SEAT HARNESS

Semi-permanent seat harness using 1" white tubular webbing:
1. Tie a firm bowline high on the left thigh with an excess of 12" to 16" on the short end.
2. Tie a second bowline high on the right thigh with a 2" to 3" crosspiece separating the leg loops. Hand over and rotate the loops to move the crosspiece high in front.
3. Wrap the remaining webbing around the hipbone, just below the crests, passing the end under the crosspiece each time. Tie the ends on the left hip with a square knot backed up with overhand knots. Secure excess.

STEP 1

12" to 16" excess
Firm bowline

STEP 2

Firm bowline
2" to 3" crosspiece

FINISH

Square knot with overhand knots

RAPPELLING SEQUENCE

A On Belay? Belay On! Is my belay ready?
B On Rappel? Belay On! I am starting to rappel.
C Off Rappel? Belay Off! You assume your own responsibility— Thanks!

PRUSIKING SEQUENCE

A On Rope? Prusik On! I am attached to the rope.
B On Prusik? Prusik On! I am starting to prusik.
C Off Rappel? Prusik Off! Lower me on the rope.

SIGNALS FOR VERTICAL ROPEWORK

I USAGE: Anytime while in a vertical or rope work environment. All signals have a response, several of which are the reverse order. Repeated signals are repeated exactly as heard. Multiple zones are numbered from left to right, facing the pitch, and the number is added to the signal.

II GENERAL SIGNALS:

<table>
<thead>
<tr>
<th>Signal</th>
<th>Response</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Rock!</td>
<td></td>
<td>Universal warning of falling object!</td>
</tr>
<tr>
<td>B Freeze!</td>
<td>Don't move! No time to explain.</td>
<td></td>
</tr>
<tr>
<td>C Clear!</td>
<td></td>
<td>Situation no longer dangerous.</td>
</tr>
<tr>
<td>D Ropel</td>
<td></td>
<td>Warning of rope toss use twice.</td>
</tr>
<tr>
<td>E Down!</td>
<td>At the bottom of pitch or rope.</td>
<td></td>
</tr>
<tr>
<td>F Up!</td>
<td>At the top of pitch or rope.</td>
<td></td>
</tr>
<tr>
<td>G (Scream)</td>
<td></td>
<td>Probable falling—catch with belay.</td>
</tr>
</tbody>
</table>

III CLIMBING SEQUENCE

A On Belay? Belay On! Your belay is ready, go ahead.
B Climbing! Climb Away! I am starting to climb.
C Slack! Slack! Give me more rope or less tension.
D Up Ropel Rope Up! Give me less rope or more tension.
E Hold! Hold! Stop movement of me and/or rope.
F Tension! Tension! Pull to give me support.
G Falling! Falling! I’m slipping and/or falling.
H Lower! Lower! Lower me on the belay.
I Off Belay! Belay Off! You’re on your own— You’re welcome!

IV RAPPELLING SEQUENCE

B On Rappel? Belay On! I am starting to rappel.
C through J are the same as in climbing.

V PRUSIKING SEQUENCE

A On Rope? Prusik On! I am attached to the rope.
B On Prusik? Prusik On! I am starting to prusik.
C Off Prusik? Prusik Off! Lower me on the rope.
Climbing Helmets

Our big project during the winter has been a study of climbing helmets. We are appalled by some of our findings. Attention to this area of equipment integrity has obviously been long overdue.

The helmet must be on your head when you need it. The chin strap must be designed to hold the helmet on your head, both in a tumbling fall and in normal climbing; and the chin strap must be fastened.

2. The helmet should not be so hot or heavy or bulky or restrictive of hearing that you leave it at home.

3. The shell must be rigid enough to spread the load of an impacting object to protect against skull fracture.

4. The shell must resist penetration by pointed objects.

5. The helmet must have an energy-absorbing liner around the head band area to cushion side impact in a tumbling fall.

6. The cost should not be too high. To these, we add:

7. The helmet must have an energy-absorbing suspension to reduce the peak force of impact (falling rock).

8. The side-to-side rigidity must be reasonably good. The above eight requirements seem reasonable enough. But what do we find in the marketplace?

