

# ROPE RESCUE MANUAL

The information and illustrations contained in this manual have been gathered from the *CMC Rescue Manual 4<sup>th</sup> Edition Revised ©2013* for the standardization and practice of rope rescue during training and emergency incidents. Not every technique is outlined, and not every style of knot is utilized; including systems. There is a responsibility inherent to every Rope Rescue Technician; to keep up on your skills, to practice them daily, and to be able to quickly and efficiently perform a rescue when called upon. Do you have what it takes to build a rope system? Are you confident enough to put your life on the line, including others, literally? If so, experience and practice will get you to where you want to be. Learn to control your fear, and study rope fundamentals every shift! Make a difference in your team.

## INDEX

|  |    |
|--|----|
| Safety .....                                       | 1  |
| Safety During Training .....                       | 1  |
| Goal .....   | 5  |
| Size Up & Stabilization .....                      | 5  |
| Ropes & Equipment .....                            | 5  |
| JFD Approved Rigging & Systems .....               | 11 |
| Anchor Selection .....                             | 11 |
| Anchor Systems .....                               | 12 |
| RPM (Rack, Pulley, Mariner) .....                  | 13 |
| Edge Protection .....                              | 13 |
| Communications and Signals .....                   | 14 |
| Lowering System .....                              | 15 |
| Raising System .....                               | 15 |
| JFD Approved Raising Systems .....                 | 16 |
| Piggyback System .....                             | 19 |
| Changing from a Lowering to a Raising System ..... | 20 |
| Changing from a Raising to a Lowering System ..... | 21 |
| Belay System .....                                 | 22 |
| Internal Patient Tie In.....                       | 22 |
| External Patient Tie In .....                      | 23 |
| Tending the Litter .....                           | 23 |

# Rope Rescue – Special Operations

## Safety

The designated **Team Leader** (TL) is in charge of the special operations team. No matter who is in charge of the incident, your TL is still responsible for the safety of your team.

A minimum of **Instructor II** qualified with Rope Technician level of training shall serve as the **Safety Officer** (SO) on all trainings, exercises, and emergency incidents.

A safety factor of **10:1** shall be utilized for rigging and equipment on all training and emergency rescue situations. A **TWO-ROPE system**, one the main line, and the other is the belay will be utilized on all incidents. For absolutely urgent, time critical, impending fall, redundancy can be built up to safety at that point. The TL and the SO must agree to this method prior to implementation.

A rescue that requires ropes and rope systems will always have an element of risk. All rigging and systems will be checked by three different people prior to use. This procedure shall be known as the “triple check”.

## Concepts

1. **System strength** – The strength of a rope rescue system is essentially the strength of the weakest link in the system. The strength of each component in the system is determined by the tensile strength when new, less what age and use have done to weaken it, plus the effects caused by its placement in the system. See rope logs for more information.
2. **Redundancy** – Rope systems are backed up by another system. Each anchor point is backed up by another, and each primary rope is belayed by another. Ask yourself “If this part of the system or this connection point in the system fails, what will catch me?”
3. **Limitations** – There are limitations on how far you can carry this approach. You can get so carried away with a backup for everything that your system becomes so cumbersome or takes so long to rig that it is no longer functional.
4. **Belays** – If the failure of the primary support system for the rescuer, subject or both has the potential for injury, a belay system should be used.

*\*\*Note: When belaying any subject or rescuer, make sure that there is no more than 2 feet of slack. Less slack the better. This represents the minimum distance the load will drop if there is a main line fail.*

## Safety during Training

1. **Fear** – People may be genuinely terrified of trusting their life to a thin rope. Fear can cause mistakes. Identify team members’ fear and issues with exposure to height. Make sure the team leader is aware of these issues. Fear is overcome by confidence in the equipment and their skills. Redirect the focus from height to the fundamentals of rope work.

2. **Live load versus a simulated load** – Two philosophies on topic are that one would say that putting someone at risk is unnecessary and using a manikin in place achieves the same goal. However, many instructors feel that the experience of being in the patient’s position during a training scenario is very informative and the value gained is well worth the minimal risk.

### Safety on the Edge and on Rappel

1. **Edge Safety** – There shall be a minimum of one person assigned to the edge when a rescuer is on rappel. Two people shall be assigned to the edge if there is to be a litter operation. Members working the edge must be in rappel harnesses, triple checked and tied off. **All others must stay outside of a safety zone established by the TL and SO.**
2. **Rappel Safety** – The rescuer shall tie off his figure 8 descender or Rescue 8 in the following manner illustrated below.

