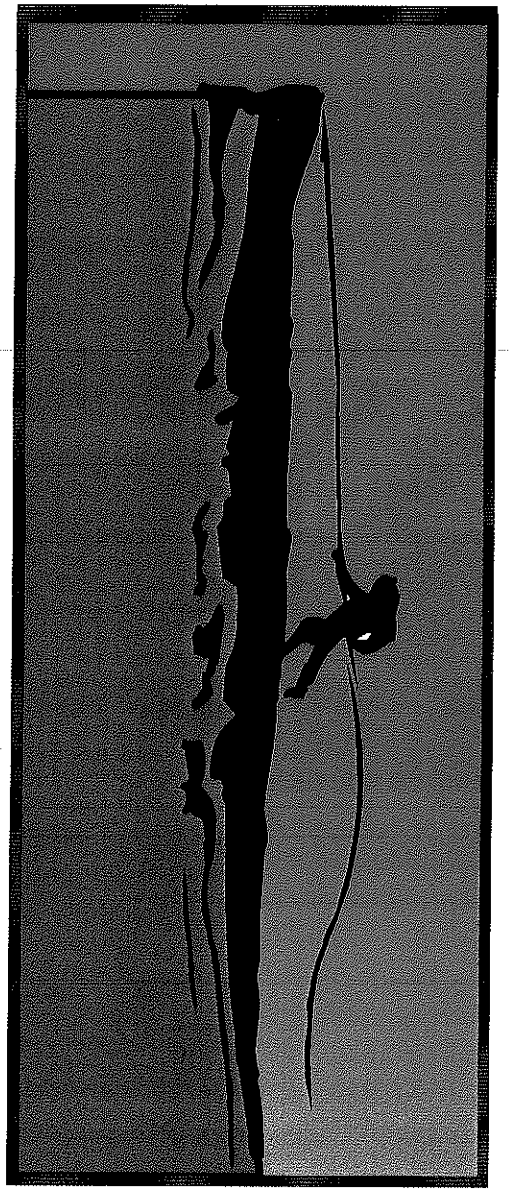
Rappelling



Rappelling
Learning Objectives

At the end of the Training Session the Scout will be able to:

1. Identify and explain the use of the following Climbing Equipment:
   - Rope
   - Carabiner
   - Descender
   - Webbing
   - Slings
   - Brake Bar
   - Sticht Belay Plate
   - Helmet
   - Gloves

2. Tie and explain the use of the following knots:
   - Water Knot
   - Bowline on a Coil
   - Rewoven Figure 8
   - Prusik Knot

3. Rig a personal sling (Figure 8 or diaper type) from webbing and carabiners.
4. Explain the setup of Main Anchors and when a Backup Anchor is needed.
5. Identify four different braking systems and rig the Figure 8 Descender
6. Explain the following Rappels and their use:
   - Arm Rappel
   - Dulfersitz Rappel
   - Descender Rappel

7. Explain and demonstrate correct Belay setup and techniques
8. Explain and demonstrate the correct method of starting a Rappel
9. Explain and demonstrate one method of stopping in Mid-Rappel
10. Demonstrate Proper use of Rappelling/Climbing Signals
11. Explain the Safety Issues associated with Rappelling

Equipment

Learning Objective

Identify and explain the use of the following Climbing Equipment:

Rope
Carabiner
Descender
Webbing
Slings
Brake Bar
Sticht Belay Plate
Helmet
Gloves

Introduction

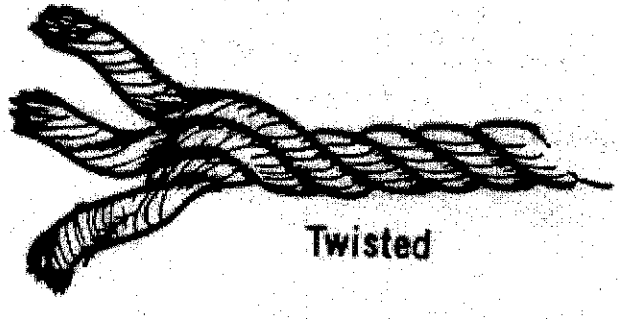
In Rappelling knowing your equipment its use and its condition is what separates a fun filled outing from a potential catastrophe.

Rope

Twisted Strand

Standard Twisted strand rope can be used but has some deficiencies

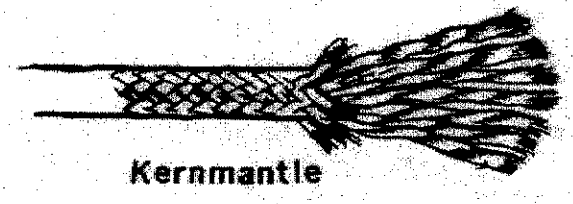
The twist in the rope causes the rope to spiral and kink when used for rappelling
It is less supple than other types of rope, which makes it more difficult to use.
It is harder on climbing gear than other types of rope.
Larger diameters are needed to gain appropriate strength.



Kernmantle

This rope was developed specifically for climbing applications

It is made of many nylon fibers surrounded by a woven outer nylon sheath.
It is extremely strong and supple.
Two different basic diameters are available 9mm and 11mm.
Two different types are available "Dynamic" and 'Static"



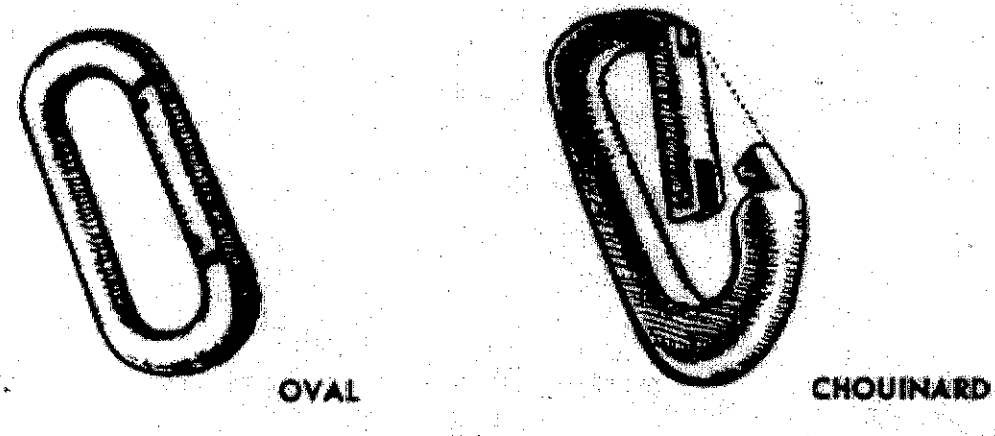
Dynamic –	This type is used for climbing (ascents) It will stretch to 100% of its original length before breaking. This characteristic allows the rope to absorb the energy of a fall. It can be used for rappelling but will stretch during its use.
Static -	This type is used for Rappelling, Spelunking (Caving), and Mountain Rescue applications. This rope does not stretch very much and is usefull in applications where continuous strains are on the rope.

NOTE: Do Not step on the rope or drag it on the ground, dirt particles can get inside the sheath of the rope and wear down then internal fibers causing the rope to fail.

