BLUE RIDGE MOUNTAIN RESCUE GROUP

VERTICAL TRAINING OUTLINE:
Summer 1979

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3. Ascending over knots and breakovers.

The ASR Seat: an alternative...

» gene harrison

A reliable, semi-permanent, webbing seat harness is valuble in vertical ropework and climbing. When the Appalachian Search and Rescue Conference was analyzing existing designs for both training and search and rescue operations, none were found to be acceptable. For example, the 'single-loop' seat is connected in front by a carabiner after one inserts one's posterior into the loop. The carabiner snaps onto a bight of loop from between the legs and a bight from each side. The three resulting sections, about the waist and each leg, easily shift and can constrict in one section while being too loose in another. It is easy to fall out of when inverted. Also, if the webbing fails, by cutting or abrading, at only a single point, the entire system disintegrates immediately, and the wearer falls.

The typical 'swiss-seat' is a webbing waist loop with an overhand knot in front. The ends drop between the legs, separately pass around opposite legs and return to the front. One end crosses the front, taking a turn around the overhand knot, and ties, on the opposite hip, to the other end. This design also permits shifting of position, constriction and loosening of sections, and failure if cut at any one point. However, these problems do not occure with the speed encountered in the 'single-loop'. The 'swami-belt' consists of two non-fixed leg loops connected to several waist wraps. Again, the movable leg loops can constrict, and the system can fail if cut at a single point.

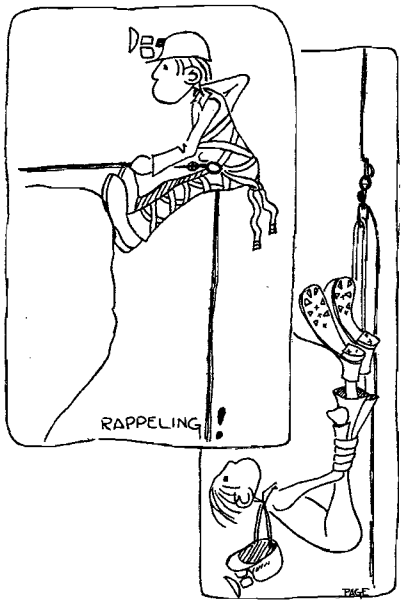
There is considerable value in a simi-permanent seat harness. It can remain partially tied and be quickly donned, often by different people. The permanent sewn rig is put on faster and is more reliable, but is a single use item, often fits only one individual, and requires skill and special materials to produce. The semi-permanent rig can be converted to countless other uses, including a simple handline by just untieing it, and is preferable in the majority of light-duty vertical endeavors.

Since the ASRC did not find any of the exiating designs acceptable, a design was created to meet what were considered to be reasonable safety and performance criteria for light and medium duty vertical situations.

Start with approximately 20 feet of 1 inch wide tubular nylon webbing. Tie a bowline in one end. It should have an 18 inch free end and be just large enough to slide over the left thigh (see Fig. 1).

After adjusting the first bowline as specifed, tis another bowline about 3 inches away. In each bowline, the standing part of the webbing is the crosspiece between the knots (see Fig. 2).

The second bowline should be the same size as the first. Next, with the remaining webbing to the right, place the first bowline on the left leg, and the second on the right. Slide the loops high on the thighs (see Fig. 3). Wrap the webbing to the right across the upper part of the hipbone (below the belt), and around to the front. Cross under the crosspiece, and wrap again, then a third time if possible (see Fig. 4). Tighten



and tie the webbing ends on the left hip with a square knot backed up by two overhand knots on each side. Connect the locking carabiner as usual around the crosspiece and wraps.

When removing the seat, leave the bowlines tied to simplify future use. However, the semi-permanent nature of the seat allows use as a handline by untieing.

Unlike most other seats, the ASCR seat must be cut or broken in at least <u>two</u> places to release the wearer. If tied correctly, the crosspiece is protected from wear by the turns of the wraps. Also, the leg loops will not tighten on the legs, cutting off circulation, nor will it fall down while walking. If properly applied, it is not possible for one to fall out of the seat when inverted.

If there are any questions or suggestions, please contact me at (703)361-3030 (H).

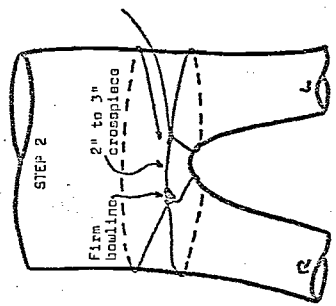
SEAT HARNESS R-WR/CL(2OJUL74GLH)

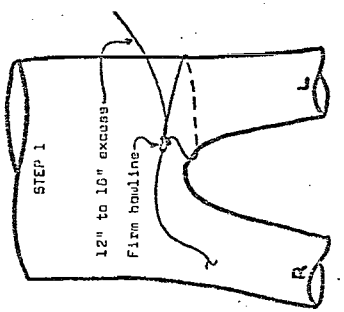
Semi-permanent seat harness using 1" wide tubular webbing:

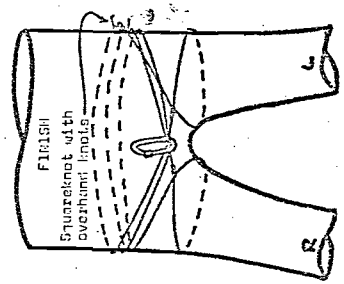
1 Tie a firm bowline high on the left thigh with an excess of 12" to 18" on the short end.

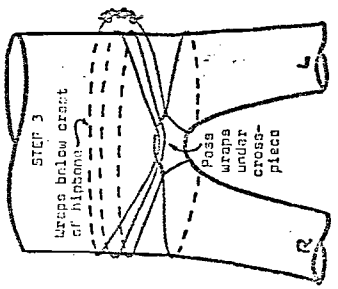
2 Tie a second bowline high on the right thigh with a 2" to 3" crosspiece separating the leg loops. Bring over and rotate the loops to move the crosspiece high in front.

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.









SIGNALS FOR VERTICAL ROPEWORK R-G-WR(2NOV74GLH)

I USAGE: Anything while in a vertical or ropework environment. All signals have a response, several of which are the reverse. Delayed signals are repeated exactly as heard. Multiple ropes are numbered from left to right, facing the pitch, and the number is added to the signal.

