



# *Boeing Employees Alpine Society*

## *ICC Rescue Outing*

### **Day 1: Rescue Techniques**

#### **Overview**

During this outing you will learn techniques for using commonly-carried climbing gear to raise and lower an injured or unconscious climber. These techniques are used to get the disabled party to safer ground preferably out of the vertical world. These systems are very complex and should produce a lot of thought. No two situations are ever going to be the same. We contrive a situation that should be as realistic as possible, yet still provides ample opportunity for learning asking questions, minor experimenting, and maximum safety.

#### **Learning Objectives**

1. Add new skills to our "bag of tricks" to attempt complex roped techniques.
2. Expand on our raise systems with 9-1 and 5-1 mechanical advantage Z-pulley systems.
3. Possibly for the first time, actually experience the difficulty with raising fully weighted, two person, live loads.
4. Construct secure, multi-person lowering systems.
5. Practice using an independent and hands free belay system.
6. Practice and experience the necessity of load release hitches.
7. Put the systems all together for transferring loads between two independent systems in order to achieve a goal.
8. Assess a rescue situation, and quickly determine a best course of action to get a victim out of harms way, and to a location of safety for all people involved.
9. Assist in a body carry out, through back country terrain.

#### **Special Equipment:**

- ✓ 20 feet of webbing in addition to standard gear. (can be 2 or 3 doubles tied together)
- ✓ Padding such as carpet scraps to protect ropes from rock edges older ropes if you have them



# *Boeing Employees Alpine Society*

## *ICC Rescue Outing*

### **Required Reading**

- ✓ Self-Rescue Skills and Techniques
  - Freedom of the Hills
    - Chapter 24 (in the 7th Edition)
- ✓ ICC Rescue Outing Document
  - Self Rescue Reference Material
  - Forces on Pulley Systems (By: Greg Schmidt)

### **Logistics**

On Saturday, we are meeting at the pullout across from the Bridge Creek Campground. Coming from Leavenworth, Bridge Creek Campground is 8.5 miles from the Icicle Creek/Hwy 2 junction, almost at the end of the pavement on Icicle Creek Road. You will not be able to get back to your car until the end of the day. Please Plan accordingly. **Be ready to leave the cars at 7:30am.**

### **Camping & Pot Luck**

We will be joining the rest of the club for the group campout. The club will provide main dish, but the rest of the campout is potluck and BYOB. Please join the rest of the club and spread good cheer and network with your future belay partners.

A short note for those who like to party: Have fun and let loose at the party, but please be in good health Sunday morning for the second day of activities. We have had students in the past show up borderline incapacitated. This is a direct insult and shows disrespect to the good instructors that volunteer their time to instruct you in The Art.



# *Boeing Employees Alpine Society*

## *ICC Rescue Outing*

### **Day 2: Climbing Systems Integration**

#### **Learning Goals:**

1. Increase the students comfort and confidence in multi-pitch, traditional climbing systems.
2. Increase the student's skills in rope management, gear management and communication.
3. Watch a demo on clipping through permanent chain anchors without causing any damage to the anchors.
4. Cover any final skills required to start the Smith Rocks and Squamish weekend outings!

#### **Agenda:**

- 06:45 Leave campsite  
07:00 Arrive at assigned area  
07:05 Start hiking to area assignment
- Hanging belay Demo
  - Commence the hanging belay-mock gear lead exercise.
  - Smith Rock chain anchor demo
  -
- 15:30 Finish up mock leads, pack up and head to the cars  
16:00 Re-group at the Snow Creek TH parking lot, quick re-cap of weekend, drive home

#### **Overview:**

A demo will be given about proper use of chain anchors at Smith Rock. The chain anchors in the park are placed and maintained only by volunteers, and cost a lot of money. It is our duty as good climbing citizens to learn and practice methods that preserve the life of the anchors.

Once at the assigned areas the majority of the day will be spent on going through the hanging belay and mock gear lead exercise. This should all be a review but will provide good practice with anchor building, rope and gear management and confidence with rock gear. This is the point where we put the most used rock climbing skills and integrate them all together.



# *Boeing Employees Alpine Society*

## *ICC Rescue Outing*

### **Smith Rock Chain Anchor Demo**

### **Hanging Belay & Mock Gear Lead Exercise:**

Each team is to:

- ✓ Build a bomber top-rope anchor
- ✓ Students simulate a traditional style lead on top-rope. Students belay each other with the lead rope; instructors man the top-rope belay.
  - **NOTE:** Tie into the top rope belay with a locking biener<sup>!</sup>. It will be obvious why after the gear swap at the "1st pitch" anchor.
- ✓ Student 1, the leader, climbs route, placing as much gear as possible (every single move).
- ✓ At the half way point, preferably at a location without any place to stand, the leader builds an all gear anchor and hangs on it.
- ✓ Student 2 follows and cleans the route. Student 2 clips into the hanging anchor.
- ✓ Gear is exchanged, the rope is prepped, and Student 2 is placed on belay to lead the second pitch.
- ✓ Move the Top-Rope on the locking biener to Student 2.
- ✓ Student 2 leads the second half, placing as much gear as possible (every single move).
- ✓ Student 2 builds NEW anchor (next to top-rope anchor) Student 1 is brought up to belay to exchange gear.

