Technical Rescuer
Lesson One
Lowers and Raises

DOMAIN: COGNITIVE / PSYCHOMOTOR

LEVEL OF LEARNING: COMPREHENSION
APPLICATION

MATERIALS

IFSTA 7th Edition Fire Service Search and Rescue manual; High Angle Rescue Techniques, 3rd Edition, by Tom Vines and Steve Hudson; CMC Rope Rescue Manual 4th Edition revised; International Manual Of Basic Rescue Methods, 2004 Edition; computer; multimedia projector; whiteboard or flipchart; and marking pens. A suitable number of 1" or 2" flat or tubular web slings for anchor slings in suggested pre-tied lengths of 5' and 12'; 1 3/4" or various lengths of commercial anchor straps; several pieces of webbing a minimum of 1 3/4" x 12' to 20' long for tying seat harnesses and chest harnesses; a suitable number of various lengths of 1" webbing for ascender slings and foot slings for self escape maneuvers; a suitable number of 1/2" NFPA approved lifelines, a minimum 100’ in length. Several Rescue 8 descenders, brake bar racks, and edge protection devices; several 20' to 25' sections of 7/16" - 1/2" diameter body cord or webbing a minimum 1 3/4" width for external lashing; several 10' to 12' long sections of webbing for internal lashing a minimum 1 3/4" wide; one of each Class II, and Class III NFPA approved commercial harness. Students may use their own harness providing it meets NFPA 1983 requirements for rescue operations. Adjustable rescue pick-off straps, carabiners, various lengths of 6 - 9mm Prussik cords for ascending and descending, and several untied lengths of 53" and 65" specifically for belay systems; Prussik minded pulleys; commercial belay devices used by the AHJ; rappelling emergency escape kits; commercial rope grab devices; a suitable number of 25' to 50' sections of training rope to practice rigging mechanical advantage systems; litter used by the authority having jurisdiction; edge protectors; litter harness for horizontal lower and material for

constructing modified litter harness;portable radios or head set systems; and one 24' fire service grade extension ladder that is within test dates.

NFPA 1006, 2013 Edition JPRs

5.5.1 Tie knots
5.5.2 Construct a single point anchor system
5.5.3 Edge Protection
5.5.4 Construct a simple MAS
5.5.5 Use a simple MAS in a raising operation
5.5.6 Function as a litter tender in a low-angle lowering or hauling operation
5.5.7 Construct a lowering system.
5.5.8 Direct a lowering operation in a low-angle environment.
5.5.9 Construct a belay system.
5.5.10 Operate a belay system.
5.5.11 Belay a load
5.5.12 Conduct a system safety check
6.1.2 Direct a lowering operation
6.1.5 Construct a fixed rope system
6.1.7 Ascend a fixed rope system
6.1.8 Descend a fixed rope system
6.2.1 Complete an assignment while suspended from a rope rescue system
6.2.2 Move a patient in a high-angle or vertical environment
6.2.3 Function as a litter tender

Junior Member Statement:

Junior Member training activities should be supervised by qualified instructors to assure that the cognitive and psychomotor skills are completed in a safe and non-evasive manner. While it is critical that instructors be constantly aware of the capabilities of all students both mentally and physically to complete certain tasks safely and successfully, the instructor should take every opportunity to discuss with departmental leaders and students the maturity and job awareness each participant has for the hazards associated with fire and rescue training.

TERMINAL OBJECTIVE

The Technical Rescuer shall correctly identify, describe and demonstrate the setup, operation and function of various types of high angle raising and lowering operations involving litters.

ENABLING OBJECTIVES

1. The Technical Rescuer candidate when given the appropriate equipment shall correctly demonstrate blanketing a victim in a litter used by the authority having jurisdiction, and secure the victim into the litter by means of internal and external lashing.

2. The Technical Rescuer candidate when given the appropriate equipment shall correctly demonstrate conducting a low angle descent to reach a victim.

3. The Technical Rescuer candidate when given the appropriate equipment shall correctly demonstrate conducting a low angle raise using a simple hauling system incorporating a 2:1 and 3:1 hauling operation to include a visual safety check, a pre-hauling load test of all systems with verbal confirmation acknowledged by all rescue personnel, and the use of appropriate commands.

4. The Technical Rescuer given the appropriate equipment shall correctly identify and describe the function of various types of litters, and demonstrate packaging a patient in a particular litter.

