25). The control display unit (CDU), which mounts in a current FM radio slot (Figure 11-26), displays output and controls the PLS by means of a standard keypad and two rotary switches which provide mode and frequency selection. The antenna group, currently consisting of the AT-450 blade antennas, is mounted on the underside of the aircraft.

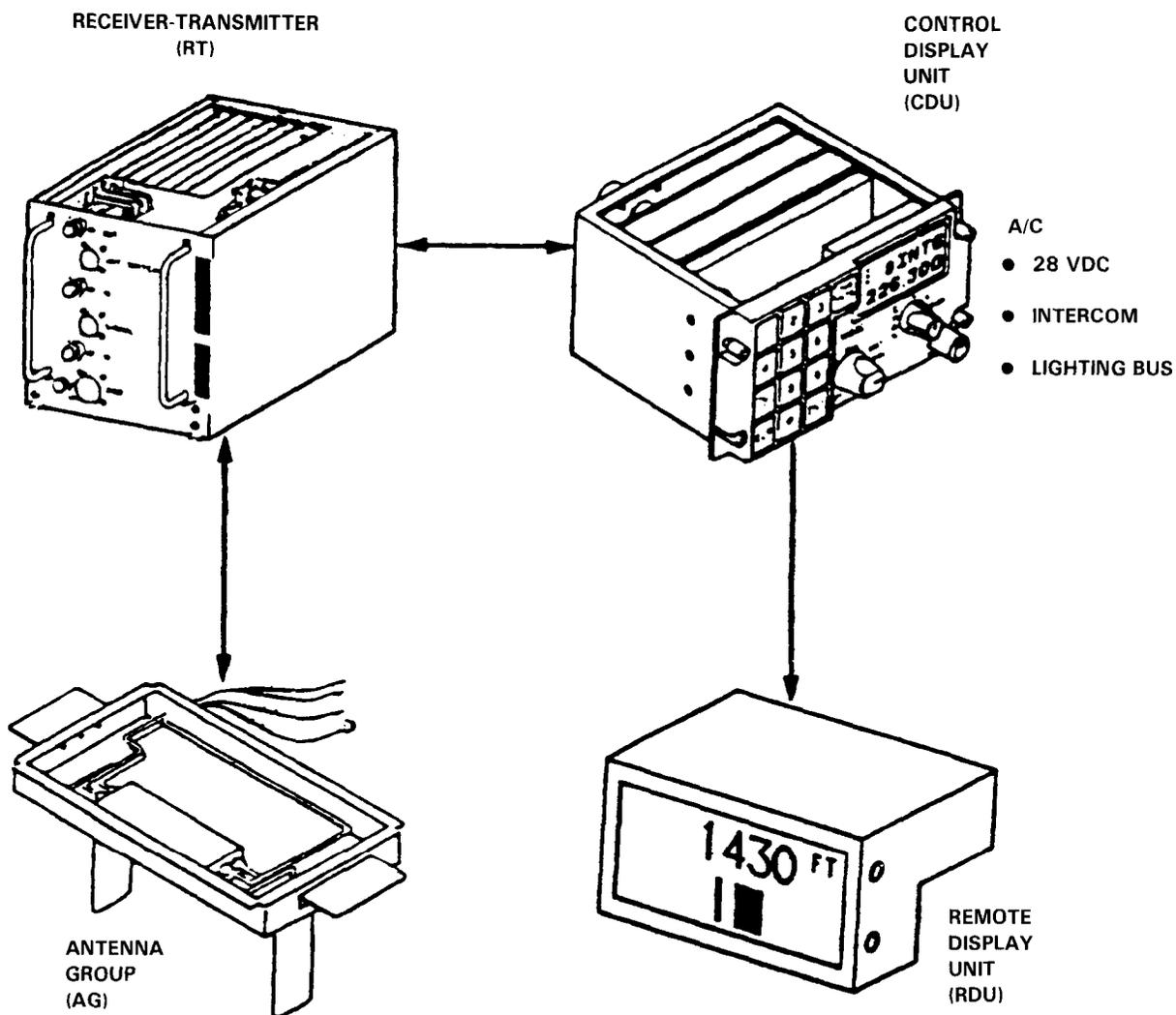
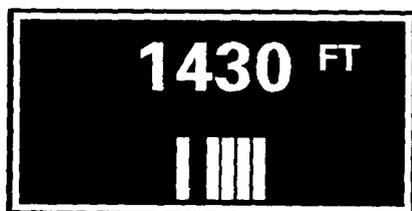


Figure 11-24. AN/ARS-6 PLS System.