II GENERAL SIGNALS:

	Signal	Response	Meaning
A	Rock!		Universal warning of falling object.
B	Freeze!		Don't move!- No time to explain.
C		Clear!	Situation no longer dangerous.
D	Rope!		Warning of rope toss- use twice.
E	Down!		At the bottom of pitch or rope.
F	Up!		At the top of pitch or rope.
G	(Scream)!		Probably falling- catch with belay.

III CLIMBING SEQUENCE

	Climber	Belayer	Meaning
A	On Belay?		Is my belay ready?
		Belay On!	Your belay is ready, go ahead.
B	Climbing!	Climb Away!	I am starting to climb.
C	Slack!		Give me more rope or less tension.
D	Up Rope!		Give me less rope or more tension.
E	Hold!		Stop movement of me and/or rope.
F	Tension!		Pull to give me support.
G	Falling!		I'm slipping and/or falling.
H	Lower!		Lower me on the belay.
I	Off Belay!		I assume my own responsibility-Thank
		Belay Off!	You're on your own- You're welcome!
J	Off Rope!	Rope Off!	The rope is available.

IV RAPPELLING SEQUENCE

	Rappeller	Belayer	Meaning
A	On Belay?		Is belay ready?/Yes, go ahead.
B	On Rappel!	Belay On!	I am starting to rappel.
C	through J are the same as in climbing.		

V PRUSIKING SEQUENCE

	Prusiker	Others	Meaning
A	On Rope!	Rope On!	I am attached to the rope.
B	On Prusik!	Prusik On!	I am starting to prusik.
C	Lower!	Lower!	Lower me on the rope.
D	Off Rope!	Rope Off!	The rope is available.

MSR

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NEWSLETTER

MSR

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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.

John Armitage was active in a study of climbing helmets as chairman of a safety equipment committee of the Sierra Club and the American Alpine Club. He published in Summit, April 1966, and in the Accident Reports of the American Alpine Club, 1966. His work was an excellent start; unfortunately, neither the Sierra Club nor the American Alpine Club continued the work on helmets when he moved to England, and most of the manufacturers and retailers paid no attention to the report.

There isn't any single specification that is complete enough for climbing helmets, in our view. Z-89 covers the cushioning of top impact, but doesn't mention side impact. Z-90 covers the cushioning of side impact, but doesn't mention top impact. The British specification 4423-69 doesn't mention top impact either.

American National Standards Institute
ANSI Z-89.1 (Industrial)

The testing machine for top impact has a headform which is supported on a hinged arm which has a 0.5" steel ball on the underside. The ball rests on a soft aluminum bar and indents the bar when the test weight is dropped. The diameter of the indent is a measure of the transmitted force.

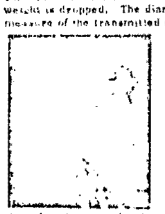

Fig. 1 - Showing a head injury at Peshastin Pinnacles a few weeks ago. No helmet. Only a small rock, but a painful laceration.

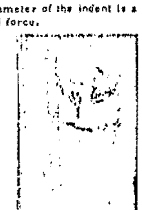

Fig. 2 - Z-89 Test Stand. 8-lb. ball dropping 5 ft. (Chin strap not fastened, Tsk! Tsk!)

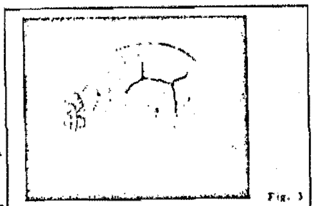

Fig. 3

This is the helmet that Bob Dyhre was wearing when he fell in a tumbling fall 390 ft. on the north side of Big Four Mountain some years ago. The helmet came off part way down, and he suffered 2 skull fractures. But, the fractures were not where the crack in the helmet is . . . Bob has long been active in Mountain Rescue, and was one of the early advocates of the use of climbing helmets, even before his fall. He is unshakably convinced now.

The helmet must have a suspension or lining in the top that reduces the transmitted force of a steel ball weighing 8 pounds dropping 5 feet onto the top of the helmet to not over 850 pounds.

ANSI Z-90.1 (Vehicular)

The chin strap must have a strength of 300 lbs. When the helmet and the headform are dropped together 6 feet onto a solid floor (striking on the side of the helmet, not the top), the deceleration of the headform shall not exceed 400 g's (4,400 lbs. force, assuming the head weighs 11 pounds).

Why is the maximum allowable force 4,400 lbs. sideways and only 850 lbs. from the top? In side blows, the brain is encapsulated in the skull and hence protected against deformation (assuming the shell is rigid enough to prevent skull fracture). But, in top blows, the hazard is fracture of the neck vertebrae, a different problem. At intermediate angles, the problem is compound.

"The protection given by any protective headgear is necessarily less than complete. The best helmet is but one link in a long chain of safety including safety education." Snell Foundation.

True, but let us assume some minimums and compare them with helmets offered for sale.

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REQUIREMENTS FOR A CLIMBING HELMET

From Summit April, 1966 by John Armitage

1. 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 lining 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 a top 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

Special Rock Helmet, Japanese Import, Recreational Equipment FJ21 $5.95

This helmet has a soft shell which dents readily. Side-to-side rigidity is poor, 6 pounds to close the rim 1/2". Further, the shell is too small, not allowing enough room around the head band for padding. The suspension straps are cotton, sewed with light cotton thread that breaks readily. The foam is far too soft to absorb much energy and does not even come down to the rim. When the Z-89 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 aluminum measuring block was off-scale, estimated 2,500 pounds. Compare this with the Z-89 maximum allowable of 850 pounds for protection of the neck vertebrae. The chin strap is only so-so for retention. Before 12 April, the Y-connection was not riveted, and the helmet would swivel. Now REI is riveting the connection, but each user should check the retention on his head.

At the REI meeting, I asked the question, why sell this helmet? The answer by an officer was that it was 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? Now I'm backed into a corner; I have to agree that wearing this helmet is better than going bareheaded. And it does meet the requirements of The Mountaineers when they specify "wear hard hat" on their climbs. And it is photogenic. But I still think our critical description should be on the helmet and in the catalog.

How do you, our readers, feel about this?

It is interesting to note that this helmet was being sold in 3 major climbing shops in Japan.

German Plastic Rock Helmet, Recreational Equipment FJ20

The store had only a sample on hand (5 April) and hence none for us to test. The side-to-side rigidity is poor, and cushioning against side blows poor. The foam they mention is practically meaningless. Another major shortcoming of the same is the chin strap. Just push up with a finger at the back and the helmet will come off forward readily. Please do this at the store twice, the first time to get attention, and the second time to show what you did. REI says the first order coming in will have chin strap as shown in the catalog but that they've written the factory asking for a better one.