Carabiners

The main purposes of carabiners (also known as beaners) is to attach ropes to various objects and equipment. There are many different types of carabiners, some of the more common are:

Oval
Chouinard
D
Locking
Rescue



CARABINERS

Locking Type carabiners are the most commonly used today due to the locking gate mechanism. In the past multiple oval carabiners were needed to provide a safe connection.
Carabiners can be used to form many different braking and belaying systems.

Descenders

These devices were developed specifically for rappelling. They operate on the principle of friction. There are many different types but the Basic Figure 8 Descender is the most commonly used.

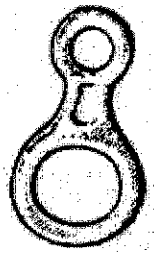
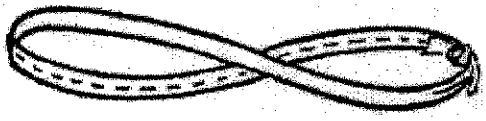


FIGURE 8 DESCENDER

Webbing

Sometimes called "Flat Rope" is a flattened Nylon tube that has great strength. It has many uses in Climbing/Rappelling:



WEBBING

Harnesses – Webbing can be used to construct the harness worn by a climber attach himself to the rope.

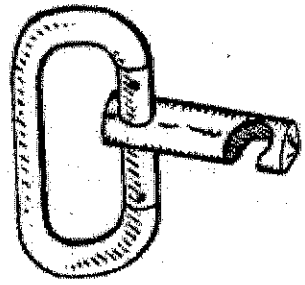
Slings/ Runners- Webbing is used to provide extensions from anchor points and and climbing hardware to protect the rope and provide an unobstructed path for the rope through carabiners.

Racks- Webbing can be used to make a sling tom carry climbing hardware

Stirrups- Webbing can be use to construct climbing ladders used in more technical ascents.

Brake Bars

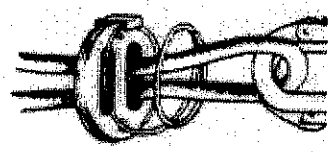
This is a specialized device used to construct rope brake systems.



BRAKE BAR

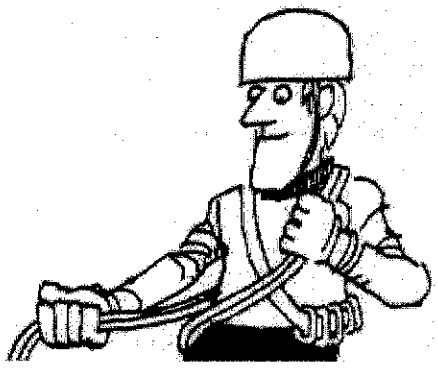
Belay Plate

This device is a specialized Friction brake device used in setting up "Belays".
A Belay is the use of a safety person or device to stop a climber from falling.
The "Sticht Belay Plate" is a specialized type of belay plate which has a spring attached which assists in allowing the saftey rope to run free until braking is required.



Helmets

A helmet is an essential piece of safety climbing gear. It protects the climber from Falling rocks and head injuries if they should slip and slid into the rock face.



Gloves

A pair of heavy leather gloves is another essential piece of rappelling gear. It protects your hands rom the friction heat developed during a rappel.

Clothing

Proper clothing should be considered for rappelling.

- Boots- Boots that provide good ankle support are best for rappelling.
- Pants- Long pants will protect the rappeller from abrasions.

Note- Clothing used for just rappelling is different from the type of clothing used in Rock Climbing

Knots

Learning Objective

Tie and explain the use of the following knots:

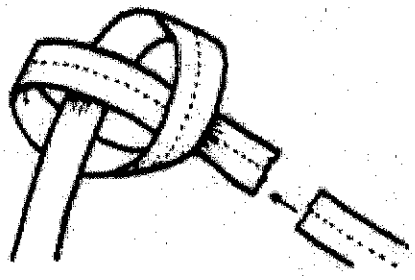
Water Knot
Bowline on a Coil
Rewoven Figure 8
Prusik Knot

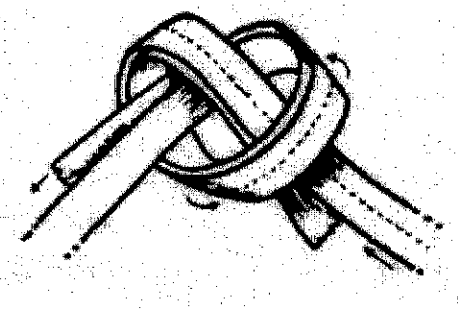
Introduction

As in any sport dealing with rope, knots are essential. In rappeling, a well tied knot can mean the difference between a slight scare and a broken bone. They can even save your life.

Water Knot

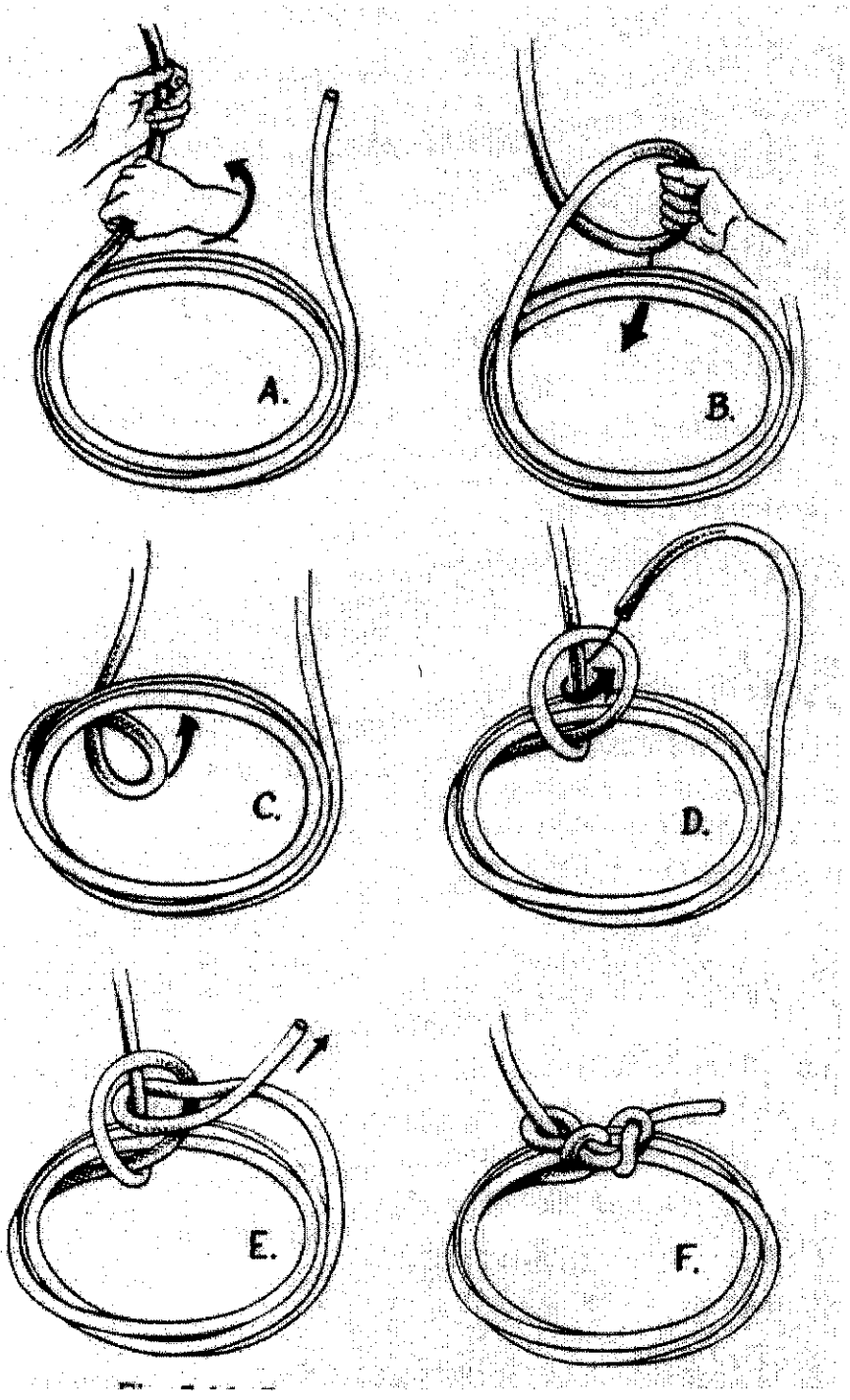
This knot is used in tying to standing ends of webbing together. This knot is critical in constructing harnesses, slings, runners, and stirrups. (see drawing for tying instructions)