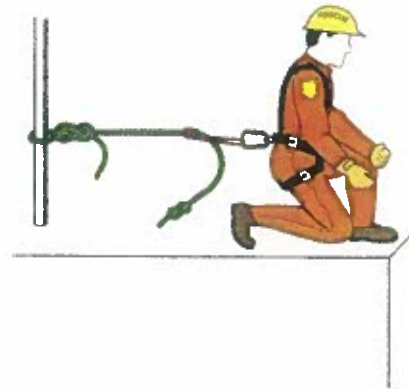


Figure 21-1: Travel Restraint System

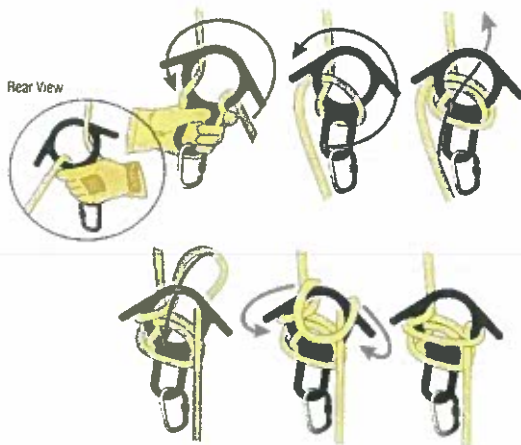


Figure 19-13: Tying Off a Figure 8 Descender

The Rescue Rack or Brake Bar is tied off in the manner illustrated below. **\*\*Note: You would tie off the Rescue Rack in the same manner for a stop on a lowering system.**

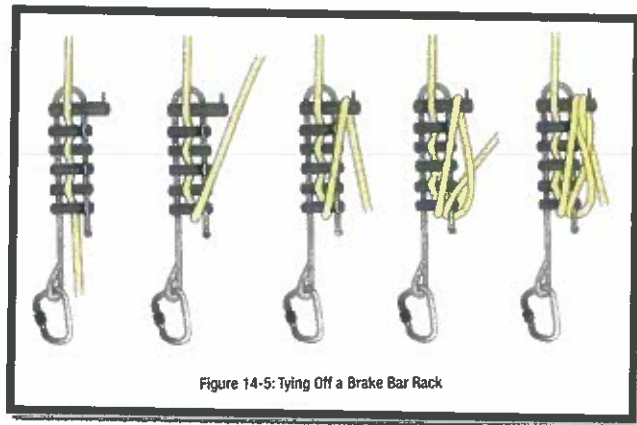
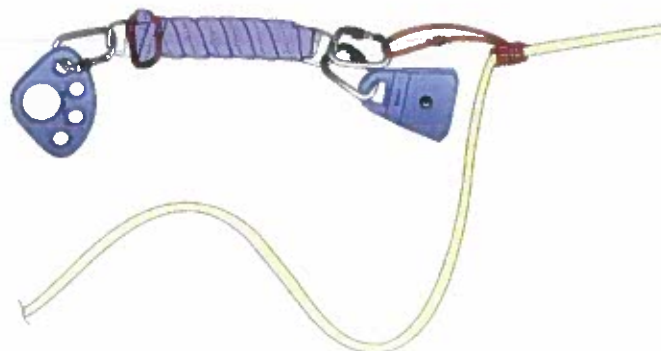


Figure 14-5: Tying Off a Brake Bar Rack

### Rappel Anchor

This setup shall be the recommended setup for the Rappel Anchor. If you are setting up an “RPM” every time, then you will not miss the required items needed to setup this type of anchor for Rappel.



## Goal

To remove the subject as quickly as possible from his predicament while minimizing the risk to the rescuers and subject.

## Size-Up

The TL makes contact with who is in charge. Determine how your team fits into the incident plan, receive a thorough briefing on the situation, note who you will report to, and where the command post will be located. If you are working with the patient directly, determine who has the medical responsibility. If your team's medics have higher qualifications, notify the person in command and offer their assistance.

## Stabilize and Belay

If you're working with an agency with little experience in rope rescue, your initial concern will be the following:

- Stabilize the subject and establish belays for every person exposed to falling
- Check any rigging already in place and confirm it is practical and stable
- Make sure the subject, whether in a litter or not, has a belay
- Start your evacuation plan

Not every agency will have the same expertise in rope rescue. Your team can be a valuable asset if it quickly merges into an ongoing response in an intelligent and professional manner. Communicating properly and your ability to work together is paramount.

## Ropes & Equipment

### Ropes

Our ropes are an extremely low-stretch kern mantle rescue lifeline constructed of 100% high-tenacity polyester fiber. These ropes are ½" in diameter, rated for general use by NFPA rating criteria and supported loads up to 41 kN (9,217 lbf).














NFPA also, required 5/8" rope for each truck. These ropes are too large in diameter for our pulleys, but are useful for other functions within a system if needed.






**Webbing**

Tubular 1" webbing is what we carry. Various lengths from 30' to 5' lengths are kept in stock. Rating for webbing is listed below. Webbing can be used for a multitude of functions in the ropes arena including anchors, carry straps, internal and external patient tie-ins to rescue devices, hasty harnesses, self-rescue, and just about anything else you can use a rope for.

