

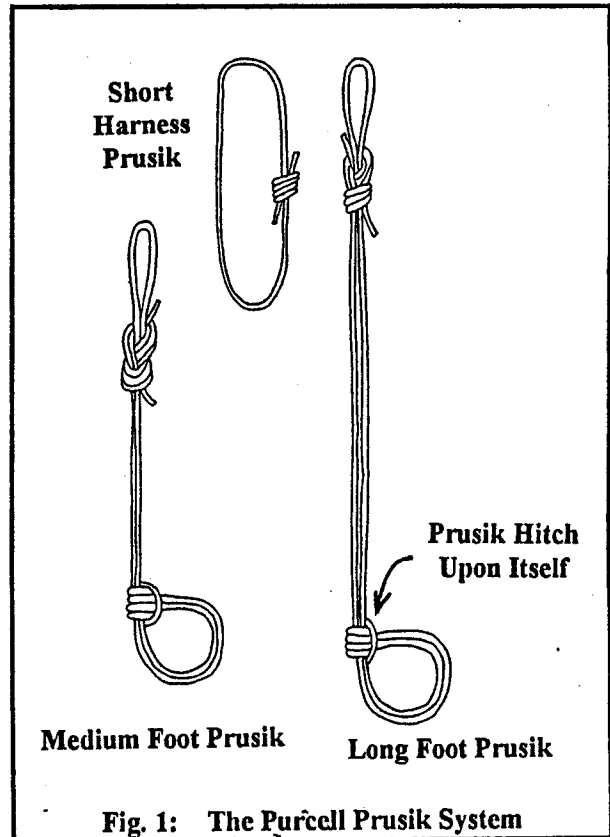


**Ascending Considerations:**

For self-reliance, safety and flexibility, a rescuer should always have the ability to either descend or ascend a rope. Therefore, while rappelling, being lowered or raised, or working an edge, rescuers should always have their ascending system with them and know how to competently use it. A rescuer should have a separate, untensioned belay rope as a back-up in case something happens to him/her, or if the main rope, anchors, or ascending system fails. This handout does not cover single rope technique considerations.

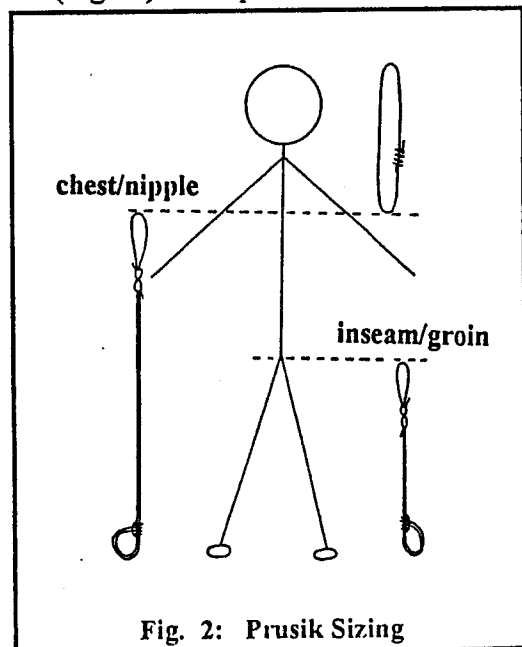
**The Purcell Prusik System:**

Many types of ascending systems exist. Some of these systems have been highly refined for special applications such as long free hanging ascents in caving. In rope rescue, however, there are strong arguments for equipment that has multi-purpose capabilities to increase efficiency, minimize equipment requirements and reduce cost. The Purcell Prusik System is an ascending system that was developed by members of the *Columbia Mountain Rescue Group* in British Columbia. It evolved from a need to combine equipment that would allow rescuers to ascend in either a free-hang or sloping environment, tie-in to an anchor system or edge/safety line, or have an adjustable tie-in link for litter work. Several other uses have come about since their introduction in the early eighties. The Purcell Prusik System (Fig. 1) incorporates the use of 3 Prusiks: 2 foot Prusiks and 1 harness Prusik. Two foot Prusiks allow easier movement in non-free-hanging terrain. Also, if one foot Prusik is being used as an adjustable tie-in (e.g. attendant tie-in), then the other can be used to ascend a short distance if required.