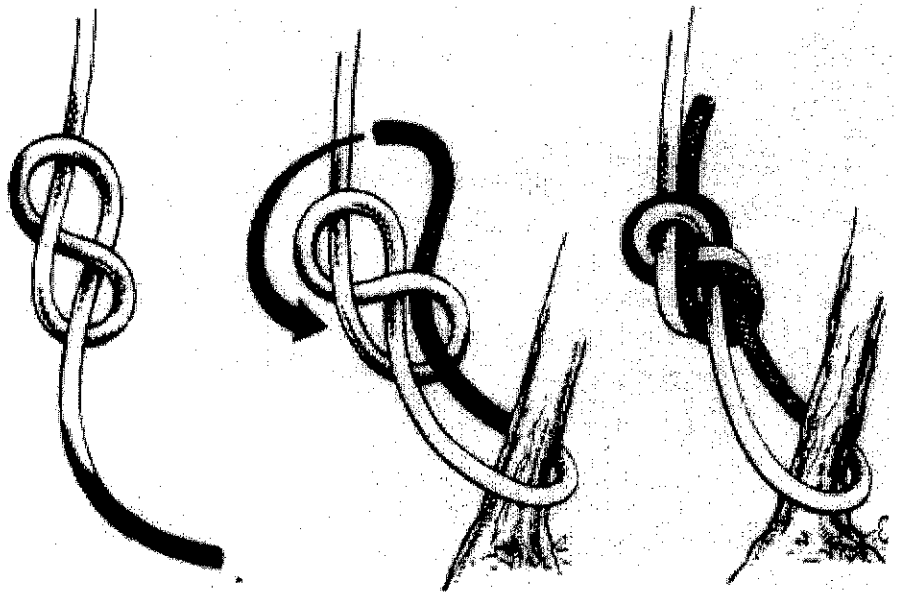
Bowline-on-a-coil

This knot is a variation of the Bowline. It is used in tying in the end man on a safety line or in this case is the method of attaching the backup safety line to the rappeller. (see drawing for tying instructions)



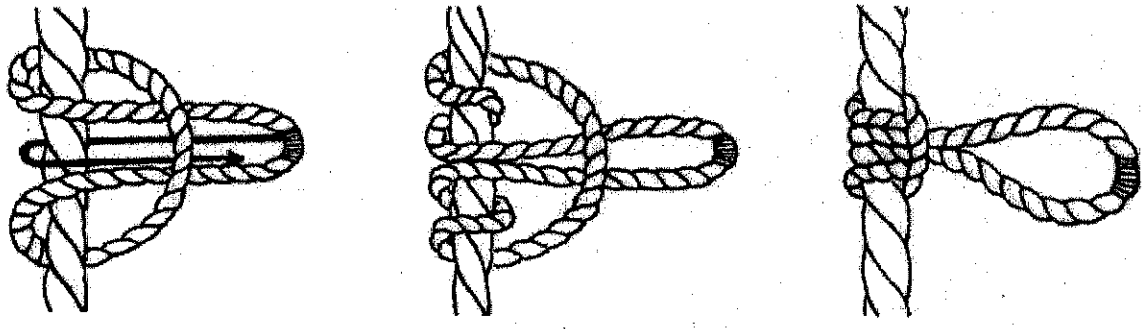
Rewoven Figure 8

This Knot is a variation of the Figure 8 knot. It is used to attach a sftey rope to a climbing harness. (see drawing for tying instructions)



Prusik Knot

This is a specialized knot for attaching moveable hand or foot holds on a rope. It can be used to make an ascender (a contraption used in climbing up a rope) or as a backup belay brake. (see drawing for tying instructions)



Harness
(Personal Sling)

Learning Objective
Rig a personal sling (Figure 8 or diaper type) from webbing and carabiners.

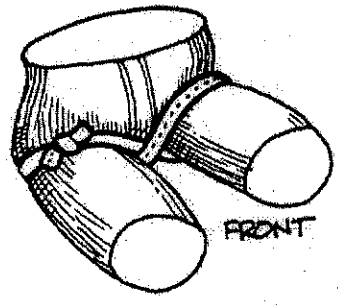
Introduction

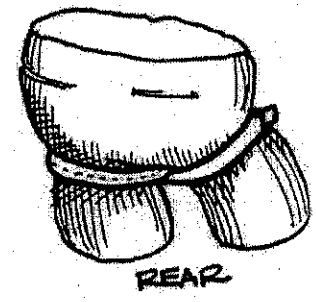
A rappelling harness is the safest and most comfortable way to Rappel. Although there are manufactured harnesses available they are very expensive. With just the knowledge of how to tie a "water knot" and @ $3.00 worth of 1 inch webbing, a comfortable and safe harness can be made.

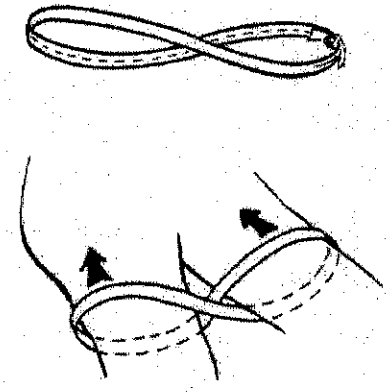
Figure 8 Harness

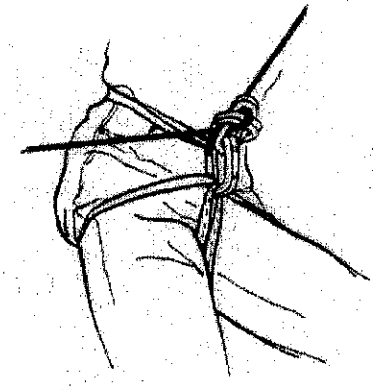
This Harness requires two pieces of webbing material (1 inch width). The frst piece should be long enough to go around the users waist three times and is secured using the water knot. This forms three loops around the waist. These loops should be tight so as not to slip up under the armpits of the user but not to tight as to be uncomfortable.