**JFD Rope Rescue Equipment – Not all equipment may be listed**






|   |   |   |
|---|---|---|
| <p><b>SKED Rescue System</b></p>                    | <p>The system comes complete with the stretcher, Cordura® nylon backpack/towing harness, two straps, horizontal lift slings, vertical lift sling, one large steel carabiner, and four removable web handles. The storage bag is 36 inches (91 cm) long by 9 inches (23 cm) in diameter.</p> |   |
| <p><b>Fire-Rescue Harness</b></p>                   | <p>UL Classified to NFPA 1983 – Class III and ANSI Z359.1</p>   |  |
| <p><b>1" Tubular Webbing in Various Lengths</b></p> | <p>4,000 lbf (17.8 kN)</p>  |  |







|  |   |   |
|--|---|---|
| <b>Etrier</b>  | Same as webbing in strength   |    |
| <b>Prussik Cord</b>  | 100% nylon, torque-free, kern mantle - 16 kN (3,597 lbf) – 8mm size |    |
| <b>Mariner/Load Release Strap</b>  | 32 kN (7,194 lbf)   |    |
| <b>Rescue Rack</b>   | 13.5 kN (3,035 lbf)   |     |
| <b>Rescue 8</b>  | 13.5 kN (3,035 lbf)   |   |
| <b>Pro series single pulley</b>  | 38 kN (8,542 lbf)   |  |
| <b>Pro series double puller</b>  | 57 kN (12,814 lbf)  |  |
| <b>Carabiner</b><br>The D style is the strongest when used on its Major axis, utilizing the "spine" from end to end. | 72 kN (16,186 lbf)  |  |

|                       |  |   |
|-----------------------|--|---|
| <b>Anchor Strap</b>   | 35 kN (7,868 lbf)                                  |    |
| <b>Pick-Off Strap</b> | 35 kN (7,868 lbf)                                  |    |
| <b>Anchor Plate</b>   | 45 kN (10,116 lbf)                                 |    |
| <b>Steel O Ring</b>   | 44.5 kN (10,000 lbf)                               |    |
| <b>Helmet</b>         | Manufacturer specifications according to NFPA 1983 |  |
| <b>Gibbs Ascender</b> | 11 kN (2,473 lbf)                                  |  |



**JFD Approved Knots - DO NOT USE UNAPPROVED KNOTS IN ANY SYSTEM**

| Name of knot   | Knot Efficiency in %                    | Picture of knot   |
|--|---|---|
| Clove Hitch  | Not given                               |  <p data-bbox="1073 642 1230 701">Clove Hitch<br/>(Half Hitches)</p> |
| Water Knot   | 64%                                     |  <p data-bbox="1127 919 1263 949">Water Knot</p>                     |
| Double Overhand<br>Fisherman's Knot                                  | 68%                                     |  <p data-bbox="1089 1167 1295 1197">Double Overhand</p>            |
| Double Fisherman's<br>Knot<br>Tie prussiks for use<br>with this knot | 68%                                     |  <p data-bbox="1073 1419 1312 1449">Double Fisherman's</p>         |
| Alpine or Butterfly<br>Knot  | 75%<br>If pulled end to end then<br>57% |  <p data-bbox="1062 1665 1315 1694">Alpine Butterfly Loop</p>      |

|   |  |  |
|---|--|--|
| <p><b>Figure 8</b></p>  | <p>51%</p>                                       |  <p><b>Figure 8 Knot</b></p>          |
| <p><b>Figure 8 Follow Through</b><br/>Great for tying around objects</p>  | <p>77%</p>                                       |  <p><b>Fig 8 Follow Through</b></p>   |
| <p><b>Figure 8 Bend</b><br/>Great for extending a line.</p>   | <p>51%</p>                                       |  <p><b>Figure 8 Bend</b></p>          |
| <p><b>Figure 8 on a Bight</b><br/>Most commonly used knot</p>   | <p>77%<br/>if pulled end to end then<br/>56%</p> |  <p><b>Figure 9 Loop</b></p>        |
| <p><b>Figure 8 Double Loop</b></p>  | <p>73%</p>                                       |  <p><b>Figure 8 Double Loop</b></p> |
| <p><b>Tensionless Hitch</b><br/>Example of establishing an anchor point without webbing or an anchor strap.</p> | <p>100%</p>                                      |  <p><b>Tensionless Hitch</b></p>    |

## JFD Approved Rigging and Systems

There are many different ways to rig a system, tie a knot, and there are several opinions as to how rigging should be setup or how a system should be built. The following systems and setups are approved for use:

### Anchor Selection

Anchors are the foundation of all rope systems. Placing a good anchor is a combination of art and technology. It doesn't matter if the rope will hold 9,000 lbf (40kN) if the anchor will let go at 90 lbf (0.4kN). **THERE IS NO EASY RULE OF THUMB THAT WILL SUBSTITUTE FOR EXPERIENCE AND JUDGMENT.**

### Anchor Types

1. **Simple** – An anchor with a single anchor point.
2. **Backed up** – An anchor that has a second, independent anchor to which the rope is also attached. Since either anchor could support the load by itself, they then back up each other.