5. The Technical Rescuer given the appropriate equipment shall correctly identify, describe and demonstrate rigging a litter and a system to perform a vertical lower and raise with and without an attendant.

6. The Technical Rescuer given the appropriate equipment shall correctly identify, describe and demonstrate rigging a litter and a system to perform a horizontal lower and raise with and without an attendant.

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MOTIVATION

High and low angle rescue operations can occur in all types of environments. As a rule the Technical Rescuer will either have to go up or down to reach the patient. Differences in elevation usually require the use of a fixed rope system to simply gain access to these patients. This lesson plan deals with various techniques of moving rescuers and patients in elevated situations. Performing a rope rescue lower or raise is a basic function of high and low angle rescue. Each is covered here along with an emphasis on safety and technique. Depending on the patient's injuries, the condition of the terrain, and the availability of equipment, the rescue team may choose to execute a vertical or horizontal lower or rise. The Technical Rescuer must be proficient and comfortable working with raising or lowering rope systems whether they are rigging the system or traveling on it. This degree of comfort is directly related to the level of confidence each Technical Rescuer has in their ability to correctly rig and use these systems. Confidence comes with knowledge and practice. These operations will place personnel in precarious situations; therefore, safety is paramount. Working from elevated points can be intimidating; but with proper training, practice and encouragement, the intimidation can be successfully dealt with.

PRESENTATION

ENABLING OBJECTIVE #1

The Technical Rescuer candidate when given the appropriate equipment shall correctly demonstrate blanketing a victim in a litter used by the authority having jurisdiction, and secure the victim into the litter by means of internal and external lashing.

1. Demonstrate blanketing the patient into an approved litter.

a) The two-blanket method. One blanket at the upper body, the other blanket at the lower body.

2. Point out that blanketing helps to immobilize and protect the patient from the weather elements.

3. Point out that blanketing may also help to protect the body from potential abrasions caused by contact with the lashing material.

4. Demonstrate internal lashing procedures.
   a) When using a Stokes litter, the internal lashing cord is tied using overhand or inverted split locking clove hitches with an overhand safety knot at the head of the litter.

5. Demonstrate external lashing procedures.
   a) When using a Stokes litter longer than six feet, a minimum of 25' of 1"– 2" inch webbing, 8 or 9mm accessory cord, or available lifeline not to exceed 1/2" diameter will be needed.
   b) When doing external lashing on a Stokes basket, or other comparable metal litter, the lashing cord will criss-cross through the “D” spaces, and the ends of the lashing cord are secured at the “D” space nearest the shoulders using an overhand or inverted split-locking clove hitch with safety knot.
   c) Show using a round turn; 2 – half hitch tie-off on pin.

NOTE: When referencing IFSTA 7th Edition Fire Service Search and Rescue manual, page 150, an alternative method for step #2 is to bring the midpoint of the lashing cord around the instep of the feet, then continue to follow steps #3 through #5 found on pages 150 and 151. The reason for this is to reduce undue pressure on the ankles created by hitching the feet. Additionally, this internal lashing resolves the possibility of the victim sliding out at the bottom end of the litter.

Reference: IFSTA 7th Edition Fire Service Search and Rescue manual, pages 150 and 151.

APPLICATION

Divide the class into small groups, and assign each group the appropriate equipment to blanket and lash a patient into a litter using an internal and external lashing.

PRESENTATION

ENABLING OBJECTIVE #2

The Technical Rescuer candidate when given the appropriate equipment shall correctly demonstrate conducting a low angle descent to reach a victim.

1. Demonstrate constructing an improvised Class II seat harness, also known as a Swiss seat.
    a) Using a 1" – 2" piece of webbing, attach the two ends with a water knot secured with an overhand safety knot on each side to form a loop.
    b) Pass the loop behind the legs and buttocks.
    c) Reach between the legs and bring the webbing under the section that is around the waist and dress it down snugly.
    d) The instructor may choose to demonstrate another type of seat harness used by the AHJ, providing it meets the criteria specified in NFPA 1983.

2. Demonstrate how to tie a chest harness.
    a) Take a 1 – 2" piece of webbing; attach the two ends with a water knot secured with an overhand safety knot on each side to form a loop.
    b) Form a twist in the webbing, creating a figure 8 in the loop.
    c) Slip the rescuers arms through the ends of the figure of eight plate so that the crossover point rests in the middle of the rescuer's upper back.
    d) Connect the ends of the chest hitch with a locking carabiner.
    e) Connect the chest harness to the seat harness using two carabiners between a short webbing tether, creating an improvised Class III harness.