Philosophical question: Why doesn't REI improve the chin strap themselves?

Several persons have written us to ask the significance of the REI catalog claim that this helmet "exceeds the 1969 Industrial Standards for top impact and penetration resistance." I answer that the side blow protection is very limited and that the helmet is likely to come off in a tumbling fall, and that the catalog should have told this also.

German Fiberglass Rock Helmet, Recreational Equipment FJ19

The shell on this helmet is fairly good, but transmitted force in the Z-89 test was 1,220 pounds (Z-89 maximum is 850 pounds). Side cushioning practically nil, made worse by eight plastic knobs inside which would be pressure points during side impact. This model is being discontinued. Chin strap same as FJ20 and same comments apply. catalog and display counter should say that this helmet is a close-out and should say why.

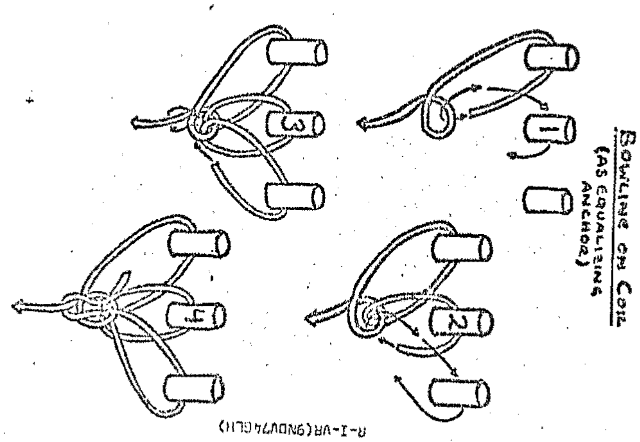
Bell Toptex Malibu Helmet

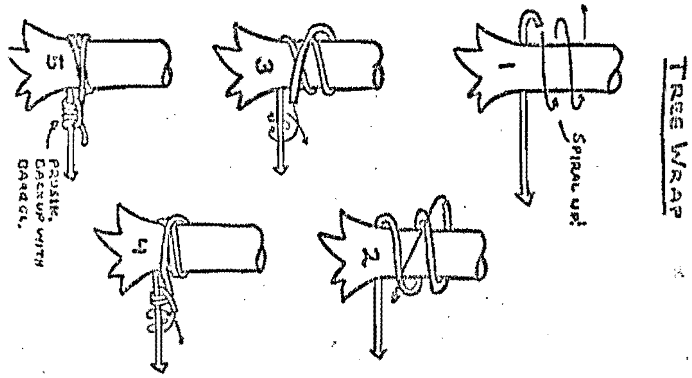
The shell of this helmet is good. The sturdy foam is good for energy-absorption of side blows. Unfortunately, this same foam is used for cushioning top impact, and it is too sturdy for that use. The Z-89 test calls for a transmitted force of 850 pounds maximum when the 8 pound ball is dropped 60 inches. We found this maximum was reached by a drop of only 16 inches.

(Compare this with the statement in Mountaineering The Freedom of the Hills (1967 page 45) which describes this helmet and says it will stand up to a 6 pound rock falling from a height of 20 feet without serious injury to the head. Don't you believe it. The person who wrote that never drop-tested any helmets. In the standard 60 inch drop, the transmitted force was 1,500 pounds. [illegible] would certainly have resulted [illegible] which we would consider to be [illegible] Wouldn't you? Clearance bet[illegible] head and the inside of the shell [illegible] compared with 1.250 inches requi[illegible] ANSI-[illegible]

OUTLINE OF INTERMEDIATE VERTICAL ROPEWORK O-I-VR(9NOV74GLH):

I Introduction
II Knots- see handout, changed
  A Review
  B New knots
III Rope Handling
  A Review
  B New handling, chaining, packing
IV Equipment
  A Review
  B Discussions
V Safety
  A Review
  B Discussions, long drops,
  C New techniques
[illegible] Signals- see handout, changed
[illegible] Belaying
  A Review
  B Considerations
  C New techniques
  D New equipment
Seat Harness
  A Review
  B Modifications, improvements, others
Ascending
  A Review
  B Criteria for rigs
  C New gear
  D New systems
Descending
  A Review
  B New software
  C New hardware
Technique
  A Safety...
  B Rig control...
  C Rig parameters...
  [illegible] independence
[illegible]l
[illegible] rescue
C [illegible]cue from above
D Rescue from below
Examination + exercise
Critique





Another major shortcoming of the Bell Malibu is .. it is hot. The soft-cushion head band is a snug .. and allows no ventilation. I drilled four vent .. s in mine, but this was not affective because the .. band and top (soft) foams contact a large portion .. he area of the head and thus block off air circula- ..

The Bell helmet has a chin strap which holds on .. e heads but tilts readily on others. The forward .. nor points are not forward enough. The back .. hor points are not far enough back and cause the .. aps to hook on the ears, not on the jaw as they .. ld, when the helmet is pushed up at the back.

The chin strap has D-rings from which the .. sing strap separates when the helmet is removed. .. D-rings are then awkward to thread. This makes .. tend to leave the chin strap unfastened, which is .. eedingly poor practice.

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

.. Brown Helmet, made by Snowdon Mouldings, .. es

The shell of this helmet is good. The foam for .. orption of energy in side blows is considerably .. ter in a JB helmet recently obtained, 60 psi com- .. ssive strength, as compared with the helmet 2-3 .. rs ago at 110 psi. Further, the foam is now .. her thin, .350". Helmets meeting the USA stan- .. d for vehicular helmets use foam about 110 psi .. ch is .625" thick. The energy-absorbing ability .. this JB helmet is thus only about 30% as much as .. USA standard.

There is a further complication. The adjustable .. d band has four buttons which are .400" overall .. They are longer than the foam is thick. There .. ten others .300" long. If the direction of a blow .. any one of these buttons, the button .. h the foam and act as a firm pede- .. the blow directly onto the skull in .. he foam will thus not get a chance to .. ushioning. The four buttons over the .. s and forehead are further elevated by resting on .. ving and actually project above the foam by .200". .. my view, this is a most undesirable situation. It .. s warned against in Armitage's report in Summit, .. p. 23, par. 1-6. ". . . there shall be no .. rigid projections on the inside of the shell which .. d injure the wearer's head in the event of a crash.