### **Gear Placement Exercises (As time permits)**



# *Boeing Employees Alpine Society*

## *ICC Rescue Outing*

### Self Rescue Reference Material

#### Overview

The purpose of this course is to teach techniques that can be used to raise and lower subjects that do not have the means to take care of themselves using ordinary climbing gear that you would typically have when climbing. These techniques are used to get the disabled party to safer ground preferably out of the vertical world. Practice them outside of the class you never know when you might need them.

In a climbing environment you may not have the tools to set these systems up exactly as shown. This will require you to improvise and assess the safety of the situation in the field. The better you know these systems and the capabilities of your equipment the safer you will be. As a climber and rescuer it is your responsibility to assess the situation and choose the **safest means** to resolve the situation. Before taking on the task of rescuing somebody there are some things to consider:

- Can the victim/s rescue themselves?
- Am I putting myself at undue risk (**victims have bad days rescuers never should, you do nobody any good if you become injured**)?
- Is anybody else being put at undue risk?
- Can I get help from outside organizations (call 911, 4 hours plus response)?
  - Can I stabilize the victim without moving them?
  - How long will it take?
- Will the rescue efforts subject the victim to further injury?
  - Physical (aggravate existing injuries such as head and back)
  - Environment (rockfall, avalanche)
- Equipment and its condition

These are all judgment calls, there are no hard and fast rules. The bottom line is when an accident happens you need to step back and look at the big picture in order to ensure the safety of you, your party and the victim.

#### Safety

#### Rescue vs Climbing

	<b>Climbing</b>	<b>Rescue</b>
Loads	Usually one person (150-300pounds) falling (Dynamic loading) on the system.	Usually two or more people (300-600 pounds). These should be static loads (the load weights the system without moving). Of course there is <i>always</i> some movement.
Equipment	Designed to be lightweight for one-person dynamic events. Use high stretch ropes to absorb falls. May not be as strong as rescue gear.	Designed to be strong and for two or more persons static event.
Anchors	One person dynamic loads, usually with a belayer between the load and the climber.	Needs to withstand greater forces.



# *Boeing Employees Alpine Society*

## *ICC Rescue Outing*

### Whistle Test

Ideally all rescue systems should be able to pass the whistle test. What this means is at any point during the operation of the system a person could blow a whistle and everybody could take their hands off the system and it would not fail.

### Safety Check

Before operations of a system a safety check needs to be done. This is by done inspecting the system from top to bottom by someone who was not involved in building that particular system. The person inspecting starts from the load side and works through the system checking harnesses, knots, carabiners and overall system design. It is best to touch every piece of the system and talk through it as you go.

### **Knots**

The following are most of the knots you need to know. Appendix B has some more knots which can be used.

Name		Figure	Comment
No-Knot (High strength tie off)	M	1	
Wrap 3 Pull 2	M	2	Strong and can be untied after loading.
Prussik Knot	M	3	
Tandem Prussik Knot	M	4	
Clove Hitch	M	10	Can be adjusted without untying. Is easy to untie after having been loaded
Double Fisherman (Double overhand bend)	M	11	
Munter Hitch Tie off	M	12	Works in both directions
Monster Munter Hitch	M		
Water knot (Overhand Bend)	M		
Figure 8 (rewoven, on bite, and with a stopper)	M		Difficult to untie when loaded with a rescue size load

