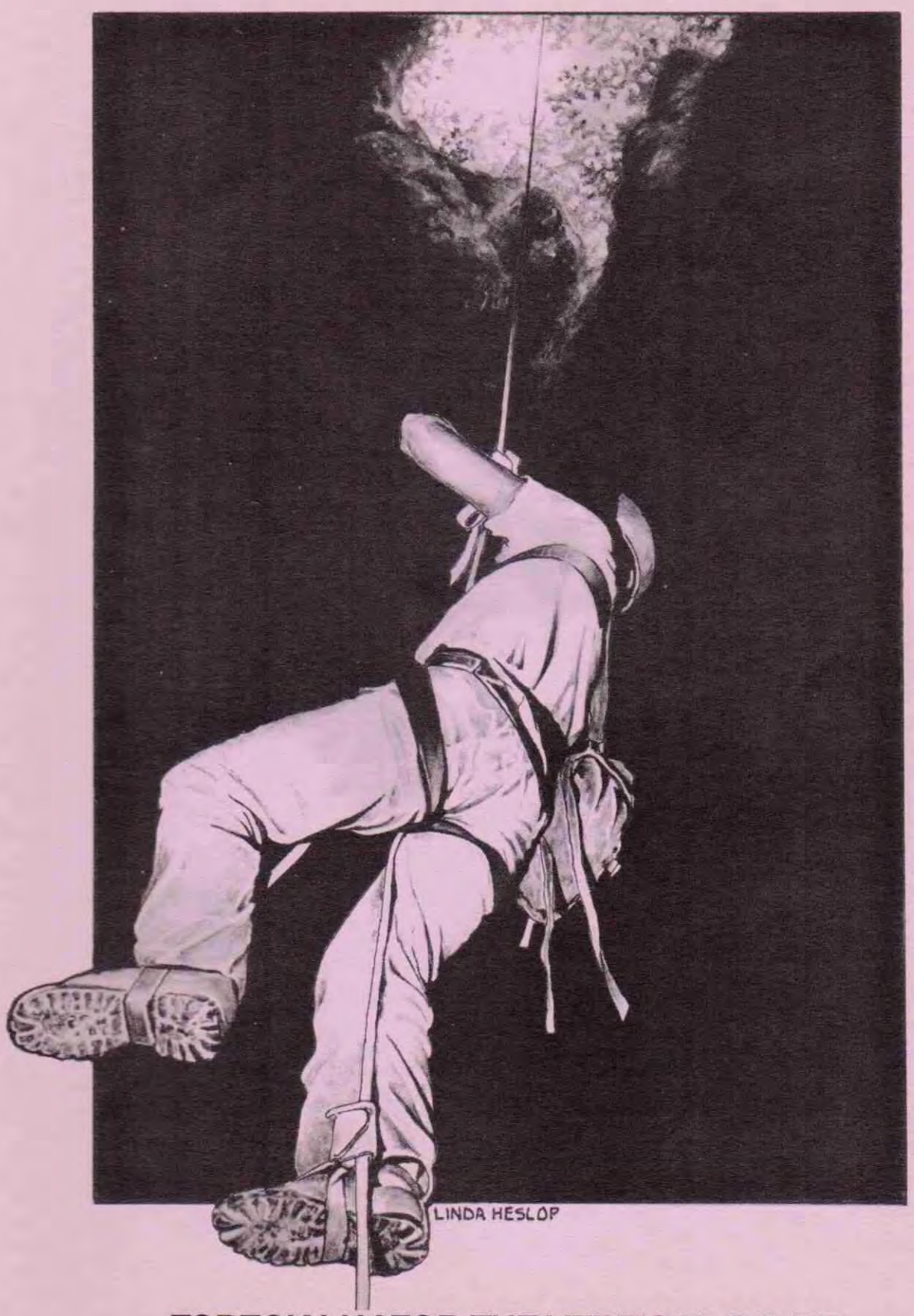
NYLON HIGHWAY NO. 37



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THE NYLON HIGHWAY

The *Nylon Highway* is published on a semi-annual basis pending sufficient material. It is the intent of this publication to provide a vehicle for papers on vertical work. All submitted articles containing unsafe practices will be returned to the author. With this issue, the Vertical Section has over 1100 members with a mail out of over 1200 copies of each issue.

Opinions expressed herein are credited to the author and do not necesarily agree with those of the Vertical Section, its members or its Executive Committee. Reprinted material must give credit to the author and source. Letters to the editor are welcome.

Cover: "Miller Time Minus 50 Feet" by Linda Heslop

Section Business: There will be a discussion on changing the Vertical Section Constitution and By Laws to accomodate incorporation and non-profit status at the annual section meeting. The meeting will be held at the 1994 NSS Convention in Brackettville, Texas.

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Editor's Column

by Maureen Handler

First of all, please let me apologize for the tardiness of this issue. I had very good intentions and most of the articles were in the computer before Christmas. However, I was still missing a "meat" article. A promised piece by Geary Shindel was delayed by an accident in the family (everyone's all right). Then, on January 2, I received Mark Jancin's article on change-overs, complete with computer disk and photos. I was saved. Late one night, I tried to read the disk. No luck, apparently it had been damaged in transit and my disk doctor reformatted the disk. As I read Mark's letter to me, I realized my error; it was formatted for a MAC. Now, I finally have all the text in the computer, it's "proof-read" and ready for layout.

The other major delay encountered was that I changed jobs, again. I became fed up with large, corporate consulting and on January 1, became a full partner in an environmental remediation firm. This has consumed much of my time for the last six weeks. Now, enough of the excuses and on to the business at hand.

I'd like to thank the members of the Section for their continued support, without which, I would be unable to publish the Nylon Highway. The quality of the articles I have been receiving, truly enable me to publish a superior newsletter.

On another note, there has been quite a few comments passed around about the current and future status of the figure eight as a rappel device. I read with interest, Steve Knutson's short article on how the device causes a permanent "kink" to the rope. While he does not say so, he implies the kink damages the rope when he announces that he is banning them from his ropes. This has led to, what I believe to be, wild speculation on the damage this causes. I have yet to see anything in print on the actual damage allegedly caused. Until the time that such documentation is provided, I caution against throwing away all of your figure eights. As with all vertical techniques, all equipment should always be evaluated for safety, practicality and ease of use. Check used equipment (including ropes) on a regular basis for wear and tear and retire it or have it tested if you are at all unsure.

I regret that I was unable to attend convention in Oregon last year. Work and family commitments prevailed. I did hear about the happenings at the Section meeting, however. In response, I have tried to be more careful in my editing of articles submitted and will probably include more editorial comments in the future. I do want to stress that the Nylon Highway is not a training manual. It is a forum for vertical ideas and innovations. I will not publish techniques that I or the caving community in general consider outright dangerous. But I will publish new ideas that may in turn inspire additional innovation.

I received numerous comments on the MARB Vertical System article published in Nylon Highway 36. The rig, as shown in the figure, has no seat harness. I inserted a quantity of editor's comments about this in the article. I was unsure if someone would actually try to put together the rig without reading the article, yet the rig has merit for large cavers such as Roman. I decided editor's comments were necessary. Shortly after publication of the issue, I received a letter from Roman. Opening it apprehensively, I was prepared for the typical author response, "How Could You Do That To My Article?" Instead, I was pleasantly surprised with the comments that he was pleased with article overall. He had assumed, that everyone else would assume, that a seat harness was so integral it was unnecessary to show. He was interested in showing the ropewalker modifications and went on to thank me for a job well done. (Who says this is a thankless job?)

So here we have it. Use the Nylon Highway as it was intended, as a publication used to explore the vertical possibilities. If you see someone assuming it is gospel, correct them and if you see someone practicing improper vertical techniques, teach them the correct and safe way. Thank you all for your support.

Change - Over With a Rack

by Mark Jancin

Introduction

"Change-over" is the changing from rappelling to climbing (prusiking), or climbing to rappelling, on a single rope. For practitioners of single-rope techniques (SRT), change-over is an essential skill that is used in a number of maneuvers involving going down and up a rope. This article does not comprehensively review the topic of change-over. Rather, it describes how to avoid having the rope become pinned in the rappel rack during change-over from climbing to rappelling. I assume the reader has some familiarity with SRT and the associated vocabulary. Regardless of the type of climbing system being used (prusik knots versus the various mechanical-ascender types and rigs), a safety (seat) ascender is required for change-over. This safety ascender preferably should be the type that is easily attached and removed from the rope with one hand (i.e., Jumar style). This safety ascender is attached to your seat harness and engaged as needed. The safety-ascender sling should be long enough to reach the rope above your rappel device, but not so long as to be out of comfortable reach. I always rappel and climb with such a safety ascender attached to my seat harness, easily accessible for quick attachment to the rope.

Although one can use a Gibbs or a prusik knot as the safety ascender, the need for using two hands with these is a fairly strong drawback. The relatively new hinged Gibbs is unfamiliar to me, but I suspect that with a little practice it can easily be taken on and off the rope with one hand (at least, this is its designed purpose). When using a rappel rack, the change-over from rappelling to climbing is, with practice, an easy maneuver with no hidden difficulties. If you are rappelling and want to change-over: (1) stop and engage your safety ascender above the rack; (2) continue to rappel, thus transferring your weight from the rack to the safety ascender; (3) attach all your ascenders to yourself and then to the rope; (4) detach the rappel rack from the rope and your seat harness, and secure it; (5) attach your chest roller to yourself and then to the rope; and, (6) stand up, remove the safety ascender (unless it is part of your normal climbing system), and climb away.

Note that, depending on the climbing system you use (prusik knots vs. Mitchell vs. ropewalker vs. Frog, etc.), the exact procedures comprising steps 3 and 5, above, will vary. Also, one can disengage the rack before attaching ascenders to the rope, if desired. (ed. - This is not recommended for safety reasons.) One of the potential problems with this change-over is that (unless you are rappelling while wearing your ascending rig) your ascending gear can be dropped while you are attaching it to yourself -- guard against this. It also is important to note that a loaded seat-harness carabiner should never be opened. This rule can never be violated, including when you are removing or attaching your rappel rack during a change-over.

When climbing you can encounter multiple reasons for a change-over to rappel. Perhaps you can't get over a lip and have no other recourse but to return to the bottom to rest and rethink your approach. Perhaps you can't ascend across a knot or a re-anchor (of course, a cave is not the place to learn). Perhaps gear problems force you to return to the bottom. Perhaps you encounter a part of the rope that has accumulated ice in a cold waterfall spray, and your handled ascenders will not hold. And when you rappel past a knot in the rope, you basically switch to climbing, down-climb past the knot, and re-engage your rack to continue the rappel -- even though you are descending, you must be able to change-over from climbing to rappelling to accomplish this maneuver.

A jammed rappel rack can require a change-over from climbing to rappelling, too. If hair, clothes, webbing, etc., jam your rack, you need to transfer your weight to a seat ascender and unload the rack to free the obstruction. Then, in effect, you must switch from ascending to rappelling to continue downward.

The Pinned Problem

Such books as On Rope and High Angle Rescue Techniques have good discussions of change-over, as well as many other SRT issues. However, these two books do not adequately address a particular problem associated with change-over from climbing to rappelling with the rack. This problem involves having the main rope become pinned between the two top bars on the rack -- I will refer to this problem as the "pinned problem" (Figure 1). Why is the pinned problem associated only with the climbing to rappelling change-over? Let's think about the steps involved.

To change-over from climbing to rappelling: (1) start by taking a sitting or resting position -- for some systems, this may require attaching a safety ascender above the imminent position of the rack; (2) remove the rope from your chest roller (if you have one); (3) take out your rack and attach it to your seat harness; (4) attach the rack to the rope, lock it off (Figure 2), and tie it off (Figure 3)[locking off the rack is not always required during the change-over, but it is a component step outlined in the two above mentioned books]; (5) remove your lower Gibbs or the long upper Jumar (if appropriate to your climbing rig); (6) stand up in the remaining foot ascender and slide the safety ascender down the rope to where it has suitable slack in its sling; (7) sit down and ensure that all your weight is now on the rack, and off the safety

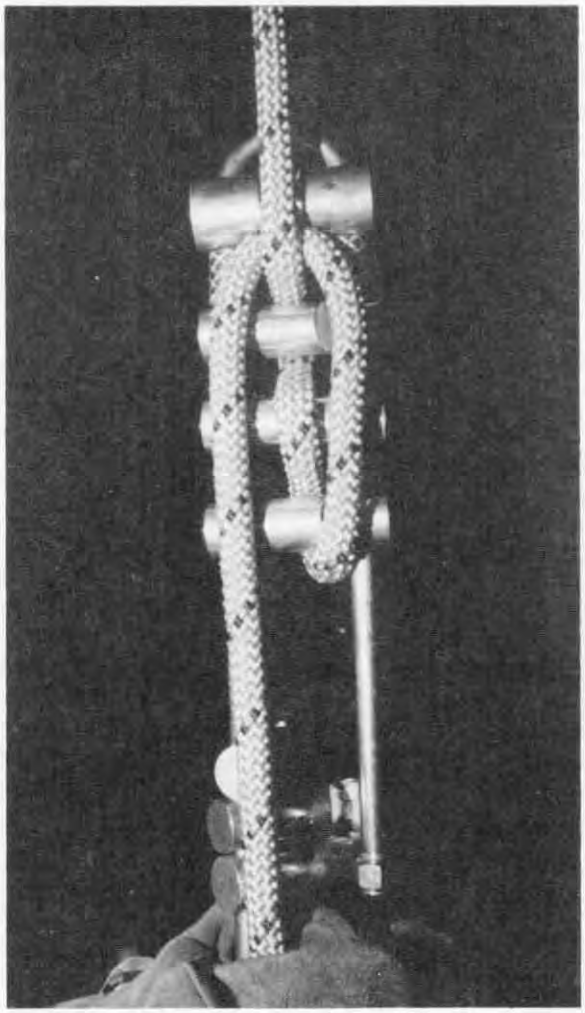

Figure 1: The "pinned problem" develops when the rope becomes trapped between the top two brake bars of the rappel rack.

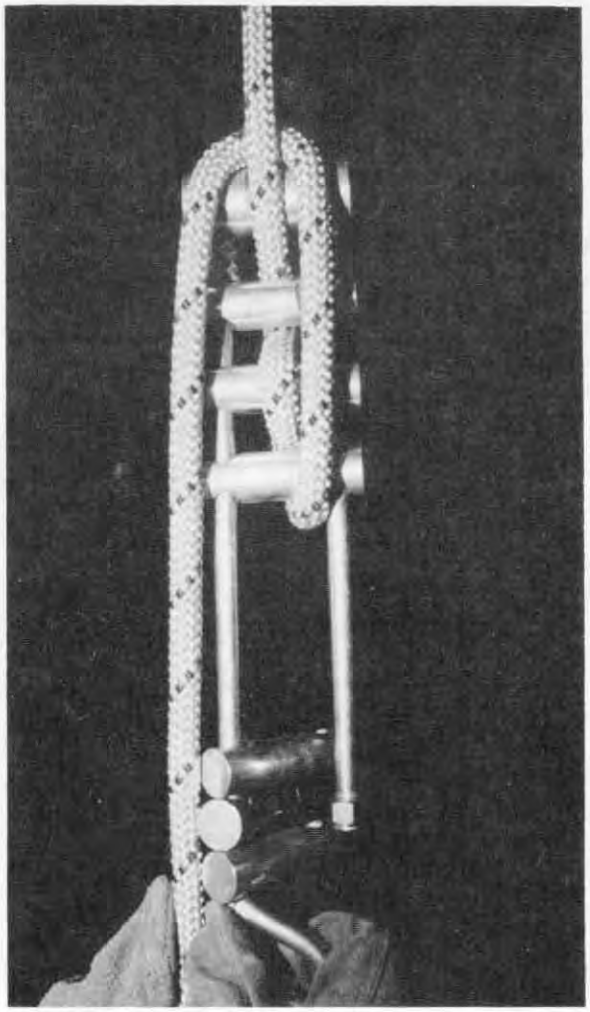

Figure 2: Standard locked-off configuration of the rack.