The crown suspension straps are sturdy, and .. e no special energy-absorbing mechanism. The .. transmitted force was 1,265 pounds on the .. er sample, and 1,080 on a recent sample.

When we wrote to Royal Robbins (USA distribu- .. r) that we thought the transmitted force was too .. we got back an aroused and spirited defense .. the JB is the best helmet on the market, up to .. anyway. To prove that the transmitted force is .. too high, Mo Anthoine, proprietor of Snowdon

head, from 2 ft., 3 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, nape straps extend to the rear of the helmet and cleat under the jaw to limit forward tilt. The chin straps held 300 lbs. The chin strap does not disengage from the buckle, and is easy to adjust. However, the spare strap was a bit short, especially when the user is wearing large sunglasses.

Hearing: Royal says the JB helmet does not impede hearing. I say it does in belay situations where the sound is faint. Any covering of the ears must diminish perceived sound. See Fig. 4.

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 upper-ear level.

Clearance between the top of the head and the inside of the shell is 1-1/4 inches which is good. The hotness of this helmet would be improved if there were ventilation holes to cooperate with the clearance. The very soft head band foam could be removed, also.

Romer Helmets

The plastic shell is not very rigid. We wrote to them last year regarding an accident in Canada where a Romer helmet dented in on being hit by a rock, resulting in a fatal skull fracture. They replied saying there is probably no helmet in the world which would have been of use in this case. Who knows? A more rigid shell would have been a good place to start.

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. Romer says in their letter, "these helmets, unfortunately, are not designed to protect against a fractured spine." Side-to-side rigidity of Model R-37 (no foam) is only 6 pounds to close 1/2", Model 42 (soft white foam liner), 16 pounds. Side padding is meager. Romer is convinced, however, "that these two helmets have certainly proved successful and have saved the lives of many people." We would

AGV Helmet

Also, a low-rigidity shell. The tag claims that this helmet passes the British Standards Institute, ANSI Z-89 and Snell tests. No way! Dr. Snively of Snell Foundation writes that they will take vigorous action if this helmet is imported into the USA bearing this label.

CONCLUSION

After investigating all these helmets and learning that the Bell Toptex Malibu is a discontinued model and will be off the climbers' market as soon as the present stock is sold out, we became alarmed. What are climbers going to be able to buy? That Japanese thing?? So, we decided to do what we did with the ice axes when we got no cooperation from the established manufacturers: go into manufacture ourselves and force a change in the marketplace.

MSR Climbing Helmet

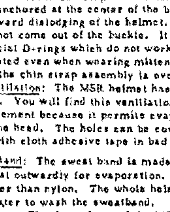


Fig. 5

1. Retention of the Helmet on the Head: The MSR helmet copies the JB chin-plus-nape strap system. Forward anchor points are as far forward as possible without interfering with vision. The nape straps are anchored at the center of the back to prevent forward dislodging of the helmet. The chin strap does not come out of the buckle. It has a pull tab and special 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.

2. Ventilation: The MSR helmet has 12 ventilation holes. You will find this ventilation to be 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 outwardly for evaporation. Cotton here is better than nylon. The whole helmet can be dipped in water to wash the sweatband.

Bulkiness: The dome form of the MSR helmet is a tracer copy of the Bell Malibu. However, we flattened the rim line 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 to have some space between the skull and the shell to allow distance for the force to be exerted.

480 inch-pounds of energy to be absorbed. The MSR suspension allows the helmet to move closer to the skull a distance of 3/4" while exerting a force of 800 pounds. 3/4" x 800 pounds = 600 inch-pounds of energy absorbed. Even after this energy has been absorbed, the head still does not touch the shell by 3/8".

Hearing: The MSR helmet leaves the ears mostly uncovered. This saves weight and improves cooling. In a tumbling fall, the shoulders generally protect the ears. We tested this by placing carbon paper on a rocky surface and trying to touch the ear portion of the helmet on the carbon paper. A simple but practical test. 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, so 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 straps which extend on impact to absorb energy. Fig. 6 shows the wireform link in successive stages of extension. The wire itself is steel of carefully controlled strength and yield point. The link works so well that we have applied for a patent.

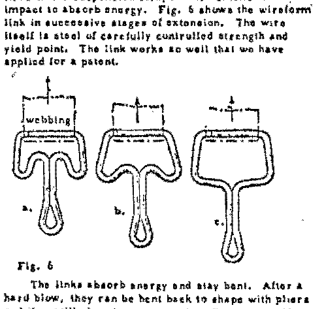


Fig. 6

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 GE Lexan polycarbonate resin, which is tough and strong. It passes the Z-89 denting test easily.

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

6. Head Band Cushion: ...

material crushes on impact, thus absorbing energy, and is of the same thickness (5/8") which absorbs two blows in the same place.

7. Side-to-Side Rigidity: None of the specifications mention this specifically. It is important in a tumbling fall. The force required to compress the MSR helmet by 1/2" side-to-side is 36 lbs., which is higher than any helmet tested. This rigidity is accomplished by a small rim. The rim has two other uses: It holds the head a little farther away from the rock in the event of side blows; and tape can be put around it to form a rain gutter if desired.