The second piece of webbing is tied into a loop using the water knot, and the loop is twisted to form a figure 8. Each leg of the user is put through one of the loops formed by the figure 8 so the cross over of the figure 8 is in the crotch area. The figure 8 should be tight enough that when the cross over of the figure 8 is pulled up the front of the user and is clipped in with a carabiner to the waist loops, it forms a comfortable sitting harness. (See drawing for explanation)



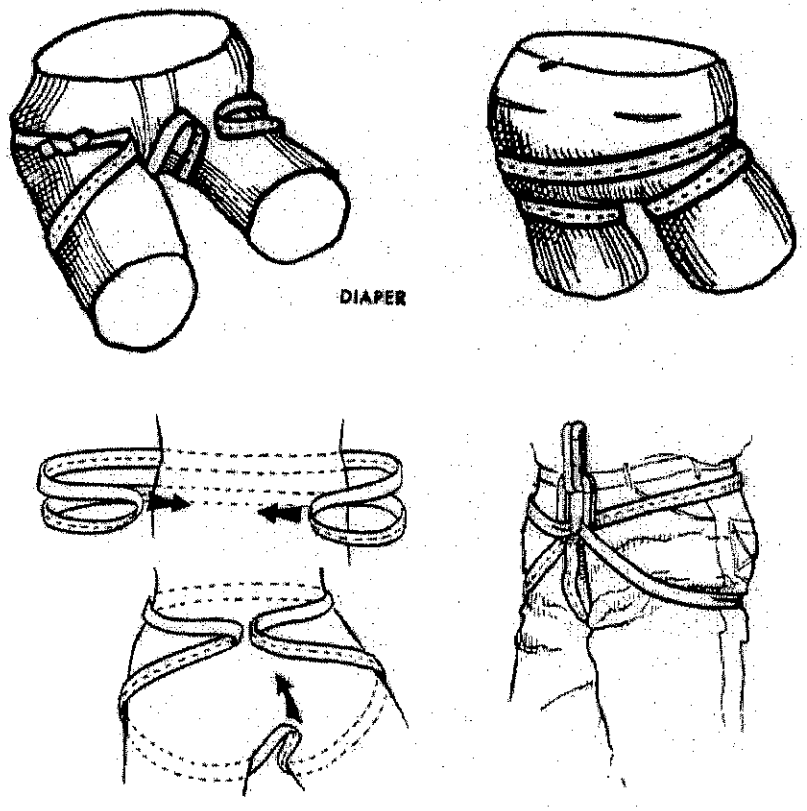






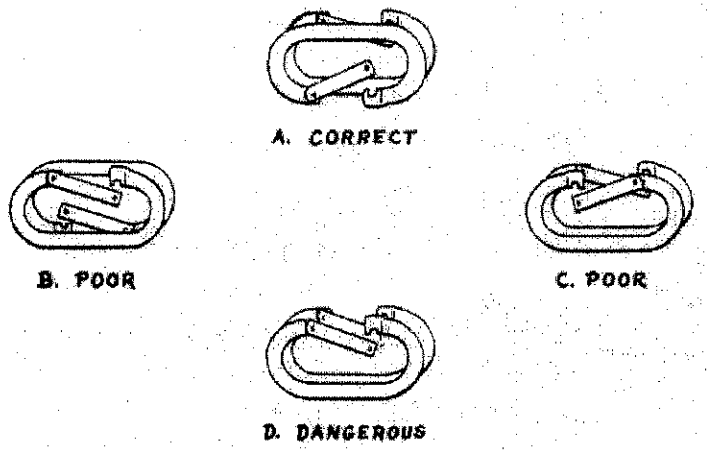
Diaper Harness

This Harness requires only 1 piece of webbing material (1 inch width). A loop is formed using the water knot. The resultant loop is passed behind the back of the user. The lower portion of the loop behind the back is grasped and brought out between the legs with a carabiner fastening the left, right and center loops together. The resultant harness should be as tight as possible without causing discomfort. (See drawing for explanation)



Carabiner Use

A locking type carabiner should be used in fashioning harnesses. If Locking carabiners are not available two carabiners used in opposing gate fashion (see Drawing) should be used.



Anchors

Learning Objective

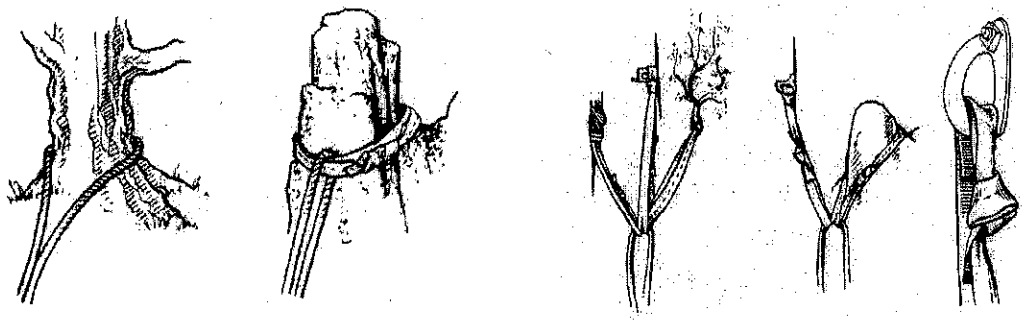
Explain the setup of Main Anchors and when a Backup Anchor is needed.

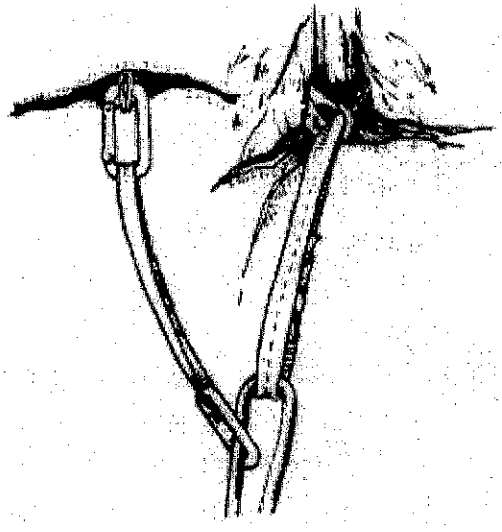
Introduction

Properly anchoring the rappelling rope is one of the most important safety aspects in the sport of rappelling. An improper anchor could fail resulting in severe injury or death.