Reference: IFSTA Fire Service Search and Rescue. 7th Edition, Pages 117 through 120.

5. Discuss the advantages and disadvantages of using conventional figure 8 plate.

a) The figure 8 plate is molded to form a large ring stacked on top of a small ring constructed from aluminum or steel.
b) The larger ring creates friction on the rope and the smaller ring is attached to a seat harness carabiner.
c) Drawbacks include large rope won't thread through the smaller designs. Ropes can slip over the large ring causing a girth hitch.
d) The Rescue 8 descender is the descender of choice for most rescue operations including rappelling.
e) The rabbit ear design allows for extra friction to be applied and the ears prevent the formation of a girth hitch across the larger ring.

6. Most manufacturers of the figure 8 plate do not recommend using these devices for rappels exceeding 75' – 100' due to excessive heat buildup and potential damage to lifelines.

Reference: IFSTA Fire Service Search and Rescue, 7th Edition, Pages 124 and 125.

7. Demonstrate rigging a Rescue 8 descender rappel system.
   a) Secure one end of the lifeline to a secure anchor.
   b) Form a bight in the lifeline with running end on rescuer's brake hand side.
   c) Slip the bight through the large ring from the top. For extra friction that may be needed for large rescuers, bring the bight through the large ring twice.
   d) Slip the bight over the small ring.
   e) Connect the Rescue 8 descender to the rescuer's seat with a carabiner with the gate in the up position.

Reference: High Angle Rescue Techniques, 3rd Edition, pages 122 through 128.
Reference: CMC RRM

NOTE: There are other acceptable locking methods for securing the Rescue 8 descender. The one described is one of the easiest to understand.

8. Demonstrate rigging a brake bar rack rappel system.
    a) Lay lifeline across the top of the training groove on the rack.
    b) Weave the lifeline under and over each bar until desired friction is obtained. This will vary depending on the weight of the rescuer.
    c) The running end coming out the bottom of the rack is held in the rescuer's brake hand and positioned between the center of the rescuers back and hip.
    d) Connect the rack to the rescuer's harness with a carabiner, with the gate in the up position.
    e) Manipulating the slack in the rope and by adding or subtracting bars from the system controls the speed of the descent. Pulling the running end of the rope up towards the top of the rack slows the descent.
    f) Slacking the running end of the rope and loosening one's grip can increase the descent speed.

Reference: IFSTA Fire Service Search and Rescue, 7th Edition, page 125.
Reference: High Angle Rescue Techniques, 3rd Edition, pages 130 through 137.
Reference: CMC RRM

9. Discuss and demonstrate the use of carabiner wrap for emergency (low angle) descents.
    a) Wrap a carabiner connected to the seat harness with several turns of the rappel rope. The more turns, the greater the friction produced.

10. Discuss and demonstrate the use of a Munter hitch for emergency (low angle) descents.
    a) The Munter hitch and the carabiner wrap afford the best protection to the rescuer during an emergency descent when Rescue 8 descenders or brake bar racks are unavailable.

11. Discuss and demonstrate using a Prusik safety as a self belay technique for emergency (low angle) decent.

Reference: High Angle Rescue Techniques, 3rd Edition, pages 138 through 139.

PRESENTATION

ENABLING OBJECTIVE #3

The Technical Rescuer candidate when given the appropriate equipment shall correctly demonstrate conducting a low angle raise using a simple hauling system incorporating a 2:1 and 3:1 hauling operation to include a visual safety check, a pre-haul load test of all systems with verbal confirmation acknowledged by all rescue personnel, and the use of appropriate commands.

1. Define slope evacuation, also known as a low angle environment.
   a) Moving rescuers and a patient over rough terrain or angled terrain requiring the litter and rescuers to be secured to a rope. The descent is controlled by a braking system, and the ascent is controlled by a hauling system.

2. Give examples of a low angle rescue environment.
   a) Road cuts and fills.
   b) Loose rocky slopes.
   c) Road embankments.
   d) Broken, uneven terrain.
   e) Low hills.
   f) Stairways.
   g) Industrial environments.

3. Discuss litter tender positions for a low angle raise.
   a) Option 1 - Use six rescuers, three on each side of the litter.
   b) Option 2 - Use five rescuers, two on each side of the litter and one rescuer at the foot end of the litter. A minimum of four tenders can be used.
   c) The victim should be transported up the embankment head first.