The Helmet Market

Specialist's Rock Helmet, Japanese Import, Recreational Equipment F12, $5.95

This helmet has a soft shell which is padded. Side-to-side rigidity is poor. 6 pounds to the rim 1/2". Further, the shell is too small, not allowing enough room from the head band for padding. The suspension straps are cotton, sewed with a light cotton thread that breaks readily. The foam is far too soft to absorb much energy and does not even contact the rim. With the 2-oz weight was dropped on it, the shell dented, the foam crushed locally, and the weight hit hard on the headform. This equates to a skull fracture. The force transmitted to the headform during the drop was cut off at 300 lbs. The shell was estimated to weigh 1,500 pounds. Compare this with the 2-oz maximum allowable of 850 pounds for protection of the neck vertebrae. The chin strap is only 10' long for retention. Before 12 April, the Y-connection was not twisted, and the helmet would result. Now REI is_twisting the connection, but each user should check the retention on his head.

At the REI meeting, I asked the question, why this helmet? The answer by an officer was that it is better than nothing, and was for persons who couldn't afford a better helmet and who would have to go bareheaded if this were not available. Is the point valid? I'm back into a corner; I have to agree that wearing this helmet is better than going bareheaded. And it does meet the requirements of the helmet. But it is too heavy, about 8 lbs, and it is too large. We still think our critical design should be on the helmet and in the catalog.

How do you, our readers, feel about this helmet?
Another major shortcoming of the Bell Malibu is that it is hot. The soft-cushion head band is not too snug, and allows sweat to run into yours eyes and onto the innershell, but this was not effective because the head band and top (soft)foam contacts a large portion of the area of the head and thus block off air circulation.

The Bell helmet has a chin strap which holds on some heads but tilts away on others. The forward anchor points are not forward enough. The back anchor points are not far enough back and cause the straps to hook on the ears, not where they should be placed up at the back.

The chin strap has D-rings from which the opposing strap separates when the helmet is removed. The D-rings are made of plastic propylene. This makes one tend to leave the chin strap unfastened, which is exceedingly poor practice.

When we wrote Bell about the high transmitted force, they discontinued this helmet in the climbing market on the basis that it was designed for surfers, not mountain climbers. (Malibu is a beach, not a mountain.)

Joe Brown Helmet, made by Snowdon Mouldings, Wales.

The shell of this helmet is good. The foam for absorption of energy in side blows is considerably softer in a JB helmet recently obtained, 60 psi compressive strength, as compared with the Bell helmet Z-34 years ago. Further, the foam is now rather thin, .180″. Helments meeting the USA standard for vehicular helmets use foam about 110 psi which is a hard blow. The energy-absorbing ability of this JB helmet is thus only about 30% as much as the USA standard.

There is a further complication. The adjustable head band has four buttons which are .40″ overall round. They are longer than the foam in this helmet. There are ten other places where the distance of a blow coinciding with any one of these buttons, the button will punch through the foam and act as a sharp blade, transfusing the plastic directly onto the skull in that one spot. The foam will thus get a chance to do its work of cushioning. The four buttons over the ears and forehead are further elevated by resting on the webbing, which is a dangerous project above the foam by .100″.

In my view, this is a most undesirable situation. It was warned against in Airman's report in Summit, April 74, p. 33, par. 1-9-1.1. . . . there shall be no . . . rigid projections on the inside of the shell which could injure the wearer's head in the event of a blow. The crown suspension straps are sturdy, and have no special energy-absorbing mechanism. The Z-49 transmitted force was 1,205 pounds on the 50 pounder, a good sample.

When we wrote to Royal Robbins (USA distributor) that we thought the transmitted force was too high, we got an answer which was an indirect defense that the JB is the best helmet on the market, up to now anyway. To prove this, they sent the transmitted force is not too high. We got another 11 pound rock on his head and friends drop an 11 pound rock on his head, from 3 ft., 1 ft., 4 ft., and 5 ft., successively. This proves that either the JB helmet is okay or that Mo's spine is okay. We jokingly replied that we were not sure about Mo's head.