Anchors

Proper anchoring of the rappelling rope serves two purposes, one to give a secure anchor for the rope under load, and second to protect the rope from damage. Solid anchors such as healthy and sturdy trees or rock outcroppings should be utilized. If the possibility of abrasion or cutting damage to the rope exists, webbing slings can be used. (Webbing is much cheaper to replace than the rope) If a main anchor is questionable, one or more back-up anchors should be used. When a jamming device (piton, nut, chalk, friend, etc) is employed to provide an anchor multiple back-ups should be used. (See Drawings)





Brakes

Learning Objective

Identify four different braking systems and rig the Figure 8 Descender

Introduction

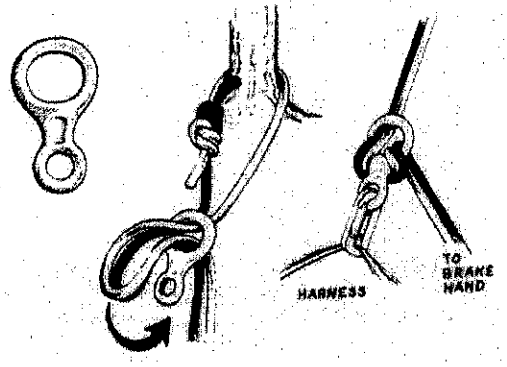
Braking systems in rappelling, as the name implies provides the stopping power to slow the decent of the rappeller. Many different systems can be constructed to tailor the speed of descent or compensate for heavy loads. Rappelling brake systems work on the principle of friction. The more friction the slower the descent. The construction of these systems can be made to provide a speedy descent as those used by the military (remember the Army commercials with solders rappelling out of a helicopter) or a descent that would make a snail seem fast.

Figure 8 Descender

This device is one of the most commonly used rappelling braking devices. It can be used with a single or double rope. Remember the more friction the slower the descent. Single rope applications feed faster than double rope applications because the contact surface area between the rope and the Descender is less, thus providing less friction. In order to rig a Figure 8 Descender, a loop of the rappelling rope(s) is pulled through the larger hole in the Descender and folded back behind the center portion of the figure 8. (See Diagram). The smaller portion of the figure 8 Descender is then connected to the rappeller's harness using a locking carabiner. If used in a double rope application care must be taken that the two ropes do not cross over each other as they feed through the device. This will cause excessive binding.

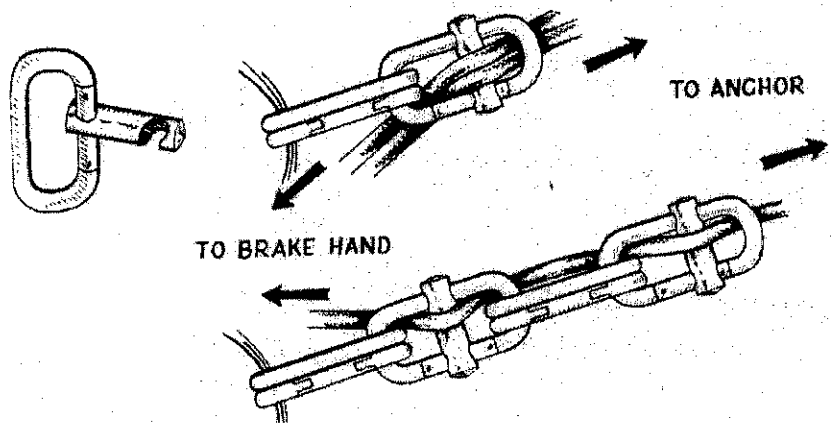
Use

The rappeller places his left hand, which is his "feeling hand" on the rope between the Descender and the anchor of the rope. His right hand which is his "braking hand" is placed on the rope on the down haul side below the Descender. When the rappeller's weight is placed on the rope, the rappeller allows the rope to slide slowly through his hands and the device as he proceeds down. If the rappeller whishes to slow his descent he moves his brake hand along the rope farther back on his hip. This action increases the friction and slows the descent. In order to stop, the rappeller moves his hand farther along the rope and tucks the brake hand into the right cheek of his buttocks. The resulting increase in friction brings the rappeller to a halt. This basic braking action is the same for most all rappelling brake systems.



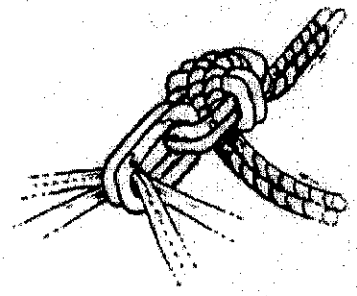
Brake Bars

These rappelling brake devices provide less friction than that of the figure 8 Descender and result in a faster descent. (See diagram for use)



Carabiner Brake

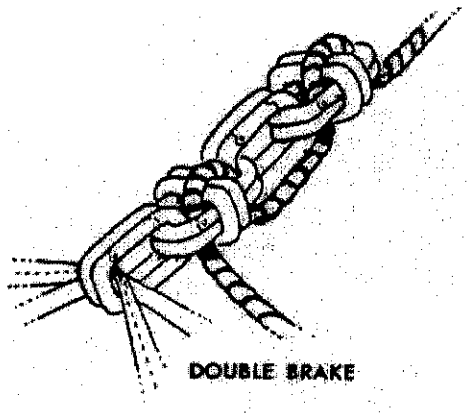
This brake system uses carabiners in place of brake bars. The non-opening side of the carabiner should be the side in contact with the rope to provide the friction. 1, 2, or 3 carabiners can be stacked to provide more friction and a slower descent.



CARABINER BRAKE

Double Carabiner Brake

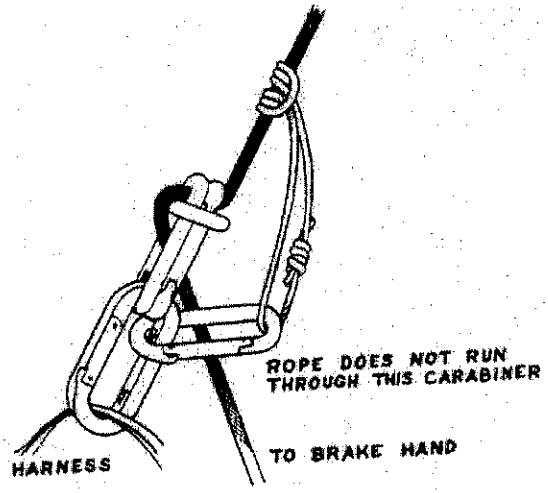
This system uses two stacked Carabiner brake systems to provide significantly more friction.



DOUBLE BRAKE

Prusik Back up

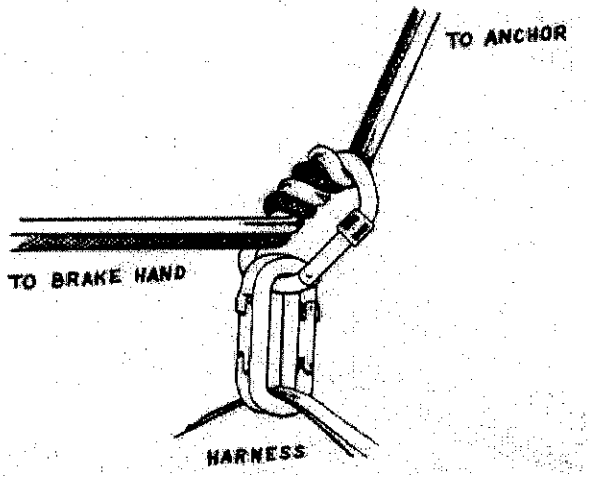
A prusik knot may be added to the system (see diagram) as a backup should the rappeller lose control. The rappeller keeps his feeling hand over the prusik knot as the rope is feed through during the rappel. If the rappeller lets go with his felling hand the prusik knot will tighten and stop the descent.



