Introduction

M. Robb.

There has been at this University a group of people active in caving for so considerable time, their interest being mainly confined to the Naracoorte region. There they have undertaken geological studies of the cave systems with a view to understanding the processes of formation of the caves. This work is being done in conjunction with the South Australian Museum and the Tourist Commission and is primarily designed to assist with the excavation of animal bones in the caves and other related matters.

It was decided in 1974 to incorporate this group ('The Naracoorte Group') into a new organisation with a much broader base and appeal. This is now the Flinders University Speleological Society.

The aims of the Society are not only to introduce people to the work of the Naracoorte group but to introduce people from all over the campus to the numerous facets of caving which are possible within this state. One of th problems with a club of this sort is the belief that it is restricted to persons of scientific orientation. This is not so. Speleology may be regarded as the study of caves and this may be done purely out of interest in this completely different environment, or with scientific aspirations or just because you like grovelling in bat dung.

The society is then a forum for people who are interested in caving or who think they may be interested, to come along, to talk to others of similar interests and with experience to plan trips accordingly.

It is the function of the club to disseminate information among its members to ensure that all are familiar with caving techniques, are proficient in safety procedures, and are aware of the need to conserve cave systems.

CONSTITUTION

FLINDERS UNIVERSITY SPELEOLOGICAL SOCIETY

1. NAME.
   1.1 There shall be a Flinders University Speleological Society, herei after known as the Society.

2. OBJECTS.
   2.1 The objects of the Society shall be:-
   (1) To foster interest amongst university members in all aspects of caving with particular interest in S.A. caves.
   (2) To promote interest, exploration and preservation of these c
   (3) To maintain records of all trips and record results of all i igations.
   (4) To continue the scientific work already in progress at the Naracoorte caves and to extend it to other areas.
   (5) To co-operate with other clubs to further these aims.

3. MEMBERSHIP.
   3.1 All members of the Flinders University Clubs and Societies Associ shall be eligible for membership of the Society and shall become members of the Society upon payment of the Society membership fee

3.2 The Society Membership Fee shall be one dollar per annum payable by 31st March each year.

4. COMMITTEE.

4.1 The affairs of the Society shall be managed by a Committee comprised of:

(i) President
(ii) Honorary Secretary
(iii) Honorary Treasurer
(iv) Immediate Past President
(v) Equipment Officer
(vi) Safety Officer
(vii) Librarian

all of whom shall be members of the Society.

4.2 The Committee shall meet at least once each month during the academic year.

4.3 The Committee shall have the power to make any regulations necessary to put this Constitution into effect.

4.4 A member of the Committee shall cease to be a member of the same upon any of the following happening:

(i) He submits, in writing, his resignation to the Honorary Secretary;
(ii) He is absent from three consecutive Committee meetings without leave being granted by the Committee;
(iii) He ceases to be a member of the Society.

4.5 The Committee shall have the power to fill any vacancy occuring on the Committee provided that such action is ratified by a General Meeting of the Society, to be held within one month of such action being taken.

4.6 The Committee shall have the power to appoint from time to time such officers and sub-committees as it deems necessary. The duties of such officers and sub-committees shall be defined by the Committee to which the said officers and sub-committees shall be responsible.

5. FINANCE.

5.1 There shall be kept a bank account in the name of the Society at the Flinders University Branch of the Bank of Adelaide.

5.2 All funds of the Society shall be kept in the Society bank account and appropriated only with the approval of the Committee.

5.3 The Honorary Treasurer shall keep proper books of account for the Society and shall prepare such statements of the Society's financial affairs as the Committee directs.

5.4 The Financial Year of the Society shall be from 1st January to 31st December.

5.5 The Honorary Treasurer shall prepare at the close of each financial year, a statement of the Society's financial affairs which shall be duly audited and forwarded to the Flinders University Clubs and Societies Association.

6. ANNUAL GENERAL MEETING.

6.1 There shall be an Annual General Meeting of the Society to be held by the end of the fourth week of 1st term each year to:

(i) receive a report from the Committee,
(ii) receive the audited statements of the financial affairs of the Society for the previous financial year,
(iii) elect the Committee,
(iv) conduct such other business as is properly brought before the meeting.

6.2 The Honorary Secretary shall give fourteen days notice of the Annu General Meeting by means of a notice placed conspicuously on a notice board in the Flinders University Union Building.

7. GENERAL MEETINGS.

7.1 The Honorary Secretary shall convene a General Meeting of the Soci
(i) at the direction of the Committee,
(ii) within fourteen days of receipt of a petition signed by one- third of the total members of the Society, whichever is the least; provided that such a petition shall state the busin to be discussed at the General Meeting.

7.2 The Honorary Secretary shall give seven days notice of a General Meeting by means of a notice placed conspicuously on a notice boar in the Flinders University Union Building.

8. VOTING.

8.1 The Chairman at each meeting of the Society shall be the President or in his absence a person eligible to vote elected by the meeting

8.2 Persons eligible to vote shall be:
(i) at Committee Meetings, members of the Committee,
(ii) at General and Annual General Meetings, those members of th Society present.

8.3 The Chairman of each meeting of the Society shall have deliberativ vote only.

8.4 All questions before meetings of the Society shall be determined b a simple majority of those voting except where stated otherwise in this constitution.

9. QUORUMS.

9.1 The quorum for a Committee Meeting shall be 4 Committee Members.

9.2 The quorum for General or Annual General Meeting shall be one thir the total membership or twenty members of the Society, whichever i the least; provided that for a General Meeting called under clause (ii) of this Constitution, the quorum shall include at least fifty percent (50%) of the petitioning members.

10. ALTERATIONS TO THIS CONSTITUTION.

10.1 The procedure for altering this Constitution shall be:
(i) The proposed amendments shall be set out in full and posted conspicuously on a notice board in the Flinders University U Building at least fourteen days before the (Annual) General Meeting at which they are to be discussed.
(ii) The amendments shall be agreed to by at least two-thirds of members of the Society present at the (Annual) General Meeti at which they are to be discussed.
(iii) The amendments shall subsequently be approved by the Flinder University Clubs and Societies Association.

11. Should the Society be disbanded or in any way become defunct then all a of the Society shall be transferred to the Flinders University Clubs an Societies Association.

* * * * * * *

COMMITTEE OF 1974.

President:	Malcolm Robb, 20 Hume Street, Seaview Downs, S.A. 5049. phone 2981781
Secretary:	Jull Sinclair, 16 Leonard Tce., Torrens Park,S.A. phone 2722683
Treasurer:	Mike Riley, 77 Archer Street, North Adelaide, S.A. 5006. phone 2673750
Equipment Officer:	Barry Bolton, 16 Narinna Ave., Cumberland Pk. S.A.
Safety & Training Officer:	Terry McKenzie, C/- University Hall.
Librarian:	Annette Walker, 15 Euro Avenue, Eden Hills, S.A. phone 2784559

A brief note of my concept of the duties of these various officers is probably necessary at this stage. During the evolution of the club these may change depending on peoples feelings.

President: to co-ordinate the activities of the club, to chair meetings and in general to ensure the club continues to operate within the aims of the constitution.

Secretary: to keep adequate minutes of meetings, to handle correspondence and to disseminate notices of meetings etc.

Treasurer: to keep records of the financial affairs of the Club, to prepare books for the auditors, and to handle all monies coming into and out of the club.

Safety & Training Officer: to make him/herself proficient in the modern caving techniques including abseiling, prussiking, first aid advice etc., and to ensure that this information is disseminated to all members of the club.

Equipment Officer: to look after and keep records of the club's equipment. Equipment can only be loaned through this person.

Librarian: to store publications of caving interest, to make them available to members and to keep adequate records of loans etc.

* * * * * * * * *

Club Publications.

I have been reluctant to have elected a publications officer since in the p all the work has been left to this unfortunate person. I envisage publicat to be organized by interested parties within the club and generally assiste by all members.

I have undertaken to commence the publications with this booklet which may be considered to be the club's first magazine. All members are encouraged to write brief trip reports, articles on aspects of caving, humorous articl verse, advertisements and so on.

Due to the size of this first magazine and its use as a reference, it is bo by hard covers. In future publications perhaps each years magazines can b bound in hard covers for storage in the club library. In this way a comp- rehensive reference facility will be established.