4. Point out that one of the tenders will be for victim medical care and should be located near the head of the victim.
   a) Another option would be to use an independent medical technician attached to the litter, but not responsible for carrying the litter.

5. Demonstrate securing the litter tender tie-ins.

Reference: IFSTA Fire Service Search and Rescue, 7th Edition, pages 117 through 120.

Note: There are several acceptable methods for tying Swiss seats and chest harnesses that may be demonstrated by the instructor.

6. Demonstrate setting up a low angle raise using a main line, a litter hauling system with mechanical advantage, a belay system, and a load release hitch.

NOTE: An independent anchor sling will need to be attached to the litter when using the 2:1 hauling system

Reference: IFSTA Fire Service Search and Rescue, 7th Edition, page 138.

NOTE: The rigging techniques for attaching a main line and belay line to the Stokes basket are the same rigging techniques used when rigging a Stokes basket for a vertical lowering system.

APPLICATION

Have the candidates construct and operate a low angle raising system, perform a safety check and a whistle test. Rotate candidates to act as a rigging supervisor.

PRESENTATION

ENABLING OBJECTIVE #4

The Technical Rescuer given the appropriate equipment shall correctly identify and describe the function of various types of litters, and demonstrate packaging a patient in a particular litter.

1. Identify the various functions of a litter.
   a) A litter serves as a means of transporting a patient.
   b) It helps with the stabilization of injuries.
   c) It protects the patient from environmental hazards.
   d) It provides a means of attaching a patient to the rescue system.

2. Identify and discuss the various designs of metal litters.
   a) Litters are now covered in NFPA 1983, Standard on Life Safety Rope and Equipment for Emergency Services, 2012 Edition.
   b) The most common litter used for high angle rescue operations is the wire basket litter generically referred to as a Stokes basket.
   c) This litter may be constructed of wire frame and covered with wire or plastic mesh, varying in length from 6' - 7' and approximately 3' wide at the widest point.
   d) The strongest metal litters are the ones constructed of tubular stainless steel.
   e) A newer design that recently has come on the market is the tubular titanium litter, stronger and lighter in weight than conventional litter baskets.
   f) All metal litters need to be inspected for material integrity, rust, and corrosion.
   g) The stainless steel litter used by the U.S. Navy is very sturdy, and is one of the longest litters on the market.
   h) Some of these litters are coated with a rubber like material for added protection.

3. Identify and discuss the various designs of plastic litters.
   a) One plastic litter design is constructed of plastic with a metal rail around the top. These baskets are not recommended for life loads suspended in a high angle environment.
   b) The second design has a metal frame encased by a plastic shell.
   c) Plastic litters are usually not as strong nor do they last as long as the stainless steel or titanium litters.
   d) Advantages of the plastic litter include that they weigh less and slide easily over rough terrain and snow. There is more protection afforded the patient.
   e) Disadvantages include plastic parts that may degrade with time, and may retain snow and water if not drained properly. They may be blown about by high winds or rotor wash.
   f) Plastic rigid liters of any type will not be used as a sole rescue platform in NCHART operations. If a

plastic Stokes is in place with the victim packaged let the air crew and HART tech know prior to initiating an extraction. The NCHART crew will provide another means of survivor packaging.

4. Discuss the characteristics of a break-away litter.
   a) It is easier to carry to the rescue site, especially in a wilderness setting.
   b) The litter can be packed on a pack frame or lashed to a 4 wheeler.
   c) These types of litters are connected with quick release pins or cotter type pins that may reduce the strength of the litter at the connection point. The pins can be lost during disassembly. Improper pinning during assembly or lost pins cause basket failure.
   d) A chicken wire basket, although used extensively in years past, is not considered to be the first choice of litters for the high angle environment because the wire tends to break causing sharp shards that can cut and puncture skin as well material.
   e) Litters sold for first aid and mass casualties are not suited for the loads and the environment that may be present in a high angle rescue operations.

5. Discuss the characteristics of flexible litters.
   a) Unlike the rigid metal litters, the flexible litter has no frame.
   b) It is constructed of heavy polyethylene plastic or configured from Cordura and webbing, and designed to be wrapped around the patient, conforming to the patient's body shape.
   c) It is sturdy and durable, working well for most rope rescue operations, especially during confined space operations.
   d) It comes with its own harness system that allows the patient to be secured in a vertical or horizontal position.
   e) Advantages of the flexible litter include being lightweight. They can be stored or carried in a backpack, are adaptable, and can be moved easily over rough terrain. They are reasonably priced.
   f) Disadvantages include that they require additional spinal immobilization, and are not rigid enough to

be carried end to end by two people. They can be caught in wind and rotor wash when not loaded or used with a tagline, and cannot be used with most litter wheels.