Carabiner Wrap System

This system uses a spiral wrap of the rappelling rope around the non-opening side of a carabiner to provide the friction. The more wraps, the more friction, the slower the descent.

Note: This brake system should not be used with twisted strand rope, as it will cause the rappeller to spin during his descent.



Rappels

Learning Objective

Explain the following Rappels and their use:

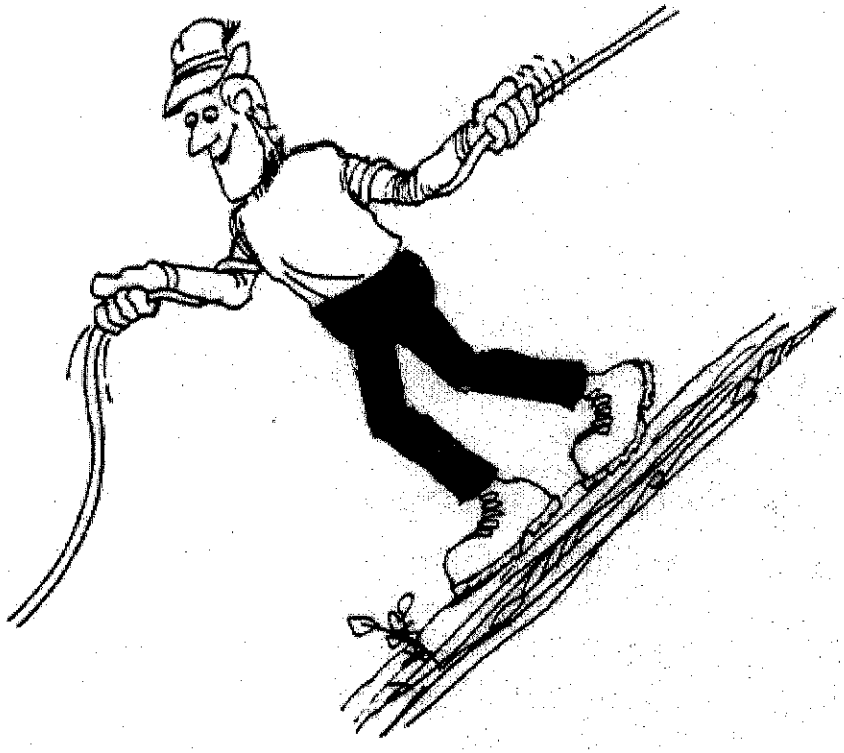
Arm Rappel
Dulfersitz Rappel
Descender Rappel

Introduction

There are many different types of rappels used for different situations. The application and resources available dictate which type should be used. Above all, safety is the main consideration.

Arm Rappel

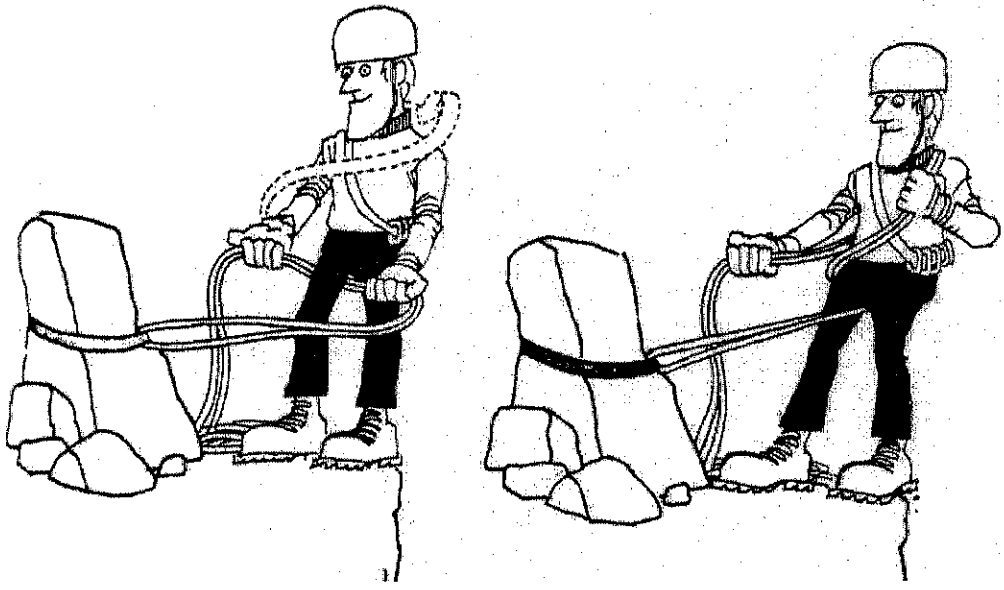
This rappel is used when the slope of the area to be traversed is not too steep. (see diagram) The rope is placed behind the back of the rappeler. One turn of the rope is wrapped around each arm. The uphill hand is the feeling hand and the downhill hand is the braking hand.



Dulfersitz Rappel

This rappel is used when a steep descent is required and minimal Climbing gear is available (rope only) As this rappel rig does not tie into the rappeller it is not considered a safe rappel and is only used in emergencies. The rappeller straddles the rope facing the anchor; the rope is passed diagonally across the chest and over the shoulder. The feeling hand is between the rappeller and the anchor and the braking hand is on the same side as the hip over which the rope passes. Braking action is accomplished by bringing the braking hand along with the rope across the rappeller's stomach.

If webbing and a carabiner are available a modified version of this rappel can be used. A harness is constructed with the webbing. The rope is passed through the harness carabiner and passed over the shoulder and around the back. Braking action is accomplished the same as the standard Dulfersitz Rappel.



Descender Rappel (Carabiner Brake Rappel)

This rappel uses a constructed Harness and a Figure 8 desecnder (or Carabiner Brake System). After rigging the rope to the descender and connecting to the harness, the downhaul end of the rope is passed over the hip of the rappeller. The feeling hand is between the rappeller and the anchor and the braking hand is on the downhaul end of the rope. Braking action is accomplished by moving the braking hand along with the rope around the hip and under the buttocks of the rappeller.