*\*\*Note: Preferred method is the Backed up unless the anchor is determined to be BOMBPROOF according to the BOMBPROOF Anchor Concept highlighted below.*

3. **Wrap 2, Pull 1** – Accepted technique for webbing rated 5,510 lbf
4. **Wrap 3, Pull 2** – Accepted technique for webbing rated 7,899 lbf
5. **Redundant Wrap 2, Pull 1** – Accepted technique for webbing rated 9,700 lbf and is the strongest and preferred method by CMC Rescue.

| One-Inch Webbing Anchors: Minimum Breaking Strength of Common Configurations |  |                           |                        |
|--|--|---------------------------|------------------------|
|  |  | Tubular Web<br>(30' x 1") | Fold Web<br>(30' x 1") |
| Web Strength   |  | 4,340 (19.31)             | 6,000 (26.00)          |
| Girth Hitch  |  | 4,799 (21.35)             | 6,776 (29.04)          |
| Single Loop<br>(90° Internal Angle)  |  | 4,832 (21.50)             | 6,130 (27.27)          |
| Wrap 2, Pull 1<br>(90° Internal Angle)                                       |  | 5,510 (24.51)             | 8,098 (36.02)          |
| Redundant Double Loop<br>(90° Internal Angle)                                |  | 7,777 (34.59)             | 10,756 (47.98)         |
| Wrap 3, Pull 2<br>(90° Internal Angle)                                       |  | 7,899 (35.14)             | 10,507 (46.74)         |
| Basket<br>(90° Internal Angle)   |  | 8,464 (37.65)             | 12,369 (57.76)         |
| Double Loop<br>(90° Internal Angle)  |  | 8,716 (38.77)             | 10,538 (46.88)         |
| Redundant Wrap 2, Pull 1<br>(90° Internal Angle)                             |  | 9,700 (43.15)             | 11,458 (50.97)         |

Figure 8-7: MBS of Common Configurations

## Anchor Systems

1. **Simple Anchor System** – By far, the most commonly used. One single source, with a backup hopefully inline at a 180 degree angle to minimize any movement if the primary should fail.
2. **Contingency Anchor** – (pictured right) A contingency anchor system allows the quick extraction of a person on a rappel line. Great for training or rescue. This anchor system is essentially a tied-off lowering system already set up to lower a stuck rappeller to the ground.
  - a. **You will need to plan on having twice as much rope, enough to reach the bottom twice.** First Anchor the rope and lower enough to reach the ground, then rig the rope through the descender and lock it off
3. **Load-Distributing** – (Used when a single anchor point with sufficient strength to support the system is not available). Pictured on next page - An anchor system that spreads the load among two or more anchor points in roughly equal amounts. In theory, the system is self-equalizing.
  - a. **90 degree Max, keep the system small in case one anchor point fails, thus reducing the shock load that will happen.** Keeping each leg to the multiple anchors less than 12 inches is a good guideline. 1 foot rule.
4. **Load-Sharing** – (Used when a single anchor point with sufficient strength to support the system is not available). An anchor system of two or more anchor points with the length of the legs adjusted to place an equal load on each anchor point.
  - a. **90 degree Max on the internal angle**



## Load-Sharing Anchor System

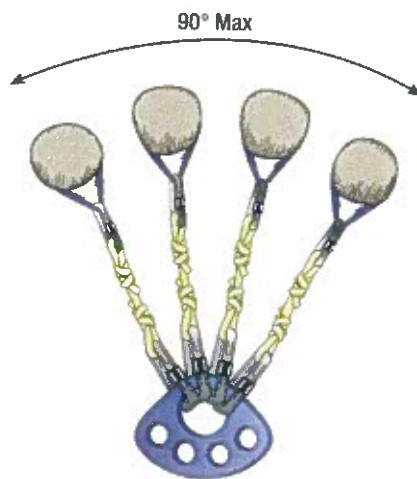


Figure 9-1: Load-Sharing Anchor System

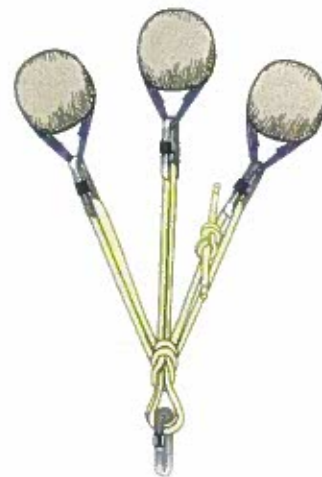


Figure 9-2: Load-Sharing Anchor System

5. **Two-Point Load-Distributing System** – A quick option if there is only two points to anchor from.