**General Purcell Prusik Sizing:**

The 3 Prusiks are different lengths: short, medium and long. With the long foot Prusik tightened over a boot, the top of the Figure of Eight on a Bight should reach the chest/nipple height of the rescuer, and the medium foot Prusik should reach the inseam/groin height. The short harness Prusik should reach from the chest/nipple area to a few centimetres (cm) above the top of the helmet (Fig. 2). The reason for the different foot Prusik lengths is to allow enough room to





comfortably advance them up the rope without having them bump into each other. The short harness Prusik length is long enough enable the rescuer to bypass a descent device (e.g. brakerack) if changing over from a rappel, but not so long that it is out of arms reach.

### Placement on the Mainline:

Two wrap Prusik Hitches are used to attached the foot Prusiks to the mainline. A 3 wrap Prusik Hitch is used to attach the short harness Prusik as it is more secure. Three wrap Prusik Hitches may also be used for the foot Prusiks if the person ascending is very heavy, or if brand new Prusiks are being used on brand new rope. Three wraps allow the Hitches to grab better and provide more security, though at a cost of being more difficult to slide up the rope. A gentle loosening of the back of the Prusik Hitch before advancing it up the rope will make this easier.

From top down, the general order in which the Purcell Prusiks are placed on the rope are: short, long, medium (Fig. 3). The acronym SLM, or 'slim' helps to remember this. While this is the final order which the Prusiks should be on the mainline, it is recommended that they be put on from the bottom up: medium first, then long, then short. This way, the placing of each Prusik Hitch on the rope is not being hampered by any Prusiks dangling from above. While the medium and long Prusiks are used as foot Prusiks, the short Prusik is clipped to a special connector strap between the sit and chest harness of the rescuer. The proper tying of the harness connector strap is not covered in this handout.

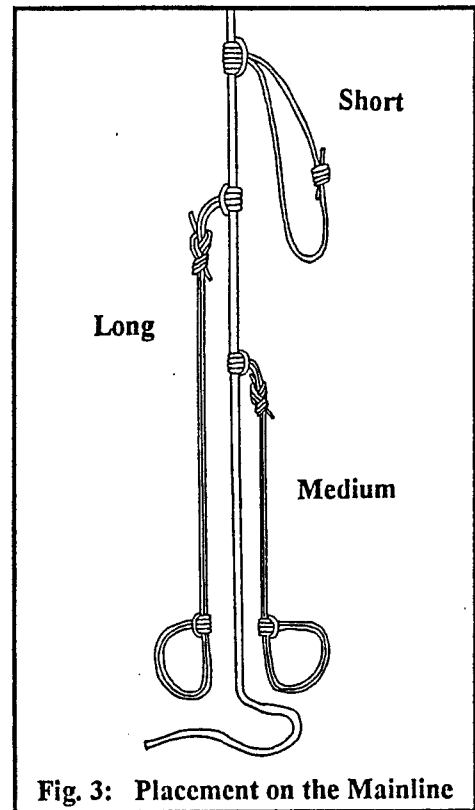


Fig. 3: Placement on the Mainline

### Ascending Techniques:

Generally, there are two types of terrain in which a rescuer may have to ascend a rope. The first is a complete free-hang where no contact is made with the cliff or building face by the rescuer. The second type is on terrain which is less than vertical whereby the rescuer will have contact with the cliff or building face.

The free-hang technique resembles that of an inchworm. The long and medium foot Prusiks are moved up the rope to the point where both feet are the same elevation. The short harness Prusik is then advanced as the person smoothly stands up on the foot Prusiks. This process is repeated to ascend up the rope in a free-hang.

In less than vertical terrain, the technique used is referred to as the "toe-in technique," which more closely resembles the movements of climbing up a ladder. The body is kept vertical, and the long and medium foot Prusiks are advanced alternately between advancement the short harness Prusik.