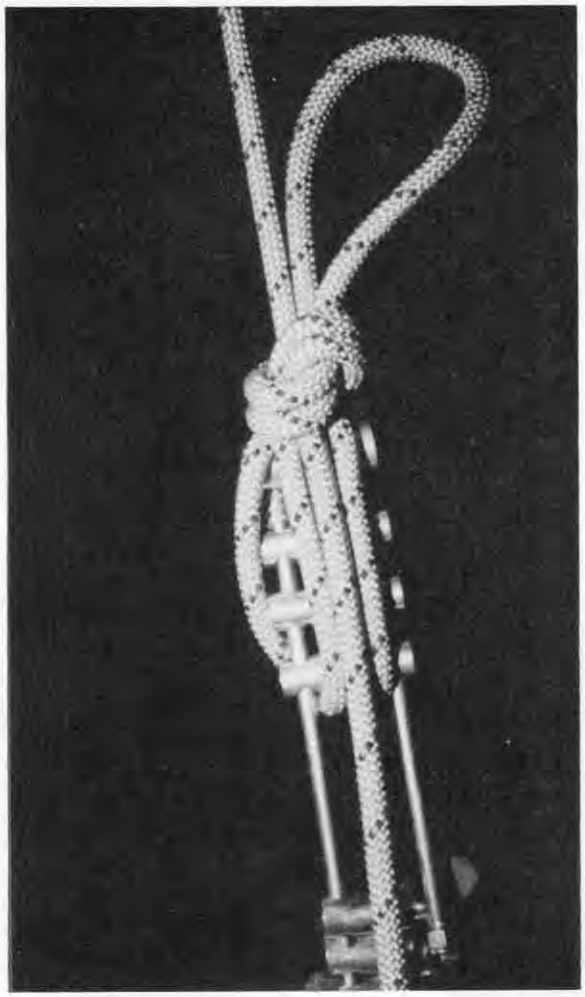

Figure 3: Tied-off rack. The tie-off is an overhand knot on a bight. The tie-off knot has been applied after the rack is locked-off.

ascender; (8) remove and secure your lower ascender; (9) remove the safety ascender; and, (10) unlock the rack and rappel away.

When does the pinned problem occur? Usually during step 6, above. The reason is that during change-over from climbing to rappel, the locked-off rack goes from an unloaded configuration to, in step 6, a loaded configuration which can easily tend to twist the rack off the vertical and otherwise pull the upper part of the lock-off loop (and/or the tie-off knot) down into the space between the two top bars (Figure 1). However, during change-over from rappel to climbing, you don't need to lock-off the rack (though some people do). During the course of a normal rappel, when you lock-off the rack the rope in it (and above it) starts in a loaded, taut configuration that will not allow the upper part of the lock-off loop to move downward.

Most people cannot strong-arm the rope out of its pinned position, and as long as it is pinned, you are not going rappelling. You have little choice but to unload and unlock the rack and try again. The pinned problem is not caused, but is exacerbated, by using the extra fat, grooved top bar that many of us prefer.

It is awkward to do this change-over without locking-off the rack. This is because, when your stand-up ascender is beneath the rack, you cannot get enough slack between this ascender and the rack to properly put the rack in the full-stop position, as you are sitting down and first loading the eye of the rack. Without a lock-off it is fairly easy to jam your rack downward onto your stand-up ascender. Whether your stand-up ascender is above, versus beneath, the rack is the basic departure point for our consideration of change-over from climbing.

I bet that many different techniques have been developed by cavers in order to eliminate (as opposed to overcome) the pinned problem. However, I have never read anything that explicitly discussed the problem and its avoidance. Below, I outline three families of techniques that can keep the pinned problem from occurring.

Method 1: Rig Your Stand-Up Ascender to Attach Above the Rack

During the change-over step where you stand up on your remaining foot ascender, and you move your seat ascender down to an untensioned position above the rack (step 6, above), the pinned problem occurs because standing up loads the main rope beneath the rack. In a standard locked-off configuration of the rack, this causes a downward load on the top of the rack which rotates or twists the rack off the vertical, greatly facilitating the development of the pinned problem.

However, if you rig your stand-up ascender sling long enough, you can attach it above the rack. Thus, when you stand up, the rack is left unloaded. With some practice, this technique may be sufficient to eliminate the pinned problem. However, when you eventually sit down and transfer your weight from the stand-up ascender to the locked-off rack, the rack is still going from an unloaded to a

loaded configuration, and it can be pretty easy for the pinned problem to develop at this step.

One technique that circumvents the pinned problem is to engage your rack to the rope, but do not lock it off. When you are standing up on your ascender, as you shift your weight to the rack by sitting down, you must make sure you maintain braking control on the rack -- remember, in this scenario it is neither locked-off nor tied-off. The best way to handle this is to, just as you are sitting down, move the braking line up to the top of the rack and jam all the brake bars upward (full-stop position; Figure 4). Once your full weight is on the rack you can easily lock-off without developing the pinned problem. Alternatively, you might not lock the rack off at all during the change-over. If this is the case, you must carefully maintain braking control while removing your ascender(s) before you rappel.

Figure 4: The "full-stop" configuration of the rack is appled by bringing the braking line above the top of the rack.

Another consideration with this method is whether you want your stand-up ascender to be attached to the rope above, versus beneath, your seat (safety) ascender. If you place the stand-up ascender between the seat ascender and the top of the rack, you need to be careful to ensure that, during your stand up, you can move the seat ascender downward far enough so that when you sit down all your weight is off the seat ascender and on the rack. If you attach the stand-up ascender above the seat ascender, you need to ensure the stand-up ascender does not get awkwardly high. All of this amounts to carefully fine-tuning your sling lengths, based upon on-rope practice. If you choose to place your stand-up ascender beneath your seat ascender, using a fairly small ascender such as a Petzl Jammer minimizes the vertical space required between the rack and the seat ascender.

Note that with Method 1 you often must engage an extra (stand-up) ascender, additional to those comprising your ascending system (although with a Frog rig, the high stand-up ascender is integral to the ascending system, as is the high ascender in a Mitchell rig). Although this is not necessarily a disadvantage, it is a consideration in comparing this method with Method 2.

Method 2: Use the Curl Wrap With an Extra Brake Bar

This approach can be used if you have your stand-up ascender beneath the rack. In such a case, the rack is locked-off; however, the finish on the lock-off is not the usual tie-off, but instead a particular way of threading the rope along the rack, as discussed below (see Figure 5). The basic idea behind using the curl wrap and extra brake bar is to lock-off the rack in such a way that, when you eventually stand up and load it, the pull on the main rope is directed along, and from the bottom of, the rack.

To use this technique the rack must have a brake bar (called the extra bar) available beneath the lowest brake bar that is packaged within the lock-off loop. I have a seventh brake bar on my 14-inch rack to be used either for this purpose or, rarely, to control my descent along the fastest of ropes (I am a heavy caver). If all your brake bars

Figure 6: The diagonal rope run over the top brake bar as viewed looking down on the top of the rack.

are packaged within the lock-off loop, you must either disengage and free the lowest bar and redo the lock-off, or use some other technique to avoid the pinned problem.

There are three particular components to using this technique: (1) running the top of the lock-off loop diagonally across the end of the topmost brake bar nearest you (Figure 6); (2) curl wrapping the rope along the bottom of the short leg on the rack, beneath the lock-off loop and above the imminent position of the extra bar; and, (3) engaging the extra bar so that the upcoming loading of the rope during the stand-up will tend to keep the extra bar closed. Figure 5 shows all three of these technique components.

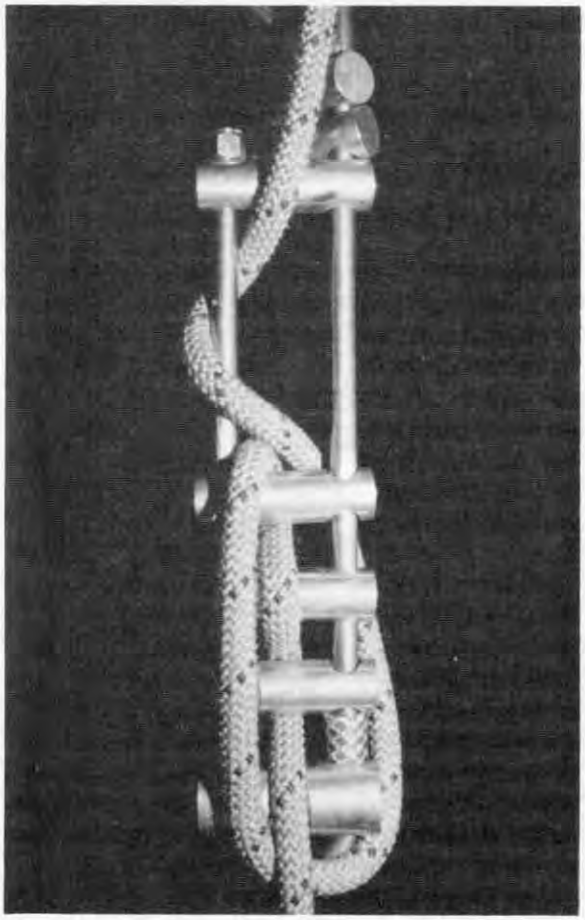

Figure 5: The curl wrap with an extra brake bar. The diagonal rope run over the top brak bar isalso shown. Note the lowest, extra brake bar will tend to be held closed by loading the rope beneath the rack.

In order to accomplish this technique it is important to eliminate all slack between the rack and the seat ascender, and to jam all the engaged brake bars on the rack upward to the full-stop position (Figure 4), before you begin to apply the lock-off loop. As you bring the braking end of the rope upward to begin applying the lock-off loop, bring it up along the short leg of the rack (which should be away from you if your rack is in the so-called "perpendicular" orientation). As you wrap the rope along the top of the top bar (in the topmost part of the lock-off loop), run it diagonally from the front (grooved side) to the back (non-grooved side) of the bar, just on the end of the bar nearest you (Figure 6). This rope position is easier to maintain on one of the extra fat, grooved top brake bars. Then run the lock-off loop downward to the short leg of the rack and put on a curl wrap, generally about three-quarters to one turn around the rack leg. Engage the extra bar and make sure that loading the rope will hold it closed (Figure 5). If loading the rope will force the extra bar open (Figure 7), you must re-rig the curl wrap -- the rope must tend to keep the extra bar closed when it is loaded. One way to re-rig the curl wrap shown in Figure 7 is to add (if you have it) or subtract one brake bar from the rope and lock-off the rack

the same way again. By doing so you switch from an odd number of bars within the lock-off loop (Figure 7) to an even number (Figure 5), which, for a fixed number of curl wrap turns, changes the relative facing direction of the extra bar against the rope.

Even though this locked-off configuration of the rack is not positively tied-off, when properly engaged, this lock-off is reliable and requires no hands on. The reasons the pinned problem will not develop are: (1) the diagonal run of the rope over the near end of the top bar makes it difficult for the rope to slip downward into the space between the two top bars; (2) the curl wrap and short leg of the rack take up a good amount of the stand-up loading as friction, which minimizes distortion of the top of the lock-off loop; and, (3) the stand-up loading does not tend to twist the top of the rack off the vertical.

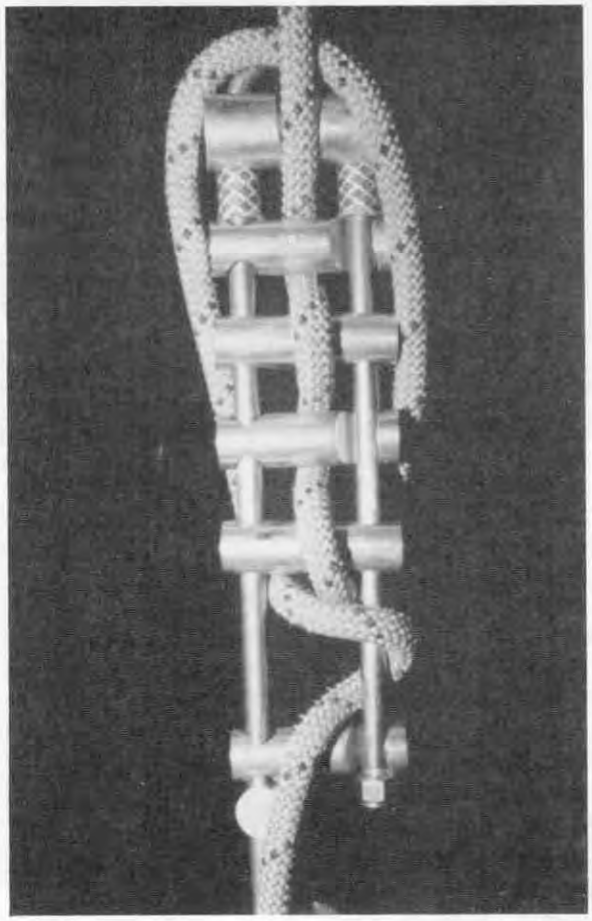

Figure 7: Incorrect curl-wrap configuration. The lowest, extra brake bar will be forced open by loading the rope beneath the rack. This configuration must be re-rigged so the extra bar will be held closed by loading the rope beneath the rack. (compare to Figure 5.)

Use of the curl wrap does tend to force the extra bar down hard onto the locknut at the bottom of the short rack leg. This is not a problem, but it's another reason to ensure that this locknut is appropriately tight.

Another approach I have used involves the diagonal rope run across the top bar, but no curl wrap. That is, the locked-off rope passes directly over the lowest, extra bar, with no nearby curl wrap (Figure 8). With this technique I tend to

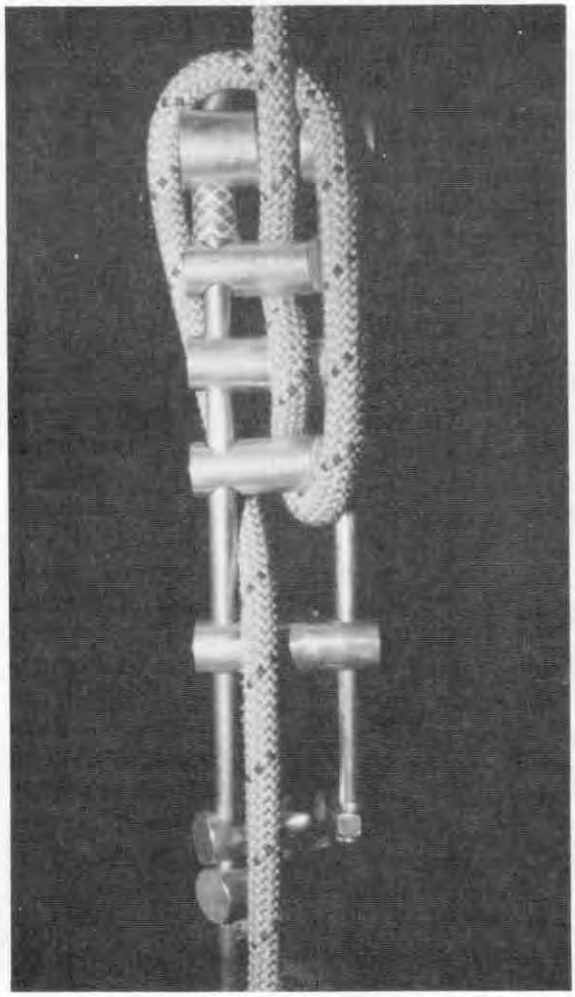

Figure 8: The diagonal rope run with the extra brake bar, but no curl wrap. A single lock-off loop is shown.

favor two superimposed lock-off loops before running the rope to the extra bar (Figure 9). This is because, in the absence of the curl wrap, loading of the rope can more easily distort the top of a single lock-off loop and promote the pinned problem. The extra, second lock-off loop takes up some of the stand-up load, minimizing the tendency for the top of the first lock-off loop to distort and slip downward.

It is possible to use only the diagonal rope run across the top bar without any curl wrap or other usage of an extra bar. However, stand-up loading of the rope will, in such cases, tend to rotate the rack off the vertical, since this load is directly applied to the top of the rack. If you clip an extra carabiner into your seat harness and run the rope from the rack through it, the tendency for the rack to rotate will be constrained (assuming your stand-up ascender is lower than your seat-harness carabiner). However, there still is room for the pinned problem to develop, so some practice is necessary to become adept at this approach. You also should note this approach involves a rather tentative lock-off which is only marginally of positive, hands-free quality.