Note that the JB helmet was built to the British Standard which does not mention cushioning against top impact, nor does it prohibit rigid projections on the inside of the shell.

The retention system of the JB helmet is excellent. In addition to the chin strap, neck straps extend to the rear of the helmet and clasp under the jaw to limit forward tilt. The chin straps held 100 lbs. The chin strap does not disengage on impact. However, the spare strap was a bit short, especially when the user is wearing large sunglasses.

The chin strap on the JB helmet does not impede hearing. I say it does in bally situations where the sound is faint. Any covering of the ears must diminish perceived sound. See Fig. 4.

Retention of the Helmet on the Head: The JB helmet copies the JB chin-strap-nape system. Forward anchor points are as far forward as possible without interfering with vision. The nape strap are anchored at the center of the back to prevent forward dislodgement of the helmet. The chin strap does not come out of the buckle. It has a pull tab and all D-rings which do not work loose and can be adjusted even when wearing mittens. The strength of the chin strap assembly is over 300 lbs.

Retention: The MSR helmet has 12 ventilation holes. You will find this ventilation a real improvement because it permits evaporative cooling of the head. The holes can be covered from the inside with cloth adhesive tape in bad weather.

Sweat Band: The sweat band is made of cotton to wick sweat outward for evaporation. Cotton here is better than nylon. The whole helmet can be dipped in water to wash the sweatband.

Bulwark: The dome form of the MSR helmet is a tracer copy of the Bell Malibu. However, we flattened the rim and added a small rim for side rigidity, and the dome is 1″ higher to provide clearance between the head and the shell.

A helmet has a small space between the skull and the shell to allow distance for the force to be exerted.

This distance-time-force is energy-absorption test. The Z-89 test is 60 inches drop times 8 pounds equals 480 inch-pounds of energy to be absorbed. The MSR suspension allows the helmet to move closer to the skull when struck while exerting a force of 800 pounds. 3/4″ x 800 pounds is 600 inch-pounds of energy absorbed. Even after this energy has been absorbed, the head still does not touch the shell by 378%.

Hearing: The MSR helmet leaves the ears mostly uncovered. This saves weight and improves cooling. In a bumbling fall, the shoulders generally protect the ears. We tested this by placing dry paper on a rocky surface and trying to touch the ear area. 100 grains of paper is not bad at all. However, if anyone really wants the ears covered, side plates of Lexan can be bolted on. These are available on special order only.

Weight: The MSR helmet weighs one pound two ounces medium size and one pound five ounces large.

3. Top Impact Cushion: Some industrial helmets meet the Z-89 requirement by using a molded polyethylene suspension together with flexure of the shell. But, polyethylene changes properties with temperature too much for climbing helmets. In our view, we abandoned the search for energy absorption in the plastics materials and turned to metal. The best system we found includes wireform links in the suspension and extending from the top to impact to absorb energy. Fig. 6 shows the wireform link in successive stages of extension. The wire itself is steel with carefully controlled strength and yield point. The link works so well that we have applied for a patent.

Fig. 4

Weight: The 7-5/8 size helmet weighs 1 pound 12 oz.

Side-to-side rigidity: 20 pounds to close 1/2″ at 50 pounds. The side-to-side rigidity of the inner shell is 1-1/4 inches which is good.

Fig. 5

We tested two models, R-37 (no foam) and R-42 (soft white foam liner). In the Z-89 test, the transmitted force was off scale for R-37, 1,000 lbs. for R-42. One thousand pounds transmitted force isn't all that bad, except that the inside foam shows local crushing under the point of impact. This is the situation which causes skull fracture. Romety says in their report, "We have concluded that the skull is too rigid, and unfortunately are not designed to perform against a fractured spine." Side-to-side rigidity of Model R-37 (no foam) is 1-1/4 inches to close 1/2″. Model R-42 (with foam liner), 16 pounds. Side padding is mesh. Romety is convinced, however, "that these two helmets have certainly proved successful and have saved the lives of many people." We would like to see the documentation supporting this statement, especially regarding Model R-37.