### **Anchors**

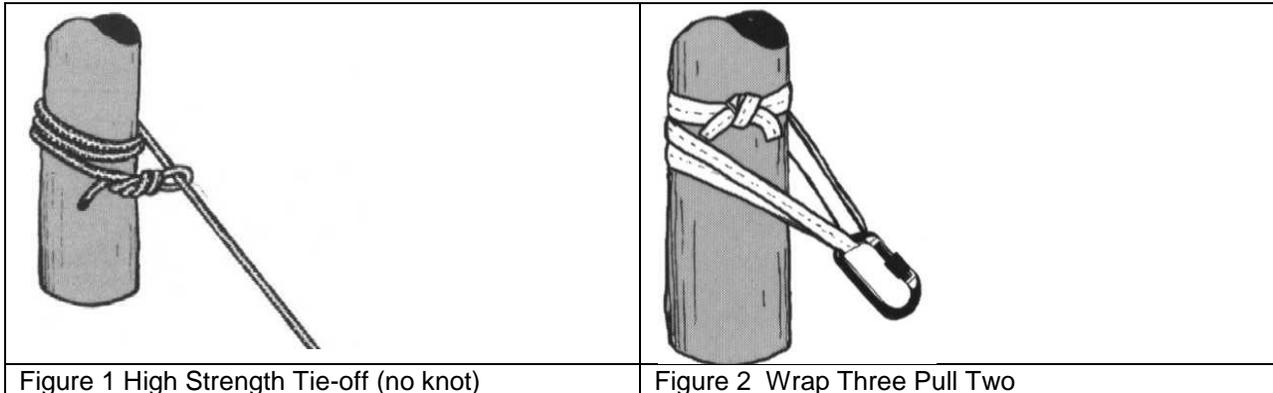
Anchors are everything in climbing as well as in a rescue situation. It is even more critical during a rescue situation to pay attention to your anchors. It is recommended to build a rescue anchor to handle more than twice the load as a climbing anchor. When using passive rock protection, 3 bomber placements is required, 4 for active. Natural pro such as BFR's (big fricken rocks) and BFT's (big fricken trees) are the best option. The following are the preferred anchor systems to be used during the course.

When anchoring to a tree the best knot use is the high strength tie off (figure 1 below). This offers the highest strength and is easy to tie and untie. The rope should be wrapped around the tree 3 times and the tag end secured. There should not be any load on the tag end, it is just tied to keep it from unwrapping. If the end of the rope is not available to be used the next best option is to use a wrap three pull two. The knot placement is important so the knot can be untied after being loaded (figure 2).



# Boeing Employees Alpine Society

## ICC Rescue Outing



In general for rescue we do not use self-equalizing anchors. This is because if one leg fails a dynamic event is created. In the case of an equalized anchor a dynamic event is minimized.

### Systems

#### Overview

The scenario we are teaching is for two climbing teams of two, where one of the four is injured. Some things being taken into account are a potentially damaged rope for the accident party. Both parties equipped for technical climbing using single rope technique.

There are two basic systems we are teaching, one for each of the two ropes. The first is the belay line (tandem prussik belay) the second is the main line. The main line is the rope doing the work, usually a raise or a lower. The rope attached to the fallen climber is generally used as the belay line and is assumed to have potentially been damaged in the scenario.

#### Leadership

Generally it is a good idea to designate a leader who looks at the big picture and makes sure the right systems are built and properly coordinated. The leader is also there to focus on clarity and communication. In a climbing rescue situation it is unlikely that this person will be able to delegate system building. The other important designated person is the safety. It is important that they not participate in building the system. A person who built the belay system can however safety the main line and vice versa.

When the systems are built and ready to proceed the leader will direct the systems operation.

#### Belay (Tandem Prussik Belay)

#### Gear

- Locking Carabiners
- Double Slings (minimum)
- Load Release Hitch (Figure 5 Munter Mule)
- Rope
- Short Prussik Loop: cord diameter approximately  $\frac{2}{3}$  less than the rope diameter
- Long Prussik Loop: cord diameter approximately  $\frac{2}{3}$  less than rope diameter
- Pulley (optional)



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## *ICC Rescue Outing*

### **Set-up (see Figure 7)**

1. Build anchor.
2. Attach load release hitch with a locking carabiner to the anchor. The load release hitch should be positioned so the loose end is towards the load.
3. Attach prussiks on the rope with the short prussik closest to the anchor and the longest towards the potential load. Each prussiks should have a minimum of 3 wraps which equals 6 times around the rope. When tied the prussiks should be sized so there is one fist width (about 3 inches between the prussiks).
4. Clip the loop sides of the prussiks to a locking carabiner on the load side of the load release hitch. The short prussik loop first (this is because the short prussik will catch first and it is best if it does not pinch the long prussik loop).
5. Attach the pulley to the rope and clip it into the locking carabiner on the load side of the load release hitch. The short one should completely clear the pulley.
6. Safety the system and make sure the carabiners are locked and all the steps have been followed (see the safety section for description of safety procedures)