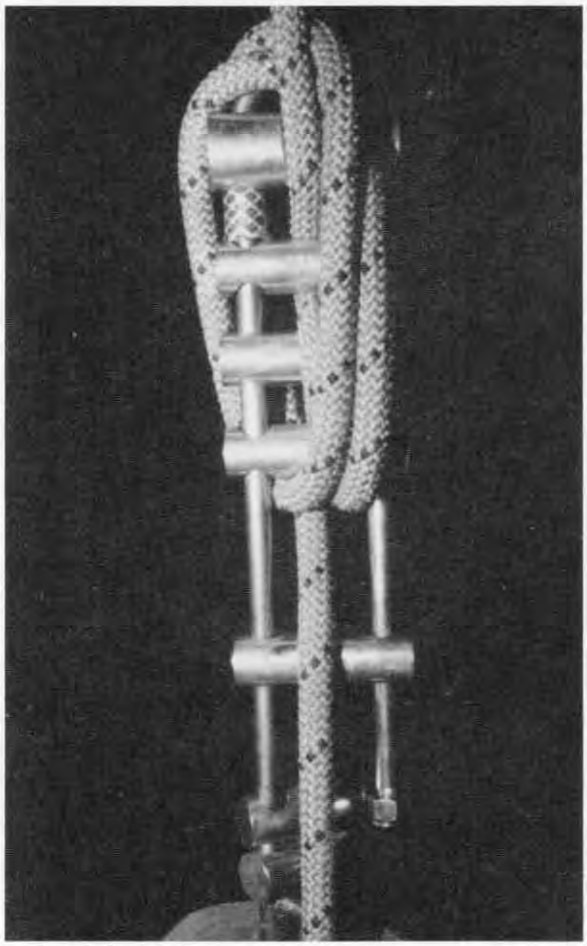

Figure 9: A double lock-off loop with the diagonal rope run and an extra brake bar, but no curl wrap.

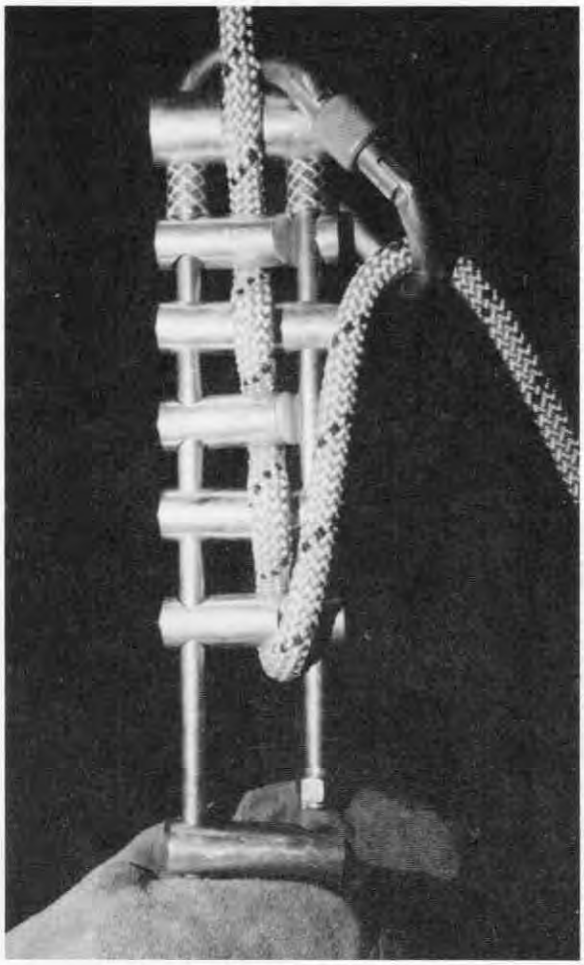

Figure 10: The carabiner-rack configuration.

Method 3: Use the Carabiner-Rack Configuration

David Bain described the carabiner-rack configuration (CRC) as a solution to avoiding tying-off the rack during change-over to rappel. He did not discuss the pinned problem, but the CRC effectively avoids it. The CRC is appropriate if your stand-up ascender is beneath the rack.

The CRC is shown in Figure 10. Before threading the rope through the brake bars, clip a carabiner to the top of the rack, above the top bar. After threading the rack on the rope, the braking line passes up and through this carabiner, as shown. During the stand-up, the brake bars are squeezed upward and the rack is frozen on the rope. When properly engaged, the CRC puts the rack in a reliable stop position which will maintain even after the stand-up load is removed. Since the rack is neither locked-off nor tied-off, the pinned problem cannot develop.

It is important to engage all six brake bars (standard rack) when using the CRC. This ensures that, even on fairly fast ropes, the rack stays in the stop position after the stand-up load is removed. Six bars should be used even when you are sure you will use fewer bars for the ensuing rappel.

Some people prefer to engage the CRC carabiner to the top of the rack after having threaded the rope through the brake bars. This approach is fine, but one needs to be sure the top brake bar remains low enough that there is sufficient room between it and the top of the rack to engage the carabiner. Engaging the CRC carabiner to the rack before threading the rack ensures this problem will not develop.

Bain noted that another application of the CRC is to provide extra friction during certain types of high-load rappels, such as a pick-off. The extra friction is considerable and is not appropriate for standard, single-person loads. Therefore, one generally removes the rope from the CRC carabiner in order to complete the change-over and start the rappel.

In closing, there are still other permutations of the above techniques that can, with practice, allow smooth rack change-overs with no pinned problem. If you practice some of these techniques you probably will quickly find an approach that suits you. Or, perhaps you will find an entirely different technique that does the job well.

Acknowledgment

I thank John Walters for taking the photographs in this article.

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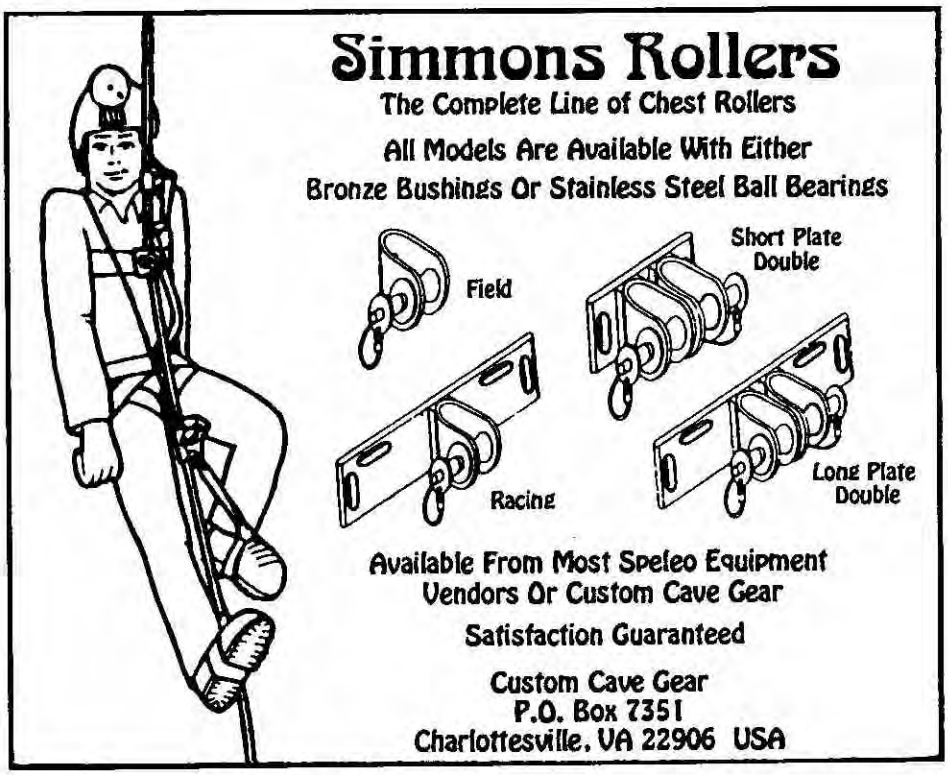

Preparation and Technique For A Long Rappel

Submitted by: Bob Coney, Chuck Henson, Kathy Minter, Chuck O'Neil, Russ Pouncey and Patty Springer

In September of 1992, a group of rappelling enthusiasts went to Yosemite National Park to rappel and ascend El Capitan and Half Dome. Nine of the participants, Shannon Cobb, Bob Coney, Chuck Henson, Franklin McKinney, Kathy Minter, Chuck O'Neil, Russ Pouncey, Patty Springer, and Jim Youmans, pooled their personal experiences for a better understanding of long rappels and the challenges they represent. This article is to share with you what we learned.

PREPARATION

Several members of the group met frequently over a nine-month period to practice rope skills. We climbed hundreds of thousands of feet of rope over several months to build endurance and test gear. Some of us used a 1,300 foot rope on a drum system that allowed us to climb non-stop for up to 1,200 feet. The drum was made so that the spool could be carried out into the yard and set up on a frame, running the rope through a rappel rack to a stout pulley hung in a tree, and the rope could be rewound after each climb. Ball bearings in the drum and pulley assemblies were necessary to tolerate the excessive wear and for smooth operation.

As many as 20 miles each were climbed in the months of preparation, the goal of this practice being to achieve a smooth steady pace with brief rest stops. It takes good friends to climb this much rope in the summer heat and humidity and remain friends. The effort paid off in the actual climb, and the most valuable lessons came from getting on the rope and climbing repeatedly.

The first lesson was the value of simplicity. Climbers were able to streamline their climbing systems and practice climbing after every modification. Frequently, problems, and some just plain nuisances, were discovered only after climbing five or six hundred feet, and things like the seat harness fouling the bungie cord, too-narrow foot stirrups, and knee ascenders catching on clothing and anatomy were eliminated in these practice sessions.

The second lesson was in efficiency. The group tested different ascending devices to see which ascenders gave the greatest return for each step. Climbers compared three types, Petzl Jammer/Croll, Gibbs Ascender, an a prototype sent to them for evaluation, by attaching them to a rope and measuring against a fixed mark the distance the ascender cam rolled down from the peak of the step when body weight was applied. The Petzl Jammer/Croll lost the least rope distance with every step, and the prototype lost the most. Even though all the ascenders worked well, the least efficient would add 500 feet to the climb at El Cap. The ball bearing Simmons roller was most often chosen for the chest harness.

The next step was to simulate, as nearly as possible, the actual rappel conditions that would be encountered in a long rappel, including rope weight, haul systems, change-overs, tandem climbing, rack length, and the dynamics of the actual rappel. Several members of the group headed to Whitesides Cliffs in North Carolina (660 feet) to test what they had learned in the backyard practice sessions and what they had speculated about in planning sessions.

We expected the rope at El Cap to weigh 150 pounds at the lip, so they practiced rappelling with someone's full body weight hanging on the rope below them. We learned that a haul system to lift the main line weight while going over the edge was essential to safety and that the extra rope weight increased the danger of the rack kicking while being rigged in during a change-over. Moving the rack side to side instead of push out and pull in significantly decreased the damage to noses and fingers.

We learned that a longer lead is necessary between the stirrup and the cam on the foot ascender when climbing tandem. If the lead is not long enough, the weight of the lower climber causes the foot ascender of the upper climber to

roll into an unnatural position, hurting the ankle with every step. In a long climb situation like El Cap, even the lower climber deals with this due to rope weight.

We learned to go over the edge with ascending gear on, especially the chest harness. The cams on the ascending gear were closed to avoid catching the rope, and all parts of the ascending system were connected to keep them from accidentally dropping a necessary piece. A longer tether was needed for the safety with the longer rappel rack. The tether had to be long enough to clip in above the long rappel rack but not too long to reach. The safety had to be close at hand, cam open to avoid fumbling, and ready to clip onto the rope immediately. A safety clipped onto a locked biner, or in any other way not immediately accessible, should probably be considered ascending gear and not a safety.

We determined that a rappel of 300 feet or more with the expected rope weight is the best method to use to truly understand the dynamic of a long rappel. The speed of the rappel builds up over the first 50 to 100 feet, and the amount of control necessary to maintain a smooth and even rappel cannot be judged or learned on a shorter rappel.

EQUIPMENT

The rope used was the same type of rope most in TAG are familiar with and use every weekend, PMI 7/16 diameter, static kernmantle rope. The two ropes purchased totaled 5,000 feet, and each weighed approximately 150 pounds at the lip, giving the rope an entirely foreign feel. It is no longer the pliable, friendly rope most rappellers know, and more closely resembles an unwieldy length of cable under pressure. The ropes were marked every 100 feet and wound onto spools designed and built to fit onto a 55 gallon drum. The drum was shipped and picked up on the way from the airport to the park. It would be easier to purchase the rope from a vendor near the rappel site and to let someone else worry about the shipping.

Because it was difficult to lift the main line and very difficult to push it out in order to back over the lip a 5:1 haul system was used to lift the main line and assist rappellers backing over the edge. The haul system was attached to the main line about 15 feet below the lip.

Everyone who rappelled El Cap on this trip used a long rack; it was a mandatory piece of equipment as a long rack is the only safe choice for a fully-controllable rappel of this distance. For 2,600 feet a rack 18 inches long for the short leg and 23 inches long for the long leg worked best. The bars are easier to add and remove if the rack is oriented to the seat harness with the open side facing out. Most group members used hollow and U-shaped steel bars and found that they dissipated heat very effectively.

We found the optimum rack configuration for a 170 pound rappeller to be a minimum of seven bars when using two spacers, 1.5 inches between bars one and two and one inch between bars two and three. Lighter or heavier rappellers modified this configuration slightly. When the haul line was used to lift the weight of the main line, all seven bars (two spacers) were needed going over the edge, but with the rope weight returned to the main line, everyone found it unwise to use less than five bars with two spacers. Although bars can be added and removed, spacers cannot. Because the racks were longer, it was necessary to take off one bar at a time, gradually pull the remaining bars down, and space them over the full distance of the rack before deciding to remove another bar. Although a rappel of this distance did not give much wear to new bars, gloves are another matter. Some reported that leather gloves over leather gloves did not provide enough protection, and others said that polypro liners under all leather gloves worked well.

Because it was necessary for the rappeller to have all bars rigged in going over the lip, a "catch biner" at the end of a safety rope hooked into the main line approximately 30 feet below the lip provides a safety. A belay line attached to the rappeller going over the lip provides the same safety.

The ascending system favored on this trip was the double bungie rope walker system. This seemed to be the most energy efficient system, especially when used with Petzl ascenders and a Simmons roller. Some climbed with a floating ascender above the chest harness. Climb times ranged from one hour and twelve minutes to two hours and twenty two minutes with this system. Two participants used sit-stand systems with

climb times of approximately five hours and forty minutes.

TECHNIQUE

From the very beginning, good radio communication between top and bottom was essential. When the rope was lowered from the top, a weighted bag was attached to keep the rope from blowing in the wind. Because the rope itself weighs about 75 pounds when half lowered, the bag should not contain more weight than can be easily hauled up if the rope must be pulled back. The bag was completely destroyed by rope abrasion. Fortunately the rocks used for weight did not fall out.

Group members found the first 300 feet of the rappel to the most important. The rappeller must get comfortable in the seat harness, set the rack, and start a safe, controlled rappel speed. The only possible method of controlling the rappel is through the rack. The free hand should do nothing but ride on the rope below the rack and, maybe, help position the body. The free hand provides no friction, and the rope hangs between the legs, not over a hip. Some placed both hands on the rack to control two or more bars at a time and "fine tune" the rappel.

Rappellers who found it necessary to stop slowed gradually and added bars to the rack at regular intervals. Because it was not possible to lift the rope for most of the rappel, they pushed the rope away (out) with their feet or hands far enough to clear the open end of the rack, adding bars without stopping the rappel.