Fig. 6

The links absorb energy and stay bent. After a hard blow, they can be bent back to shape with pliers and they will absorb energy again. But, we would rather have the helmet and story for our museum and give you a new helmet.

4. Shell Rigidity: The MSR shell is made of GIF Lexan polycarbonate resin, which is tough and strong. It has a 1″ dotted test which is 200% of the Z-89 test.

5. Penetration Resistance: Again, the MSR helmet passes the Z-89 test easily. Z-89 uses a one pound pointed bob falling 10 feet. The point only makes a mark.

6. Head Band Cushion: The MSR helmet copies the expanded polystyrene foam that passes the Z-90 vehicular tests. Our lines are made of the same materials by one of the same companies. This
9. Fitting for Size: Adjustable headbands have knobs and buttons which would be pressure points at the time of a crash and therefore we considered them not acceptable. Instead, strips of soft adhesive foam are supplied with the MSR helmet; you apply as much as needed under the cloth sweatband for a comfortable fit.

CAUTION: Regarding the Polycarbonate Shell

Polycarbonate resin (made by General Electric, named Lexan) is an excellent material for helmets, being tough and strong. Industrial and vehicular helmets by the million are made of this material.

But, don't paint the helmets because paints contain Toluene, acetone, and chlorinated solvents which polycarbonate doesn't like. For decoration and closing the ventilation holes, use only cloth tape provided by us. But a layer of this tape under Dymo nameplate tape and felt-pen marks.

Sun lotions are harmless, and a bit of insect repellent carried to the helmet by the hands is also no problem. But, don't pour repellent directly on the helmet shell. It will mar the finish.

GIBBS ASCENDERS IN ACTION

FOOT AND KNEE RIGGING

For long ascents this is the easiest method of climbing. Especially for free hanging climbs. One ascender is attached to a foot and the other to the opposing knee. This allows one to walk naturally up the rope and places the weight on both feet. The third ascender attached to the seat harness allows the climber to sit down and rest. An ascender at shoulder level will help the climber stand straight up and relieve the weight from his arms.

AID SLINGS

Fast and simple for following aid. Tie webbing from the lower ascender to your seat sling so that you cannot fall out of your aid slings. When following an overhang clip your seat sling to the piton then unclipping the unweighted rope from the pin, or remove one ascender and move it around the pin.

PACK HAULING AND RESCUE

LITTER RAISING

Heavy objects can be raised with complete control by minimum of effort using GIBBS ASCENDERS. The system shown above has a mechanical advantage of two to one. Lifting can be done by either arms or legs.
**Overhand Bend**

1. (Overhand Knot)

2. (Figure 8 Knot)

**Square Knot**

1. (2 on each side, if webbing)

2. (Or barrel knot backup/side if rope)

**Bowline**

1. (If webbing, 2 overhand knots per side; if rope, use 1 barrel knot)
When using stiff (almost static) belaying techniques, all parts of the "belay chain" (rope, piton, carabiner, the falling body and the belayer) are highly stressed by holding the fall. In addition to the energy-absorbing of the static rope, it is essential in most cases to use a further method of gently braking. Twists in the rope affect all safeguarding methods and are a hazard. Twists must be corrected each time before the beginning of a rope load.

A fall can be stopped gently by the dynamic belay which brakes the rope during a fall in a sliding manner. In cases of not 100% secure fixing points (pitons, etc.) and in case of ice and firm (icy snow) the use of a dynamic safeguard method is a must.

The alpine shoulder (tuck) and the sitting hip (pocket or seat) belay methods are the conventional type of dynamic safeguard. It is most effective and often impossible, however, to keep control of braking the fall that way, because of pain due to heat and the cutting effect. Using the shoulder method creates an additional danger. The rope may be pulled away from the belayer.