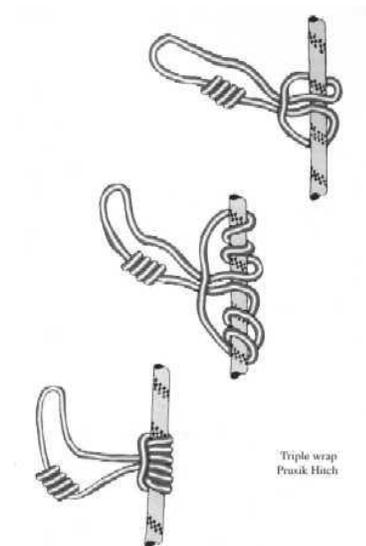


Figure 3 Prussik Knot



# Boeing Employees Alpine Society

## ICC Rescue Outing

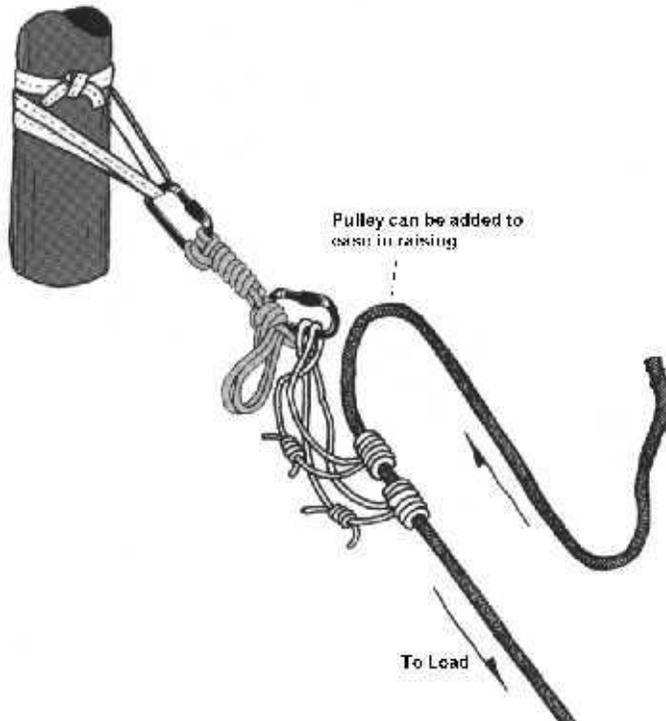


Figure 4 Tandem Prussik Belay

### Knot Pass (Belay)

	During a Lower	During a Raise
1)	Prepare a tandem prussik and a load release hitch.	Prepare a tandem prussik and a load release hitch.
2)	Attach the new tandem prussiks on the non-loaded side of the knot. Then attach the load release and tandem prussiks to the anchor. (before transferring to the new system it should be safety checked)	Attach the new tandem prussiks on the loaded side of the knot. Then attach the load release and tandem prussiks to the anchor. You may need to extend it with a sling to get it below the knot. (before transferring to the new system it should be safety checked)
3)	Using the old load release hitch lower the load onto the new belay. When the load has been transferred, remove the old belay and proceed.	Using you raise system, release the load on the old belay and remove it from the system. Tighten up the new prussiks and proceed

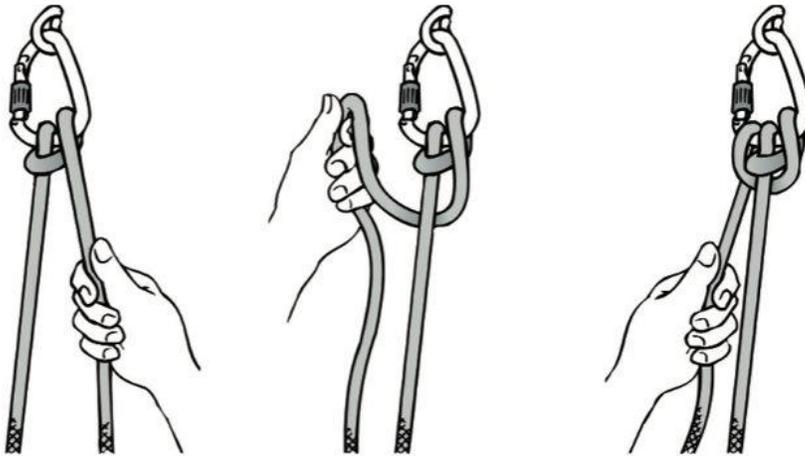
### Lower (Monster Munter)

The lower is a mainline system used to control the descent of a load. It is used instead of rappelling so the rescuer can have both hands free and can handle a two-person load. Rappelling with two people on one rappel device exceeds design and won't hold the load. Especially if the system is exposed to a dynamic event. Most rescue organizations use specialized gear for ease of use and to speed things up.



# Boeing Employees Alpine Society

## ICC Rescue Outing



Munter to Monster Munter

### Gear

1-2 locking Carabiners

Prussik

Edge protection like packs and pads to protect the rope from abrasive or sharp objects.

### Set-up

A monster munter is attached via locking carabiner to the anchor. Keep in mind the amount of friction needed to control a lower changes depending on the environment and the amount of load on the system and can change during the lower. It is best to error on the side of too much friction than too little. The load end is connected to a rescuer to be lowered to the victim.