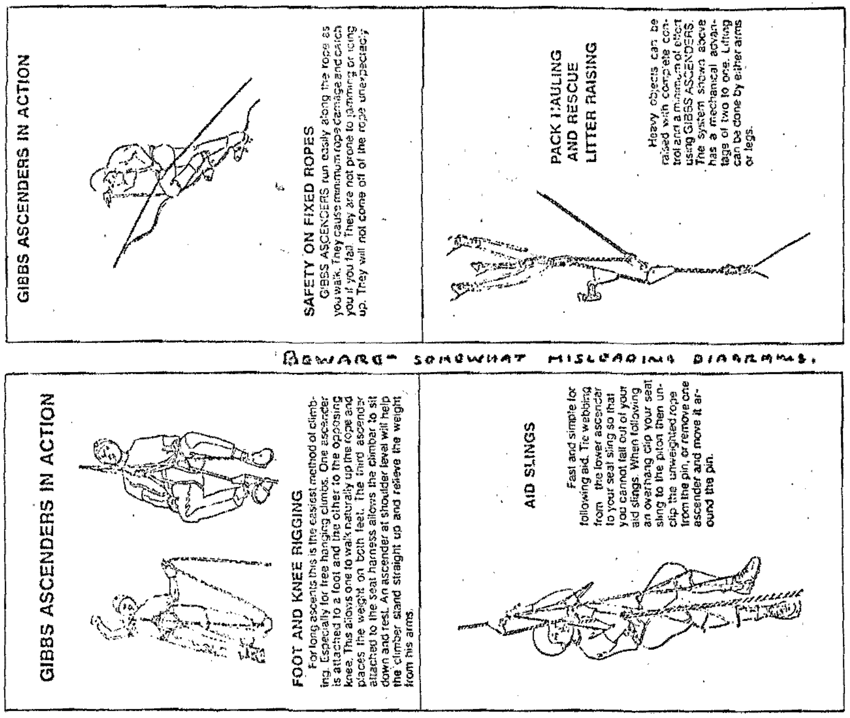
8. Cost: We wanted to manufacture a helmet that would retail at $15.00 but we just couldn't do it. This has been an expensive project and the selling price has been set at $21.66 less 10% immediate dividend equals $19.50. We hope this won't be too high; but what is the measure of too high? What is your head worth? Bob Byhre paid $28 for the helmet he was wearing when he took a tumbling fall 350 ft. down the north face of Big Four. See story p. 6-1. He is confident the helmet saved his life.

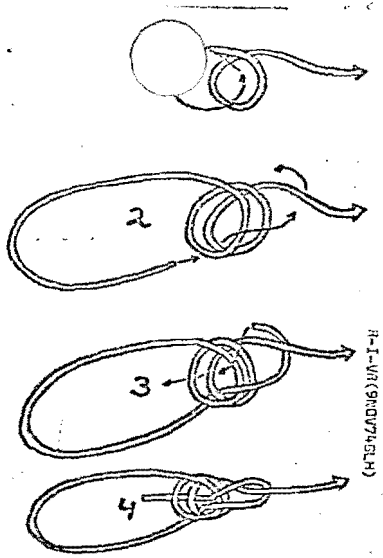
9. Fitting for Size: Adjustable headbands have knobs and buttons which would be pressure points at the time of a crash and therefore we considered them not acceptable. Instead, strips of soft adhesive foam are supplied with the MSR helmet; you apply as much as wanted under the cloth sweatband for a comfortable fit.

CAUTION: Regarding the Polycarbonate Shell

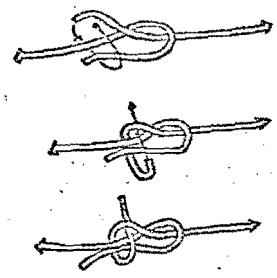
Polycarbonate resin (made by General Electric, named Lexan) is an excellent material for helmets, being tough and strong. Industrial and vehicular helmets by the million are made of this material. But, don't paint the helmets because paints contain Toluene, acetone, and chlorinated solvents which polycarbonate doesn't like. For decoration and closing the ventilation holes, use only cloth tape provided by us. Put 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.





R-I-VR(9NOV74GLH)

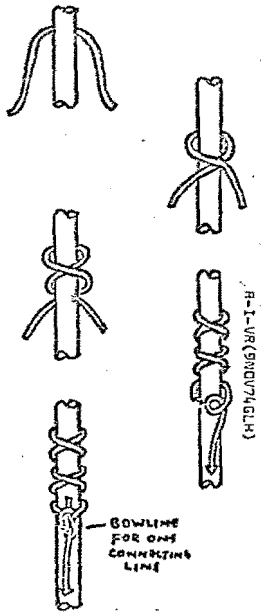


END THROUGH ONCE, SINGLE (NORMAL) SHEETBEND

R-I-VR(9NOV74GLH)

END THROUGH TWICE, DOUBLE SHEETBEND

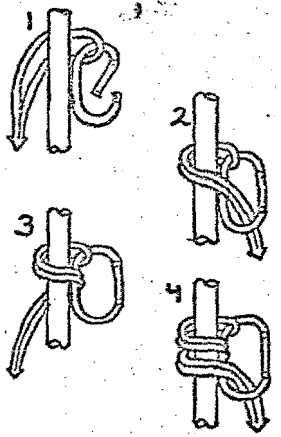
FRENCH PRUSIK



BOWLINE FOR ONE CONNECTING LINK

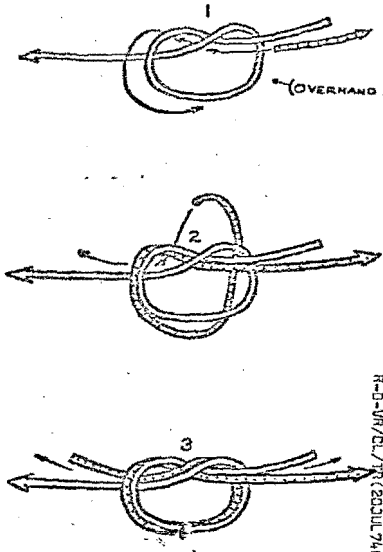
R-I-VR(9NOV74GLH)

BACHMAN KNOT



R-I-VR(9NOV74GLH)

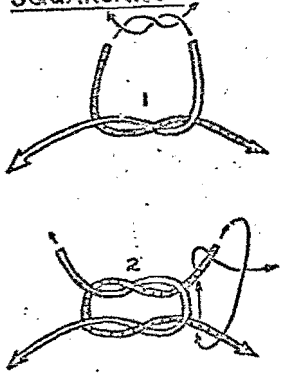
OVERHAND BEND



R-D-VR/CL/TR(20JUL74GLH)

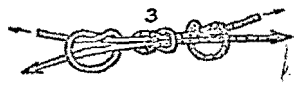
2-3a.

SQUAREKNOT....



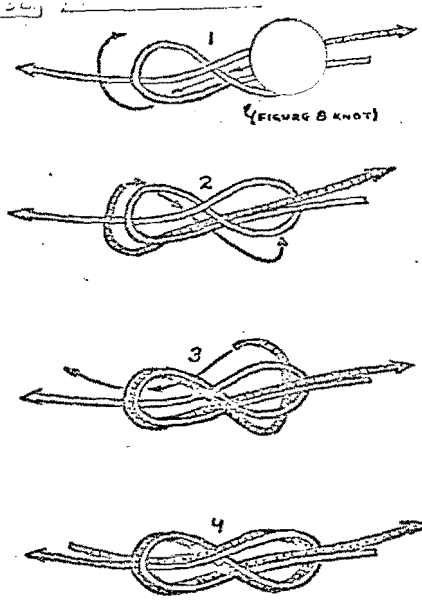
WITH OVERHAND KNOTS

(2 ON EACH SIDE, IF WEBBING!)