In the ensuing publications I would like to see a collation of information of caving areas around South Australia, expanding the information in the AS handbook. Members are encouraged to make known any such information and t actively seek it out.

Trips.

A minimum of experienced persons must be present before an official trip ca take place. I see two types of trips - those officially organised by the committee for the club at large - and those which are organised among the members. That is to say if anyone wishes to go caving to a particular are all they have to do is to find other people interested, get information and equipment and go. More will be said about trips at future meetings.

* * * * * * * *

First Aid.

A kit containing basic equipment will be made up and packed in a tin for ease of transport through caves. The contents will be decided at later meetings. The kit will be held by the equipment officer. It is pointed out that the St. Johns ambulance run good first aid courses and people are encouraged to attend or at least to make themselves familiar with the handbook, copies of which will be held by the club.

Safety.

Caving can be dangerous if people are not aware of the safety precautions necessary. The following article is a compilation of the information which I feel people should be aware of.

The work has been done by J. Toob and other members of the University of Queensland Speleological Society and my thanks and acknowledgement goes to them. This is in fact a reprint of their magazine 'Down Under' with a few deletions, additions etc.

All members are encouraged to read it as Safety Training days will be held to illustrate these techniques.

While it is recognized that most caving in S.A. is not vertical and does not require elaborate climbing techniques, these are nevertheless important for safety and for interstate caving.

SAFETY AND TRAINING

G. J. TOOP

REQUISITES FOR CAVE SAFETY

1.Don't cave alone. Desirable party size equals four.

2.Each caving trip is to be under the control of a trip leader possessing qualities of responsibility and discipline needed to ensure the safety of the party and protection of the caverns.

3.A suitable helmet (Australian or British standard) should be worn at all tim

4.Wear close but not tight fitting clothes, e.g. one piece overalls.

5.Wear tough boots, heeled, and with vibram soles. Do not wear flat soled sandshoes.

6.A first aid kit is to be carried on all trips.

7.Two totally independent forms of lighting are to be carried by each person.

8.Don't take underground anyone affected by drugs or alcohol.

9.In the event of all persons going underground at the same time, leave some indication at the campsite of whereabouts and expected time of return. The idea of leaving an orange flag, with the initials of the flag owner, outside caves entered is a good one.

10.Ropes and tapes are not to be used for any purpose such as car towing.

11.Dry out ropes and store in a cool dry place away from sunlight.

12.Do not uncap carbide lights in confined places.

13.Carbide lamps are not reliable indicators of foul air.Use matches or candle

14.Internal combustion engines are not to be used underground or on the surfa where exhaust fumes are likely to enter a cave.

15.Ensure that all cords used to,carry whistles, lights, compasses, ect. around the neck will break with reasonable ease should they be caught during a slip or fall.

16.A belayer should be experienced and have a <u>failproof</u> anchor.

he trip leader should ensure that no member of his party is coerced into a tion beyond his capabilities.

safety line should be used in any situation where a fall could result in y. The trip leader should make the decision considering:
(a) experience of party (b) physicial condition of party
(c) difficulty of obstacle (d) difficulty of rescue if fall occurs
tches exceeding 25' ,always use a belay.

ly one person at a time should ascend or descend ladders or ropes.

least three members of the party should be experienced in knots and the f climbing equipment on trips where such equipment is used.

re must be taken of ropes to avoid damage by sharp projections.Do not or stand on ropes.

ternative means of contact should be used on pitches where unaided voice ct is difficult.Whistles are probably the best for this.

Whistle code: One whistle means to stop.
Two whistles means to take in the rope.
Three whistles means to let out the rope.

careful not to burn ropes with carbide lamps.

ke care not to dislodge loose rocks down pitches.Remember we lost a 150' antle rope last year because of this.Considering the frequency of this ing, it's a miricle no one has been seriously injured.

ke notice of weather conditions when entering caves which may take water.

ever climb ,prussik or ascend ladders with a pack on.It becomes extremely ing. There have been cases where temporary paralysis of the arms has red while laddering with a pack on.

* * *

ASF Code of Ethics

he Federation expects that the following rules will guide the actions of embers of A.S.F. societies

y will, in reporting their work, avoid and discourage sensationalism, geration and unwarranted statements.

y will treat guides and other officials of tourist caves courteously respectfully.

They will carefully observe the established rules of good camping conduct.
They will be careful to bury all carbide and rubbish.

They will have specific or tacit approval from the owner or guardian before ring private property or caves in reserves.

4. b.They will follow normal local practices regarding gates on properties or reserves.

c.They will not, except in cases of emergency, persume on the goodwill of owners in dry areas for supplies of water. Prior arrangements must be made.

d.They will take care to avoid interference with stock or crop.

e.They will, where a cave entrance has been blocked by the owner to prevent injury to stock , either reblock the entrance or construct a substantial and permanent fence around it.

5. a.They will not leave rubbish in caves.Spent carbide, flash bulbs,wrappings and other refuse must be brought out of the cave.

b.They will not disfigure caves by any unecessary markings.

c.They will take care to avoid disfiguration or destruction of cave decoration or formation.

d.They will not under any circumstances leave faeces in the caves. They will prepare them selves beforehand or, when underground, make provision for the removal of faeces.

6.They will when visiting an area frequently visited by another club, do all in their power to co-operate with that club.

* * *

METHOD 1

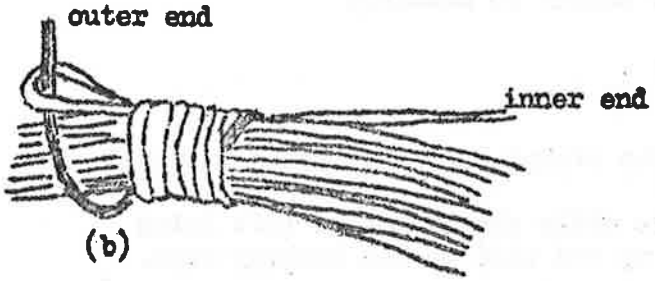
COILING THE ROPE

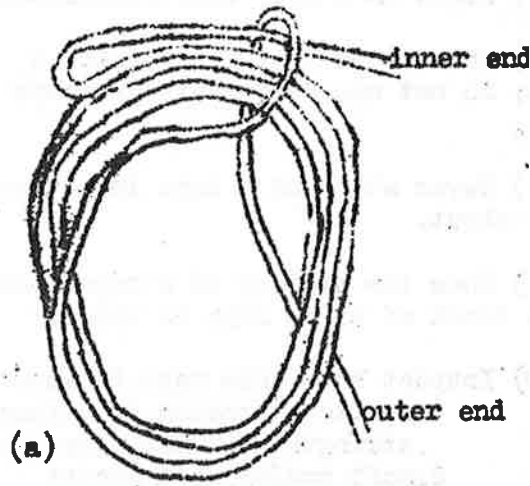
1.Bend the inner end back on itself.

2.Wrap the outer end around the rope (including the bent back inner end) several times,working towards the loop in the inner end.Keep firm at all times.

3.Thread outer end through loop in inner end and pull tight.

4.To uncoil the rope, undo the knot, and unwrap from the outer end.