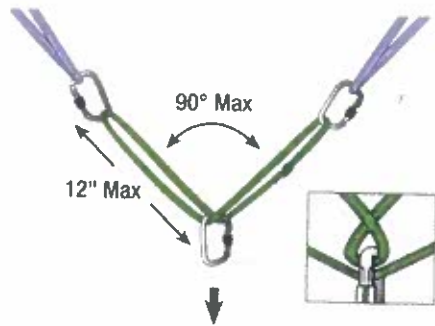


Figure 9-4: Two-Point Anchor System

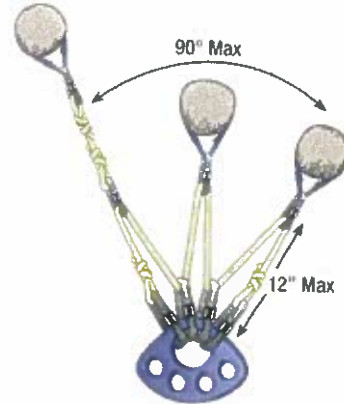


Figure 9-3: Load-Distributing Anchor System

**BOMBPROOF Anchor Concept** – An anchor or anchor point so strong that there is no question in anyone’s mind that it will support far more than the expected and unexpected loads of the rescue system. A very large rock (BFR), large tree, big red truck (BRT), water tank, or any other immovable objects are good examples.

### RPM (Rack, Pulley, and Mariner)

This in conjunction with carabiners, prussik cords, and an anchor plate shall make up the minimum requirements for a system.

1. Anchor Plate
2. Carabiners to attach the following to the anchor plate:
  - a. Rescue Rack with Carabiner – on one slot
  - b. Pulley with Carabiner and Prussik cord attached – on one slot
  - c. Mariner with Carabiner, Pulley and Prussik cord attached – on one slot



### Edge Protection

Ropes seldom just break; failure comes from cutting or abrading over an edge. The highest percentage of climbing, caving, and rescue incidents for rope failure were situations where the rope suffered abrasion or received an impact load while bent over an edge. We utilize the Rescue Tech Edge Roller on the left, old hose sections, rope bags, and tarps to protect our ropes from sharp edges.



*\*\*Note: Do not stand on rope, straddle or place yourself in an area where if and anchor were to shift or fail that it would take you OUT.*

## Communications

Effective team communication is an essential element of a rope rescue operation, particularly the coordination between the system operators and the tender (or team leader "TL").

### Verbal Commands

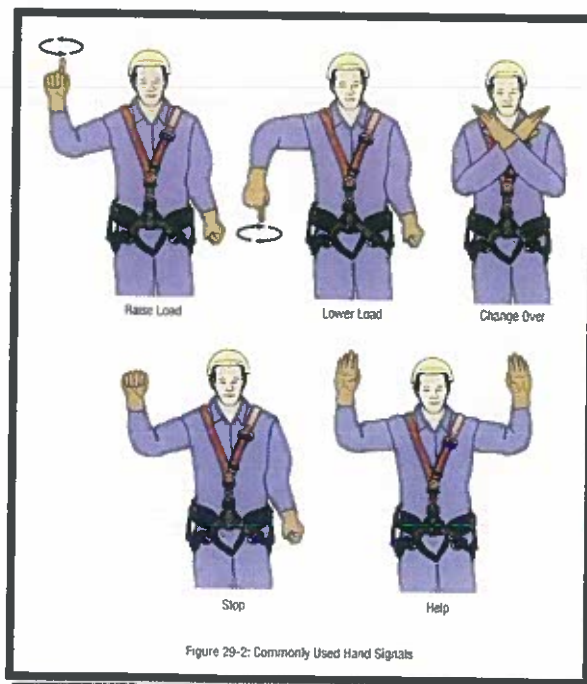
- **On Belay:** Is the belay ready?
- **Belay on:** Yes, the belay is ready.
- **On system:** Is the main line ready.
- **System on:** Yes, the main line is ready.
- **Down rope:** Begin pulling rope in.
- **Up rope:** Begin pulling rope in.
- **Faster:** Increase the rate of movement.
- **Slow:** Decrease the rate of movement.
- **Rope free:** Rope is clear and no one is relying on it for support.
- **Stop:** Stop all movement

### Whistle Signal System

- **Stop** – 1 short whistle blast
- **Up** – 2 short whistle blasts
- **Down** – 3 short whistle blasts
- **Rope Free** – 4 short whistle blasts
- **Help** – Continuous Blast

### Hand Signals

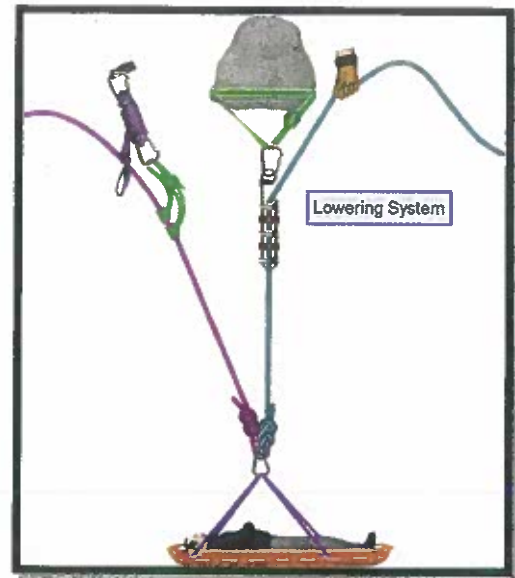
*\*\*Note: The person giving signals should be able to see the subject and the system. Take your time in moving the subject and rescuer/s.*



### Lowering System

Given a choice, lowering to the bottom is always preferred over raising to the top. The systems are simpler, the ride is smoother and the loads on the anchors are less than a raising system, thus requiring fewer personnel to operate. The lowering system can be used with a litter, a rescuer assisting the subject and, if appropriate, the subject alone.