Approximately 300 feet into the rappel, a phenomenon begins that should be considered on all long rappels. The effect is a bouncing-like action, and it may be caused by the downward force of the rappel on the rope. Bouncing on the rope by stopping and going is easy to start on any rappel. The rappeller falls, stretching the rope; the rope then zips back through the rappel rack and the rappeller falls again. On a rappel of 2,600 feet, the distance of the fall is greater due to the long rope. The rappeller reacts by jamming the bars together to slow down. The rappeller then stops in relation to the rope, but continues to fall in relation to the cliff until the maximum stretch is reached, as much as 40 or 50 feet. When the rappeller tries to let the rope feed through the rack, the rope zips through the rack fast enough to "sing," but the rappeller does not move. The fall is arrested by the rope and there is just enough friction from the ascending rope to hold the rappeller's position relative to the cliff. It is very disconcerting to hear and see the rope singing through the rappel rack at high speed and then look at the cliff wall and not be descending. Of course, the subsequent fall of 20 or 30 feet when the stretch is relieved is also disconcerting.

Some of the other considerations in this phenomenon are that the stretched rope contracts and stretches during the fall to a slightly smaller diameter and that the rack warms and reduces the friction against the rope. These factors increase both the speed of the rappel and the downward force of the fall. It all seems to happen so quickly that the rappeller will over-compensate and slow the rappel too quickly causing a "bounce" by the sudden change in rappel speeds. The bounce gets worse if the rappeller continues to try to regain control by increasing and decreasing the friction in order to slow or speed up the rappel. This condition needs to be brought under control quickly; it can become very serious. Usually coming to a full stop slowly and then starting the rappel again is the only way to stop it.

Many rappelling at El Cap reported this effect. Just as we reached a smooth rappel speed, we felt that we were suddenly going too fast. When we increased bar friction just a little, we were suddenly going too slow and started to bounce from the extreme change in rappel speeds. A number commented that it felt like "zip-n-stick." Zip-n-stick can be considerable in the quick accumulation of speed during the zip, followed by the sudden stick when a seemingly small amount of friction was applied. It was very unnerving to some rappellers. Zip-n-stick gets worse the further down the rope the rappeller gets. Another factor in zip-n-stick could be the effect of the wind blowing and/or lifting the rope which either increases the weight/tension or decreases the weight/tension of the rope. Most rappellers had totally calm wind conditions and still experienced some degree of zip-n-stick.

It is almost impossible and dangerous to belay from the bottom on a long drop. If the belayer has a climbing system on and can immediately begin the climb to 20 to 30 feet of rope that the rappeller will stretch down ahead of the rappel and if the belayer weighs enough, then it may be

possible. This is unproven in the field. However, if the rappeller does not have near enough bars in place, then there is no chance of a belay. This means that the chances of belaying a rappeller with only 3 bars engaged -- or 4 bars with 2 spacers -- are not good, even if the belayer is able to climb all the stretch out of the rope and get full body weight on below the rappeller. The person attempting the bottom belay is directly in the line of a person falling at a rapid speed. It might be possible to rig a re-directional pulley at the bottom that would allow a safe attempt at bottom belay.

When the opportunity presented itself to rappel off El Cap with camp packs rather than hike out, most of us who were camping on top chose to rappel with our camp packs. This was accomplished by rappelling over the lip without the pack and returning the weight of the main line below the rappeller. Then, before we removed any bars from the rappel rack, the camp pack was lowered down to us using a separate haul line. The packs were attached to our rappel rack -- not the rappeller via the seat harness -- with a biner and tether long enough to allow the pack to be positioned away from the rope. Because the camp packs added 35 to 50 pounds of extra weight to the rappeller, we gave due consideration to individual rappel rack configurations of bars and spacers. Generally, the extra weight caused another bar to be necessary throughout the rappel.

A NOTE FROM GROUP MEMBERS

We all learned new things before and during our trip to Yosemite, and we hope readers find some things to think about in this article. We hope this will help someone plan a safe, fun, long rappel. We cannot overemphasize how powerful both prior planning and actual practicing are to the safety and realization of the goal.

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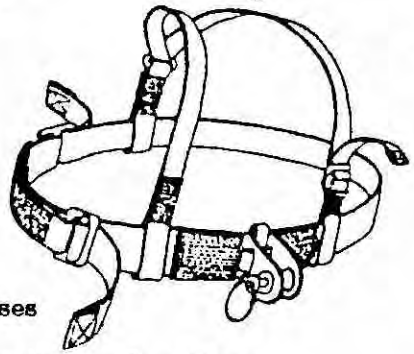

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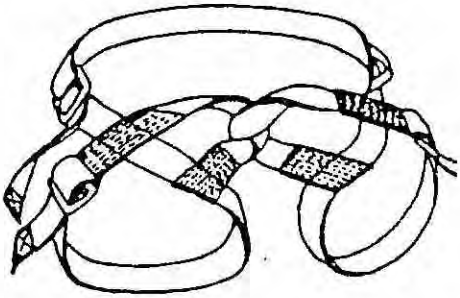

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The Climbing Contest, Workshop, and Rebelay Course at Convention

Let's Look at Reality

by Bill Bussey

For quite awhile some people have been saying that the Vertical Contest at the NSS Convention should be replaced or restructured because it does not represent "real caving" under real climbing conditions. Several letters over the years to the NSS News and Nylon Highway have expressed this view. Most recently, Diana Gietl's letter (NSS News, November 1993) and Bill Storage's article (NSS News, July 1993), as well as others have called for replacement and redesign of the Vertical Contest and Vertical training at the NSS Convention. However, they may not be looking at reality.

The reality is the Bill and Miriam Cuddington, along with all those Vertical Section members running, staffing, and participating in the rope climbing contests, are doing what they want to do. They don't want to do training instead of the contest. They all believe in training mind you. Many do a lot of training at convention and on the grotto level. The contest is just one of their many contributions to the NSS. They are giving of their valuable convention time to run a contest the way they want to run it. For them it's not a waste of time. It's a labor of love.

The reality is most of the people running and staffing the contest spend most of their convention week at the contest, working on prizes for the contest, Vertical Section meeting and Session, and Vertical Techniques workshop. They have precious little time for anything else. Some of these people haven't made it to a complete paper's session or Section meeting, other than that of the Vertical Section, in years. Though they want to, they don't even think about caving during convention week.

The Vertical contests have been run essentially in the same manner, by essentially the same people, for twenty years. New people come and go, making their contributions along the way. But the Cuddingtons and several other people have been organizing and running the contest from Day 1. Every year, Bill begs for staff, as well as thanks his staff for the contest, at the Vertical Section meeting. Sometimes staffing is hard to find. Bill and other contest organizers know how to rig varying facilities because of these years of work and experience. Convention staff, contest participants and contest staff generally also know what to expect. They know the contest is as much a fixture at convention as the photo salon, exploration sessions, and awards banquet.

Times have come down, new techniques and new skills developed, and a lot of people have learned something about safe Single Rope Techniques. There is a "whole lotta training going on" at the contest. The reality is a lot more people than you might think compete in the same climbing gear they use for caving. Heck, most people can't afford a completely separate racing rig. Contrary to some opinion, most climbing contestants can climb quite well underground thank you.

Sure, the climbing contest is as about unrealistic to "real caving" as auto racing is to "real driving." But millions of folks pay a lot of money to enjoy auto races. And a lot of cavers enjoy the climbing contests at Convention, SERA, TAG, OTR and other places. You can thank the contest for the development and popularization of Gibbs ascenders, PMI rope, and helical knots. But like Champion Spark Plugs and STP do for auto racing, "unrealistic conditions" don't stop PMI from supplying ropes for the contest. They must see some good in it.

Another thing to note, the Ukrainian Speleological Association organized a US style rope climbing contest this year. They liked what they have seen and read about our contest. Also, I've heard unverified reports that there have been 30 m climbs using the Frog system in under 60 seconds in contests in Europe. That beats anything done here so far. Europeans may be complaining about our contests being "unrealistic, with no educational value", but like the development of Single Rope Techniques, they sure seem to be copying us and organizing their own.

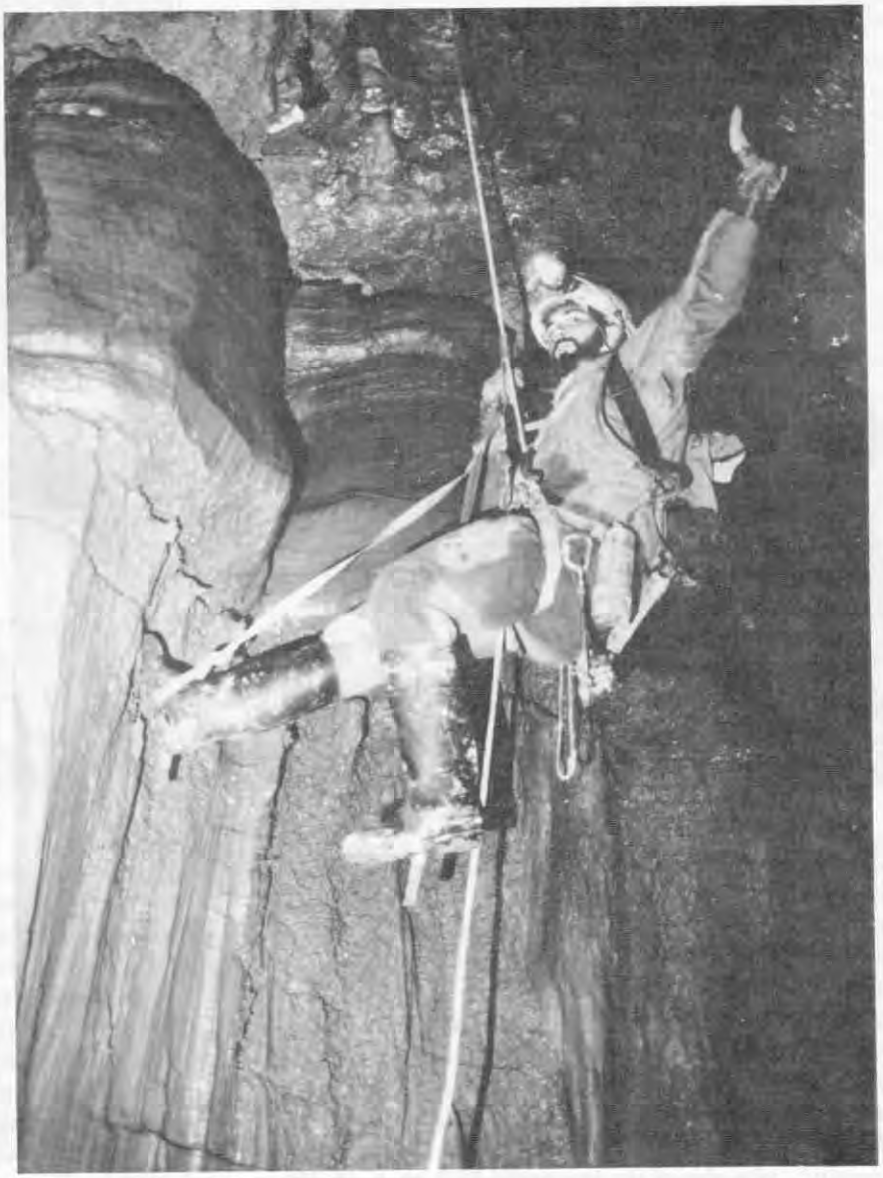
Another reality is, we have a Rebelay Course. Those organizing it, usually staff the climbing contest, as well as doing other Vertical Section activities, so they don't really have time for it. However, they make time for it. They give a hoot.

Give the job to the person who doesn't have time for it and it will get done. Because the Rebelay course is so new, finding a place for it at most conventions is quite tough. The organizers are doing it because you Vertical Section members asked for it. However, trying to find knowledgeable, or even novice staffing to organize, set it up and run it is like pulling teeth. Where are those who have been screaming for a rebelay course or contest for years, when we need them?

The Vertical Section will gladly support anyone or group who wants to set up demonstrations or training at conventions as Diana describes, or alternative rebelay or self rescue contests, as Bill describes. You need gear, we'll buy it. You need staff, we'll do our best to get them. You need space and time, let us know about it ahead of time and we'll try to get it. You can run it pretty much as you please.

However, like Bill and Miriam Cuddington do with the climbing contest every year, and just like David McClurg does with the Vertical Techniques Workshop, just like Gary Bush does with the Rebelay course, just like I do with the Vertical Section meeting and just like Maureen Handler does with Nylon Highway; be prepared to spend a lot of time before, during, and after convention to organize and run it. Be prepared to consistently be at each convention, year in and year out, to grow it into as much a fixture there as the Vertical contest, the photo salon, or US exploration session. It's not easy, but it must be worth it, because these people keep coming back with smiles on their faces, year after year.

The reality is we don't seem to have enough people willing to give a hoot to do the work needed, to lead the organization of what would be now alternative contests and training. At the moment, everyone who has been leading contests, workshops and the like, are too busy leading them. In an organization of over 1100, I think there should be at least a few others who would be interested in caring enough to lead and organize alternative contests and training. If you want these things to happen, please come forward and put your leadership and time where your pen or mouth is to help us all be better cavers and Single Rope Technique users. WE NEED YOU!



Troy Keith climbing frog Dumbat Cave, Marion County, Tennessee

Photograph by Maureen Handler

Military Fast-Roping

by Duncan Lill, ex-Staff Sergeant, U.S. Army Special Forces

What's more fun than falling and just as fast? It's Fast-Roping, a very old method of descending a rope that the military is taking another look at. Fast-Roping is the term for rappelling using only hands and legs wrapped around the rope. Think of firemen sliding down a pole and you've got the concept.

Of course you're saying, "That's the stupidest thing I've ever heard of!" But let's take a look at the situation. Here's a true story: Picture yourself somewhere in Europe in the back of a helicopter flying NOE (nap of the earth) at 0200 hours. Certainly it's a deserted moonless night, too bad it's not also raining. You fight back your nausea from the pilot's crazed flying as you barely make out the other faces in the dim red light. The rear of the chopper is open, like a menacing black hole, with a rope sack right on the edge. On command, you stand up (no little feat with an 80 pound pack, rifle and gear) and shuffle to the door. When it's your turn, you grab the rope in your arms, attempt to wrap legs around it, but fail of course because the rope is being dragged away from the chopper. Now you're out and you realize you're going way too fast. You never went this fast in practice! But then you never had this much weight on your back in practice. Only time to mutter one quick prayer- "Oh, Lord, don't let me break a leg and be laughed at the rest of the night!" Not to worry - even if the rope didn't actually slow you down, at least it kept your head above your rear. You land on your pack and that breaks your fall (along with all the breakables in the pack). Of course, the ground slopes away precipitously and so after the initial thud, you're now flopping around headed down hill until you ungraciously come to a halt not too far from everyone else. At least you don't use the barbed wire fence to stop your fall like some of the others! Miraculously, no one is hurt...the mission can continue.

Sounds like fun, eh? Actually it is fun, just too much margin for error. In the context of being shot at by bad guys with automatic weapons, however, the margin for error is acceptable. Rappelling is safer, but the problem is getting unattached from the rope instantly and without fail. On a figure eight or carabiner wrap, we usually let the whole rope run through the friction device to get off the rappel. This must be done instantly or the guy on the next rope will break his fall with your head. Getting stuck could be an unrecoverable situation with the chopper moving forward. Unlike rappelling, only one rope is needed to Fast-Rope and so there is no other rope to get tangled with. Remember, the chopper usually has a forward speed which pulls the rope and dramatically increases the chances of error. There is no extra friction devices to carry

or clank. Therefore Fast-Roping is simpler and so may be the safer choice. These are several reasons why Fast-Roping may prove to be the technique of choice in certain military situations.

The technique is simple. Attach a fuzzy, laid, two and a half inch diameter rope to a rig point on the ceiling of the rear of a good sized transport chopper (chopper not yet available at Bob and Bob's). The jumpers wear helmets and thick wool gloves with overmitts. Or hands serve as friction devices, so getting unattached is not the problem (staying on is the problem). The gloves insulate the hands well for these short drops. After the first few seconds, you can't really stop, just more or less control your descend. In practice, if the chopper can hover motionless, it's no problem to wrap both legs around the rope for sufficient friction. On a real mission, however, the pilots get jittery, so the chopper has some forward speed. This causes the rope to drag back, making the hands the only point of contact. As long as the drop is less than about forty feet, this works fine. You don't build up too much speed on the way down, and you land somewhat comfortably. Higher than that, however, the speed keeps increasing and the drop becomes considerably more dangerous.