Reference: High Angle Rescue Techniques, 3rd Edition, pages 214 through 216.
Reference: CMC Rope Rescue Manual, 4th Edition revised, pages 119-125.

6. Identify the safety factors for a rescue operation involving a litter.
   a) Rescues involving litters are very complex, requiring expert skills in high angle techniques, incident management, and teamwork.
   b) The litter system usually bears a heavy load including the weight of a patient and hardware necessary for rigging.
   c) Safety issues to be addressed include the stress applied to all components of the system.
   d) Knowing the safety factor of each component is not enough.
   e) Rescue personnel must know how to calculate the safety factor necessary for a safe litter operation, and they must design the system so that the safety factor for the whole system provides an acceptable risk. No longer is the assumption that 'every person connected to a rope system is 300 lbs.' considered acceptable.

Reference: High Angle Rescue Techniques, 3rd Edition, page 261.
Reference: CMC Rope Rescue Manual, 4th Edition revised, pages 119-125.

7. Discuss the reasons for properly packaging a patient in a litter.
   a) It protects the patient from physical and environmental hazards. Use appropriate materials for the existing weather conditions.
   b) It provides patient stabilization.
   c) Proper packaging protects medical equipment.

8. Be sure to protect the patient's spine from objects that could penetrate the bottom of the litter. A closed cell foam pad or blanket works well.

9. Demonstrate procedures for securely packaging a patient into a metal or plastic litter.
    a) Using two blankets, place the first blanket across the litter in a perpendicular fashion, allowing 12” to 18" to extend above the patient’s head.
    b) Turn the top of the blanket back on itself, then at the head, turn down each side to form a 45 degree angle.
    c) Place the second blanket over the first so it lies parallel to the litter and overlaps about 18".
    d) Allow 18" to extend below the patient’s feet.
    e) Lay a 10' to 12' section of webbing across the litter, just below the midpoint.
    f) Follow local medical protocol when placing the patient in the litter.
    g) Pick up the middle of the webbing and bring it up between the patient’s legs forming a bight.
    h) Bring the ends around the front of the patient and feed them through the bight from bottom to top
    i) Tie a half hitch or overhand knot where the ends come out of the bight.
    j) Take the ends up to the head of the litter and secure them, one on each side of the patient’s head to the top rail, using a suitable knot such as a split clove hitch, or round turn with two half hitches. Finish with a safety knot.
    k) Complete the packaging process by folding one side of the blanket across the patient followed by the other side, making sure all edges are tucked in.
    l) Internal lashing is not mandatory, but should be used any time there is a chance of the patient sliding or being slung out of the top of the litter.

10. Demonstrate external lashing procedures for the metal or plastic litter.
    a) Form a bight in a suitable length of webbing or body cord.
    b) Place the bight under the instep of the patient’s feet.
    c) Don’t immediately cross over the top of the feet; instead, take both ends up to the “D” space (metal litter) or the slot (plastic litter) just above the feet.

d) Begin by criss-crossing the lashing line at this point, working towards the top of the litter and keeping it below the top rail.
e) Secure each end of the lashing to the “D” space or slot on each side of the patient’s shoulder using a split locking clove hitch or a round turn with two half hitches, and a safety knot.

NOTE: When using a long NAVY Stokes litter, or other comparable metal litter, use a 25’ section of webbing or body cord.

The High Angle Rescue Techniques, 3rd Edition, shows an alternate method that may be considered for use with a plastic litter.

11. Demonstrate packaging a patient into a flexible litter.
    a) Follow manufacturer’s guideline for packaging and securing the patient in a flexible litter.

Reference: IFSTA 7th Edition, Fire Service Search and Rescue, pages 148 through 152.
Reference: High Angle Rescue Techniques, 3rd Edition, pages 221 through 223.
CMC Rope Rescue Manual, 4th Edition revised, pages 111-118.

PRESENTATION

ENABLING OBJECTIVE #5

The Technical Rescuer given the appropriate equipment shall correctly identify, describe, and demonstrate rigging a litter and a system to perform a vertical lower and raise with and without an attendant.