### Raise (z-pulley, 3:1, 9:1, 5:1)

Raises are mainline systems used to assist the movement of a load up hill.

### Gear

1 Locking Carabiner

2-4 Non-locking Carabiners

2-4 Pulleys (Carabiner will work, significantly increases the amount of friction in the system)

2-3 Prussiks

Edge protection like packs and pads to protect the rope from abrasive or sharp objects.

### Set-up

See figures 5-7 below. It is important to remember that the average person can pull up to 100 pounds and with mechanical advantage and friction that can add a lot of load to your anchors. The rule of thumb is to use the least amount of mechanical advantage as is required to raise the load. Usually it is best to start with a z-pulley (3:1 mechanical advantage, figure 10) and add mechanical advantage as is required. Always keep in mind how much you are loading the anchor and other components. An example: is if you set up a 9:1 and have three people pulling full strength you could potentially get approximately 2700



# Boeing Employees Alpine Society

## ICC Rescue Outing

pounds of force on your main line and anchor. This more than your rope should be loaded. The other reason for using less mechanical advantage is to speed up the raise. The more mechanical advantage the more rope you have to pull and the more resets of the system.

Warning: Always keep an eye on the prussik nearest the anchor. They have a tendency to bind up or jam into the pulley. This can cause slack in the system and potentially a dynamic event. To prevent this it may be necessary to have a person tend the prussik.

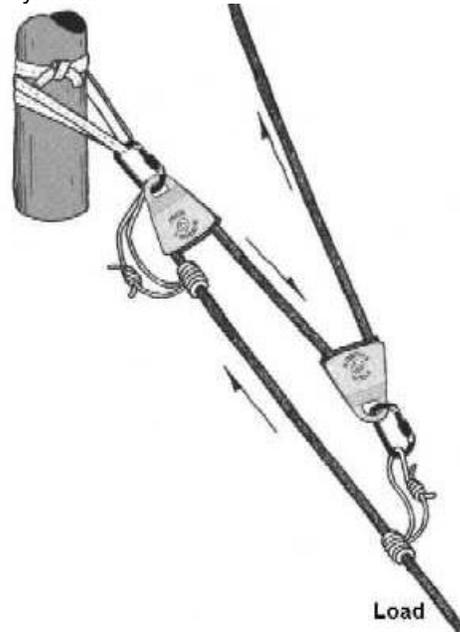
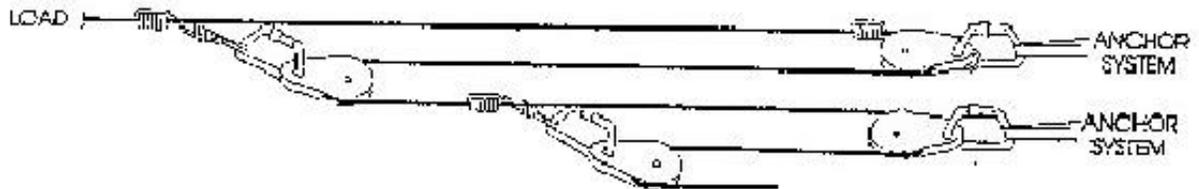


Figure 5 z-Pulley 3:1



9:1 (3:1 ON 3:1)

Figure 6 z on a z 9:1



5:1

Figure 7 c on a z 5:1



# *Boeing Employees Alpine Society*

## *ICC Rescue Outing*

### Mid Face Pick-off

This system is used to raise or lower an injured subject who is unable to take care of themselves to get to safe ground. If the subject is not mobile (broken back, or neck) do not move them until help and proper patient packaging can be obtained.

### Gear

- About 20 foot of webbing figure 8 (2-3 doubles tied together)
- Prussik
- Sling
- Couple Carabiners (locking and non locking)

### Systems

- Lower
- Belay
- Raise
- Victim Harness (if required)

### Set-up

	<b>Rescuer</b>	<b>Team</b>
1	Obtain 20 foot plus webbing, 3 or more single slings, a prussik, some locking Carabiners and a Harness if required for the subject. This can be a webbing harness.	Set-up Lower and Tandem Prussik belay (see sections above)
2	Attach prussik and sling to the main line (this will be used to relieve the patients load from the rescuer).	
3	Attach the rescuer to the main line and belay/lower.	Safety Rescuer and systems.
4	Secure subject to rescuer's harness (if the subject does not have a harness the rescuer will need to supply or make one out of webbing).	Lower Rescuer to the subject
5	Secure sling from subject harness to prussik on the main line.	
6	Safety Check the subjects attachments to the system.	
7	Attach subject to rescuer (see figure 8 on the next page)	
8	Tighten prussik on the main line so most of the subjects weight it directly in the main line.	
9	Call for raise or lower (as appropriate).	Build a raise system if applicable.
10		Safety check the system.