Competent instruction should be sought in both the free-hang and toe-in techniques, as well as in techniques to pass knots, ascend over an edge, and/or change over from rappelling to ascending, or ascending to rappelling.

**Constructing Purcell Prusiks:**

Select a 10 metre (m) length of good quality 6 or 7 millimetre (mm) nylon kernmantle accessory cord with a manufacturers rated breaking strength of at least 7.5 kiloNewtons. The 10 m length will be sufficient to make all 3 Prusiks for people up to 2 m tall. To minimize waste, all three Prusiks can be tied before any cut is made to the cord.

1. To begin making the long foot Prusik, tie a Figure of Eight on a Bight at one end of the 10 m length of cord (Fig. 4). Make the bight approximately 20 cm long. The bight needs to be this length so that a 3 wrap (6 coil) Prusik Hitch could be tied onto the rope being ascended, even though a 2 wrap (4 coil) will most likely be used.

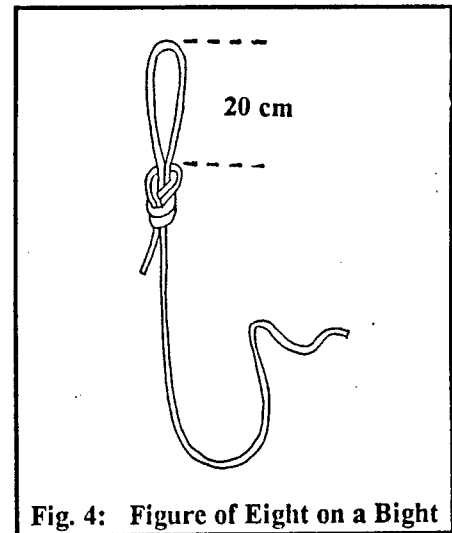


Fig. 4: Figure of Eight on a Bight

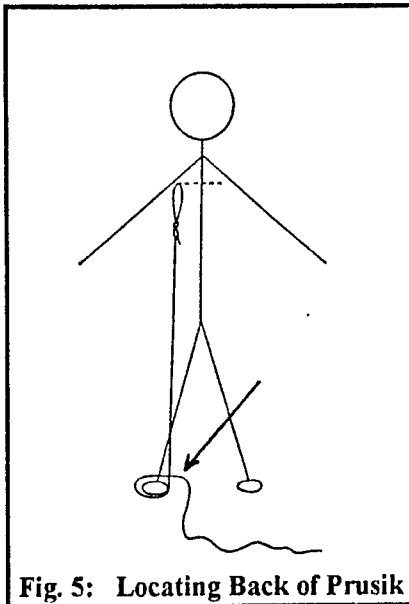


Fig. 5: Locating Back of Prusik

2. While standing, position the top of the Figure of Eight on a Bight at the chest/nipple landmark. From there, run the cord down to the ground and make one loop around your foot. Locate the point on the cord approximately 3-5 cm past where the loop crosses itself around your foot (Fig. 5). Pinch that point between your thumb and forefinger—being careful not to lose that location—and undo the wrap around your foot. This location on the cord will become the back, or bridge, of the Prusik Hitch upon Itself.

3. To make a Prusik Hitch upon Itself, the coils of the Prusik Hitch need to be made first, and then the standing parts of the Prusik Hitch are passed through the coils. With the back of the Prusik upon Itself identified (step 2), make the 4 coils of Prusik Hitch (Fig. 6), and then pass both standing parts—the long cord and the one with the Figure of Eight on a Bight—through the 4 coils. Dress the Prusik Hitch upon Itself (Fig. 7). This becomes the adjustable loop of your long foot Prusik. If this step was done correctly, then when you slip the foot loop over