In conclusion, Fast-Roping is an alternative to rappelling in those situations in which you're under hostile fire (like an irate landowner). It's cheap, fast and elegantly simple. It has good application to certain military situations, but probably not any civilian ones. Now if I can just figure out to get a chopper into Ellisons...

Equipment Evaluation

New SMC Steel Figure-Eight

by Tom Moss

I bought one of the new SMC steel figure eights a few months ago. Yes, I know it's a dead device, but I can rappel pretty well with it anyway. If it were alive, it might object.

I've used a figure eight for years on shorter drops (less than 100-150 feet, depending upon body weight) and like it because it's small, simple and lightweight. My rack is perfect for deep drops and is the best all-around rappel device, but I'm just not interested in hauling a rack underground for a short in-cave drop! However, the aluminum eights do wear out quickly, particularly on dirty rope, and I've been on the lookout for something comparable in steel. The Swiss-made Bachlie (aka Seilbremse) is a great device for these kinds of applications, but not available in this country to my knowledge (If you know where I can buy a Bachlie, please let me know!). However, several steel figure eights have become available recently. The most appealing to me from the size perspective was the SMC.

My old aluminum 8, made by CMI, is 5.5-inches long and 2.85-inches wide. It has two round holes, one 1-inch in diameter for the seat attachment, and one 1.75-inches in diameter for the rope. The thickness of the material varies from 0.4-inch to 1-inch at the waist, but at the point where it's most deeply grooved, it's 0.4-inch thick and the groove is about 1/3 of the way through. About time to retire it! The device appears to be made of cast aluminum, and the weight is 4.25 ounces.

My new steel toy is 5-inches long and 3.7-inches wide. It appears to be made from three pieces of approximately 0.35-inch diameter stainless steel rod, with five welds. The main piece is bent to go all around the circumference of the device, and is welded at the top. There are also two smaller pieces that are welded to the longer piece on the inside, and divide the eight into three holes. The attachment hole is U-shaped, and 0.75-inch by 1.1-inches. The center hole is hourglass-shaped, and is 1.5-inches long, varying in width from 0.75-inch to 0.45-inch; this center hole looks like it could be used as a Sticht plate with a carabiner. The large hole on the business end is shaped like a human ear, and is 1.35-inches by 2.9-inches. The weight of the device is 7.25 ounces. What all the above is saying is that the SMC steel figure eight is about the same size as the standard small aluminum eight, a little heavier, but made of thinner material.

OK, now for the important stuff, performance. After five cave trips, doing 16 in-cave drops and 6 entrance drops totaling 745 feet, I find that I like the SMC eight very much, especially on clean rope. I tried it on PMI max-wear, PMI flex and Blue-water II for drops ranging from 11 feet to 104 feet. Most of the rope was clean, some was new and fast, but some had been hanging in-cave for over a year. There was no noticeable wear on the steel figure eight after all this.

The steel SMC has more friction than the aluminum eights, probably because of the smaller diameter of the material, and the wide design of the top hole, which tends to make the rope take a different path through. The device tends to sit cocked to the side while rappelling, not straight up and down like the aluminum eights that I have used. The rope goes more through the sideways long axis of the large hole.

I think the increase in friction is in general a good thing, but on a very dirty rope, it can be a pain in the butt. I had to feed for all 100 feet on one pitch, but this was the only drop I encountered serious problems with. You shouldn't let your ropes get this dirty anyway, and I shouldn't either... The 100-foot drop was rigged with the same rope on three different occasions; on the first it was clean, by the third time it was very dirty, having a consistent coating of mud and bat guano. The rope should be washed after every use on this pitch. I wonder if a steel eight can be rigged like a Bachlie for lower friction in situations like this, sort of like a single crossed-carabiner rig. Hmmmm...

One other possible problem with this device that I've been unable to quantify is an apparent increase in the twist that is put into the rope; i.e. the steel eight seems to put more twist in than the aluminum one does. This is most apparent

when you've got extra rope on the ground at the bottom of the drop.

On a soapbox! This twist is not permanent, comes out in the wash, and doesn't damage the rope, but it can cause one to spin sometimes while on rope. Following Steve Knutson's officious pronouncement in the last NSS Accident Reports that "The Figure Eight is Dead", I would like to see someone do controlled studies on the long-term effects of using figure eights, and put some hard data into this opinionated discussion. I haven't seen any permanent kinkiness, nor any damage to any of my ropes that I can attribute to using figure eights. One person's opinion, based upon twelve years of vertical caving and many, many rappels using figure eights, racks, etc. Off soapbox!

So my feeling is that the SMC steel eight is a valuable addition to my vertical bag of tricks. Being stainless steel, it doesn't rust. It seems to be very robust and can possibly be used for Sticht-plate style belaying in addition to figure-eight style belaying and rappelling. The size is comparable to aluminum eights, and the increase in weight is acceptable to me, considering that the device should last a lot longer. Another important consideration is that this friction device will not get aluminum dust on the rope.

On the down side, there are the problems with excessive friction at times, and possibly increased twist to the rope. Let's hope there's always a down side to rappelling; it keeps us looking for the perfect friction device.

Gravity; it's not just a good idea, it's THE LAW...

Editor's Note: I purchased one of these figure eights a couple of years ago. I was tired of buying a new aluminum figure eight after every 2 trips into Scott Hollow in West Virginia. Our trips included five rappels all less than 32 feet, usually on muddy rope. The new steel figure eight worked beautifully on very stiff, very muddy ropes with no appreciable wear (Figure 1) versus a few training rappels and two Scott Hollow trips on an aluminum figure eight (Figure 2). Until I see some hard data on how destructive figure eights are claimed to be on rope, I'm sold!!!

Figure 1: The Stainless Steel Figure 8 after some practice and one trip to Scott Hollow.

Figure 2: An aluminum Figure 8 with approx. 500' training use and 2 Scott Hollow trips.

Belays, Fact or Fable?

by Michael A. Payne, NSS 36371

Belays and their uses I believe to be one of the most misunderstood aspects in rope related operations, both sport and rescue. All belays have positive and negative properties, uses and misuses, strong points and limitations. In this article, I will try to cover some of the more common belay techniques in use today and their qualities.

First, let's start with just what a belay is or is supposed to be. A belay is a method of preventing a fall or catching or bringing under control a person who has lost control or become injured while on rope. Belays are used when ascending, descending or crossing areas while attached to a rope.

Now, let's go into some of the different types of belays. First, the bottom belay; probably one of the most used and misused types. The attentive belayer will be at the bottom of the rappel area with the rappel rope in hand and should be closely monitoring the rapellers progress as he descends. If the rappeller has an emergency, such as loss of control or possible injury, all the bottom belayer should have to do is pull on the rappel rope, tightening it, thus putting more friction on the rappeller's descend device, slowing them down or stopping them. The belayer should not yank down forcibly on the rope. Yanking down on the rope of an out of control rappeller, who may descending at a very high rate of speed could cause severe injury, not to mention shock loading the system. Are your anchors bomb proof or are they just a couple of expansion bolts set in the rock, such as in the attic of Fantastic Pit in Ellisons Cave? The forces of a mass travelling at a high speed and being brought to a sudden stop can be extreme! You could also cause further injury to an already injured rappeller.

On the positive side, the bottom belay is very easy to teach and to manipulate and it gives good control on a properly rigged rappeller.

On the down side, the bottom belay is useless on an anchor or rope failure. It can be dangerous to use around sharp edges. It is useless if the belayer is not paying attention to what's happening above. The bottom belay may have limited or no effect when the rappeller is improperly rigged on rope or is using modified equipment in some instances. We also need to take into consideration that on very long rappels, there will be more rope stretch to contend with. Another point to consider is that the bottom belay can put the belay person in the fall zone of equipment, rock or people.

Next let's cover the top belay. This technique can be used for ascending or descending and is used quite frequently in teaching beginners and in rescue work. It consists of tying a rope into the harness of the person who is preparing to rappel or ascend on a separate rope. The opposite end of that rope is then run through a belay device and securely anchored. As the person on rope moves, the slack is either taking in or let out, as needed, by the belay person. The amount of slack in the belay should be kept to a minimum.

A few examples of devices used in top belay systems are Sticht plates, figure eights, munter hitches rigged on a locking carabiner or prusik minding pulleys rigged as a tandem prusik belay. There are numerous other devices being used, but may aren't feasible for belaying climbers as well as rappellers. A good example is the rappel rack, which works well for belaying rappellers, but not for climbers because the slack can not be pulled up through the rack fast enough, especially when the climbers are using modern rope walker systems that hold 100 foot climbing records at under 30 seconds. Devices to stay away from for belaying are ascenders. They are not designed, intended or warranted for this purpose. There have been cases of rope failures from falls of as little as six feet because an ascender pinched or cut through the rope. I have witnessed this in drop tests on several occasions. Ascenders are for ascending!

On the plus side of the top belay, the person on rope is protected in case of a main rope or anchor failure, providing the belay person is being attentive and the belay device is rigged into a separate anchor.

On the negative side, your system can get tangled up if the person on rope spins around. This is more apt to happen on long rappels or ascents that are in excess of 200 feet or if rappelling with a device that twists the rope, such as a figure eight, but could happen anytime. Also the top belay requires more equipment and an

additional rope. For a 500 foot rappel you would need in excess of 1000 feet of rope. Note: If using a tandem prusik belay, it is advisable to have a load releasing hitch (LRH) or mariners hitch rigged into the system.

The third type of belay is the self belay. This is done by attaching a belay device to the rope just above your descending device when rappelling or in an unlimited number of ways while ascending. Care must be taken that the device, when activated, will not be out of reach or damage the rope. Commonly used devices are shunts and three wrap prusik hitches when rappelling and Jumars, Gibbs and expedition ascenders when ascending. When using shunts, you simply let go of the device to activate the belay and tug on a piece of accessory cord or webbing to release the belay. Spelean shunts may or may not need to be held open while rappelling. If rigged with a heavy steel carabiner, the shunt should free wheel on the rope until the cord that is attached to the harness is pulled. A pull on a cord or the webbing gets you going again. When using prusik hitches for self belaying, you hold the wraps and keep the cord that is attached to your harness slack until you need to stop. Then you simply let go of the wraps which will grip the rope. When using prusiks, make sure that the hitches are properly dressed and without slop between the hitch and the rope. Once activated, you must be able to get your weight off the hitch to release it. This can be done by stepping on an additional, longer accessory cord that is attached to the rope, or by using a foot wrap to step up in. The ascenders used when rope walking grip the rope when progress is stopped or when downward pressure is exerted on them. When rope walking, the climber is, for all practical purposes, on a self belay.

On the positive side, self belays are simple to use and very reliable when used properly. The descending device you use will help dictate which belay device to use.

On the down side, you have no protection from anchor or main line failures. Also, belay devices may cause damage to your rope if engaged during a high speed rappel. Another key point is that you may have to release the device you're holding in order to engage it. This is not a natural act when falling and many people have cratered in at the bottom still holding a prusik hitch.

Next, consider the climber's belay or hip belay which is used primarily by rock climbers and often misused by others. A lead climber, once at the top of a pitch, will turn so he is facing the climber that he is to belay, take the rope, bring it around behind him and over his hips keeping one hand on the loaded side of the rope and the other hand on the loose side of the rope to pull in or let out slack as needed. When the climber takes a fall, the belayer will take the hand holding the loose end of the rope and quickly bring it across the front of his body, thus using his body as a friction device and hopefully arresting the fall. To some of us this belay may seem totally off base. But with the direction that modern rock climbing is taking with many climbers free climbing with absolutely no belays or protection in place, I say any belay is better than no belay at all when climbing.

The hip belay is also used when top roping climbers. This is done from below the climber instead of above. A rope is usually tied into the climber's harness, run to the top of the of the climb, through a pulley or carabiner and then back down to the belayer who will be providing the hip belay.

Top roping is also done with the belayer using a belay device such as a Sticht plate, tuber or munter hitch for example, instead of a hip belay. It is much safer if the belayer attaches the belay device to a solid anchor instead of to themselves. People are not recommended for anchors at any time. Hip belay are primarily used for sport and should not be used in rescue work.

On the plus side, the hip belay requires no extra equipment and is easy to teach and operate.On the negative side, it uses people for anchors, can put the belayer in the fall zone and gives no protection in case of a rope failure.

Another type of belay that has come into use has been called the auto belay. It involves taking the rappel rope and tying a slip knot into it about six feet above the ground or, in the case of a very long rappel, high enough above the ground to stop a rappeller before he hits the ground due to rope stretch. The ides is that the out of control rappeller will be stopped when they hit the knot. Then someone from below can come up the rope and hopefully pull out the slip knot, if it is not jammed into the rappel device and allow the rappller to descend.

On the plus side, the auto belay will keep people out of the fall zone and it requires no extra equipment.On the down side, it can cause a shock load to the system. It will not work if the slip knot is tied upside down. The knot can be pulled through many devices, such as rescue eights. The knot may become jammed into rappel racks and it gives no protection in case of an anchor failure.

Another variation of the bottom belay is the double rope rappel with a bottom belay. Simply stated, a person rappels with two ropes going through their descender instead of one and uses normal bottom belay procedures. The two rappel ropes should ideally be tied into separate anchors and the ropes must be the same size. This technique will leave the system still intact in case of a single rope or anchor failure.

On the up side, this technique can sustain an anchor or rope failure and keep the rappeller intact. I know of some training facilities that use this technique with two 1/2" ropes, not just for safety, but also to slow down the speedsters. It is nearly impossible for the average size person to rappel quickly on two 1/2" ropes running through a figure eight.

On the down side, it still puts the belayer in the fall zone, it requires twice the amount of rope to set up and it is very hard to teach good rappelling techniques when the rappeller has to forcibly feed the rope through the descender due to excessive friction and rope weight. Note: The two rope technique may be more manageable if using smaller diameter ropes.

An while on the subject of 1/2" ropes, which is safer or has the greatest safety margin? Rappelling on a single 150' length of 1/2" rope rated at 9000 lbs. or taking 300' of 3/8" rope rated at 5800 lbs., doubling it and anchoring the lengths to separate anchors. The combined rappel rope strength is now in the 11,000 lbs. ball park and if either rope or anchor fails, you will be supported. I'm not suggesting that everyone should go out and buy 3/8" rope, I just mentioned it to give some food for thought.

Just for your information, fire fighters, for the most part, are using 1/2" or larger diameter static kernmantle ropes. Cavers generally use 7/16" static kernmantle ropes. The majority of rock climbers that climb with protection are using 10 to 11 mm dynamic kernmantle. And expedition mountain climbers have been know to use from 6 mm to 11 mm dynamic kernmantle ropes, depending on how much weight they are planning on carrying and the safety margin they wish to maintain.

The techniques listed in this article are by no means all that are being used, but are some of the more common techniques being used today. Also, this article is not meant to be an instruction guide for the techniques listed, but is to be an informative and comparative article. It is recommended, that no matter what technique you use, that you should seek and receive competent instruction in its use. There are also a great number of publications available covering these techniques.

What it comes down to is this. Is there really any one belay system that will be 100% suitable all the time, in every circumstance and still maintain system integrity and practicality? Not that I know of. Maybe if several techniques were used together. And if we do that, will the system be feasible or practical to use? What is the practicality of trying to top belay off of El Capitan or rappelling on two ropes off of the New River Gorge Bridge?

It's a fact that all of these belays have their uses. It's a fable that any one of them is 100% effective and practical for every instance. Therefore, it is in our best interest to become familiar with several techniques and to know when and where to use them.

Some last thoughts. I believe that if we all were to use our belays, but think and operate on rope as if there were no belays, we would all perform in a safer manner.

Also, when we are training or practicing, as we all should do to become proficient on rope, we should do it exactly as we would any other time. If you belay during an actual rescue, then you should belay in practice. If you use a shunt when caving, then use one when practicing.

Last but not least, the next time, before you get on rope, back up to the edge and put your weight onto it, ask yourself a question. Am I really on belay or just going through the motions?

Off Rope

Weybridge a la Mode

by Peter Grant

Click-pop...click-pop. The sound of Quebec cavers as they try to keep their Petzl ceiling burners going. A friend from Montreal stopped by with two fellow students on the way to Weybridge Cave. I hadn't been there for some time, so I went along for a quick trip. It's only 8 miles from my place and they wanted to get back to the big city before the big evening traffic jams.