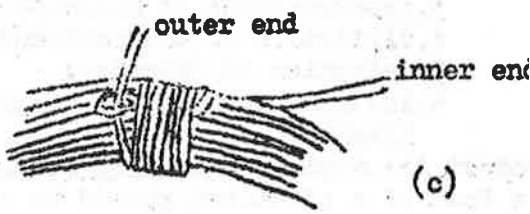


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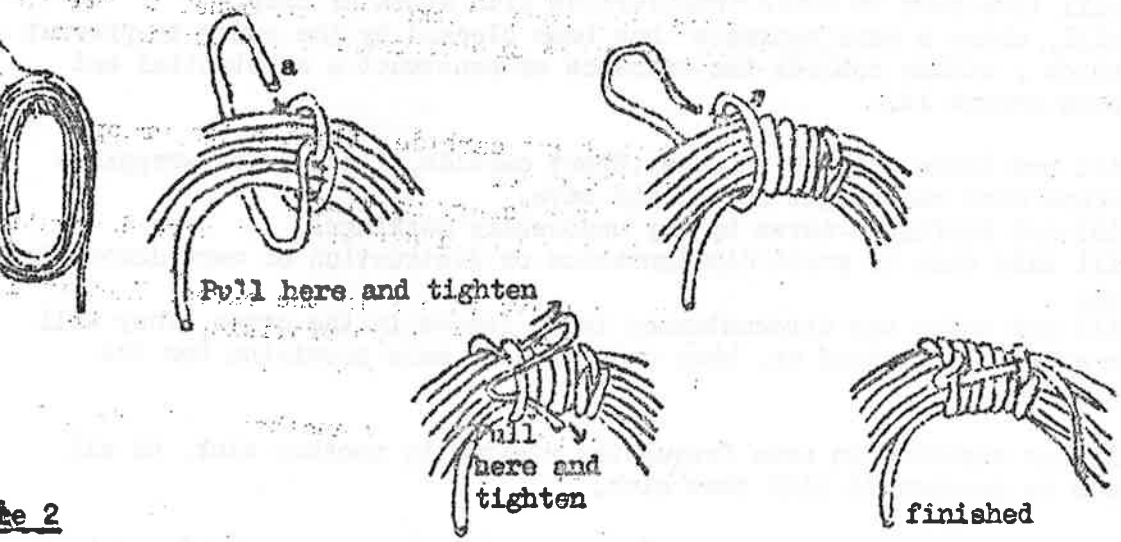
Fig.1

OD 2

ing the rope - One hand grasps the rope about one foot from the end, and other forms successive coils about five feet long. The final finishing should be about five feet long.



be 2

w points on the handling of ropes:

a) A rope that has been used to halt a leader's severe fall, pull a car from a (i.e. any rope that has been extensively stretched)or which has had rocks or pment fallon it, should never be used as a bely rope.

b) Keep ropes free from kinks and unecessary knots.

c) Store in a dry, well ventillated place away from direct sunlight.

d) Wash ropes that have picked up grit or mud, but do crush or twist wet s; do not use detergents or soaps (some are extremely harmful to synthetic s.

e) Never stand on a rope in any sort of shoe or boot; never throw coiled s about.

f) Know the history of a rope - mark it permanently when first bought and p track of which rope is which.

g) Inspect the whole rope frequently for:

1. surface abrasion (the fuzz on nylon ropes does not reduce the strength much and makes the rope easier to handle);
2. soft and/or hard spots;
3. decayed burnt or mildewed areas;
4. distortion of the continuity of the lay;
5. reduction of diameter;
6. internal abrasion, powdering at the strand axis and broken internal fibers.

rotect the rope from falling rocks ,loose coils should not be left lying he foot of a pitch but should be coiled up and tied to the hanging rope.

Rigging a Pitch

A pitch should always be rigged for ease of access if possible. The anchorage point should be back from the lip and should be above the level of the lip, so that the rope is not flat against the rock above the lip. A tackle bag or rope protector should be placed where the rope touches the rock. If possible, lower the rope down the pitch rather than throw it.

Ropes used for belaying and abseiling and other uses where life and limb are directly dependant on it, are generally ready for retirement at the end of two years.

All in all treat your rope like a camera or car and look after it.

* * *

TAPES: Care for as for ropes. See section on ropes

* * *

Rope Protectors

Because the security of the rope is paramount, it is necessary to protect the rope from abrasion wherever it touches the rock. At the top of a pitch, a tackle bag can be placed between the rope and the rock and tied to the rope with a piece of twine. At contact points partway down a pitch special rope protectors must be used. These are pieces of hose pipe or clear plastic tubing with a lengthwise slit forplacing them on the rope. They are of a circumference such that they will grip the rope and are put in place by the last man down the pitch.

However, the slit plastic tubing is unsatisfactory and substitute methods of protection are desirable. It should have the following properties:

1. Lightweight
2. Compact
3. Easy to place and remove
4. Will not allow the rope to slide out of position.

Several lines of enquiry are open at present. One is to fasten canvas pads to the rock using pitons, small bolts or natural anchorages. Another is to wrap canvas around the rope and fasten it using bulldog clips, press studs or something similar. Another idea yet to be tried, is to rivet sections of split tubing to a piece of matting, thereby combining the advantages of the matting and the split tubing. The matting would prevent the tubing from turning over which is the main disadvantage.

* * *

Rope Types

Purchasing your own rope:-

A number of rope types have been used for caving, i.e. Nylon Terylene Cour

and Manila.

Caving ropes are usually multipurpose-belaying, abseiling, climbing, handlines, prussiking and gear hauling. (NOTE: ROCK HAULING IS NOT CARRIED OUT WITH ROPES USED FOR ANY OF THE ABOVE).

Because of this multipurpose use, NYLON ROPE, or its German equivalent, Perlon, is the only type to be recommended. Its extensibility may be unwanted for prussiking and handlining, but compared to other ropes, nylon is by far the best all round rope material. Terylene is not to be recommended due to its low shock strength, while polypropylene types (courlene, etc.) are not recommended because of their low temperature tolerance. This can be as low as 45°c and is exceedingly dangerous in a club like ours where abseiling is the norm.

For general caving use, excluding climbing, ordinary top-quality nylon rope is quite suitable as long as its tensile strength exceeds 3,500 lbs. I would recommend however, that only ropes of U.I.A.A. mountaineering standards be purchased. After all, your life is totally dependant on your rope. For climbing, always use a doubled 9mm or a single 11mm rope of U.I.A.A. standard. The advantage of Kermantel construction over hawser lay in nylon ropes, lies mainly in ease of handling and since Kermantel is superior in shock strength to its hawser laid equivalent, the weight can be considerably reduced for the equivalent shock strength.

For the case of long abseil, prussik pitches terylene rope has found a definite place. It is heat resistant for abseiling and because it only elongates 4% under load it is very convenient and superior to all else for prussiking. Kermantle construction dampens spinning during the ascent. Due to its low shock strength however never use it for belaying where long falls could occur. Also ensure that the rope is of sufficient diameter to provide 3500lbs. breaking strain.

* * *

MAINTENANCE OF CARBIDE LIGHTS

Despite the fact that carbide lights are very easy to care for, members of this club never seem to carry out the simple procedures necessary.

- Always clean carbide lights out after a trip.
- The occasional polish of the reflector improves the light output a great deal.
- Never more than ½ fill a carbide light with carbide, since it expands when water is added and can block the acetylene outlet.
- Always carry a pricker to clear the carbide jet.
- The felt filter in the premier carbide light can become wet or clogged with spent carbide and can stop the acetylene very efficiently. Remove clean and dry.
- Pipe cleaners are ideal for cleaning out the acetylene tube from filter to jet.
- Always be very careful not to lose any pieces of the carbide lights during filling. This applies particularly to the sealing washers.

8. If a carbide light has been damaged or the sealing washer has been lost always report this to the Equipment Officer.

9. Take care not to drop carbide lights on pitches, i.e. clip to waistband with a Karabiner

* * *

KARABINERS

The karabiner (snaplink) is a most useful piece of gagetry, but there is an unfortunate tendancy to regard them as indestructible: the karabiner may be le strong than the rope. Tests carried out gy the National Engineering Laborator in Glasgow revealthat new snaplinks do not come up to specification(4500lb. with the gate closed). This is very significant when one sees the old and bat karabiners of cavers of a few years experience.

Afew points on handling;

(a)Use a screwed up screwgate karabiner where possible- they are saf

(b)Arrang, them so that when the strain comes on the assemblage ther is no strain on the gate, e.g. face gates away from rock face,

(c)Don't drop or throw karabiners; if one is dropped further than a feet, mark it, and use it only for packhauling and the like.

(d)Don't put a three way pull on a karabiner;e.g. don't use a karabi to clip the end of a waistloop around you - you may be tempted to tie another rope into the karabiner.

(e)Keep steel bright, cleened and oiled; even mild rust pitting can reduce strength up to 35%.

There is a tendancy for firms to make cheap screwgate karabiners by sinking a pin into the gate of their standard clipgate karabiner and simply adding a sc keeper to screw up and down on this pin. Typical exampls of this are the allo screwgates of Simond and Cassin

Please note that in this club we have had instances where this pin has suddenly fallen out instantly converting the supposedly failsafe screwgate karabiner into a clipgate. This has occurred with both the Simon and Cassin screwgates. In other cases the keeper has been found to screw easily off the pin - on examination the pin has been found badly worn by repeated use.