1. Discuss the criteria for using a vertical lowering system.
    a) They are used primarily for low angle rescue operations.
    b) The patient is without a spinal injury or severe lower body trauma.
    c) For high angle operations, vertical lowers are used for short distances, 2 to 4 stories, and are most effective in confined space urban or wilderness operations.

d) The lowering area should be free of any obstruction.
e) Is there enough rope for at tag line to reach the ground?
f) A litter tender can be attached to vertical lower system, but a vertical lower system is more difficult for a tender to maneuver than a horizontal lower system.

2. Demonstrate procedures for connecting a lifeline to a metal litter for the purpose of executing a vertical lower.
   a) Using one end of a lifeline, measure the length of the litter and add an arm's length.
   b) Starting on one side of the litter at the "D" space nearest the patient's shoulder, on the foot side of the pin, pass the lifeline under the rail to the point of measurement and tie an inverted clove hitch splitting the pin so the running comes out on the head side of the pin, a safety knot isn't required. The running end should be pointing towards the ground.
   c) Pass the running end of the rope under the litter between the wire and the frame to the opposite side.
   d) Starting on the head side of the pin, tie an overhand clove hitch splitting the pin, the running end should be pointing upward.
   e) Take the running end past the head of the litter about a forearm's length and secure it to the standing part using a self adjusting bowline or a figure-eight-follow-through knot and secure it with a safety.
   f) Make sure whichever knot is used, it lies in the center of the top rail.

NOTE: There are several ways that a lifeline can be attached to a litter for a vertical lower. The above method is commonly used by many rescue teams and is considered very efficient. High Angle Rescue Techniques, 3rd Edition, and CMC Rope Recue manual show alternate methods that may be considered for use for metal and plastic litters. The AHJ should make the decision as to what method is best suited for the litter being used during the rescue operation.

Reference: High Angle Rescue Techniques, 3rd Edition, pages 232 through 233.
Reference: CMC Rope Rescue Manual, 4th Edition revised, pages 119-126, 251-262.

3. Demonstrate attaching a back-up line, or belay, to a metal litter for a vertical lower.
    a) Using one end of a lifeline, measure 1/2 to 3/4 the length of the litter.
    b) Beginning at the head of the litter attach the back-up line in the same manner as for the mainline using the vertical pin below the top at the head of the litter.
    c) Take the running end past the head of the litter half of a forearm's length, and secure it to the standing part using a self adjusting bowline or a figure-eight-follow-through knot and secure it with a safety so that the knot is positioned halfway between the head of the litter and the mainline knot.
    d) For a vertical lower without a rescuer, attach a tag line to the foot end of the litter.
    e) Take the running end of the tag line and pass it around the vertical pins at the foot end of the litter.
    f) Bring the running end away from the litter about a forearm's length and tie a bowline or a figure-eight-follow-through knot with a safety.

NOTE: The style of the litter will usually dictate the best location for attaching the mainline and the back-up line.

4. Demonstrate attaching the litter tender to a vertical lower system.
    a) Using a 15' - 20' foot section of lifeline, tie a figure-eight-on-a-bight, or other appropriate loop type knot into one end of the litter tender's safety line.
    b) Using the appropriate diameter of accessory cord, secure a triple wrap Prussik hitch on the mainline and the belay line approximately three feet above the head of the litter.
    c) Attach the litter tender's safety line into both Prussik hitches.
    d) Secure the opposite end of the litter tender's safety line to the litter near the foot end.

e) The litter tender will need to have the capability of ascending and descending while being connected to both the main and safety line during the course of the lower or raise. The tender should be equipped with the appropriate gear to accomplish this task.

5. Demonstrate attaching a brake rack to the mainline in preparation for making a vertical lower.
   a) Select a stable anchor point and secure an anchor sling with locking carabiner to it for the mainline lowering system.
   b) Thread the mainline through the brake rack, using as many bars as needed to control the load.
   c) Make sure that the guide bar (one with groove) is on top to ensure correct threading of the rack.
   d) Attach the brake bar rack to the mainline anchor.

6. Demonstrate procedures for locking and unlocking the brake bar and changing the number of bars in the system.

7. Demonstrate procedures for attaching tandem Prussik belay system.
   a) At a separate stable anchor point, secure an anchor sling with locking carabiner for the belay line lowering system.
   b) Construct a load release hitch and attach the Munter hitch end to the belay line anchor.
   c) Construct a tandem Prussik belay system using a Prussik minded pulley and attach it to a load release hitch.
   d) Construct a tandem Prussik belay system without using a Prussik minded pulley and attach it to a load release hitch.