Patrick, the leader, mentioned that he hoped I wouldn't be too upset with the time they take rigging the cave. I explained the main problems of the two drops, so they brought two ropes. There was a locked gate into the cornfield and a sign saying no motor vehicles with a picture of an ATV. We parked out of the way on the road, as best we could, thinking that the corn had been cut and no one needed to come in again until spring. At the cave, there was much changing into French caving suits and big carbide outfits, etc.

I waited 2/3 of the way down the first drop, as they rigged it. They like to have two anchors, so the rock spur wasn't enough. The existing bolt was in US threads, so they had to drill another for a metric bolt. A short way down, it was time to put in a 'deviation' (the British call it a rebelay). It was hard to find a place. One of them was climbing all over, without a belay, looking for a place to put a climbing nut, to make the rope safe and so it wouldn't chafe on the rock.

They finally rigged the deviation at about the level where I was, but I was now down at the main drop, watching the rigging of that. Again, US versus metric threads and the hanger was thin, and not strong enough to hold a jeep as theirs are, so another drilling and a lot of click-pops. Again, one went above to place another anchor. He placed a chock just over the drop. With that anchor, the drilled anchor and an existing bolt, used to deviate the rope over the hole, the rope was ready. They didn't want to use the 4x4 timbers either. About six of these were near the rigging point. Patrick went down about 10 feet and stopped.

Is he putting in a deviation? I had hoped I could go down without having to cross a deviation. I talked him out of it. Now to squeeze into the hole and get down. At the bottom, we looked into where the water went, when there was some. I had never been in there even though I had been in the cave many times - just a muddy crawl - yecch. But, no. There was even walking room and some real live formations, like a 3-inch stalactite and something like popcorn on the ceiling. Wow.

Back at the rope, Guillaume was getting ready to go out. Patrick went up behind the big rock, so I told him about rock climbing out. He started on out, up the rock, over to the wall and on up, so I reminded him to put an ascender on the rope as a safety. Further up, he stopped to put some protectors on the rope to stop any possible rubbing. I tried to tell him that he had missed a large part of the cave, but I guess the clock started to chase him. Rock climbing out is a lot easier than rope climbing against the wall, but Guillaume and Matthieu frogged it out. One problem I had though, is my folding Gibbs was not fully closed, so a few feet up the climb, I had to put it back on the rope and close it right.

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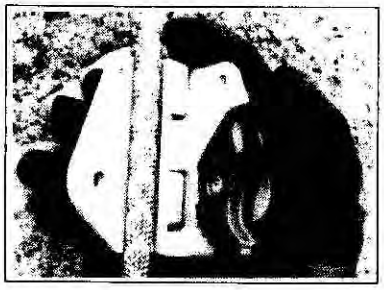

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Ukrainian Cavers Run American Style Climbing Contest

by Alexander Klimchouk

In July 1993, the Ukrainian Speleological Association held a ten day training seminar on advanced vertical techniques and cave rescue in Tchaturdag Massif, Crimea Mountains. About 80 cavers attended this seminar from all over the Ukraine, Moscow, and Ural (Russia). Teresa Williams of Atlanta, Georgia also participated.

The seminar provided advanced level education and training for cavers in the following specializations:

- Standard SRT (European style)
- Dome and Wall climbing
- Cave Rescue

At the end of the seminar all students participated in an American style climbing contest. Teresa Williams acted as judge and advisor to assure that all conditions would be comparable and compatible to those in the American contest. The contest was run with only two categories: 30 meter Mechanical, which like the American contest had the most contestants; and the 30 meter Open Sit-Stand. The list of records are presented here. This was the first time any of the contestants had ever climbed in a contest. Thus, with more practice and training, they have good potential for improving their results. Ukrainian cavers plan on running climbing contests on a regular basis and will send the results to the Vertical Section.

Climbing Contest Ukrainian Records

Men's Mechanical

Age	Name	From	Time
13-16	Lubomir Jasynsky	Poltava	0:47
17-19	Oleg Klimchouk	Kiev	0:40
20-29	Igor Khil'ko	Ivano-Frankovsk	0:40
30-39	Konstantine Tsurikov	Simferopol'	0:46
Overall	Oleg Klimchouk	Kiev	0:40
	Igor Khil'ko	Ivano-Frankovsk	0:40

Men's 30 m Open Sit-Stand

0-12	Andrej Lukjanchouk	Kiev	2:09
13-16	Denis Klimenko	Kertch	1:50
Overall	Denis Klimenko	Kertch	1:50

Women's 30 m Mechanical

13-16	Julia Smoljakova	Simferopol'	1:14
17-19	Katherina Gonchar	Kiev	2:18
20-29	Larisa Karionova	Zaporozhje	1:30
40-49	Nataly Joblokova	Kiev	1:39
Overall	Julia Smoljakova	Simferopol'	1:14

Women's 30 m Open Sit-Stand

30-39	Ludmila Lukjanchouk	Kiev	2:20

by Teresa Williams

I acted as an advisor -- more or less-- to make certain all the rules and conditions of this contest were as close to NSS standards as possible. However, there are some factors you need to definitely aware of:

We used PMI rope, but it was not even close to virgin. It was a well-used piece of cave rope. I climbed it on my knots and was a good 30 seconds slower. Only one timer was used (instead of three as in American contests) and times were not recorded in fractions of seconds. We used my standard American rack for a spool. The rope travelled through a pulley about 20 feet in the air attached to a tree branch.

Other factors I find of interest or importance. These guys usually climb Frog in real caving. On occasion, they will add a foot cam. Thus, they basically have no previous experience with a Ropewalker system. Bearing this in mind, realize that they were busily assembling these systems by trial and error during the course of the contest. Also, no one had a chest plate. The best option for some was a roller with slots on the back to put webbing through and tie on with a makeshift harness.

Considering all this, I am extremely impressed. These guys are really strong and fast, and they'll only get better. The only regret I have is that they were too much caught up in just plain speed to give a good go at competing with the Frog system. With lots of caving experience using the Frog system, they are "fine tuned" with it. Using it, I think they could give a very strong showing.

El Capitan, July 1993

by Eric Esterson, NSS 32575

Our Expedition to El Capitan consisted of four members from the Central Florida Cavers grotto. The team members were Patrick Newman, Jamie Rogers, Kris Esterson and myself. We were well aware of the unfortunate situation that had unfolded on the 1992 trip and were determined to make every effort to prevent any mishaps or injuries.

With the small size of our team, we spent many hours training until each team member could perform all the tasks that were required of the other team members. El Cap requires a serious amount of prior planning and I feel that planning and training are the keys to a successful trip.

Six months prior to the departure date, we began to accumulate the gear needed for a long rappel. We decided to use PMI 7/16" Maxi Wear rope. Custom racks were made, with most of us using 21-inch racks, (14 inches working length) with six CMC stainless steel bars and a cylindrical grooved top bar. This heavier top bar proved to be a mistake, as it retained an extreme amount of heat. We experimented with two types of safety shunt, one using a Gibbs ascender and a Petzl shunt. We chose the Petzl due to its ease of attachment and controllable action.

Practice during the months of March, April and May concentrated on familiarization with the longer racks, placement of the shunt and setting up the mechanical advantage system for the haul line. Early in our preparation, we had planned to bring the main line up from the bottom using 5.5 mm PMI accessory line. We tried to simulate the environment of El Cap by using a weighted rope for rappels from a tower. A rope weight of 143 pounds was used as an estimate of the actual rope weight we would encounter. Spacers were placed 1 3/4-inch from the top bar and at 1 1/2-inches for the next two bars. Seven bars were used on the rack. The number and length of spacers varied some according to individual preferences.

Working with a rope weight of nearly 150 pounds posed some problems. The mechanical advantage system made rigging in and working the edge easier, plus the ascender below also served as a type of safety. We found that by using 6 bars, one could safely move over the edge, apply rope weight and adjust the bars for the desired movement until arriving at the advantage ascender. One of the biggest concerns was whether bars could be added or removed under load. We found that by struggling, a bar could be dropped, but addition of a bar was hampered by the nut on the short leg of the rack. The bar being added was usually the last one, and it would hang on the nut, causing no problem, except it couldn't be moved up for braking.

Three members of the team made a trip to DeSoto Falls, Alabama, where a rappel of 150 feet can be done, terminating in the water close to shore. Two days were spent there working with equipment and simulating uncontrolled descents and recovery.

One of the final equipment problems was where to attach the shunt. Placing it below the rack worked, but required a hand to keep it from activating and when it did jam, the shunt rode up into the bottom bars of the rack. We attached the shunt to the top of the rack and found it worked fine here. A 2-inch quick link with a 3-inch Blue Water loop gave just the right clearance from the rack. A metal pin was made to insert into the shunt's cam to prevent it from jamming unless needed.

Upon arriving at Yosemite, we met with Ted Farmer and got some very good information about El Cap including an excellent drawing showing the best rigging point at the summit. The main line was moved to the base in four coils and the rigging team left for the summit the next morning. Hauling the main line went smoothly and total rigging time was six hours. We had dedicated one day for rigging and rappels were scheduled to begin the next day.

All of our rappels for the next 48 hours went without a hitch. Drop times averaged 20 to 30 minutes. The mechanical advantage system worked extremely well. We found that adding and subtracting bars was difficult at the start of the rappel, but became easier after only a few hundred

feet. Dropping down the face of El Cap is a definite butt tightener. The structure of the rock changes in subtle ways. There are protrusions, cracks, shadows and ledges which are not visible from the base. The wind is also a factor. You will move sideways 50 or 60 feet being close to the face and them be blown out 15 feet or so. The weirdest sensation is when you are watching the rope flow through the rack and you are not moving down the face, the wind is pushing you up. When the wind slacks, you move down rapidly, until the whole process starts again.

We learned an immense amount of information from this trip. Perhaps most important, is the necessary amount of prior training and planning. Inevitably, there will be comments by others about your equipment, the whole "you're gonna die" spiel. At the time you attach your rack to the main line for a long rappel, many thoughts will be flowing through your mind. This is not the time for doubts. Proper planning and training will enable you to say to yourself "This worked before, it will work now". Once you overcome the mental obstacles and start the drop, you can enjoy the view.

Are You Using Your Safety?

by Patricia Kambesis

Well, are you? One of the most important but often overlooked component of any vertical system is the handled ascender safety. This component consists of a handled ascender (i.e. a Jumar, Petzl expedition ascender, etc.) which is connected to the seat carabiner or maillon by a short length of rope or webbing. When not in use, the safety can be clipped into one of the side loops of the seat sling, keeping it out of the way, but always handy.

The safety has a precautionary function. When preparing to rig onto the rope for rappel, first clip in with the safety, then rig the descending device. Should you slip before completely rigging in, the safety will keep you on the rope. Before you remove the safety, make sure that you are rigged in correctly.

The safety comes in real handy if it becomes necessary to do a changeover (rappel to ascend or visa-versa), for negotiating difficult lips, for crossing rebelays or for resting while on rope.

The safety can also be used for negotiating horizontal traverse lines as long as a carabiner is attached to an intermediary loop in the sling near the bottom of the ascender. When clipping the safety onto a horizontal line, clip on the carabiner too. This will keep the ascender parallel with the rope, a vitally important configuration considering the forces exerted on the rope if it were to be suddenly loaded (i.e. if you slipped). A handled ascender that is not parallel with a rope under load can do serious damage to the rope or it can slip off the line.

For vertical systems with only two points of attachment to the rope, the safety is added insurance should anything go wrong with either of the ascenders.

Assembling the safety is an easy operation. All you need is a handled ascender and 1-inch tubular webbing or rope. You can determine how much rope or webbing you need by putting on your seat harness and hanging from a locked off rack. There should be enough webbing between the seat sling and the ascender such that the safety will reach above the rack.

If you are using rope as the sling material, it can be attached to the ascender with a figure-8 or bowline knot, or with a quick link. If webbing is to be used, loop it through the bottom hole in the ascender, make sure there is 5 to 6 inches of overlap, then sew it up close to the ascender. Or you may tie the webbing with a water knot as an alternative to sewing. The rope or webbing should be inspected periodically and replaced when wear is apparent.

So, next time you get on rope, will you be using your safety?

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New Equipment

Titanium Racks

Howell 'N Man Industries, Inc.

Development History of the "Titan" Racks

by Larry Howell

In late October of 1992, my oldest son returned from the Marine Corps where he was involved with various types of helicopter search and rescue. After returning home, he became involved in our local High Angle Search and Rescue team here in southern Colorado. Having been involved in SAR, climbing and "on rope" experiences most of my life and motivated again because of the son vs. dad syndrome, I re-activated.

After re-familiarizing myself with some of the techniques and hardware, I found that some of the devices, in my opinion over the few years I was away, had not evolved in the area of more modern materials and technology. I noticed that devices in the ascending areas were progressing very well as climbing was becoming ever more popular. However, the device my son was using to rappel on did not strike me as being as safe as other devices. It was very difficult to control, but it was light and compact.

Coming from a rack and brake bar background, I suggested to my son that he should consider this type of descender. No sooner than the words left my tongue, he commented that it was too heavy, too bulky and that people in high angle rescue would laugh him off the mountain. At that point, I interjected and assured him that we would come up with something better, as I did not feel good about the device he was using.

Trained in an aviation background, R & D and fabrication, I put my best efforts forward to refine and develop one step further, John Cole's famous rack. Some people, including myself, just feel absolutely naked on anything else. But my son was right and some changes needed to be made to lighten and compact the unit to make it an acceptable and dependable high angle descender.

The idea of a closed loop micro-device soon developed. Because of being new in the area we were living in, we didn't know a machinist. However, there was a bike shop called "Alamosa Schwinn" and the owners not only sold bikes, but also had a machine shop in the back. My wife, Laurie Anne and I introduced ourselves to the owners, Gary and Carol Teckenbrock. Ideas exchanged and I told Gary of a device I was in the process of developing and asked if he could design and build the gate closure needed to complete the closed loop rack. He replied that he would give it his best shot. He was also machining some parts for the biking world out of titanium and suggested that the frame could possibly be constructed of the same material and I immediately agreed. Since then, Carol has become vice president of Howell 'N Man and has become actively involved in the business in the realm of material gathering, which can sometimes be a never ending battle in the world of titanium and other exotic metals. Laurie, secretary/treasurer for Howell 'N Man and Colorado State University graduate with a degree in engineering could perform destructive and non-destructive testing of our products through the test labs as well as function as general manager of the company.

I now realized that the necessary ingredients were in the mix. Gary Teckenbrock, an excellent machinist; Carol Teckenbrock, coordination and material acquisition; Laurie Howell, our on-site engineer and myself designing concepts and parts.