The use of these karabiners for rigging is quite alright but please ... DO NOT use them as your failsafe attachment karabiners for abseiling, prussiki or belaying.

Karabiners are available where an actual screw thread is cut into the g This is the type to own at least two of ,as your failsafe screwgate karabiner The only problem that can be encountered with these karabiners is that the thread can be burred rendering the karabiner inoperative.

Examples of such karabiners are:-

BONATI	STEEL D	SCREWGATE
STUBAI	STEEL D	"
STUBAI	ALUM D	"
R.E.I.	ALUM D	"
HIATT	SMALL D	"
HIATT	LARGE D	"
CASSIN	HEAVY D	"
STUBAI	HEAVY D	"
STUBAI	5000	"

HIATT and CASSIN are available from TISO of Scotland Mountain Equipment and Bushgear. STUBAI are available from Paddy Pallin.

* * *

. Care of Ladders

1.Normally the life of a wire rope will depend on the amount of bending it receives. Bending can minimised by the following:-

(a)An extra trace should be used if a large anchorage causes the ends to diverge excessively;

(b)The rungs should be horizontal not tilted;

(c)If the wires between adjacent rungs tend to form a helix the ladder has probably passed through itself;

(d)Do not walk on ladders;

(e)Place padding over sharp edges;

(f)Do not coil ladders in a circular fashion since this kinks and weakens the wire. To coil bring every second rung together so the ladder is loosely coiled;

(g)When laying a pitch beware of kinking the wire.

2.Protect the ladder from falling rocks.The site should be cleared of loose rocks and equipment.

3.Always protect ladders when caving by carring them in ladder bags.

4.If the previous usage of the ladder is not known, it should be inspected for damage as it paid out over the edge. A few broken wires may not be serious but any damage should be repaired.

5.Always have home made ladders tested after they are made.

6.CORROSION. Experience has shown that occasional wetting of the ladder will

produce any significant differential corrosion. However it should be washed muddy and dried before storage. Greater care will be needed if exposed to s water. Always store ladders in a dry place.

* * *

KNOTS

Knots greatly reduce the strength of a rope on the testing bench but in ac use the rope usually breaks at some other stressed point.

A knowledge of all knots is not necessary. The following however shuold be considered minimal.

1. Bowline
2. One and half fisherman's bend
3. Bowline on a bight
4. Tape knot
5. Fisherman's knot
6. Grapevine knot (double fisherman's bend)
7. Prussic knot
8. Figure of eight

1. Bowline Used for:- tying off belay and abseiling ropes, tying ropes arou the body or into waistbands ect. There some doubt about the holding power o the Bowline. However if correctly tied and finished off with a half hitch o overhand knot, which prevents it from becoming undone, particularly in stif ropes, this knot will hold.

If worried, use a double looped or double knotted bowline which is recommended by rockclimbers today.

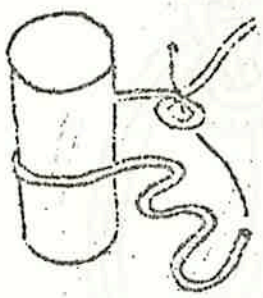
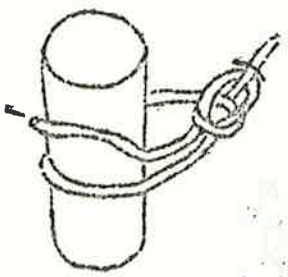
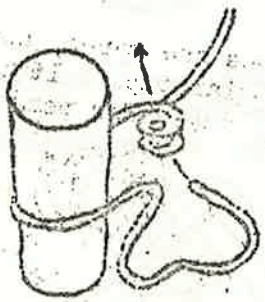


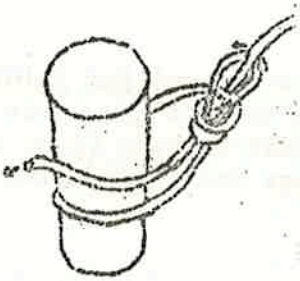
Fig.3



Use an OVERHEAD KNOT to secure the en



The DOUBLE BOW LINE holds better.



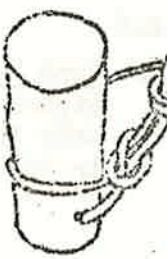
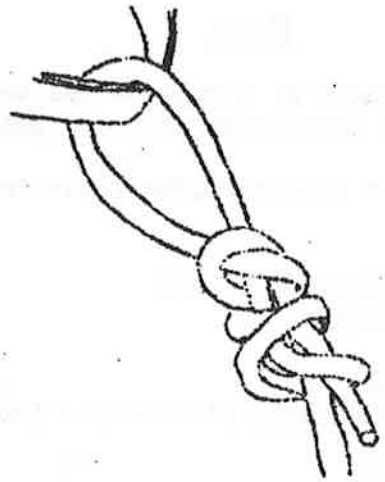


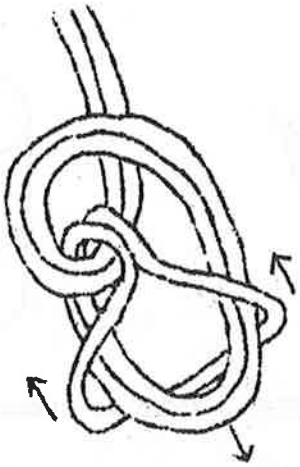
Fig.4

. One and a half Fishermans bend. The most secure tie to a waistband is the one and a half fishermans bend. The first half of the knot is an overhand in the standing part (the start of a single fishermans bend). The second half is that of the double fishermans bend or grapevine knot.



ig.5

. Bowline on a Bight. This knot provides two loops and is a secure knot for tying on a person during rescue. Each leg can be passed through a loop. A chest harness then secures the upper body to the rope but via a non-slip knot, not a sliding krab.



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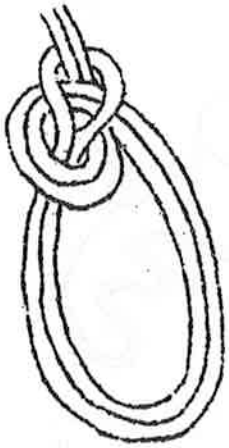
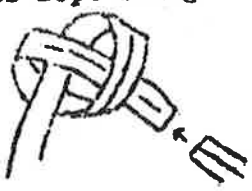


II

g.6

4. Tape knot. This knot is used for joining tapes and ropes, however, experience has shown that it can untie in tubular tape. It is now recommended only for 1" and 2" flat webbing (i.e. waistbands). For permanent knots in tape or rope slings use a grapevine knot.



ig.7

5. Fisherman's Knot. Has been used for joining two like or unlike ropes.A far more secure knot is the grapevine knot below.

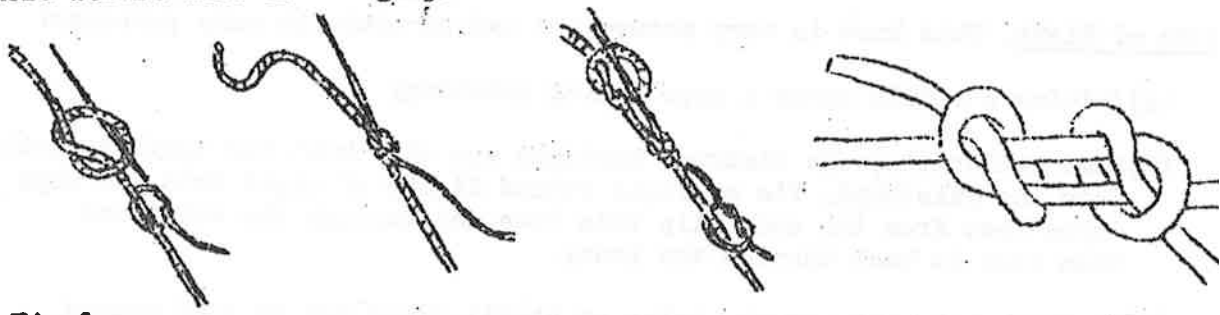


Fig.8

6. Grapevine Knot. (double fisherman's bend). Preferred for tying together the ends of rope or tape to form permant loops or slings. It is also excelle for joining the ends of two ropes on long pitchs.