8. Demonstrate operating the belay system.

9. Demonstrate operating a load release hitch.

Reference: High Angle Rescue Techniques, 3rd Edition, pages 258 through 260.
Reference: CMC Rope Rescue Manual, pages 251-262,127-134 and page 82.

APPLICATION

Divide the class into small groups and assign each group to rotate through the following stations.

STATION 1
Demonstrate packaging a patient and rigging the litter for a vertical lower without a litter tender.

STATION 2
Demonstrate packing the patient and rigging the litter for a vertical lower with a litter tender.

STATION 3
Demonstrate procedures for attaching the various hauling systems to a litter.

Reference: High Angle Rescue Techniques, 3rd Edition, pages 278 through 288.

APPLICATION

Divide the class into small groups and assign each group to rotate through the following stations.

STATION 1
Demonstrate packaging a patient and rigging the litter for a vertical raise without a litter tender.

STATION 2
Demonstrate packaging the patient and rigging the litter for a vertical raise with a litter tender.

PRESENTATION

ENABLING OBJECTIVE # 6

The Technical Rescuer given the appropriate equipment shall correctly identify, describe, and demonstrate rigging a litter and a system to perform a horizontal lower and raise with and without an attendant.

1. Discuss the criteria for using a horizontal lowering system.
   a) This system is more comfortable for the patient.

b) The patient has sustained a spinal injury or severe trauma to the lower body.
c) The patient may require constant monitoring during the operation.
d) The terrain requires one or more litter tenders to help navigate the litter around obstacles, and remove potential debris or loose objects that may dislodge during the course of a lowering operation.

2. Demonstrate procedures for creating a simple litter harness with rope for a non-adjustable horizontal lowering system.
   a) Using four 7’ lengths of rope with a minimum diameter of 7/16", tie a figure-eight-on-a-bight on each end of the ropes.
   b) Using a locking carabiner, clip one end of each rope into the litter, two on each side with two near the top and two near the bottom.
   c) Clip the other ends to a rescue ring or a rigging plate.
   d) Tie a figure-eight-on-a-bight into the end of the mainline, and clip it into the rescue ring or rigging plate.

3. Demonstrate attaching a back-up line (belay) to a litter for a horizontal lower.
   a) Using a separate lifeline, initiate securing the belay line to the head of the litter in the same manner as the belay line for a vertical lower system.
   b) Once the belay line is secured at the head of the litter, measure the distance between the head of the litter and the rigging plate.
   c) Tie a directional figure eight knot and clip into the upper side of the rigging plate or rescue ring.

4. Demonstrate procedures for creating an adjustable spider sling with rope for a horizontal lowering system.
   a) Using two 12’ lengths of rope with a minimum diameter of 7/16", form a bight in the middle of each forming four strands and tie a figure-eight-on-a-bight knot.
   b) Clip the two figure-eight-on-a-bight knots to a rigging plate or rescue ring.

c) Using four 4’ long Prussik cords, form a bight in each and tie a Prussik hitch on each strand about halfway up.
d) Tie the two ends of each Prussik hitch to each strand of rope using a double fisherman knot or figure eight bend.
e) Clip a locking carabiner into each loose spider rig, and then clip them into the litter.

Reference: High Angle Rescue Techniques, 3rd Edition, pages 262 through 264.

5. Demonstrate attaching the litter tender to a horizontal lower system.
   a) Rig a change of direction pulley at an elevated point and thread the mainline through it.
   b) Tie a figure-eight-on-a-bight into one end and clip it into the rigging plate or rescue ring.
   c) Raise the litter a short distance off the ground and tie the mainline off.
   d) Using a 12’ piece of lifeline, a minimum of 7/16" diameter, tie a figure-eight-on-a-bight in one end and clip it into the rigging plate or rescue ring.
   e) The litter tender is attached to the lifeline line also called a pigtail, using two ascenders.
   f) The bottom end of the pigtail is clipped into the litter tender’s seat harness or can be crossed under the litter and clipped to the rail on the opposite of the litter.
   g) The litter tender will also need to be able to descend the safety. The tender should be equipped with the appropriate gear to accomplish this.
   h) This system gives the litter tender the freedom to maneuver as needed up and down, and side to side.

Reference: High Angle Rescue Techniques, 3rd Edition, page 264.