The mechanical-dynamic Sticht belay system also works statically in the lower range of stress up to approximately 440-550 lbs. (200-250 kp), without rope sliding. It enables passing rope slowly to the companion and to keep a firm hold of the companion's body weight (for tension on artificial climbs or after a fall) by using the least physical strength.

Light falls (approx. to fall factor 0.4) which stress the securing parts only a little can be caught without rope sliding through.

The use of the Sticht belay is very simple. If the stress is bigger than 440-550 pounds, the rope begins to move into the belay plate. The belay plate brakes the fall automatically until the rope does not move any further. This system does not require a control of the restraining force by the belayer. It is strongly recommended in all cases to apply the maximum holding power of the "brake hand".

However heavy a fall may be, no greater stress than 250 kp will occur on the brake if the diameter of the rope is right. The brake slowdown distance differs depending on the height of the fall.

All dynamic kinds of safeguard require thin leather gloves, or in cases of emergency (when no gloves are available), a sleeve of a pullover or similar garment to safeguard the hands of the securing person.

I. For belaying the leader:
   Normal position. Self-anchor to a piton. The rope brake is operated in front of the chest. The rope runs through another piton and carabiner to the climber.

II. In order to belay the leader, one can (if the stand position is not favourable) hook the brake into a piton by means of a carabiner. Only if no second wall-hold is available, the self-anchor is attached to the same piton. Diversion-piton above the stand position. In picture II, the falling person would be held automatically. The securing person has complete freedom of action.

In case of the diversion piton coming out, it would be advisable to place the brake with two linked carabiners (instead of one) and by means of an additional tape sling onto the anchor. Thus the brake can better adjust itself to a change in direction of rope pull.

III. Belaying the second climber. If this person requires the rope to be fixed tight, the belayer pulls the belay plate close to the carabiner.

The detailed sections do not show the binding of the rope on the climbing belt for reasons of better view. Because of this, tightening up cord for the belay plate has also been left out.

Instead of the loop for the braking carabiner as sketched above, the carabiner may also be attached straight onto the climber's belt.
Zum Auf- und Absteigen an Bergseilen

Kleinnetzgeräte im Rocktasschenformat

For ascent and descent operations on ropes. The universal and compact rescue device in pocket-size

Pour l'ascension et la descente à la corde

Petit appareil de sauvetage format de poche

Pour alpinisme – expéditions – spéléologie – sauvetage

travaux de contrôle et de rénovation d'objets élevés

Sans peine – car la manœuvre des poulies est assurée par le JUMAR.

Mains libres F.

 grâce à la simplicité du système qui permet une plus grande liberté d'action.

Sans danger – car il n'y a pas de risques indésirables.

Sécurité – chaque poulie peut supporter effectivement un poids de 50 kg, les poulies sont donc sécurisées.

Remarque de corde G.

 sont faciles à mettre en œuvre par dénudement frontal et/ou dehors.

Montre-charge M.

 sont disposées comme sur le cordeau et comme montre-charge de remise de la corde.

Endommagements – sont exécutés grâce à une main de baril direct, sans risques de chutes mortelles.

Pieds et dimensions – 42 cm, largeur de 5 cm, poids moyen 50 gms, dimensions 17 x 7,5 x 4 cm

G + H Laststeigen – Spaltrettung

Spaltrettung: oft kann das Gestänge selbst mit dem JUMAR aus der Spalte steigen. In schweren Fällen steigt der Rette-

Hausübung des Verantwortlichen gemischter Vorschlag H. Der Pflecker ist an Gese 3 das Griffe angue邦 und durch

G + H Pulling, respectively raising of loads – rescue from a crevasse

Reconnu from a crevasse: The JUMAR climbing preparations are the only rescues that first with the JUMAR – offering first aid and carrying out the rescue preparations.

Raising of the victim takes place in accordance with Fig. N. The ice axe is tied to eye of strop, a sliding connection to the anchor rope is achieved through strop.

G + H Remont, d'œuvre – Sauvetage dans une crevaison

Sauvetage dans une crevasse: la technique de l'ancien peut souvent remonter de la crevasse par ses propres moyens grâce au JUMAR. Dans ces cas graves, le sauveur descend dans la crevasse à l'aide du JUMAR, premiers secours, passant en sécurité.