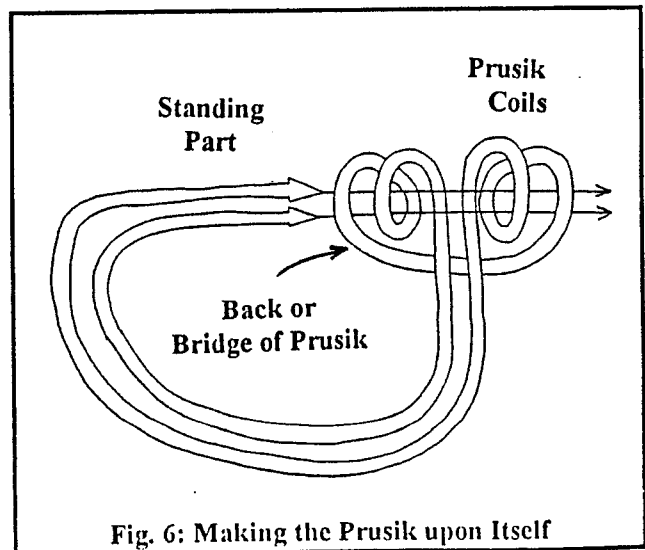


Fig. 6: Making the Prusik upon Itself



your foot and cinch it down on top of your foot, the Figure of Eight on a Bight should reach your initial chest/nipple landmark. If not, make minor adjustments by either feeding cord into, or out of, the Prusik upon Itself until you have the correct landmark length.

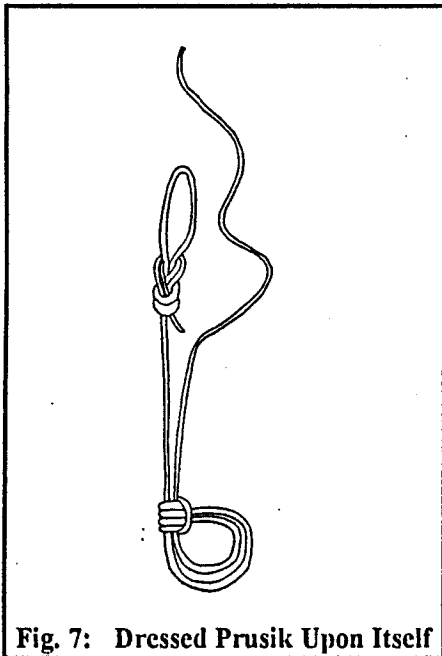


Fig. 7: Dressed Prusik Upon Itself

4. Trace the remaining length of cord through the Figure of Eight until the two cords exiting the Prusik Hitch upon Itself are the same length (Fig. 8). The remaining cord should exit the Figure of Eight towards the bight. Either cut the remaining cord off now (leave enough tail), or repeat steps 1-4 with the other end of the cord to make the medium foot Prusik, except this time, use your inseam/groin as your new landmark height (Fig. 2).

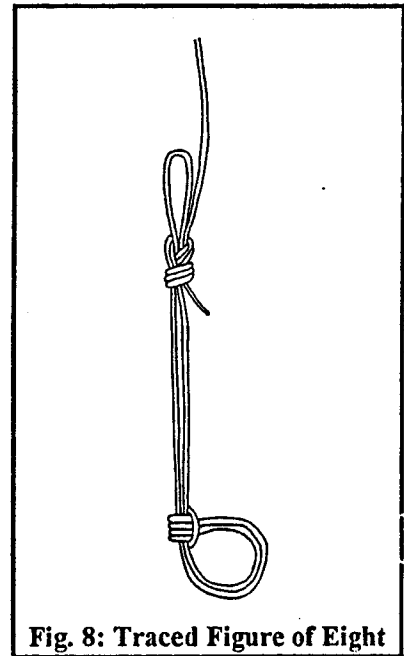


Fig. 8: Traced Figure of Eight

5. Once the two foot Prusiks are made, make the short harness Prusik with the remaining cord. Tie the loop of cord into a sling using a Double Overhand Bend. Size this sling from the chest/nipple landmark to only a few cm above your helmet (Fig. 2).
6. Once you have ascended a rope with your Purcell Prusik System using both the free-hang and toe-in techniques, you can make any minor adjustments—lengthen or shorten—or fine tuning you deem necessary.