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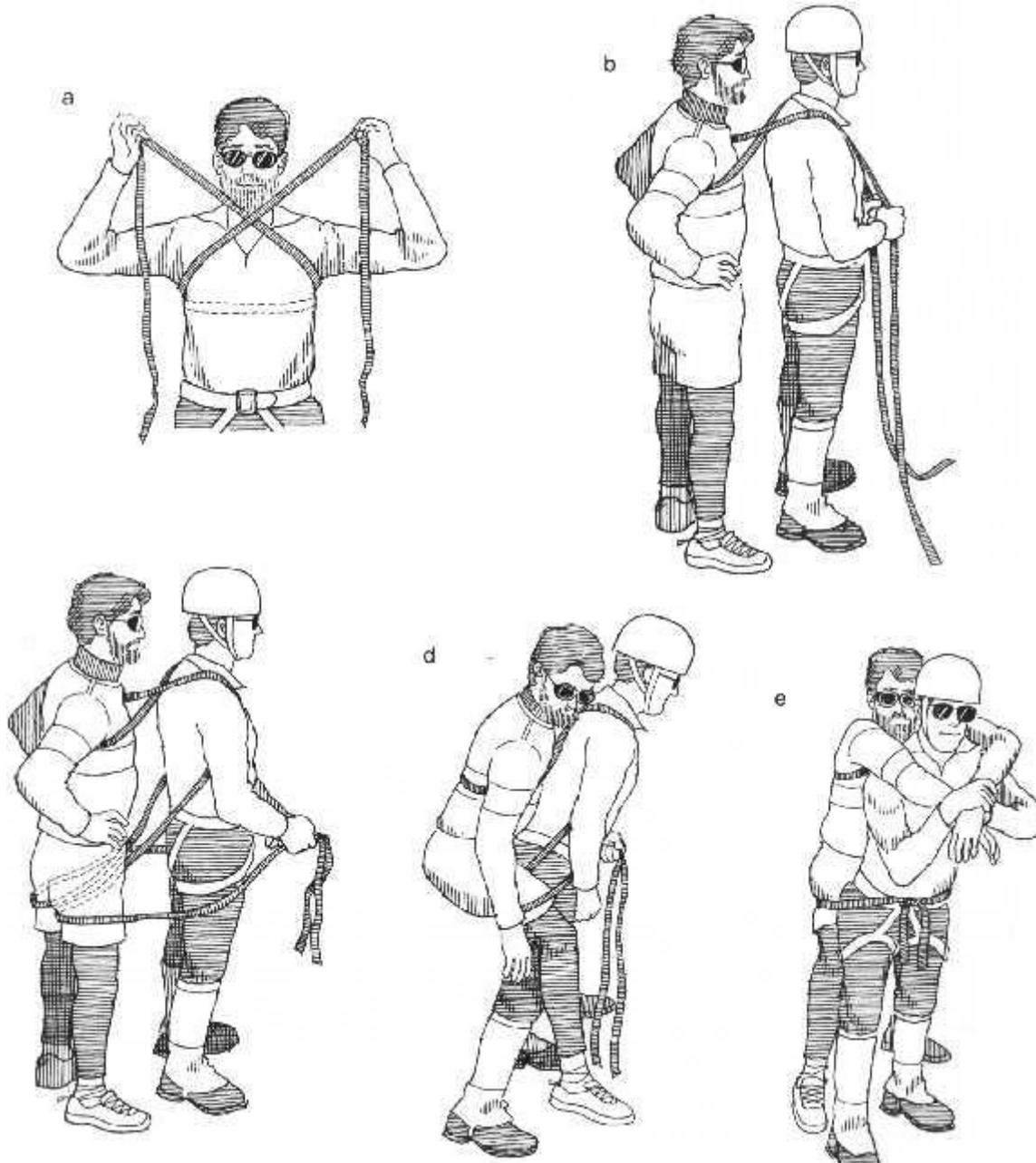


Figure 8 Subject Packaging



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## *ICC Rescue Outing*

### Rope Litter

#### **Gear**

#### **Set-up**

See Figure 9 on the next page. Use webbing and other cord to further secure the litter. For patient care provide lots of padding and protection below and above them. Secure the subject to the litter so they cannot slide forward or backwards. Provide the subject with eye protection. It may be helpful to attach webbing to the rope rails on the litter to give the rescuer something to hold on to.