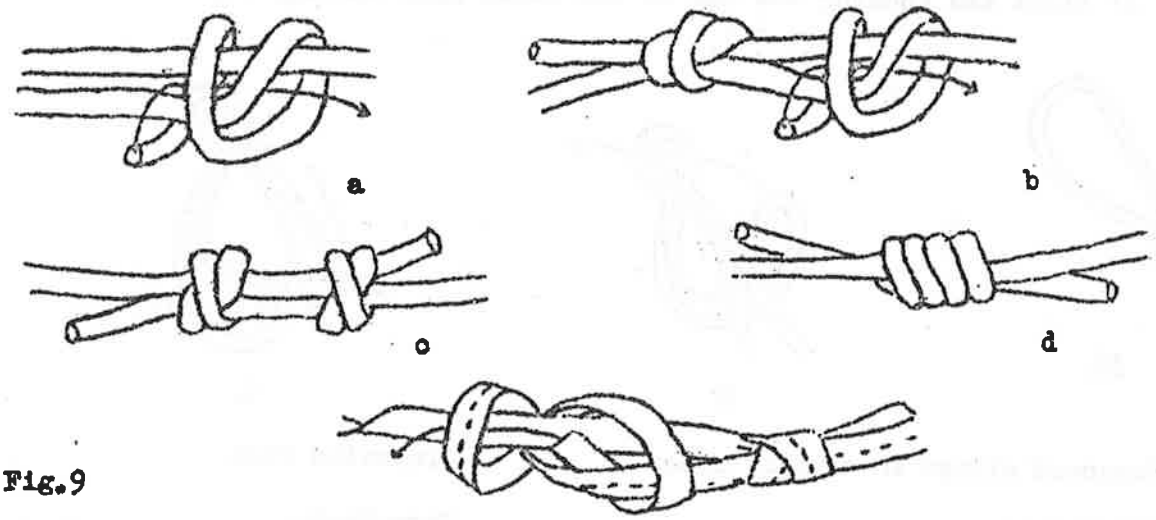


Fig.9

7. Prussic Knot. Used for ascending ropes but clogs or jumars should be used you expect to use the technique often.

The knot will slide freely up or down on the rope, but will solidly when weighted.If one has fallen on a belay the prussic might provide means of ascentor at of taking the weight off one's waist preventing suffoca It is a girth hitch tied twice. The prussic has been know to slip on worn ro Its girth can be increased by passing through the blight three times. Best p slings are made of Kernmantle rope 5mm diameter.

Fig.10

gure of Eight. This knot is very secure and can be used for many purposes:

(a) Joining a middle manon a rope during climbing;

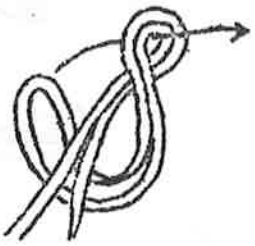
(b) Some authorities who distrust bowlines use this knot for tying directly into the waistband. Tie a single strand figure of eight into the rope three feet from the end. Slip this free end through the waistband then feed it back through the knot.

(c) In the same way as above, belay or abseil ropes can be tied around trees ect.

(d) Ropes can be joined for long pitches by tying a single strand figure of eight and feeding the end of the other rope through it.

11

III



II

1

MARY

Permanent slings in tape or rope	Grapevine Knot
Waistbands	Tape Knot
Tying ropes into waistbands	Bowline, figure of eight, one and half fishermans bend
Joining two ropes	Grapevine, figure of eight
Tying abseil or belay ropes to anchors	Bowline, figure of eight, one and a half fishermans bend.

* * *

CAVING TECHNIQUES

LADDERING

1.A safety helmet should be always be worn.

2.A belay is a must. Always use one even on short climbs. See Belying.

3.Only one climber at a time should be on the ladder.

4.A karabiner is attached to the waistband it is useful because the climber can hook himself onto the ladder rung and rest in comparative comfort leaving both hands free.

5.When climbing only 20 ft. or s technique is not very important but on longer climbs an inexperienced person can become exhausted very quickly.Climb using the legs to lift the body rather than the arms, keep the body upright, do not hang back on ypur arms. Hands grip from behind and heels also are placed on the rungs from behind. Some cavers alternate one heel from behind with a toe placed in from the front.

To climb against rock push the knee bearing the weight against the rock and push the foot backwards away from the rock. The next rung will be available for the next foot. Alternatively the body must be swung onto the rock, thus placing the rungs perpendicular to the rock face.

Fig.12

SIGNALS

OFF BELAY: Said by either belayer or climber .Indicates the belay either may is being dispensed with. Keep the belay on until the climber says "Off Belay". This should normally be only after he is anchored.

UP ROPE: Climber to belayer. Means "Take in rope " wether up or down.

SLACK: Climber to belayer. Opposite to "Up rope " Never say "Take in slack" when ypu mean "Up rope".

ION: Climber to belayer.Means,"Hold rope tight!"Sometimes it means, "Pull hell!!"

: Ashout of warning similar to "Fore" in golf. Shout it loudly upon dislodging ssile.

cave safety for whistle signals.

* * *

BELAYING

best belay techniques have taken away the emphasis on the strain being taken he belayer's body and transferred it to the failproof belay anchor. Beware any of the early books on belaying technique which show hip and shoulder ys without anyanchor at all. Such techniques are extremely dangerous and ld be never used.

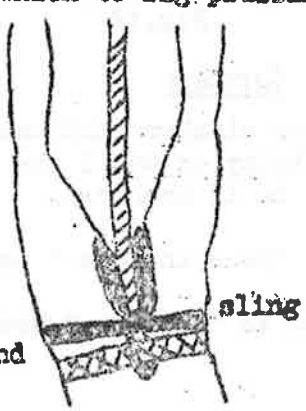
belaying always use heavy but flexible leather gloves.

s my opinion that most people would be surprised at the difficulty of stopping ll using a glove belay. For this reason I would prefer to see mechanical ces used.

mber any fall should be stopped quickly in the shortest possible distance inimise the possibility of the caver hitting ledges or rock projections.

fall has occured and the caver caught successfully in most cases they will ble to contimue the pitch. If shock or injury prevent this the caver can be red to the bottom of the pitch or a half hitch can be tied on top of the y device using the free end of the rope. Remember however that once tied off this a caver cannot hang around just on a waistband waiting for rescue. sure on the ribs can be relieved by fastening an emergency diaper out of a dard sling.

sling is twisted into a figure of eight - The victim turned upside down and legs placed through both sides of the figure of eight. When the victim is ed upright the body weight is supported by the sling acting on the buttocks diagram) This method is used mainly by rockclimbers, after a fall this gives mfortable position from which to rig prussik gear for the ascent to the belay tion.



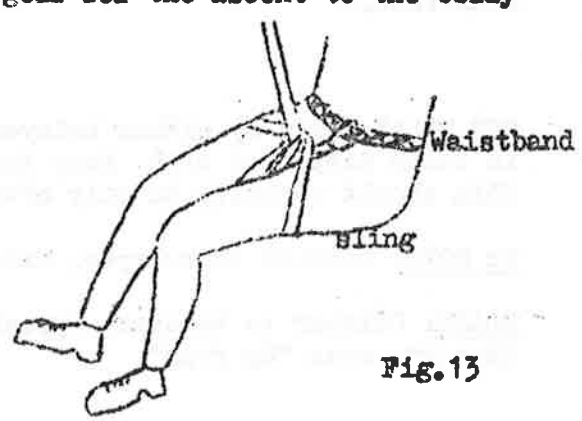


Fig.13

(1) Sticht Plate Belay

Ths sticht plate is an aluminium plate with a slot of the size appro riate to the rope in use. The loop of the rope is pushed through the slot and clipped into the anchor karabiner.

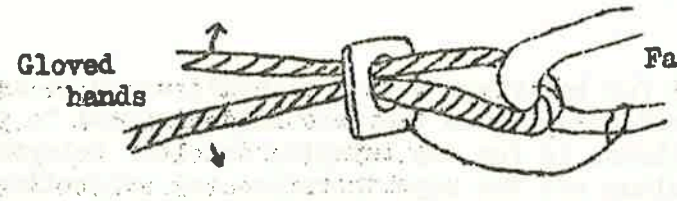
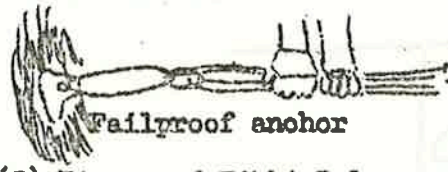


Fig.14

Sticht plate belay: Braking effect increases as the ends of the rope are moved apart using gloved hands.