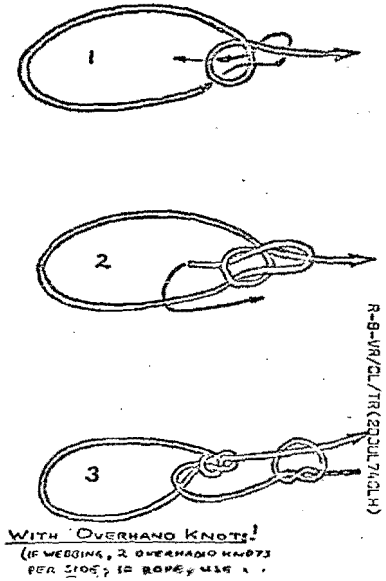
(OR BARREL KNOT BACKUP/SIDE IF ROPE!)

R-D-VR/CL/TR(20JUL74GLH)



R-D-VR/CL/TR(20JUL74GLH)

BOWLINE...



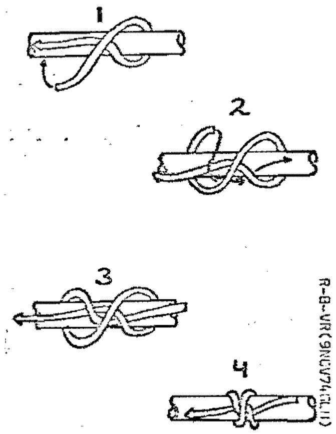
R-B-VR/CL/TR(20JUL74GLH)

WITH OVERHAND KNOTS!

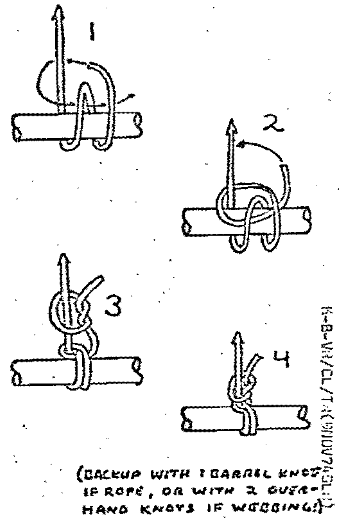
(IF WEBBING, 2 OVERHAND KNOTS PER SIDE; IF ROPE, USE 1.

2-3c.

...L KNOT

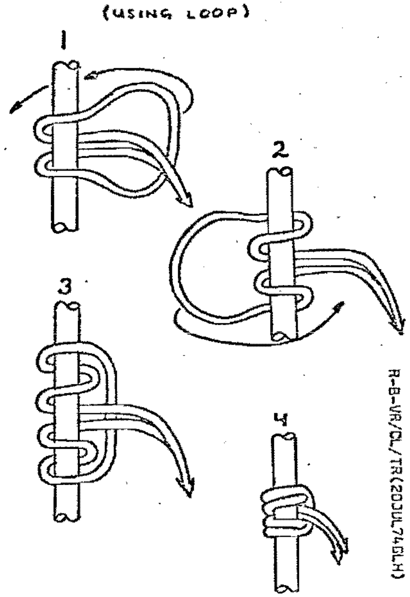


ANCHOR HITCH

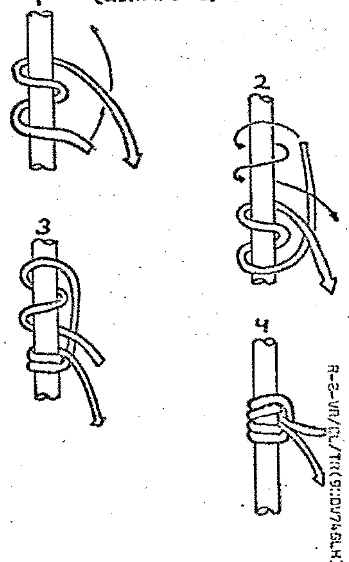


(BACKUP WITH 1 BARREL KNOT IF ROPE, OR WITH 2 OVER-HAND KNOTS IF WEBBING)

PRUSIK KNOT
(USING LOOP)



PRUSIK KNOT
(USING END)



CHECKLIST FOR INTERMEDIATE VERTICAL ROPEWORK   R-I-VR(9...)

Print NAME: ______________________________   DATE: ________

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		PHASE 2		DO 1-12 PHASE 1 BEFORE PHASE 2.
R	W	---	---	1 Overhand bend
R	W	---	---	2 Figure 8 bend
R	W	---	---	3 Bowline + backup
R	---	R	---	4 Bowline on coil + backup, for anchor
R	W	R	W	5 Double bowline + backup
R	W	R	W	6 Barrel knot
R	W	R	W	7 Barrel bend (double fisherman)
R	W	R	W	8 Anchor hitch + backup
R	W	R	W	9 Sheet bend
R	W	R	W	10 Double sheet bend
R	---	R	---	11 French prusik
R	---	R	---	12 Bachman
FOUR TIMES EACH (A, B, C, D) UNLESS OTHERWISE NOTED:				
A	B	---	---	13 Chain + unchain rope without tangles
A	B	---	---	14 Pack + unpack rope without tangles
A	B	C	D	15 Hip belay; tieoff + release at least twice
A	B	C	D	16 Plate belay; " " " " " "
A	B	C	D	17 Hitch belay; " " " " " "
A	B	---	---	18 Tie seat harness
A	B	(C)	(D)	19 Ascend rope using french prusik; vary system
A	B	(C)	(D)	20 " " " Gibbs cams; " "
A	B	(C)	(D)	21 " " " jumars; " "
A	B	(C)	(D)	22 Long rappel using double-brake-bar rig
A	B	C	D	23 Short rappel using rack; vary control
A	B	(C)	(D)	24 Changeover: up/down/up with bachman + DBB
A	B	(C)	(D)	25 Same as above but with knot in rope (haha!)
A	B	(C)	(D)	26 Improvise lowering; several methods
A	B	(C)	(D)	27 Improvise hauling; several methods
(A)	(B)	(C)	(D)	28 ______________________
(A)	(B)	(C)	(D)	29 ______________________
(A)	(B)	(C)	(D)	30 ______________________

(HAVE YOU TURNED IN YOUR CRITIQUE ???)