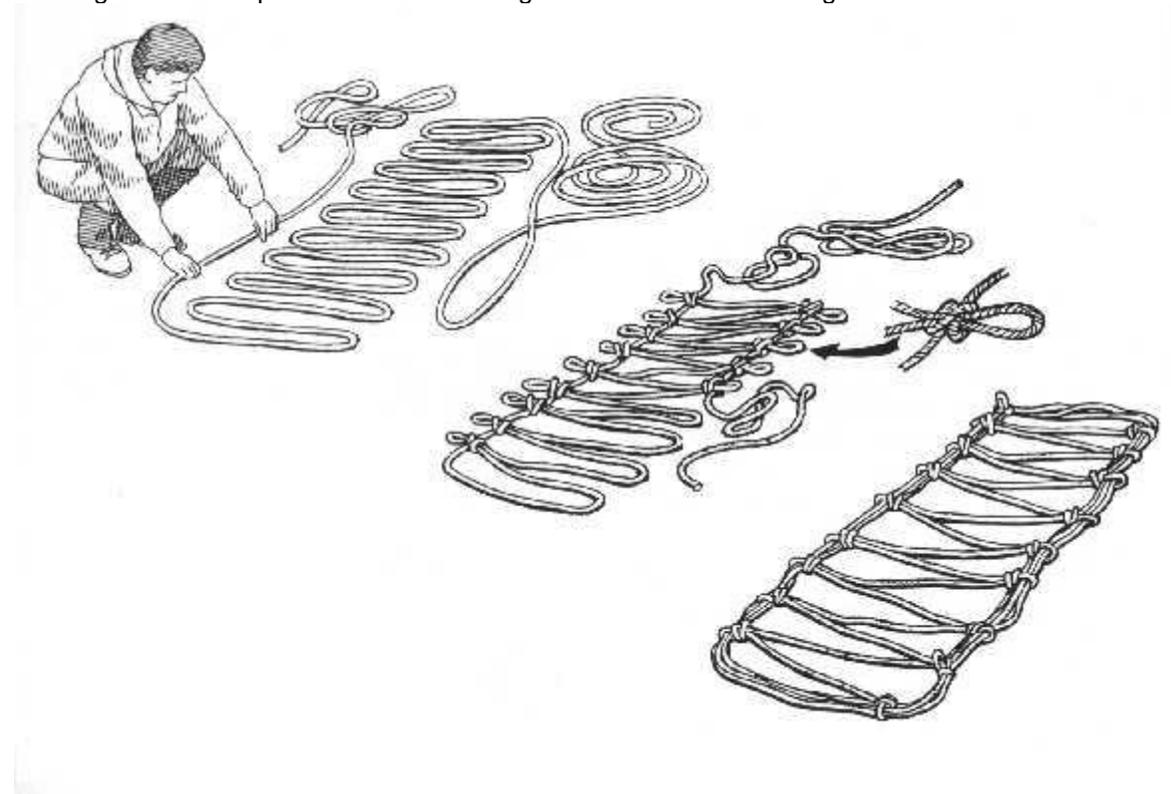


Figure 9 Rope Litter



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## ICC Rescue Outing

### Appendix A Miscellaneous Knots

Bowline (Yosemite tie off optional)	O		Easy to untie when it's been loaded. Can be used as a tie-in instead of a figure 8.
Radium Hitch	O	18	Load release hitch using 6mm or greater accessory chord (like a cordelett or ascenders), 20 feet minimum
Butterfly	O		Easy to un-tie after being loaded.
Quick Release Prussik (Optional)	O		Doesn't jam into pulleys, and self loosens.
Tied-off Munter Hitch (Load Release Hitch)	O	19	This can be used with the end of the rope during the tying off a fallen climber procedure.

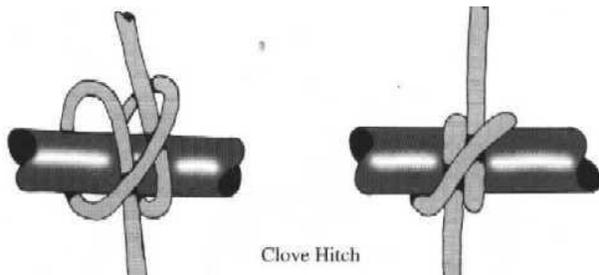
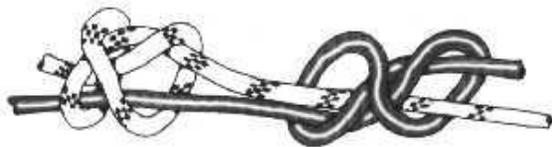


Figure 10 Clove Hitch



double overhand  
bend



Figure 11 Double Fisherman's Knot

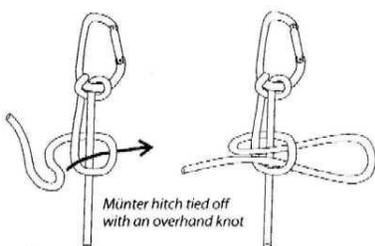


Figure 12 Munter Hitch Tie Off



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## *ICC Rescue Outing*

### ***Appendix B (Knot Passes)***

#### **Knot Pass (Lower)**

1. Prepare a prussik and a load release hitch.
2. When the Knot gets about 6-12 inches from the Carabiner break stop the lower and attach the prussik and load release hitch on the load side of the Carabiner break. Tighten the prussik as much as possible and safety check the system.
3. Continue lowering the rope until the load is on the prussik. And remove the Carabiner break from the system.
4. Re-attach the Carabiner break on the other side of the knot (the side without the prussik). Safety check the Carabiner break.
5. Using the load release hitch lower the load onto the Carabiner break.
6. Remove the prussiks and Carabiner break from the mainline and continue the lower.