(2) Glove Belay

The belay rope is passed throug. a karabiner attached to the anchor and back parallel to itself. The two strands of the rope are gripped by gloved hands. The closer the hands are to the karabiner and the tighter the grip, the greater the braking effect. Some people pass the two parallel strands of the rope either side of their body gripping the rope in front - this helps increas friction somewhat as the rope also works on the body of the belayer - if using this technique, makesure the rope is passed through the anchor karabiner. A common fault is to anchor the belayer off the waistband and just have the bela rope around the belayer. The force of any fall should be taken by the anchor not by the belayer.



Glove Belay - Rope is gripped in both gloved hands close to the karabiner.

Fig.15

(3) Figure of Eight Belay

A Fisher's or Black's descender is used for this technique. The rop is passed through the figure of eight as in the diagram. Braking is obtained pulling the free end of the rope back with gloved hands. This technique is no recommended as it twists the rope.

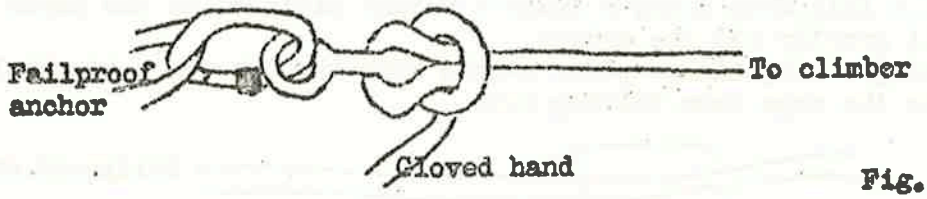
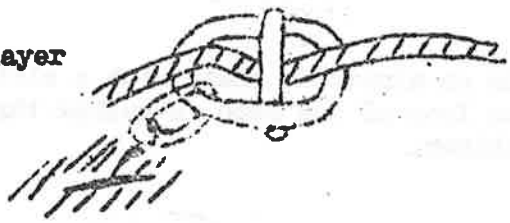


Fig.16

(4) Brake Bar

A brake bar can be used for belaying. The brake bar and karabiner ar attached to the anchor and rope is easily played out or stopped. This method is best used for belaying down a pitch - taking in is inconvenient.

Diagram is on the next page.



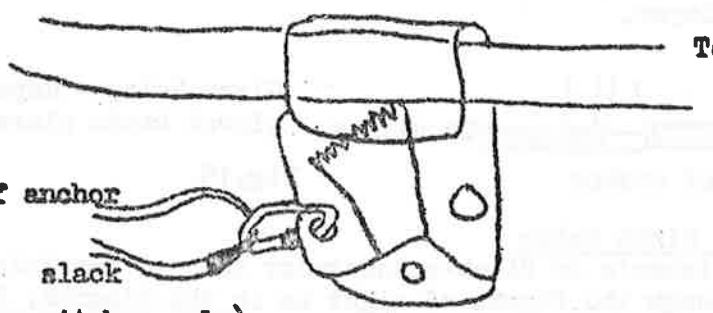
g.17

assiking devices can be used for belaying, but they should never be used in es where any long falls could occur since they are only designed to take up about 1000 lb. Their usefullness is for top belaying and self belaying since both the climber just pendulums off the rope therefore not subjecting the assiker to undue strain. Some climbers do not trust the light construction of jumar and for this reason it is not recommended for top belaying since if e slack is left in the rope the fall can generate a reasonable amount of force.

at we badly need is for clubs to pool resources, purchase some clogs, jumars l ropewalkers and have them tested to breaking point. Then we would have some finite figures to work with.

) Clog Belay (ascending pitches only)

The clog is attached via a short sling to the failproof anchor in such way that the rope can only be drawn upwards by the belayer. Caution, always ld some slack in the sling. It can be very difficult to release the cam if the imber calls for some slack rope and the rope is taut.



g.18

)Self belay (ascending pitches only)

This method is recommended because it greatly speeds up the ascent of pitch especially for large parties. Using this method ,the clog or jumar is tached directly to the climber's waistband by karabiners in such a way that ring the ascent it slides up the rope but will immediatly catch the climber in e event of a fall.When using a jumar a weight attached to the lower clip sition will greatly aid the ascent.

TE:When using a clog always place a free krab through the bottom hole since is prevents the rope from falling out.

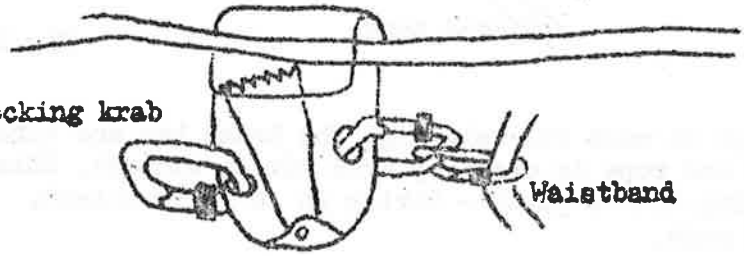


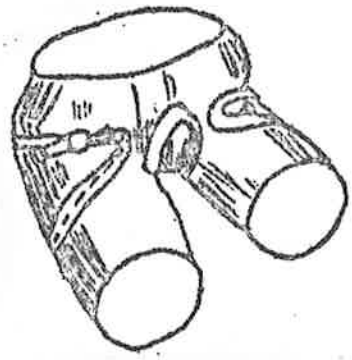
Fig.19

ABSEILING

The traditional methods of "Classic" and "over the Shoulder" have been super by mechanical devices."Thank God". These devices cause far less rope damage and provide more control of the rate of descent. In abseiling, the upper han is used for balance, and the lower for breaking. Walk the feet down the wall Do not let the feet get too high or you can run the risk of turning upsidedo Remember,a freewheeling, bouncing fast abseil is mainly a stunt and certainl not a working abseil, espscially in a cave. Good leather gloves (thick but flexigle) are essential for abseiling and belying.

1.The classic abseil should only be used in an emergency or on very short pi i.e.10'or less. Straddle the rope facing the anchor point. Bring the rope ov left hip, across the chest, over the right shoulder and down the back to be in the left hand. The classic is inherently dangerous.Be very careful using

Fig.20 Classical



Diaper

Fig.

2.MECHANICAL ABSEILING

All mechanical devices make use of webbing harness. Fully made up harnesses such as the Willians sit harness can be purchased and considering the great of use it will receive, it is probably a worthwile investment. Most cavers a waistband (2"terylene seat belt webbing 15' long or long enough to go aro the waist 4 times with enough left over to tie a good tape knot),coupled wi diaper sling (1"or1½" nylon tape - length varies with the size of the backs but about 10'.) The three loops of the diaper sling are held together by a screwgate karabiner which is clipped to the waistband.(NOTE:DO NOT USE A CL GATE KARABINER).Another screwgate krab carring the abseil device is clipped into the waistband diaper karabiner. This provides a harness which, if tie snugly is impossible to slip out of. In this light a waistband can be used However on long pitches this can hurt the ribs and it is better to couple i a diaper. Do not use a diaper alone as the body can slip out.

Abseiling has proved extremely dangerous and there three commonly used safe procedures:

1.Belaying on a separate rope - excellent but in practice this uses too muc

2.Should a caver lose control during an abseil it is possible for someone s bottom of the pitch to stop the fall by pulling down on the rope from the b as shown in the diagram.(See next page.)

Accidential falling can be guarded against by tying a prussic knot to the rope ove the abseil device and clipping it to the waistband karabiner. Keep the ot loose on the rope and cupped in the balance hand as it slides along with e abseiler. If you lose control during the abseil the knot tightens. But e sure that the prussic loop is not so long that the knot tightens out of ach. This method is also used to stop at the bottom of an unknown abseil ile searching for a platform.

e the diagrams.