DULFER WITH SEAT SLING

CARABINER BRAKE RAPPEL

Belays

Learning Objective

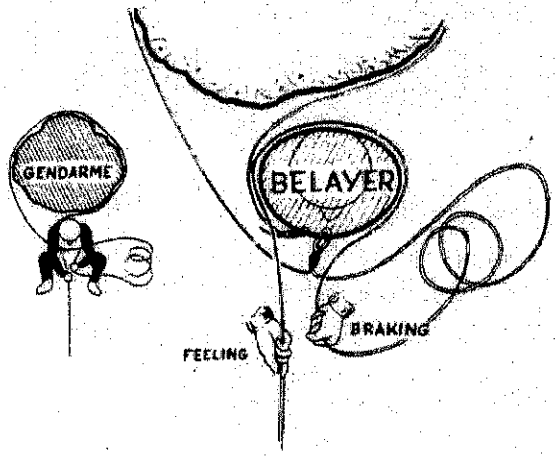
Explain and demonstrate correct Belay setup and techniques

Introduction

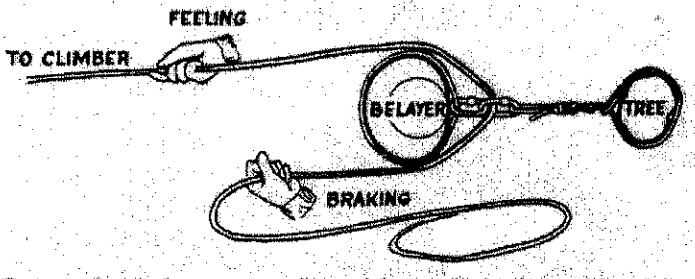
Proper Belay techniques are synonymous with safety. The Belayer literally has the rappeller's life in his hands.

Anchor

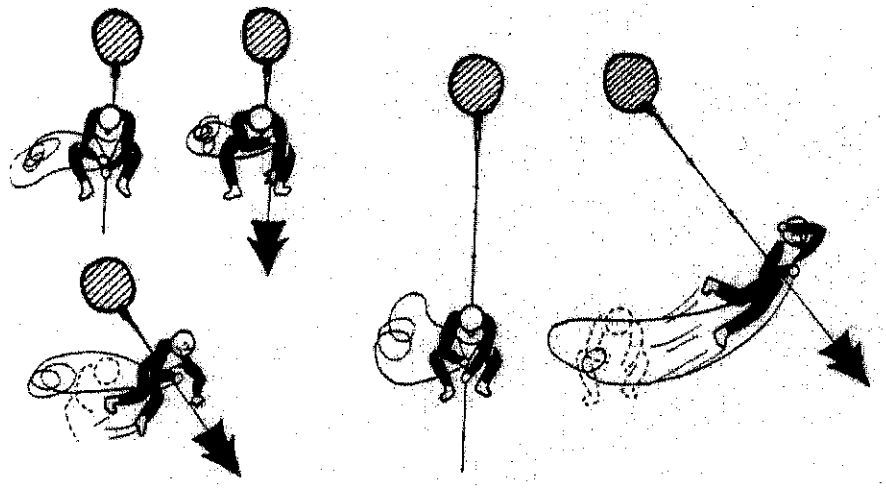
A solid anchor is paramount to a safe belay rig. The purpose of the Belay anchor is to anchor the belayer solidly so they will not be pulled from position due to a fall of a climber or rappeller. The same basic anchoring techniques already discussed are utilized in anchoring a belay although a belay anchor's primary purpose is to solidly anchor the belayer. **Short** anchor lines between the anchor and the belayer keeps the belayer from being pulled out of position should a pull force on the rope come from an unexpected direction.



Using a loop of the rope to anchor to very large rock formation. Note anchor attachment must go around feeling hand side.



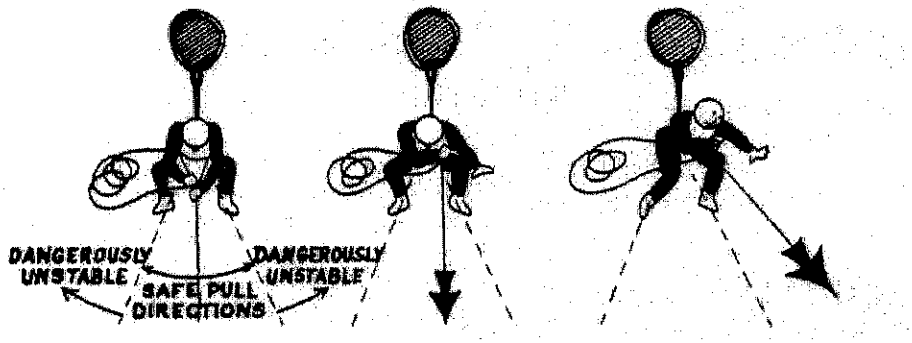
Connecting belayer to anchor with two linked carabiners into the back of the belayer's harness.



Relationship between belayer and anchor. *Left*, short anchor in line of pull is best; even if pulled to side, belayer is moved only a short distance. *Right*, long anchor is poor; belayer can be pulled far to side or lifted up.

Position

The belayer assumes a tripod form with his feet and anchor point making up the three legs of the tripod. The expected direction of pull from the rope should be centered in the tripod form and in direct line with the anchor point. If pulls occur outside of the safe zone formed by the tripod it could pull the belayer out of his stable position and cause him to lose control.



Left, Stable direction of pull for sitting hip belay. *Center*, a pull on the belayer between the foot braces increases position's stability. *Right*, a pull on the belayer outside tripod formed with foot braces can tip the belayer out of position

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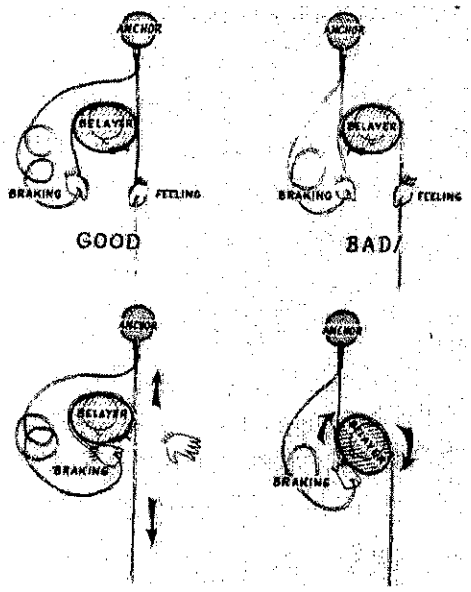
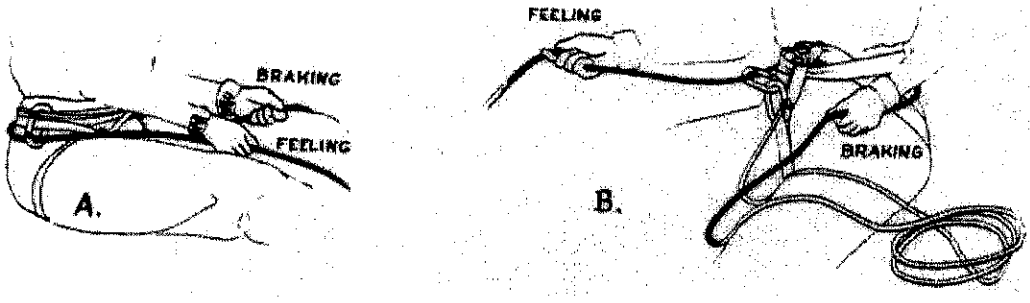


Using Climbing rope tied to front of belayer's harness to attach to anchor. Left, rope loop to anchor correctly runs around belayer's feeling hand side. In fall, anchor restrains belayer from being rotated. Right, rope loop to anchor around braking hand side spins belayer under force of a fall.