The lowering system consists of a braking device (Rescue Rack) connected to your anchor. A figure 8 descender has been utilized in emergency cases and was the choice of many in the past. However, teams were beginning to find that its ability to hold the weight of a litter, patient, and tender was border line. Therefore, the **Rescue Rack** is preferred.



**Utilize a belay for all lowering systems whether they involve a litter or not.**

### Raising System

A team of rescuers pulling on a mechanical advantage system is the most common means of raising a litter. The load may be a litter with a patient and one or more tenders, a patient supported by a rescuer or, if appropriate, just the subject alone. Raising systems are also used to return rescuers to the side of the road when the slope is too steep to negotiate without assistance.

A raising system can be as simple as a single rope attached to the load and pulled on by a team of people to a complex combination of pulleys that increase the mechanical advantage (M/A) to the point where one person can raise a load much heavier than his own body weight.

#### *Pulleys have 2 functions*

1. When attached to an anchor is a "fixed" or "change of direction"
2. A "moving" or "mechanical advantage pulley" acts to increase the M/A of the system.

#### *Ratchet or progress capture device (PCD)*

**Every raising system from a simple one-t-one pull on the rope to the most complex should be protected by a ratchet.** The "ratchet" is a rope grab device that attaches to the anchor and holds the rope, so that the load will not lower when the pulling force is released from the system (pg. 143 CMC).

The following are approved ratchets for JFD:

1. Prussik hitch (most common used)
2. Gibbs Ascender



Figure 15-4a: Piggyback with Ratchet in Back



Figure 15-4b: Piggyback with Ratchet in Front

**JFD Approved raising systems are as follows:**

1. 1:1 M/A – simple system with a ratchet
  - a. **Setup** – Anchor plate, 3 carabiners, mariner, single pulley, 1 prussik, main line



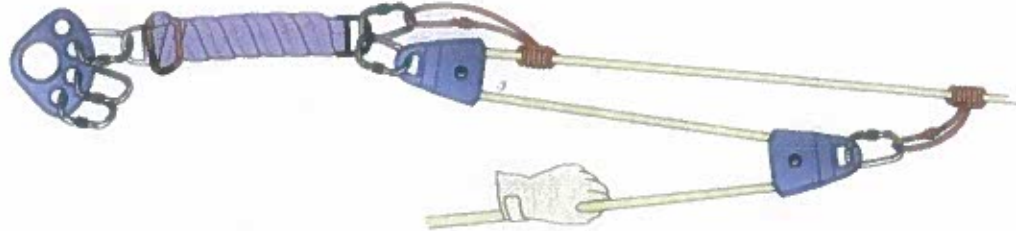
2. 2:1 – simple M/A system with change of direction
  - a. **Setup** – Anchor plate, 5 carabiners, mariner, 2 single pulleys, 1 prussik, main line





3. 3:1 (Z-Rig) – simple M/A system

- a. **Setup** – Anchor plate, 4 carabiners, mariner, 2 single pulleys, 2 prussiks, main line



4. 4:1 – simple M/A system with Double pulleys

- a. **Setup** – Anchor plate or attachment point, 3 carabiners, mariner, 2 double pulleys, 1 prussiks, main line.



5. 5:1 (Block & Tackle) – simple M/A system with Double pulleys or 5:1 Complex below.

*\*\*Note (simply reverse the 4:1 and you have a 5:1 Block & Tackle)*

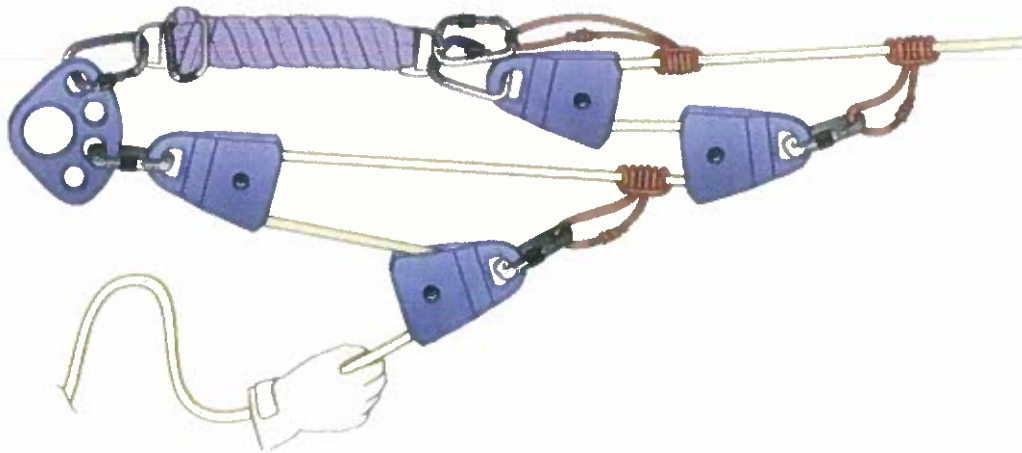
- a. **Setup** – Anchor plate or attachment point, 3 carabiners, mariner, 2 double pulleys, 1 prussiks, main line.  
b. Used for a portable pick-off – pre rig before descending for the pick off.