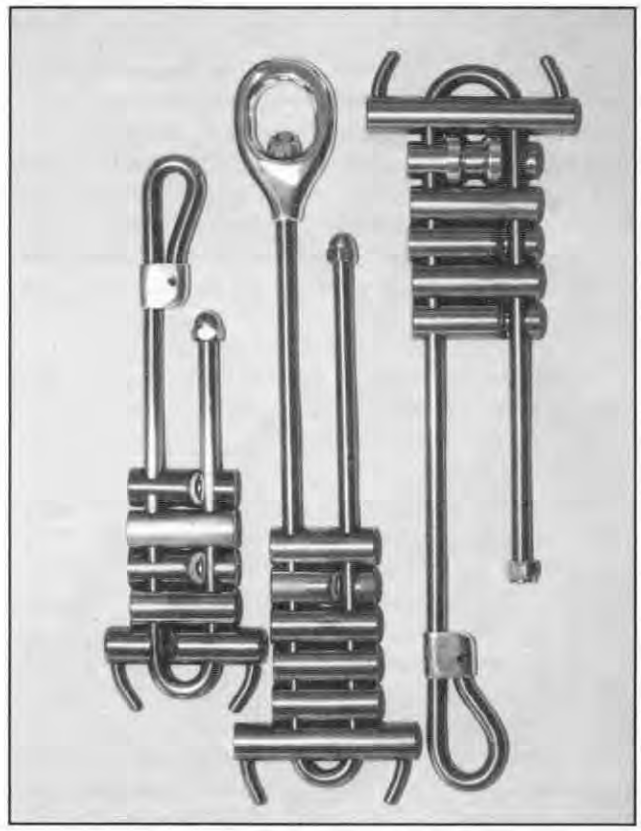
Soon, my idea had developed and the Howell 'N Man TITAN I and TITAN II closed loop racks were reality. Naturally, as with any prototype device, massive testing and further development pursued. Through on rope testing, I noticed that a bottom belay could not be effectively executed due to the fact that the harder a person pulled on the rope from below, the worse the problem became. Because of the brake bars spreading further apart there would be less friction. The Hyper Bar, probably one of the more effective and efficient designs, came to be. After realizing that I could not stop a runaway rack, I conceived the

idea of an extended bar in the top position with a vertical pin on one side. My theory behind this was that if the rope could be routed up and over the top bar, being retained in that position by a vertical pin and then continuing down, not only could an effective bottom belay be achieved, but automatic braking of the bars from the top position could also be a possibility. Gary immediately constructed a bar and me, the test dummy, jumped off a cliff to check out the new idea. It was, to say the least, quite awesome! It not only provided bottom belay capability with an immediate stop on rope, but through testing, I also found out that braking had increased tremendously. In the realm of two fold for every bar that was being used. (i.e., three bars braking with the Hyper Bar engaged would produce approximately six bars braking. Another pin was added to the other side of the Hyper Bar and an effective and simple tie off was accomplished. The Hyper Bar is accessory equipment to all Howell 'N Man racks.

With the closed loop design primarily targeted for high angle and a larger, close tolerance five bar unit designed as an anchor point, litter descender completed, we sent a message, via computer networking, around the world to advise persons of our little TITAN racks. Within two days, Gary Smith of Madison, Alabama called and asked about our device. After several minutes of discussion, I agreed to send him one to try out. This device was not suitable for cavers and Gary did not hesitate in telling me. However, through several months of discussion with Gary Smith and Roger Hailey, the TITAN SPELEO was born and on rope in Madison, Alabama. This brought forth a rack that they refer to in TAG country, due to Gary Smith, as the "New Generation" rack. Someone once said to me, "What more could possible be done to a rack?" and thanks to diligent effort and space age materials, the "Titan Series Rack Type Descenders" are reality.

Jerry Smith, the president of Progressive Rescue Solutions of Rome, Georgia delegated dimensions for what he thought would be a successful open leg rack for rescue purposes. After several months of testing one of our "Titan I Rescue Racks", Jerry seems pleased with its performance and has endorsed the rack for his business.

At the 1993 NSS Convention in Pendleton, Oregon, Bruce Smith approached me and delegated dimensions for a rack he though would be appealing. He was absolutely correct. Weighing in at a whopping 15.5 ounces, The "Bruce Smith Special" is the first titanium SRT rack available anywhere. From this fine little addition to Howell 'N Man products evolved the TITAN 5 Bar SRT Mini-Rack; 12" in length, 2" wide and weighing 13 ounces. The new products designated for SAR will be unveiled in November at the hardware symposium in Snowbird, Utah.



I must also mention that because of titanium's incredible strength, ultra-light weight and dynamic wear capabilities, it proved to us that there was, in fact, quite a bit more that could be accomplished. A rack is not just a rack, it's a concept. Through our efforts I hope we have improved function and safety for everyone in descending situations, that it compliments Jon Cole's original design and it pleases Mr. SRT himself, Bill Cuddington.

We are now members of the NSS and have only been caving a few times. However, we have met some of the most helpful, caring and certainly some of the most interesting people through the caving community and I would like to thank all of them, even the one we haven't had the pleasure to meet as of yet.

A very special thanks goes to those I prepare to mention. For without them, our efforts would have been futile.

Gary Smith and Roger Hailey from Madison, Alabama for their undivided attention, patience and all their comments that gave us the insight to the development of the TITAN SPELEO.

Jerry Smith, Progressive Rescue Solutions, Rome, Georgia, whom I met in Tampa, Florida at the NASAR Response '93 conference, with whose help the definition of the open leg rescue rack came into play.

Bruce Smith, for his amazing insight to our concept. His optimism and humorous outlook on life in general. Being open minded and believing that there is always something else. A special thanks to Bruce for the invitation to the NSS Convention in Pendleton. I wish I could only convey in words our appreciation. Thanks Bruce!! You truly make things happen.

A very special thanks to the members of the NSS for having us attend, listening to what we had to say and reviewing our devices. To all of the board members and especially TAG cavers - thank you very much!

An inside thanks goes out from all of us to Bill and Miriam Cuddington. You are everything we were told you would be and much more. I only wish the rest of this planet were inhabited with folks such as you. It was an honor to meet with you.

To Steve Hudson and Diane Cousineau, thank you for your help and support. It's always a pleasure meeting and talking with you.

To all the other I've failed to mention and also to those who are currently using or plan to purchase TITAN products by Howell 'N Man, we thank you for your support.

Editor's Note: After much correspondence and many phone conversations, I finally met Larry at the TAG Fall Cave-In and was able to handle some of his new equipment. It appears to be a very innovative design. I hope to be able to publish some more technical specifications in a future issue of the Nylon Highway. I am also interested in hearing from cavers using the TITAN Racks. Questions such as: How they hold up under regular caving use? What kind of rope wear is evident on the bars after numerous rappels? and How well do they function with new rope on some of the longer drops such as Golondrinas or El Capitan? I look forward to hearing more about this equipment as I'm sure are most Nylon Highway readers.

A Visit to Candlelight Cave

by Ralph E. Powers, NSS 37616, Timpanogos Grotto, Utah

Candlelight Cave. A name repeated over and over at every Grotto meeting my partner (Eric Malm) and I attended. When we asked a prominent member of our grotto if we could go, we were flatly turned down. Primarily because we were beginners in vertical caving, didn't have our own gear and hadn't proven that we could successfully cave with that gear. All of these disqualifications were for good reason.

So, for the next year and four months, Eric and I devoted a good portion of our free time to learning vertical SRT and purchasing the necessary gear. We then set about to prove that we were capable of descending and ascending on said gear. Then, having done that, we patiently endured almost two months of cancellations on trips that we had signed up for at our grotto meetings. Then, finally a trip that was originally cancelled, ended up postponed and we were going to go. We were excited to be sure, but a little nervous (although we weren't going to tell each other that), and why not? A caver nearly killed himself rappelling into it. But we were going and nothing short of the trip leader (Michael Gomm), ironically the same guy who turned us down flat the first time, was going to stop the trip.

Briefly, Candlelight Cave is a modern name applied to an extensive hydrothermal cave originally discovered by miners in the late 1920's. The cave is located a the 95-foot level in a 260-foot shaft. The cave was rediscovered in December 1991 and has been the focus for the largest cave conservation effort in Utah next to the Timpanogos Cave National Monument Restoration Project. So far, over a mile of passages, pit and rooms have been surveyed. There are, according to the latest reports, still more virgin passages to be found. Access to the cave is through a specially designed steel and concrete gate over the shaft opening from which the 95 foot rappel into a mine drift leads to the cave itself, which has no natural entrance.

My partner and I prepared for this trip pretty well. Extra batteries, film, lunch and what not. We left early in the morning and had only gone a block when we realized that we had forgotten the camera in our haste. Following instruction received the night before, we arrived at the mine entrance where other members of our party had camped out the night before. Saying our greetings and waiting patiently for them to break camp, we kicked around trying to ward off any apprehension.

The preparations to open the cave gate are taken seriously. From two juniper trees located at opposite ends of the gate, safety lines are rigged and anchored which will be used by the person assigned to open the gate. The gate itself is rigged with two short pieces of webbing through which a steel pipe is threaded to facilitate opening the steel plate covering the shaft. Two or three people are needed to lift and pull the steel door away from the opening. A steel frame, used for the vertical rigging, is hauled out from its storage space just beneath the door. The frame is then put into its place astride the entrance.

Two lines are prepared for the rappel. First the main line is tied directly on the steel bar with a traced figure-8 knot. A top belay line is threaded through a figure-8 descender, which is anchored to the gate. A volunteer stands by on belay as cavers make their descent.

The first person down is required to have their entire rig on prior to their rappel for safety reasons and in case he passes the entrance. That person also has the daunting task of being able to stop their rappel at the drift and then swing themselves into the opening. The entire shaft is an 8' x 8' x 260' drop of potentially loose rocks and once you're on the drift, located at the 95-foot level, there is still 165 feet of vertical shaft below you. The shaft bottom is littered with large rocks, logs and scattered debris.

Once safely on the drift, the caver needs to haul up the remaining rope and anchor it to two manmade jug handles some distance into the tunnel, which extends twenty five feet before intersecting the cave. Then attaching a safety to his harness, the first caver edges to the opening of the drift before shouting off rope. This person is then responsible for the bottom belay should it be requested.

Anyone not familiar with the drop is strongly encouraged to have their ascending gear on, or at least within easy reach, before rappelling and all newcomers to this cave are required to have a top

belay. My partner, Eric, was third in line to descend and he immediately experienced problems. His ascending gear was getting in his way and he stopped to make adjustments. While he was doing this, our trip leader and the belayer has noted that my friend was in "freefall" and would have promptly done so had it not been for the top belay.

Eric is deaf and didn't hear this chilling assessment of his situation. When his adjustments were complete, he looked up and nodded that he was ready to continue. He then slowly descended and I watched with interest and morbid fascination until he was swallowed up by the dark. From that vantage point you can't see down more than thirty feet. A few minutes later we heard one of the others shouting "off rope" on Eric's behalf. It was then my turn.

Boy, was it ever. I went through the necessary preparations and before getting off the sitting-start position on the edge, I looked up at our trip leader. "260 feet, eh?" I asked. He grinned and nodded, adding (unnecessarily I thought) "straight down".

"Thanks...I think" I had responded grimly and then shouted "on rope" to the people below, and pushed off. I had to wiggle a bit to get my caving pack off the edge. Once clear, I was able to attend my thoughts to the task at hand. The drop is undoubtedly one of the neatest I've ever done. Thanks to the frame work above, it's a free hanging descent all the way down, so there were no worries about touching the walls and dislodging rocks.

I am not used to having a top belay on me when I rappel and was getting a little annoyed by the belayer inadvertently impeding my progress. (I later learned that the belayer was still inexperienced in performing this maneuver.) At some points, I was able to just sit there, free-hanging while my brake hand was completely relaxed on the rope. The top belay is a hinderance until you look down between your feet and see the remainder of the drop below. All of a sudden, your brake hand tightens and you're thankful for the belay above and below you.

I reached the drift moments later and allowed myself some speed as the bottom belayer pulled the slack into the drift, and me along with it. My feet gratefully touched solid rock and I immediately set about disengaging myself from the rope. Once clear, I stepped cautiously to the edge and shouted "Off Rope!" Eric was sitting comfortably in a spot on the drift and grinned at me asking how I liked it. I could only grin back and shake my head in wonder.

Since this is a written for the Nylon Highway I won't detail the caving/surveying part of the trip. Suffice it to say that Candlelight is fantastically decorated with beautifully colored calcite, gypsum, aragonite needles and a host of other mineralogical formation. Pits abound in this cave with some exceeding 50 feet in depth and there are a reported seven separate levels and dozens of unsurveyed and unexplored passages. Eric and I only spent four hours in the cave with the rest of the party and were allowed to explore the cave, after the initial survey was done for that section, until it was time to leave.

Back at the drift, we set about getting our ascending systems together and choosing the order of ascent. One nice thing about caving with a small group, (there were six in ours) is seeing a variety of ascending systems and their use. After the first person has complected her ascent, our trip leader had suggested that Eric and I climb in tandem to speed thing up a bit.

This was going to be a first for us as we normally go up one at a time and wait for the first to get clear off rope. The main reason we do this is that we are both hearing impaired (Eric is totally deaf and I am deaf in one ear), and should anything happen the communication level between us is limited to near zero. As of this writing, we are still working on eliminating the problem of non-aural communication on rope.

I was elected to go first and had gotten my system on rope. Once checked out by the trip leader, I moved close to the edge. There's enough slack given at the edge to literally walk out over it and step out into empty space in order top put weight on the ascenders to get started. This becomes extremely unnerving as the thought of stepping off a ledge above a 165 foot drop and putting your full faith on your ascending system to keep you there. It's one thing to start off at the bottom of a drop and work your way up, and still another to start at the middle. But by system held and after I hung there for Eric to take a picture, I was dragged back in so he could hand me his camera so I could shoot him as he swung out. I was given slack again and after I was out in the shaft and steadied, I started to climb.

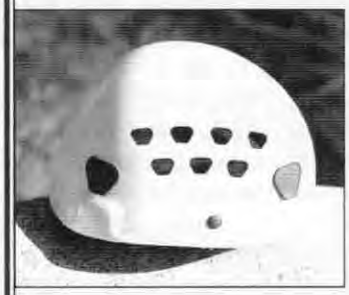
When I reached what I presumed to be the two third's mark, I yelled down where I was and to let them know I was taking a rest. A few sharp jerks on the line told me that Eric was preparing to step out into the shaft. I glanced down just in time to see his helmet and lamp fall off his head and tumble end over end to the bottom. For a brief moment I thought he was still in it. The helmet hit with a quiet 'pok' sound and killed the light (natch!). Eric cursed silently and began his climb up towards me. I managed to get a few shots of him with the camera before stowing it to finish my own climb.

By the time I had reached the knot, I was frazzled. Even with Eric's weight on the rope below me, my system had taken its toll. I managed to get myself up and out of the gate and get my gear off the rope while Eric's weight threatened to pull me back in. At that moment, I had promised to get myself a double bungie system, especially for drops such as these. I love my present system, it's durable, reliable and simple to use, but I realized how tiring it can be after 40 or 50 feet. I did manage to get a good 60 - 70 second pause before continuing, but the level of exertion, especially after 4 hours of caving started wearing me down.

After about 5 minutes, Eric reached the top. His face covered with sweat, I could tell he was thinking about a double bungie system too. We've both trained and practiced on it and enjoyed the ease of effort it requires. Nylon Highway #35's publication of Bruce Smith's article on "Fabricating a System" couldn't have come at a better time.

Still for all the effort, tense moments and long wait, the cave was well worth it. The vertical experience alone is worth repeated trips. The knowledge of potential injury or death can instill valuable habits in regards to safety techniques.

IMPORTANT SAFETY NOTICE



PETZL

A manufacturing defect has been detected in a number of the Petzl AO1 Ecrin Roc helmets

sold since August 1, 1993. Although the defect is not present in every helmet, we are, for reasons of safety, seeking total recall of every unit in the US. If you possess one of these helmets, we ask that you please return it to the dealer from which you purchased it, or send it directly to:

Pigeon Mountain Industries
PO Box 803
4466 N. Highway 27
LaFayette, GA 30728

PMI will refund your surface transport expenses and send you a free Spirit carabiner for your trouble. We will replace your helmet with one which has been factory-tested to be defect-free. We apologize for this inconvenience and thank you for buying Petzl products. If you have any questions or comments, please call our toll-free number below.

1-800-282-7673

Minutes of the 1993 NSS Vertical Section Meeting August 4, 1993

by Bill Bussey

The 1993 NSS Vertical Section meeting and papers session was held Wednesday, August 4th, 1993 at the Pendleton Convention Center in Pendleton, Oregon. Executive Committee (EC) members present were Chairman Gary Bush, Contest Coordinator Bill Cuddington, Vertical Techniques Workshop Coordinator David McClurg, Secretary/Treasurer Bill Bussey, and Bruce Smith and Ed Sira. *Nylon Highway* Editor Maureen Handler and Angela Morgan could not make it to convention. Approximately 60 Vertical Section members were in attendance.

After a short announcement, Gary Bush called the meeting to order at 9:12 AM by introducing the Executive Committee.

Secretary's Report: We have 1179 members. We mailed 1282 *Nylon Highway #36's* in July. Had 115 members desiring representation in the NSS Congress of Grottos.

Treasurer's Report: Total Income: $10692.22. Total Expenses: $9248.05. Net Income $1444.17. Balance of $6853.65. We are now incorporated in the State of North Carolina. Am working on obtaining 501- C3 tax exempt status by the Texas convention.