RDU GIVES RANGE IN NAUTICAL MILES OR FEET, PLUS SIMPLE, STABLE STEERING DISPLAY. THE DISPLAY INDICATES THAT THE SURVIVOR IS 1430 FEET AWAY AND TO THE RIGHT OF THE AIRCRAFT HEADING.

Figure 11-25. Remote display unit.

COVERT SEARCH

1. SET MODE SWITCH TO "BRST."
2. PRESS THE KEY (1 THROUGH 9) CORRESPONDING TO THE SURVIVOR.
3. PRESS "INTG" TO OBTAIN RANGE AND STEERING INFORMATION RELATIVE TO THE SURVIVOR'S AN/PRC 112 RADIO.
4. PRESS KEY CORRESPONDING TO NEXT SURVIVOR.

HIGH ACCURACY COMBAT RESCUE

1. SET MODE SWITCH TO "CONT."
2. PRESS "INTG" FOR CONTINUOUS INTERROGATION.

A detailed diagram of the control display unit. It features a keypad on the left with buttons for digits 1-9, 'CLR', and 'ENT'. A 'T/R INTG' button is located above the keypad. The central LCD display shows '1 INTG' and '258.000'. Below the keypad is a 'MODE' switch with positions for 'BIT', 'FREQ', 'CODE', 'BRST', 'CONT', and 'HOME'. To the right of the mode switch is a 'CHAN' selector with positions 'A' and 'B'. Below the mode switch is a 'TOL' knob. The unit has two speaker grilles on the left and right sides.

PRE-FLIGHT

1. SET MODE SWITCH TO "BIT." (15-SECOND SELF-TEST. LCD DISPLAY SHOWS "PASS" TO INDICATE PLS IS FULLY OPERATIONAL.)
2. SET MODE SWITCH TO "FREQ" AND CHANNEL SWITCH TO "A" OR "B."
3. USING KEYPAD, ENTER SURVIVOR RADIO FREQUENCIES FOR CHANNELS A AND B.
4. SET MODE SWITCH TO "CODE."
5. USING KEYPAD, ENTER UP TO 9 SIX-DIGIT SURVIVOR CODES.

PEACETIME (OR PRC-90) HOMING

SET MODE SWITCH TO "HOME." (PLS PROVIDES STEERING TO ANY SIGNAL SOURCE ON SELECTED FREQUENCIES.)

NOTE: PLS PROVIDES 2-WAY VOICE COMMUNICATIONS IN ALL OPERATIONAL MODES.

Figure 11-26. Control display unit.

11-50. Application

a. The PLS is designed to be used with the AN/PRC-112(V) survival radio to locate survivors in any weather or altitude. The PLS is particularly well-suited to combat operations due to its burst method of survivor location. In this mode, the system uses a 300 millisecond artificial noise burst for both interrogation and response of the survival radio. When located close to the survivor, the system can be switched to the continuous mode, making interrogation continuous and allowing a pinpoint location to be established. The PLS has the memory to interrogate up to nine radio codes at one time when the radio is preceded during the preflight checks on the aircraft.

b. The PLS, when set in the *HOME* position, provides directional information to any UHF transmitter. The feature is normally used in peacetime.

11-51. Operation of the Personnel Locator System

a. The PLS operates much like a very high frequency (VHF) omnidirectional range station/tactical air navigation (VORTAC)—the PLS being the receiver and the survival radio being the VORTAC station. Its ability to remember up to nine

survival radio codes at one time necessitates preceding the six digit codes assigned to each of the survivors' radios. Once the codes are entered into the PLS, they can be recalled by a single digit corresponding code. During operations, the PLS is transmitting the downlink message to all the survival radios, but receives an uplink response from the survival radio corresponding to the entered code, thus only using battery power from that radio and saving power on the others. Distance and direction to the survivor are displayed on the RDU. Figure 11-25 shows the survivor 1,430 feet away and to the right of the aircraft. Upon initiating the search in a combat environment, the system would be set on the burst mode (shown as *BRST* on the CDU) to avoid enemy detection. When closely approaching the survivor, the mode would be changed to continuous (shown as *CONT* on the CDU) for an exact location of the survivor. During the mission, the aircrew may use the systems voice capabilities to authenticate the survivor's identity.

b. The PLS can home in on any continuous source of transmission in a frequency range from 225 to 300 MHz (in 25 KHz increments), although no distance information is available in this mode. The unit has two preset frequencies—243.0 and 282.8—and two frequencies (A and B on the CDU) that can be set using the keypad. The range of the system is 100 nautical miles (line of sight) at 10,000 feet and has an accuracy of 50 feet from the target.