6. Demonstrate attaching a brake bar rack to the mainline in preparation for making a single line horizontal lower.
   a) Select a stable anchor point and secure an anchor sling with locking carabiner to it for the mainline lowering system.

b) Thread the main line through the brake rack, using as many bars as needed to control the load.
c) Make sure that the guide bar, the one with the groove, is on top to ensure correct threading of the rack.
d) Attach the brake bar rack to the mainline anchor.
e) Demonstrate procedures for locking and unlocking the bar, and changing the number of bars in the system.

Reference: High Angle Rescue Techniques, 3rd Edition, pages 258 through 260.
Refrence: CMC Rope Rescue Manual, 4th Edition revised, pages 135-140.

7. Demonstrate procedures for attaching a tandem Prussik belay system with and without using a Prussik minded pulley.
   a) At a separate stable anchor point, secure an anchor sling with locking carabiner for the belay line lowering system.
   b) Construct a load release hitch and attach the Munter hitch end to the belay line anchor.
   c) Construct a tandem Prussik belay system using a Prussik minded pulley and attach it to a load release hitch.
   d) Demonstrate operating the belay system.
   e) Demonstrate operating a load release hitch on the belay line.

Reference: High Angle Rescue Techniques, 3rd Edition, pages 192 through 198.
Reference: CMC Rope Rescue Manual, 4th Edition revised, pages 127-134 and page 82.

8. Demonstrate attaching the lowering line to the primary braking system.
   a) Both lines are rigged through the same brake bar rack using enough bars to control the descent by a single brake person.
   b) An alternate method is to set up a separate lowering system for each lifeline and have each controlled by a brake person.
   c) The above system needs to be anchored as close to each other so the communication between each brake person is clear and concise.

9. If available, discuss the application of a brake tube device for a double line lower.
    a) Advantage of a brake tube includes, knot can be easily passed through it, accommodates double lines and affords good control of the lower.
    b) The disadvantage of the brake tube is it is heavier and bulkier than a brake bar rack.

APPLICATION

Divide class into small groups and assign each group to rotate through the following stations.

STATION 1
Demonstrate packaging a patient and rigging the litter for a horizontal lower without a litter tender.

STATION 2
Demonstrate packing the patient and rigging the litter for a horizontal lower with a litter tender.

STATION 3
Demonstrate procedures for attaching the various hauling systems to a litter.

Reference: High Angle Rescue Techniques, 3rd Edition, pages 278 through 288.
Reference: CMC Rope Rescue Manual, 4th Edition revised, pages 141-161.

10. Demonstrate procedures for passing a knot though a lowering system.
    a) A back-up system should be rigged with an ascender clipped into one end of the back-up line.
    b) The back-up line can be run through a Rescue 8 descender, a brake bar rack, or a Prussik minded belay system. Tie a knot or attach a Prussik hitch to the mainline to simulate the need for passing a knot.
    c) Approximately three feet before the knot reaches the primary braking system, stop the lower.
    d) Attach the ascender from the secondary braking system to the mainline just below the primary braking system, make sure the back-up system holds the mainline secure.

e) Remove the mainline from the primary braking system and reposition into the primary braking system so now the knot is forward of the primary braking system.
f) Lock the primary braking system off.
g) Slowly release the tension on the back-up system until the all of the tension is transferred back to the mainline.
h) Unlock the primary braking system and continue the lower after taking the pressure from the secondary braking system off.
i) The back-up system would act as belay system.

Reference: High Angle Rescue Techniques, 3rd Edition, pages 274 through 275.
Reference: CMC Rope Rescue Manual, 4th Edition revised, pages 163-168.

APPLICATION

Divide class into small groups and assign each group to rotate through the following stations.

STATION 1
Demonstrate packaging a patient and rigging the litter for a horizontal raise without a litter tender.

STATION 2
Demonstrate packaging the patient and rigging the litter for a horizontal raise with a litter tender.

STATION 3
Demonstrate the procedures for passing a knot through a primary braking system.

SUMMARY

Rappelling, ascending, and performing vertical and horizontal lowers, are all necessary components of the Technical Rescuer's knowledge base. Each of these operations involves specific steps and techniques, and are based on safety and efficiency. A thorough review of each of these operations is warranted due to the fact that all of them are conducted at some level of elevation above or below ground. Mistakes are not tolerated well in these situations. They usually have catastrophic results for patients

and rescuers. It is imperative that the Technical Rescuer practice the lessons learned here, not only from the aspect of safety, but also for confidence and comfort. For a Technical Rescuer to safely perform “on rope” with confidence, a certain sense of being comfortable with the operation is required.