Gary Taylor moved and Bob Stucklin seconded :"that the Secretary's and Treasurer's reports be approved as presented." The motion passed unanimously.

Editor's Report: Maureen Handler could not make it to convention. Gary Bush and the membership commended Maureen for a super job as editor over the past year. Maureen has received an article in French and some cartoons with Russian captions. She is looking for someone to translate these. Ed Sira mentioned he lived near a Ukranian community. She could send copies of the cartoons to him. There was some discussion on various ways to do translation including professional translation (expensive) and foreign language departments at colleges.

Chairman's Report: The Section is obviously strong and growing. We rely on our membership for Executive Committee members as well as all of our endeavors, including the Climbing Contest, Rebelay Course, and Vertical Techniques Workshop. Please consider participating.

Vertical Session Report: Bruce Smith reported that the Vertical Session was outlined in the Convention *Rag*. Larry Howell and 2 associates will be talking about his titanium racks, and there will be other presentations as well.

Contest Chair Report: Bill Cuddington thanked everyone for help with the Climbing contest. We cannot run contest without volunteers working hard. Contest was formed to give something for the Vertical cavers to do at convention as there wasn't much for Vertical cavers at the time. It is a learning laboratory. Contrary to some opinion, climbing contest contestants can indeed climb quite well underground.

Vertical Techniques Workshop: Dave McClurg said we have 36 students signed up for this our 11th Workshop. Need at least 20 and preferably 30 to help with Workshop. Special skills with particular systems are not required.

Rebelay Course Report: Gary Bush reported that this was the third real year of the Rebelay Course. Had a problem finding a spot for it this year. He reiterated that the Section does not advocate any particular climbing system. We present and provide means to teach current climbing and rappel systems so individuals can make up their own minds on their merits. Matt Oliphant and Peter Haberland were thanked for their help setting up the course this year.

Gary Bush led the group in reminiscing about Jim Gossett who recently passed away. Jim, along with his wife Marilyn, were very active with the Climbing contest from its beginning, as well as with other Section activities. A thinker and doer as well as a strong caver, he was the inventor and manufacturer of the Gossett Box, as well as a lot of other lesser known vertical equipment. He was instrumental in moving caving from sit-stand systems to the Ropewalker systems in large use today. Most of all, Jim was a friend to everyone who had the opportunity to meet and get to know him. He is greatly missed....

Gary Bush led the group in discussion about the article by Safety and Techniques Chair, Bill Storage in the July 1993 *NSS News*. He noted the article was simply another valid viewpoint on what the Vertical Section does. Bill may not have really felt the way as harshly as it was written. Bill Cuddington stated, that contrary to the article, that the rappeller who was killed at El Capitan last fall did indeed have ascending gear. Bill Bussey mentioned he had talked at length with Bill Storage about the article earlier that week. Storage concluded that he may have been wrong in lambasting *Nylon Highway* for presenting sometimes unproven and unreviewed techniques and equipment. Policy by recent editors has been to consider *Nylon Highway* a forum for new ideas, with all but blatantly unsafe techniques and equipment presented for peer review by readers of *Nylon Highway*.

Several Section members noted a lot of good ideas might never make it to press if it were perceived that a few reviewers could tear apart an article based only on what was written in the article. Others thought it was good idea to let the editor and others, and possibly even a review committee, add their comments to questionable articles. Prior review might also keep others from reinventing the wheel with systems developed and rejected years ago. Some things that were considered safe not all that long ago, are not considered safe now. Also some techniques which might work in one part of the world, may not work in another location.

Caver Information Series: Bill Bussey reported that updated articles on the Frog System and Knots System, which were recently published in Nylon Highway, have been sent to Caver Information Series Editor Mike Camilletti for comments and publishing. Articles on the Rack and the Gossett System are still being worked on and will be sent to Mike when ready.

Bussey thanked Tray Murphy for doing a great job with handling make up and the order fulfillment for Vertical Section symbolic items. Elaine Hackerman was also thanked for providing and helping to staff the time display board at the climbing contest. This board conveniently shows the official time of the climber who was last on rope.

There was also some discussion on a display timer clock for the contest. Again, most members voiced appreciation for the one at this convention. We rented one for $100 for this event. Purchase price is approximately $1400. At the Indiana convention we got a $500 anonymous pledge for a clock. The Section would only use it once a year, though it could be utilized by other contests. It was suggested a computer connected to a monitor could be used as a lower cost display timer. The question was, who will make such a timer?

The EC is looking at putting together a Vertical instruction training manual to be published by the Section. This has been discussed for a couple of years. A committee would have to be set up to look into and do this project.

The Vertical training camp that was discussed at the 1992 meeting didn't happen. We need to get a person or a group to sponsor and provide leadership for this. Gary hopes to find out more in an EC meeting later this week.

On Rope II: Bruce Smith passed out and discussed an outline for an updated and revised edition of **On Rope**. All Vertical Section members need to know that the NSS does NOT own the rights to the illustrations in **On Rope**. They are owned and copyrighted by the artist, Pandra Williams. Do not copy any illustrations from **On Rope** for use in grotto or training publications without permission from her. Bruce and Allen Padgett have a new illustrator in mind for **On Rope II**. Maureen Handler will be the photographer for the book.

In a new chapter titled "Other Rope Users," the book will not get into high angle rescue, nautical applications, or rock climbing because of the significant amount of publications already addressing these topics. Personal or group self rope rescue is being considered as the NCRC is very interested in this. When and under what conditions to retire equipment was discussed as a possible topic to be included as well. David McClurg reminded all that it will be at least 2 or 3 years before **On Rope II** will be published. Until then, the current **On Rope** is still very much a current and desirable publication.

There was some discussion on possible minimum standards for vertical caving, such as one should be able to reverse directions on rope before attempting vertical caving. Would we be asking American cavers to be conformists by doing things the same way? Any standards should express what you are trying to accomplish instead of doing something specific. Some state and national parks require specific equipment to enter caves on their lands. While Europeans currently utilize standards and caver certification, Bill Cuddington quipped if we had listened to the Europeans back in the 40's, we'd still be using winches.

Editor Maureen Handler had asked Bruce Smith to bring to the attention of membership that she has had a problem of obtaining the bylaws required yearly article from each Section Executive Committee member. Smith moved: "that elected Board members that fail to fulfill their obligations to write, or cause to write, a significant *Nylon Highway* article will be ineligible for re-election the following year." Tray Murphy seconded.

After much discussion, the Vertical Section membership voted nine for, and the majority against the motion. The motion failed.

In elections, Bill Bussey was re-elected Secretary/Treasurer. Maureen Handler was re-elected Editor of *Nylon Highway* by acclimation. Ed Sira, Allen Padgett, Bruce Smith, and Miriam Cuddington were elected At-Large Executive Committee members. Later that week, the Executive Committee met and elected Bruce Smith chair of the Vertical Section.

In the Papers Session portion of the meeting, Larry Howell of Howell and Mann told the story of and answered questions about his USA fabricated lightweight titanium rappel racks.

Bill Cuddington spoke on the advantages and use of long racks on 7/16" stock with spacers. As far as he was concerned, aluminum bars are only good for wind chimes. This is because the deep grooves which develop in solid aluminum bars allows more hot contact area with the rope increasing the possibility of friction caused glazing.

David McClurg spoke on whether or not the Figure-8 rappel device was really "dead" as proposed by Steve Knutson in the *1992 American Caving Accidents*. General opinion is because the Figure-8 twists the rope, over time, it may shorten the life of the rope. More specific study and testing should be done.

Ed Sira presented a device called the Rappel Tube made by Caroll Bassett from New Jersey. He says its a good device for short drops. Bruce Smith noted that, unlike in most cases the rack, but like many other devices like the Figure-8, the device would fail the "hands up" test. That is, the rappeller would drop quickly if both hands were removed from the device and rope. Ed wants feedback on the device.

Bruce Smith demonstrated a failure mode on an unlocked locking carabiner by simply twisting it against the rack approximately 90°. One should always leave the top ascender attached to the rope while the rack is being loaded.

Bob Handley showed a new rope pad which quickly attaches and detaches from the main rope. Mark Fritzke demonstrated his $105 Fritzke Chest Box which allows the gate to be opened and unlocked one handed while the rope is loaded.

Bill Storage, NSS Safety and Techniques Committee Chair, spoke about the myths of strength and safety noting that one does not necessarily equate to the other. He said we should not rely on strength alone as a criterion for selecting equipment. Keep in mind that safety is the avoidance of hazards.

With the conclusion of the Paper's session, the Vertical Section meeting adjourned at approximately 1:00 PM.

CALL FOR PAPERS

The organizers of the 1994 NSS Convention in Brackettville, Texas have issued a call for papers for an Equipment and Techniques Session. The Technologies and Techniques of Cave Exploration will be the focus of an all-day session that draws together many NSS Sections and other interested cavers. Before an interdisciplinary audience, both new developments and standard practices will be described, analyzed and compared. Presentations by non-US cavers are especially welcome.

Abstracts are being solicited in the following areas:

Accident and Safety Analysis	Lighting	Communications and Electronics
Photography and Video	Computing	Survey & Cartography
Digging	Rescue	Diving
Vertical		

There will be two formats:

- Oral: a presentation before an audience, with time for questions (tentatively, between 15 and 25 minutes for each speaker).
- Poster: a 'show and tell' presentation in which each presenter is provided with a booth, poster boards and a table. This format is ideal for demonstrating wearable and hand held equipment, computer applications, etc. The Poster session will not conflict with the Oral session and should last 2 to 3 hours.

Please submit an abstract that includes the title, name and address of the primary author and a summary of the content of the presentation. The abstract should be self-contained and informative. For media, the order of preference is: (1) Clear laser-quality printing, lest justified only, that can be scanned; (2) a DOS or MAC floppy disk with common word processing format or text file; (3) dot-matrix printouts or other text. Abstract length is limited to 250 words. Please indicate your preference for Oral or Poster format. The deadline for Abstracts is April 15, 1994. The Equipment and Techniques Session will be co-chaired by John Ganter and Bill Storage. Please send your abstract to: John Ganter, 1408 Valencia NE, Albuquerque NM 87110 USA, H: 505-265-5007, O: 505-844-1304, FAX 505-844-0244, Internet: jganter@ttd.sandia.gov

TREASURER'S REPORT - NSS VERTICAL SECTION

FOR PERIOD BEGINNING JULY 28, 1992 AND ENDING JULY 14, 1993

INCOME:

Memberships	$ 5714.00
Subscriptions	384.00
Back Issue Sales	1020.40
Symbolic Item Sales	2169.00
Vertical Techniques Workshop (92)	810.00
Advertisements in ***Nylon Highway' 35 & 36***	210.00
Bank Interest	384.82
Total Income	**10,692.22**

EXPENSES:

■ Editor:

Printing **Nylon Highway #35**			2057.63
Mailing **NH #35**	International	70.02	
	Domestic	285.00	
	Mailbacks	13.55	
Total Mailing **NH #35**			368.57
Printing **Nylon Highway #36**			2394.00
Editor Advances for **#36** Postage			550.00
Dues Renewal Postage			82.81
Other Postage			75.70
Ventura Publisher Software Upgrade			75.00
Mailbacks on **Nylon Highway #34**			13.55
Graphic Arts Salon			4.00
Bulk Permit & PO Box Rental			125.50
Mailing Envelopes			167.90
Supplies			55.82
Total Editor Expenses			5,970.48

■ Secretary-Treasurer:

Postage			561.08
Supplies	Dues Renewal Notice	$76.17	
	Envelopes	35.33	
	Copies	41.95	
	Other	43.34	
Total Supplies			196.79
Vertical Techniques 92 Workshop Expenses			167.04
Contest Prizes at 1992 Convention			257.00
Binding *Nylon Highway's 1-30* for Sale			67.34
Symbolic Items Cost			1544.68
Ads (1993-4 **NSS News** and Members Manual			91.50
Reprint **NH #4,20, & 27**			174.53
Rebelay Course Equipment			101.00
Check Charge			9.29
Linda Heslop Drawings for C.I.S. articles			102.00
Other			5.32
Total Secretary-Treasurer Expenses			**$3,277.57**
TOTAL EXPENSES			**$9,248.05**
NET INCOME			1,444.17
BALANCE AS OF JULY 27,1992			5,409.48
NET INCOME			1,444.17
BALANCE AS OF JULY 14, 1993			**$6,853.65**

Vertical Techniques Workshops at the 1994 NSS Convention Conducted by the Vertical Section

A new workshop in intermediate vertical skills will be conducted by the Vertical Section at the 1994 NSS Convention. The regular basic skills workshop, now in its 12th year, will also be offered. Both workshops provide 4 1/2 hours of intensive hands-on instruction. Students should come prepared to work hard and learn new skills. Depending on your experience level, you can sign up for one or the other - but not both.

Basic Workshop.

The workshop begins with a short lecture and demonstration covering each system or skill. The topics taught are:

- Rappel Rack
- Figure 8 and Bobbin
- Gibbs System
- Mitchell System
- Frog System
- Knot Prusiking
- Cable Ladder
- Basic Caving Knots

Special emphasis is given to the pros and cons of each system and how to choose the best one for you. A printed handout summarized the presentation and includes information on rigging and climbing signals. After the demonstrations, we move immediately into four hour of hands-on instruction. Each subject is taught at individual learning stations with four to six students, two instructors and two or three ropes. This gives every student the most learning in the shortest period of time. You won't come away ready for Valhalla or Golondrinas, but you'll learn, in detail, about the most popular systems.

Workshop limited to 36 students. Please pre-register as early as possible, since we can only handle 36 students and the course is invariable over-subscribed. Please specify Basic Workshop when registering. Those registering past the maximum number of 36 will be notified in advance and placed on a standby list. However, we can't guarantee participation. If you don't make the cut, your workshop fee will be refunded.

Minimum age 15 years. We're sorry, but our gear won't fit children under 15 and ill-fitting gear is too much of a hazard for child, parent and instructors. Students under 18 must have a parent sign the liability waiver. Workshop fee $15.00 - payable to the NSS Convention. The fee covers the printed hand-out, lengths of one-inch tubular sling and seven-mm Perlon sling. Seat Harness Required. You must have your own seat harness and it must be a sewn seat harness, such as those available from Petzl, REI and several other suppliers. For safe and efficient vertical caving, a comfortable seat harness that fits properly is mandatory. You're also welcome to bring any other vertical gear you have.

Intermediate Workshop

To qualify for the Intermediate Workshop, you must have at least one year experience in basic rappelling and prusiking. The topics taught are:

- Rappel to Prusik Changeover
- Prusik to Rappel Changeover
- Crossing a Knot on Rappel
- Crossing a Knot on Prusik
- Simple Self Rescue
- Long Drop Rappelling

The intermediate skills taught in this workshop are fundamental to the next level of vertical caving. A printed handout summarizes the skills taught and includes information on rigging and climbing signals. After the demonstrations, students will get on rope at learning stations using their own personal vertical gear for hands-on instruction. Each learning station is dedicated to one skill and has four students, two instructors and two or three ropes.

Workshop limited to 24 students. This workshop will fill up fast, so please pre-register as early as possible. Please specify Intermediate Workshop when registering. Those registering past the maximum number of 24 will be notified in advance and placed on a standby list. If you don't make the cut, your registration fee will be refunded. Minimum age 18 years. Workshop fee $15.00 - payable to the NSS Convention. The fee covers the printed hand-out, lengths of one-inch tubular sling and seven-mm Perlon sling.

Full vertical gear a prerequisite. You must have your own complete vertical system for descending and ascending and know how to use it. At a minimum, you need a sewn seat harness, a rappel rack, prusik gear and a safety Jumar with a sling or etrier. The prusik system can be either a ropewalker, Mitchell or frog. Your system should fit you properly and show evidence of regular use. We'll be checking all vertical systems before the workshop.

Vertical Workshop Schedules

- 1994 Basic Vertical Techniques Workshop

  Wednesday, June 22, 1944, 1:00 to 5:30 PM

- 1994 Intermediate Vertical Skills Workshop

  Thursday, June 23, 1994, 1:00 to 5:30 PM

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