Remarque du passage selon Disposition H; le piquet est attaché à l'œillet de la poignée 5 et fixé avec la poignée

à la corde tue. de façon à pouvoir glisser.
In order to improve ASRC training and keep it responsive to changing needs, it is important to have constructive feedback from participants in ASRC activities. Please help by writing below any comments, evaluations, suggestions or opinions that might aid the Staff. The sample questions below are of particular interest:

1) Were the discussions, handouts and exercises relevant and sufficient in both theory and practice? Why?

2) Do you think that you could perform the subject skills effectively and safely alone? With a small team? With darkness or foul weather? Why?

3) Did the instructors give you adequate individual attention? Did they stress safety and effectiveness?

4) Would you recommend this course to someone who had some previous experience, perhaps as a refresher or to close 'loopholes'? Why?

5) What should be added or deleted and why?

Thank you for your participation!
CHECKLIST INSTRUCTIONS

Students: You are responsible for the following items:
1) Attention to safety and the warning of any hazards.
2) Participation in each training activity, with the required equipment, and being available for checking.
3) Performance of the checked activity without coaching.
4) Completion of this checklist and the critique sheet and the return of both to the instructor.

Instructors: You are responsible for the following items:
1) Attention to safety and the warning of any hazards.
2) Familiarity with the activity to be checked, and the availability of any special or limited equipment needed.
3) Constructively critical analysis of a student's performance of an activity (safety, technique, sequence, speed, etc.) with evaluation on a GO/NO-GO basis ("Can I trust a Life to this...?")
4) Inquiry into and aid in areas where the student needs assistance.
### CHECKLIST FOR INTERMEDIATE VERTICAL ROPEWORK

**K-I-VR(940V745LH)**

**Print Name:**

**Location:**

**Note:**
1. Before starting, please read instructions on other side.
2. **R =** rope; **W =** webbing; ( ) = option
3. **Backup knots are 2 Overhand if webbing, 1 Barrel if rope.**

#### PHASE 1

<table>
<thead>
<tr>
<th>PHASE 1</th>
<th>PHASE 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td>W</td>
</tr>
<tr>
<td>R</td>
<td>W</td>
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<td>R</td>
<td>R</td>
</tr>
<tr>
<td>F</td>
<td>R</td>
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</tbody>
</table>

#### PHASE 2

<table>
<thead>
<tr>
<th>PHASE 1</th>
<th>PHASE 2</th>
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<tbody>
<tr>
<td>R</td>
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<td>F</td>
<td>R</td>
</tr>
</tbody>
</table>

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**00 1-12 PHASE 1 BEFORE PHASE 2.**

1. Overhand bend
2. Figure 8 bend
3. Bowline + backup
4. Bowline on coil + backup, for anchor
5. Double bowline + backup
6. **Backup knot**
7. Barrel bend (double fisherman)
8. Anchor hitch + backup
9. Sheet bend
10. Double sheet bend
11. French prusik
12. **Backman**

---

**FOUR TIMES EACH (A, R, C, U) UNLESS OTHERWISE NOTED:**

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>13 Chain + unchain rope without tangles</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14 Pack + unpack rope without tangles</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 Hip belay; tieoff + release at least twice</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16 Plate belay; &quot; &quot; &quot; &quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17 Hitch belay; &quot; &quot; &quot; &quot;</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>18 Tie seat harness</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 Ascend rope using French prusik; very system</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 20 
| 21 Gibbs came; 
| 22 Long rappel using double-brake-bar rig |
| 23 Short rappel using rack; very control |
| 24 Changeover: up/down/up with Backman + 003 |
| 25 Same as above but with knot in rope (haha!) |
| 26 Improvise lowering; several methods |
| 27 Improvise hauling; several methods |
| (A) (B) (C) (U) |
| (A) (B) (C) (U) |
| (A) (B) (C) (U) |

---

(HAVE YOU TURNED IN YOUR CRITIQUE ???)