Fig.22
opping an abseil

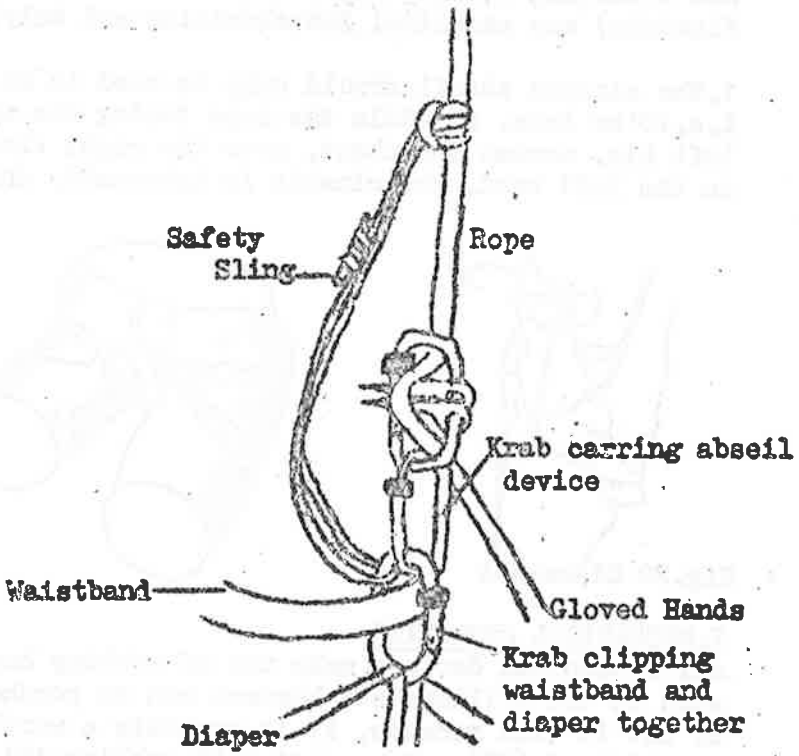


Fig.23 Safety Rig

TYPES OF MECHANICAL ABSEILING

Sticht plate: This method is recommende because it does not twist ropes but ortunately it is only made in sizes for kernmantle rope. Considering the amount kernmantle in the club, however, this device is a good investment, especially it can be used for belaying. In this club most members use 11mm slots on our kernmantle and this has proved quite controlable. I would suggest that a ble slot (both 8mm and 11mm slots) model be purchased since the extra friction the 9mm slot is handy on wet ropes, long abseils and for belaying.

erently safe - safety methods 2 or 3 can be used here.

Crossed Karabiners: This has the advantage that it does not twist the ropes large numbers of karabiners must be carried. Two karabiners with gates turned opposite directions are attached to the diaper screwgate krab. Two or more abiners the second pair and the abseil rope forms a blight over them providing

Fig.24 Use of a Sticht Plate

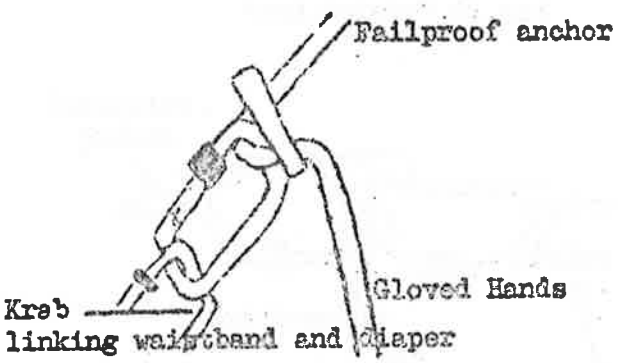


Fig.25 Sticht Plate

the friction. This single karabiner brake is used on double rope abseils. Doul brakes can be used on single rope abseils. In practice the single brake has pr reasonable on single ropes and can be adequately controlled.

NOTE: It is essential that the gates of the two karabiners (horizontal) be reversed. If not the whole gadget may unclip and come off the rope.

If assembled correctly this method is inherently safe. Safety methods 2 or 3 can be used.

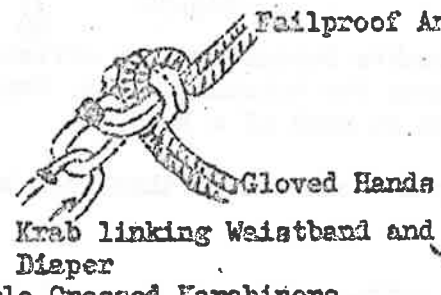


Fig.26 Single Crossed Karabiners

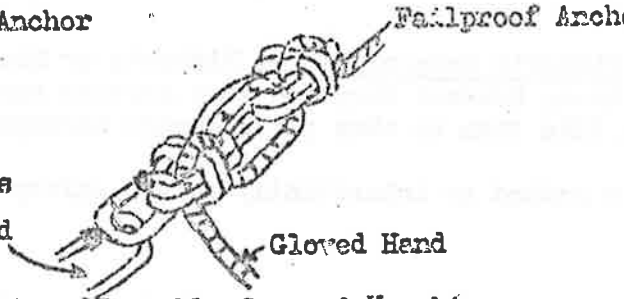


Fig.27 Double Crossed Karabiners

(c)Brake Bar: The brake bar is made in two types - one a solid D frame with a cross bar and the other just the bar which can be slid on an oval karabiner. With both of these the rope is easily inserted and cannot be removed under an tension. These methods are fairly restrictive in use since they are only to b recommended for double ropes. Two may be joined for single abseils.

A home made brake bar can be formed by sliding angle pitons on a screwgate karabiner and in actual fact is just as safe as the other two and more flexib since two pitons side by side can be used for single ropes and only one for double ropes. See diagram in abseil safety methods.

These methods work in the same way as crossed karabiners. However it is not inherently safe since it possible that on say an intermediate stance during an abseil, relaxed tension may allow the rope to un clip.

Only rely on safety method 3. See diagram on the next page.

(d)Twisted Knot: This method is only to be recommended if short of equipment. Its main disadvantage is that it twists the rope. The twist should not be ove the gate of the karabiner and should be placed as in the diagram so that the twisting rope will screw the gate shut if it happens to contact the other sid

This method is inheritantly safe - safety methods 2 or 3 can be used.

28 Brake Bar

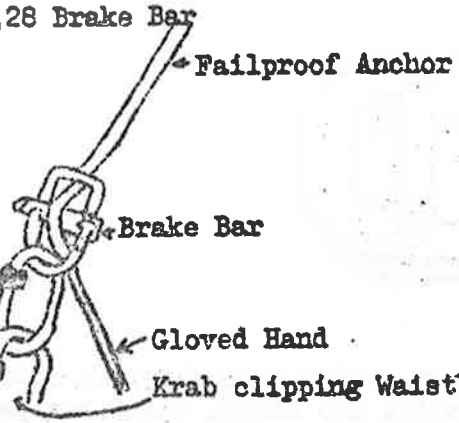
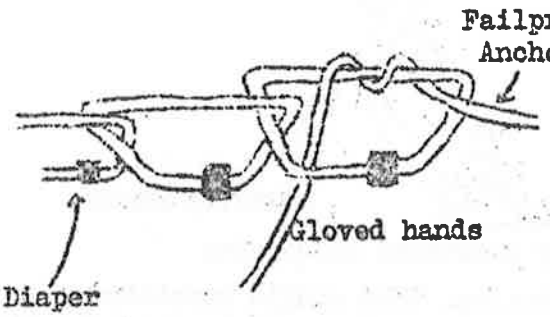


Fig.29 Twisted Knot



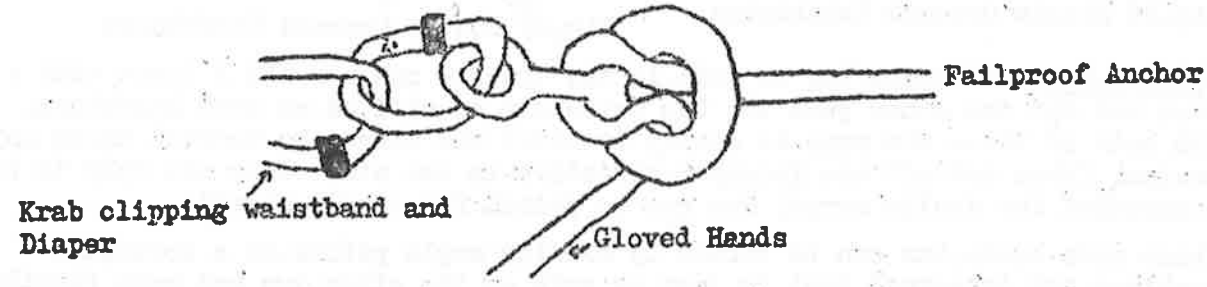
Pierre Allan Descender: Fairly hard to obtain in Australia. Its major advantages are that the rope is twisted and it is not inheritantly safe as rope could come off.

ly on safety method three.