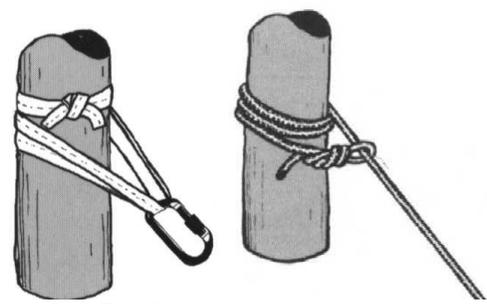
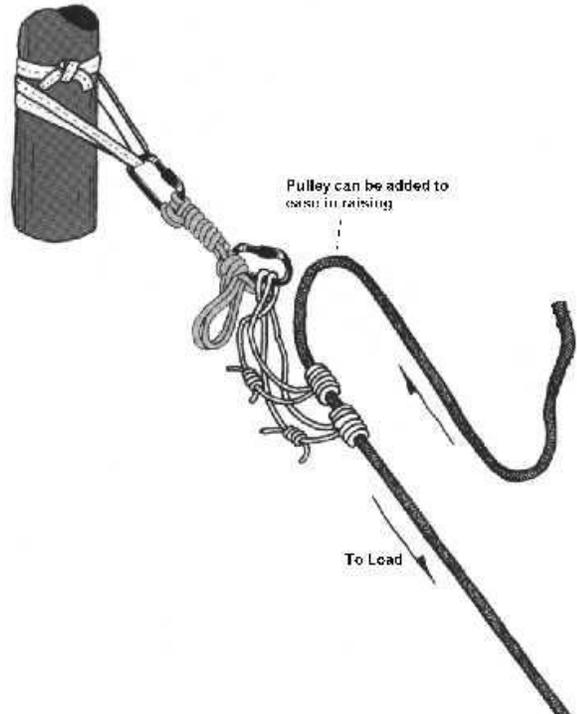
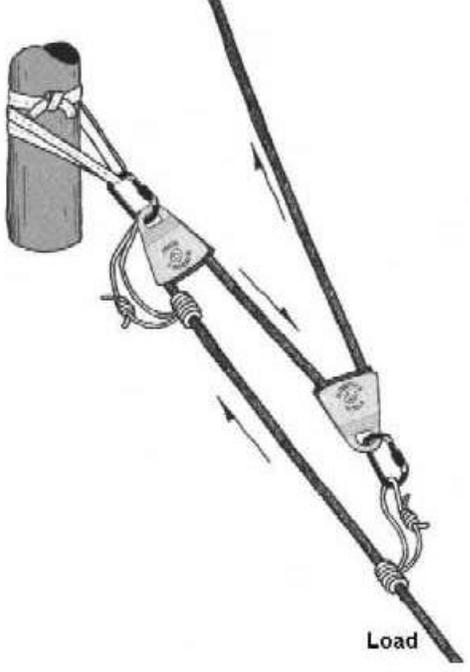
#### **Knot Pass (Raise)**

1. Raise knot up to first prussik. Stop the raise. Move the prussik over the knot. Keep in mind this prussik only has a load on it when the system is being pulled on.
2. Tie a prussik and pulley below the knot and attach it to the anchor. Re safety check the system.
3. Raise up on the system and tighten the new prussik. This releases the load from the old prussik.
4. Remove the old prussik and pulley from the system.
5. Pull the knot up to the second pulley (and each subsequent pulley) and move the pulley and prussiks if necessary around the knot. Remember the pulleys and prussiks that are not attached to the anchor are not loaded when the system is at rest.



# Boeing Employees Alpine Society ICC Rescue Outing

## Appendix C Self Rescue Cheat Sheet

<p>Knots</p>  <p>Wrap 3 Pull 2      High strength tie off</p>	<p>Belay (Tandem Prussik)</p>  <p>Pulley can be added to ease in raising</p> <p>To Load</p>
<p>Main Line Raise</p>  <p>Load</p>	

Z-Pulley 3:1



# *Boeing Employees Alpine Society*

## *ICC Rescue Outing*

### References

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