Hip Belay

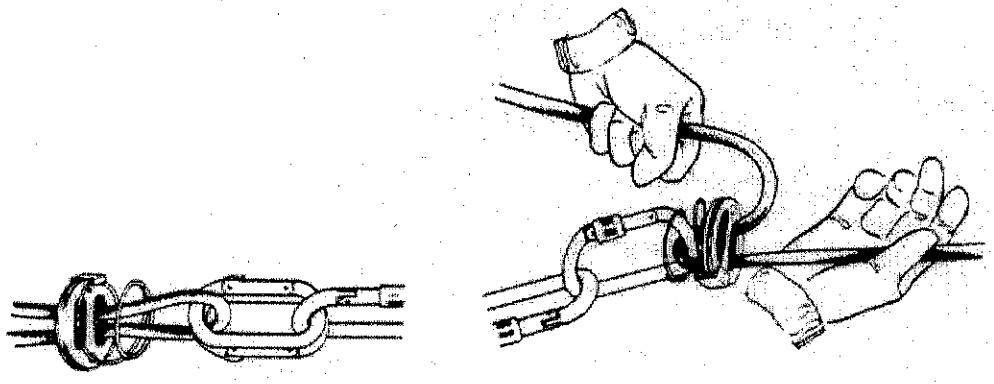
This is the most common type of belay. This type of belay can be done in a standing or sitting position. The rope coming from the climber/rappeller is past around the back of the belayer. The feeling hand is placed on the rope between the belayer and the climber/rappeller. The brake hand is placed on the rope after it has passed behind the belayer. Feeding out or taking in rope is accomplished by the belayer using a sliding seesaw motion between his feeling and braking hands. At no time should the belayer's hands leave contact with the rope. Braking action is accomplished by moving the braking hand along with the rope across the front of the belayer.



Control carabiners. Belay rope running through carabiner clipped to belayer's harness before passing around feeling hand side ensures hip wrap if force should come from an unexpected direction. *Left*, on feeling hand side of hand tied harness. *Right*, on front of commercial harness.

Sticht Belay Plate

The Sticht Belay Plate is a device, which increases the mechanical advantage of the belayer. It also has the advantage of putting the control point for the belay in direct line with the anchor but allows the entire system to pivot if a pull comes from an unexpected direction. The Sticht Belay Plate is rigged by pulling a loop of rope through one of the two slots in the plate (each slot is for different diameter rope). The spring attached to the belay plate should be closest to the belayer. This spring assists with allowing the rope to freely pass through the device when braking is not required. The rope loop is then connected to a carabiner (locking or two opposing gate carabiners) which is attached to the front of the belayer's harness. The anchor is attached via carabiners to the backside of the belayer's harness in the middle of his back. The feeling hand is placed on the rope between the belay plate and the climber/rappeller. The braking hand is placed on the rope on the downhaul end exiting the belay plate. Again, feeding out or taking in rope is accomplished by the belayer using a sliding seesaw motion between his feeling and braking hands. At no time should the belayer's hands leave contact with the rope. Braking action is accomplished by the belayer pulling his braking hand along with the rope down towards his hip. This action compresses the spring and forms a mechanical friction lock between the carabiner and belay plate.



Sticht Belay Plates. Left, in use letting out rope. Right, holding a fall. If the spring should pass over a single, non-locking carabiner it could open the gate.

Starting the Rappel

Learning Objective
Explain and demonstrate the correct method of starting a Rappel

Introduction
Starting the rappel is the hardest part of rappelling. Going over the edge of a cliff is inherently the scariest aspect of rappelling. Proper technique and practice will allow you to overcome this obstacle.

The Tripod
In starting a rappel, the sooner you stabilize your position the easier the operation becomes. A tripod is a very stabile structure. Three-point contact is what creates the stability in the tripod. The three contact points in a rappel are the two feet of the rappeller and the rope. Each of the three points of contact must be stabile for the stability of the tripod to exist. When rappelling there is a transition period from when the rappeller is standing on top of the cliff to when the rappeller establishes a stabile three-point contact. The first step in establishing the tripod is from a standing position at the top of the cliff to transfer a portion of your weight from your feet to the rope. The contact point for the rope on the rappeller is the harness.

Note: The following instructions relate to a rappeller starting directly from a high anchor.

Transferring the Load
With the rappeller attached to the rope through his harness, and his feeling and braking hands in place on the rope, and his belay man alerted, he is ready to begin the transition phase. The rappeller takes up any slack in the rope between himself and the anchor and slowly back-steps toward the cliff edge. With his feet spread shoulder width apart and the balls of his feet on the edge of the cliff, the rappeller than begins transferring his weight from his legs to the rope attached to his harness by leaning back while maintaining a brake on his rappel. The biggest mistake made by beginning rappellers is to try to hold their weight on the rope with their feeling hand, rather than letting the weight be taken up by the harness. This severely fatigues the arm and is not stabile. With a portion of their weight transferred onto the rappeller's harness, the rappeller lets a little rope feed through his descender allowing his body to begin to tilt out over the edge of the cliff. This transfers more of the rappeller's weight onto the harness and begins to balance the load on the tripod. This operation of letting a little rope feed through the descender and leaning farther back continues until the rappeller is at about a 30 to 45 degree angle with the cliff face.

The First Step
With the rappeller reaching the 30 to 45 degree angle with the cliff face, they are ready to take the first step. It is important to remember that the rappeller is still in the transition phase and even though the tripod has been established it has not yet stabilized. Although the weight has been transferred to the rope via the harness, the rope contact point of the tripod easily moves from side to side. The first step with either foot should be a small one. Again caution should be taken not to transfer weight from the harness to the feeling hand. Once the first step has been taken the second foot is moved down parallel with the first. Be sure to maintain a shoulder's width between the two feet. The act of taking these first steps will decrease the angle between the cliff face and the

rappeller. The 30 to 45 degree angle between cliff face and rappeller is once again established by the rappeller feeding some rope through the descender.

Stability Point

The process used to take the first steps is repeated a little at a time until the rope comes in contact with the cliff edge. After this contact is made and the 30 to 45 degree cliff face to rappeller is once again established, the rappeller has left the transition phase and is at the "Stability Point" with the tripod fully established and stabilized.

Continuing the Rappel

From the "Stability Point" the rappeller can now proceed with the rest of the descent. This is done by slowly walking backwards down the cliff while feeding rope through the descender to maintain the correct body to cliff angle.

Note: Beginning rappellers should be warned to take it slow and easy. The commercials on TV, showing soldiers rappelling down cliffs in leaps and bounds, or high speed "Free Rappels" from helicopters, are done by very well trained experienced veterans of the art. As the beginners become more experienced and comfortable with rappelling, other advanced techniques can be taught and practiced.

Slipping

While rappelling it is possible that the feet of the rappeller can slip on the rock face. This could result in the rappeller losing his footing altogether and end up hanging from the rope along the cliff face. First rule is don't panic. (Remember your safety belay man) Apply the brake by pulling down on the braking hand. Then the rappeller must position himself or herself so they are facing the cliff face. The next step is to make contact with the cliff face with the feet. Feet should be spaced shoulder width or more apart. Once the feet have good contact with the cliff face again rope is feed through the descender while keeping the feet stationary until the 30 to 45 degree angle is reached and the stable tripod is again established.