STICHT Rope Belay Plate (Brake)

FALEWA

made in West Germany

Releasing or hauling in of the rope. Parallel passing of the rope. The braking plate remains 5–15 cm from the carabiner swivel.

When falling or restrained by pulling, straight run of rope (180°), the brake hand holds the rope tight – automatically (instinctively). Due to this, the plate will be pulled close to the carabiner and creates braking energy. Use two carabiners for double rope and hook them in so that the rope slits are positioned close to the carabiner's length axis.

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 elastic 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 lead.

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 firn (icy snow) the use of a dynamic safeguard method is a must.

The alpine shoulder belay and the sitting-hip belay methods are the conventional type of dynamic safeguard. It is most difficult 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.

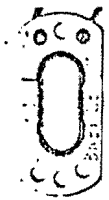
The mechanical-dynamic Sticht belayer system also works statically in the lower range of stress up to approximately 440–550 lbs. (200–250 kp), without rope sliding. It enables passing rope slowly to the companion and to keep a firm hold of the companion's body weight (for tension on artificial climbs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

Sticht brake for 9 mm double cord rope (with approximately 2 feet of 5/8" cord attached to climbing belt). The double cord brake is also suitable for rappelling



Sticht brake for 11 mm single cord rope

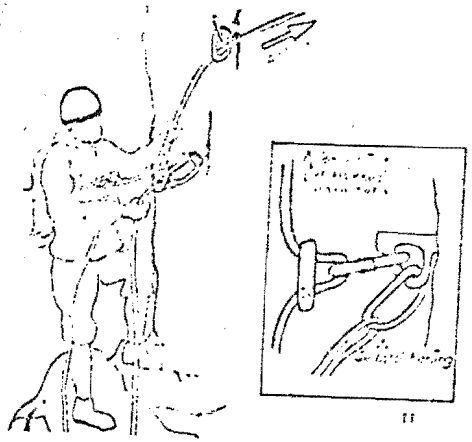
Sticht brake moments before a fast fall (Fritz Sticht has withstood approximately 100 test falls of all kinds of toughness by using various safeguarding methods)

I. For belaying the leader:

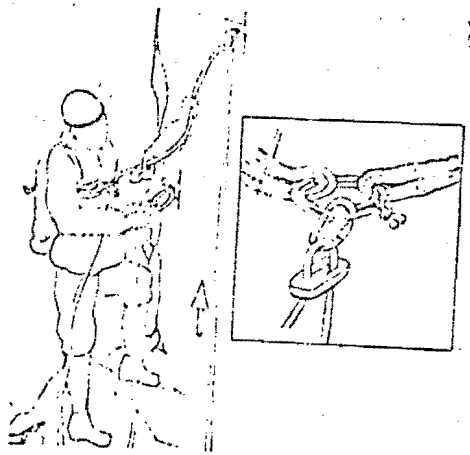
Normal position. Self-anchor to a piton. The rope brake is operated in front of the chest. The rope runs through another piton and carabiner to the climber.

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-hook 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.



II



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.

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

Ideal for
mountaineers — expeditions — cave explorers — rescue work-inspection and renovation work on high buildings

Effortless	— because progressive ascent is carried out by the legs (ref. C, D, E)
Freedom of both hands	— owing to the application of a chest sling ② both hands are free for work
Without danger	— because two independent stirrups ① and ② are used. The laden stirrup is automatically secured
Safety	— the testing of the stirrups takes place by means of a test load of 300 kp. Weights exceeding 150 kp and / or shock loads are not permitted
Rope knots ⑫	— can be easily passed by unhooking the stirrups alternately
Pulling and raising of loads (G, H)	— the stirrups are used as reverse lock ⑤ and for pulling and / or raising of loads ⑰
Damage to rope	— cannot occur because of positive stirrup operation even when ropes are wet or frozen
Weight + size	— 420 grams; weight including slings ③ ⑦ 580 grams. size: 17 x 7,5 x 4 cm

① blue stirrup for right hand
② red stirrup for left hand
③ eyelet for fastening the stirrups H
④ rope pawl made from high quality steel
⑤ safety catch providing high degree of safety
⑥ blue foot sling for right leg
⑦ red foot sling for left leg
⑧ adjusting screw for foot sling diameter of 7—14 mm

Zum Auf- und Absteigen an Bergseilen Kleinrettungsgerät im Rocktaschenformat

für
Bergsport — Expeditionen — Höhlenforscher — Rettungszwecke — Kontroll- und Renovationsarbeiten an hohen Objekten

Mühelos	— weil das schrittweise Steigen von den Beinen geleistet wird C D E
Hände frei F	— durch die Verwendung der Brustschlinge ② sind die Hände für jede Arbeit frei
Gefahrlos	— weil zwei unabhängige Griffe ① und ②. Der belastete Griff ist automatisch gesichert
Sicherheit	— Prüfung der Griffe mit 300 kp. Gewichte über 150 kp oder Stossbelastungen sind nicht erlaubt
Seilknoten ⑫	— können durch abwechselndes Aushängen der Griffe leicht überstiegen werden
Lastenziehen G H	— die Griffe werden als Rücklaufsicherung ⑤ und zum Lastenziehen ⑰ verwendet
Seilbeschädigung	— keine, weil direkte, schlupffreie Arbeitsweise, auch bei nassem oder gefrorenem Seil
Gewicht + Grösse	— 420 g; mit Standseilen ⑥ ⑦: 580 g Grösse: 17 x 7,5 x 4 cm

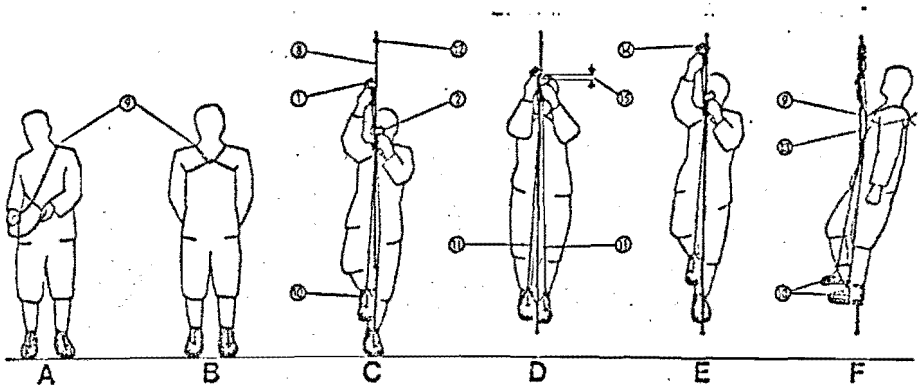
① Griff blau — für rechte Hand
② Griff rot — für linke Hand
③ Oese zum Zurückbinden der Griffe H
④ Seilklinken aus hochwertigem Stahl
⑤ Sicherungsklinke für optimale Sicherheit
⑥ Standseil blau — für rechtes Bein
⑦ Standseil rot — für linkes Bein
⑧ Steigseil — Durchmesser 7—14 mm