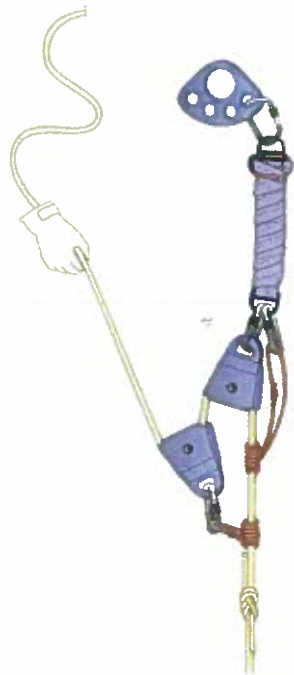
6. 6:1 – complex system with a 2:1 system pulling on a 3:1 system with loads under 500 lbf
- Setup** – Anchor plate, mariner, 6 carabiners, mariner, 3 single pulleys, 3 prussiks, main line, and second line.



7. 9:1 – complex system with a 3:1 (Z-Rig) pulling on another 3:1
- Setup** – Anchor plate, 6 carabiners, mariner, 4 single pulleys, 3 prussiks, main line.



8. The Piggyback with ratchet in front or back is acceptable or is commonly used for passing knots.
- a. **Setup** – Ratchet attachment in back or front of the prussic for the piggyback system, Piggyback line, 3 carabiners, 2 single pulleys, 2 prussiks, possibly a Gibbs ascender if available.



**Step 1**  
Continue to raise until the knot reaches the ratchet and the system is completely collapsed.

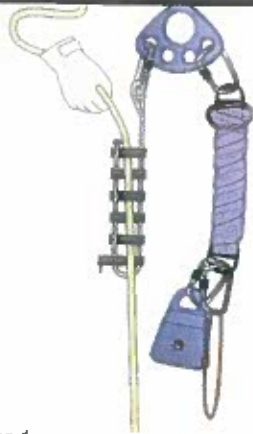


**Step 2**  
Attach the piggyback system to the anchor and extend it out as far as possible. Connect it to the main line below the knot with a Prusik hitch.

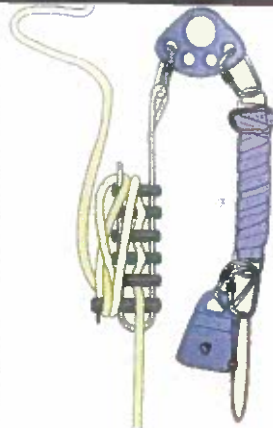


**Step 3**  
Continue to raise using the piggyback system until there is enough room to rig the primary system below the knot. When the load is back on the primary system and the pull starts, disconnect the piggyback system.

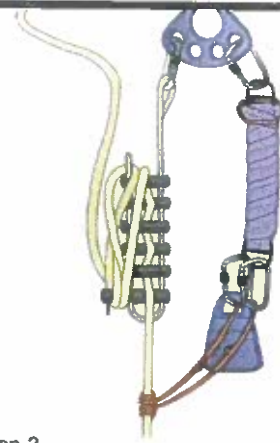
**Changing from a Lowering to a Raising System** (Illustrated and described below)



**Step 1**  
Throughout the conversion the load can remain supported by the main line. The belay line should be locked off or continually tended.



**Step 2**  
Lock off the descender.



**Step 3**  
Attach a rope grab for the ratchet on the main line.



**Step 4**  
Unlock the descender and gently lower the load onto the ratchet. Remove the rope from the descender and rig it through a pulley. Attach the pulley to the load release strap.



**Step 5**  
Rig a second pulley onto the running end of the rope and attach a carabiner.



**Step 6**  
Tie a Prusik hitch onto the main line and clip it into the carabiner on the second pulley. Your system is now a 3:1 M/A and you can tell the team leader that you are ready to raise.

**Changing from a Raising to a Lowering System** *(Illustrated and described below)*



**Step 1**  
Throughout the conversion the system load can remain on the main line. The belay line should be locked off or continually tended.



**Step 2**  
Let rope out until the ratchet is holding the load. Remove the Prusik hitch and the pulleys and store them in a secure place.



**Step 3**  
Rig the rope onto the descender and lock it off. Try to eliminate the slack between the Prusik hitch and the rack. Carefully release the load release strap and transfer the load to the descender.



**Step 4**  
Retie the load release strap. Your system is now a lowering system and you can tell the team leader that you are ready to lower.

## Belay System

Whenever rescuers or subjects are placed on a rope system, it is important to reduce their risk as much as possible.

The "belay system" consists of a second rope attached to a separate anchor. The belay system setup should be near the main line setup as to reduce the possibility of a pendulum type swing if the main line fails and has to switch to the belay.

1. **Tandem Prusik Belay will be the standard for JFD.** This works for both a raising and a lowering system. For the pulley in the raising belay, pull rope through the system as the raising continues; make sure there is very little slack.

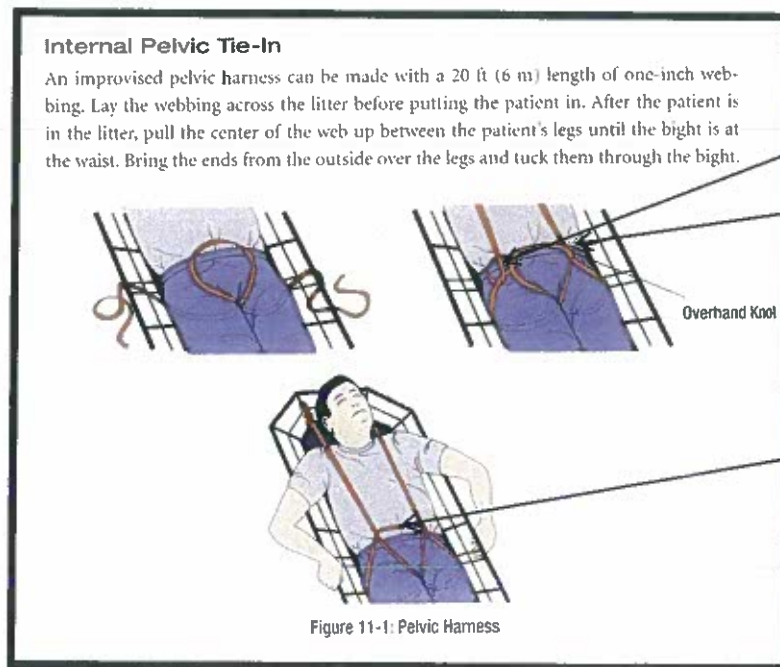
As a general rule, a belay line should not run through a change-of-direction. When lowering, ensure that the belay line has just enough slack to allow for operations but not more than 2 feet as prevent a long fall/shock load/injury to the subject or rescuers.



Figure 13-1: Tandem Prusik Raising Belay

## Rigging the Litter and Securing the Subject

The following Tie-in methods are approved for use at JFD during special operations. Start with the patient. If the patient is conscious and can assist or if they are lightweight and easy to maneuver, then place a "Rescue Harness" on them and then apply to straps upwards of the shoulders to the stokes basket. If not, use the illustrated technique for an internal tie in.



**\*\*Note:** The overhand knots tied here will keep from cinching down into the patients growing if done properly.

Attached a carabiner here and to then connect to the ring above or the rescuer as a safety line for the subject.

An external tie in shall be conducted as illustrated below. A 30 ft. section of webbing may be utilized, starting midline of the Stokes basket nearest the feet and crisscrossing throughout. After each cross, perform a half-hitch back on itself, ratchet it tight and proceed to the next cross. Do not tie webbing to the rub bar (outside rail) as this can damage the webbing and potentially compromise the safety of the subject. You can end the tie in with two half hitches and an overhand knot or clove hitch; make sure it's secure and the subject's hands are accounted for.



Figure 11-4: External Lashing

#### External Tie-In

An external lashing is used to hold the torso and legs in the litter. Insert a 20 ft (6 m) length of one-inch web between the upper rails of the litter just below the vertical tubes located next to the midpoint of the patient's legs below the knees. Pull the web through until the center point of the web is between the patient's legs. Bring the ends of the web around the vertical tube, across the patient in a big X and around the next set of vertical tubes toward the patient's head. Continue until the vertical tubes by the patient's shoulders are reached.

Skip past those and connect to the vertical tubes by the patient's head. Tie one end of the web to the vertical tube with a round turn and two half hitches or clove hitch. Tighten the webbing by backing down from the tied end and then back up the opposite side. Finish with a round turn and two half hitches or clove hitch.

#### Tending the Litter

The TL shall decide when a tender is needed for the subject.

- A second line – Belay line should always be attached to the litter at the O ring. The main line is attached to this point. This fulfils the two rope requirement.
- The rescuer simply connect to the O ring (a pick off strap works well here or adjust a webbing setup as needed; then connect to the Stokes for a second point of attachment.
- The subject's internal tie in is also connected to the O ring. *\*\*Note: The O ring is less likely to fail than any other component in the system as it is rated higher in strength.*
- Consider the need for a "puke line" setup or take a portable suction unit with you (make sure you secure any lose items).
- Rig for a tag line for control of the Stokes basket.
- The tender can be rigged above the basket for pushing the load over a cliff face or just under the basket for walking the patient down the side of the obstacle