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 montée des jambes est assurée pas à pas C D E
Mains libres F	— grâce à la sangle de poitrine ② qui libère les mains et permet une plus grande liberté d'action
Sans danger	— car il y a deux poignées indépendantes ① et ②. La poignée chargée est assurée automatiquement
Sécurité	— chaque poignée supporte expérimentalement un poids de 300 kp. Les poids de plus de 150 kp et les à-coups sont défendus
Noeuds de cordage ⑫	— sont franchis à vaincre par décrochement alternatif des poignées
Monte-charge G H	— les poignées sont utilisées comme sécurité de retour ⑤ et comme monte-charge ⑰
Endommagements de la corde	— sont exclus grâce à un mode de travail direct, sans glissement ou dérapage même en cas de corde mouillée ou gelée
Poids et dimensions	— 420 gr. corde de position ⑥ ⑦ comprise 580 gr. dimensions 17 x 7,5 x 4 cm.

① poignée bleue pour la main droite
② poignée rouge pour la main gauche
③ oeillet pour la fixation de la poignée H
④ loquets en acier très résistant pour la corde
⑤ loquet de sûreté pour une sécurité totale
⑥ corde de position bleue pour la jambe droite
⑦ corde de position rouge pour la jambe gauche
⑧ [illegible] de réglage pour [illegible]



A Eine endlose Seilschlinge, oder ein ca. 2 m langes Seil dient als Brustschlinge ②
B Die Brustschlinge muss eng anliegen — durch Knoten ⑫ verkürzen
C Griffe ① und ② am Seil ④ einhängen (mit einer Hand) Schuhschlinge ⑩ öffnen, zum Schuhabsatz schieben und schliessen. Grösse der Schuhschlinge durch nachziehen anpassen
D Steigen C D E: Griffe auf Augenhöhe, wenn nötig Standseile ⑥ und ⑦ durch Knoten ⑫ verkürzen
E Hinuntersteigen E D: Griff ⑰ entlasten, wenig aufwärts schieben, gleichzeitig Klinke ⑤ öffnen und Griff bis 3 cm zum unteren Griff schieben ⑯

A An endless sling or a rope of some 2 m in length serves as chest sling ②
B The chest sling must fit tightly — it can be shortened by means of knot ⑫
C Attach stirrups ① and ② to rope ④ with one hand, open shoe sling ⑩, slide same to shoeheel and lock firmly. Adjust size of shoe sling simply by pulling the rope.
D To ascend C D E: Move stirrups to eye-level; if necessary shorten foot slings ⑥ and ⑦ by means of knots ⑫
E To descend E D: Relieve stirrup ⑰ and move it slightly upwards; simultaneously open latch ⑤ and move stirrup to a distance of 3 cm to the lower stirrup ⑯

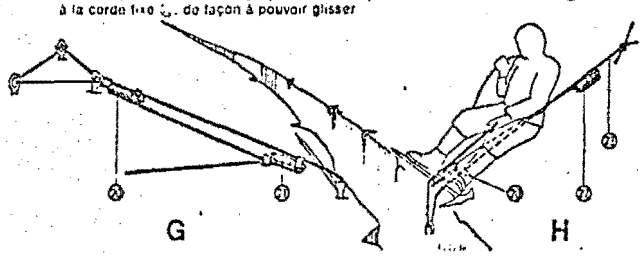
A Une boucle de corde sans fin ou une corde d'environ 2 m sert de sangle de corps ②
B La sangle de poitrine doit être serrée, elle sera raccourcie par le noeud ⑫
C Les poignées ① et ② sont fixées à la corde ④ (à l'aide d'une seule main) — Ouvrir l'étrier ⑩, glisser le pied jusqu'au talon et fermer. Adapter la grandeur de l'étrier en serrant plus ou moins fort
D Monter C D E: pourvoir à la hauteur des yeux, au besoin raccourcir la corde ⑥ et ⑦ de position par le noeud ⑫
E Descendre E D: décharger la poignée ⑰, la glisser un peu vers le haut, ouvrir en même temps le loquet ⑤ et glisser la poignée supérieure jusqu'à 3 cm au-dessus de la poignée inférieure ⑯

G + H Lastenziehen — Spaltenrettung
Spaltenrettung: oft kann der Gefallene selbst mit den JUMAR aus der Spalte steigen. In schweren Fällen steigt der Retter mit den JUMAR zum Gestürzten hinunter — entscheidende erste Hilfeleistung und Vorbereitung zur Rettung

Heraufziehen des Verunfallten gemäss Vorschlag H: Der Pickel ist an Oese ③ des Griffes ⑰ angebunden und durch Griff ⑰ verschiebbar am Ankerseil ⑰ befestigt

G + H Pulling, respectively raising of loads — rescue from a crevasse
Rescue from a crevasse: The fallen man can often climb out of the crevasse himself by means of the JUMAR climbing stirrups. In serious cases the rescuer descends first with the JUMAR — offering first aid and carrying out the rescue preparations.
Raising of the victim takes place in accordance with Fig. H. The ice axe is tied to eye ③ of stirrup ②; a sliding connection to the anchor rope ⑰ is achieved through stirrup ②

G + H Remontée d'une charge — Sauvetage dans une crevasse
Sauvetage dans une crevasse: la victime de l'accident peut souvent remonter de la crevasse par ses propres moyens grâce au JUMAR. Dans les cas plus graves, le sauveteur descend dans la crevasse à l'aide du JUMAR, premiers soins, préparation au sauvetage
Remontée du blessé selon proposition H: le piolet est attaché à l'oeillet ③ de la poignée ⑰ et fixé avec la poignée ⑰ à la corde fixe ⑰, de façon à pouvoir glisser



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