Fig.30

Fisher's Descender: The Fisher's or Black's Descenders are efficient abseil vices. However they the best devices known for twisting ropes. Many cavers do t like them as they put the rope through to much of a bend.

is method is inheritantly safe - safety methods two or three can be used.



g.31 Fisher's Descender

creasing interest in vertical caving over recent years has resulted in the velopment of a number of devices specifically designed for tackling deep caves particular the Americans have produced at least three variable friction scending devices. On pitches over 250' long, there is a considerable difference tween the top and the bottom of the pitch in the friction created by passing e rope through the descender. This difference is due purely to the weight of e rope hanging below the descender. Variable friction descenders allow the caver adjust friction to suit the weight of rope below him.

Australia two of these devices are used. 1. Whaletail Descender
2. Rappel Rack

(1) Using the Whaletail

The Whaletail is used on single ropes. Its advantages over simpler and more convential abseiling devices (e.g. brake bars) are:

1. variable friction

2. the big aluminium backbone acts as a very effective heat sump. Al other devices we have tried become very hot very quickly. After a slow 300' a brake bar assembly has caused burns. This overheating is a serious problem long pitches which have been tackled by joining ropes, since;

a. when moving across knots the descender has to be handled.

b. when stopping before the knot the descender remains in cont with one portion of the rope for many seconds. A hot descende may melt the rope with obvious consequences. There has been a least one mountaineering death due to rope melting.

3. The gate can be used to stop in safety on abseil(see Fig. 32 c) Provided the rope is wound tightly back up the descender. This is useful for resting, bolting, untangling rope etc.

4. A very comfortable sitting can be effortlessly maintained when abseiling. This balance is upset when carring a pack of 20 - 25 lbs. weight.

5. It has very few moving parts. As a general rule increasing the n of moving parts in a device increases the chance of malfunction.

Its one noticable disadvantage over simpler devices is its weight (1½lbs). This is only minor when considered in view of the other advantages.

The Australian version with the safety clip is inherently safe and safety methods 2 or 3 can be used.

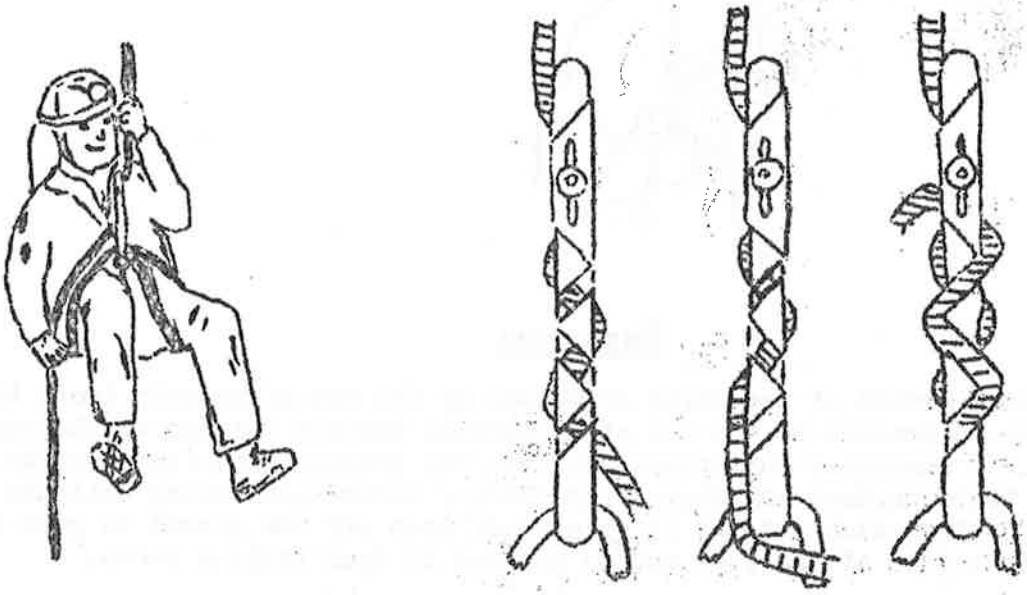


Fig. 32 Using the Whaletail a b c

Rappel Rack

a specially designed abseil device for long pitches ,resembling a large l hairpin with six steel brake bars mounted on it. The rope is threaded in out through the brake bars, which are spread out at the top of a long drop use of the weight of the rope, and are closed up as the pitch is descended. provides good control over the speed of descent.

rently safe, it is most unlikely that all bars could possibly unclip. safety methods 2 or 3 .

first glance the whaletail appears to be the better of the two. It is a better sink, spreads the wear over more bars and it is faster to put on the rope. is more difficult to lock up than the rappel rack. When the whaletail wears it must be replaced, whereas individual bars can be replaced in the rappel k.

the Whaletail and Rappel rack have to be made. Make sure you talk to some- who knows the dimensions, alloys and techniques necessary before going ahead.

E: Abseiling is dangerous - many good mountaineers have finally got the chop seiling. During an abseil you are totally dependent on your own gear so look er it. Always ensure the rope has a failproof anchor. Always use a screwgate abiner. Always use at least one backup safety technique.

PRUSSIKING

traditional method of ascending ropes was by the use of prussic knots but s has been superceded by the use of mechanical devices because of the ease handling. In emergency suitations however, the prussic knot (see section on ots) and Bachmann Knot may prove very useful. Before prussiking coil the rope the foot of the pitch and tie it up several feet off the ground to give some ght to the bottom of the rope and to protect it from falling rocks.

hanical Prussikers. Only the Jumar and Clogger ascenders are to be recommended. not purchase Hieblers as these are exceptionally dangerous as the rope can slip

out. The Jumar has a spring loaded safety catch which prevents the rope sl out. The clogger is safest of all since with the lower krab in position, i impossible for the rope to slip out.

Do not buy the older style jumar or clogger secondhand. In the jumar the r channel was too shallow which allowed the rope to slip out, while the olde cam in the clogger tended to slip on hawser laid rope. The modern clogger excellent. However many people do not trust the light construction of the jumar; apparently there are cases of the handle snapping off under heavy l (belaying). In the U.S.A. a tape is tied from the upper karabiner positio to the lower position so that in the event of a snap off the two halves ar connected.

The Gibbs ropewalker, an American device, is also fairly efficient. Its ma disadvantage being that is has to be dissassembled to put it on the rope - there a danger of dropping parts.

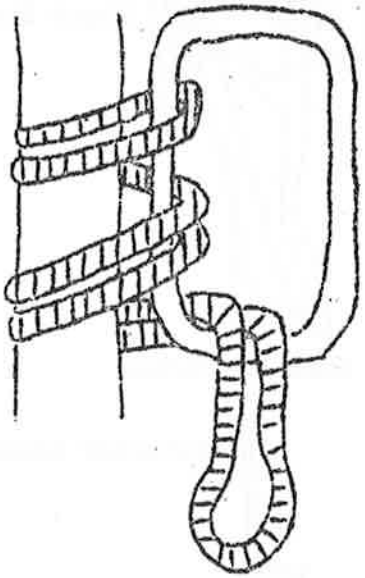


Fig.34 Bachman Knot

Fig.35 Jumar

Attachment of slings to feet

Some cavers persist in using C links to attach the main sling to the foot lashing. This is also to facilitate unhooking from prussikers to walk arou Such complications are avoided by tying loops, in the ends of the slings, t fit tightly around the boots. Such an arrangement rarely slips off the boo yet is easy enough to take off to walk around.

a)Yosemite Method - diagram

n this method a sling stirrup is attached to each prussiker into which the boots re placed. Alternate upward movements of the left hand and foot to the right and and foot result in a step by step progression up the rope. A safety sling s attached from the upper clog to the waist or chest harness in case of accidents r to rest. For long pitches the safety sling is attached to the diaper sling aistband combination to make resting far more comfortable. Always secure this afety sling with screwgate karabiners, both to the body harness and to the russiker.

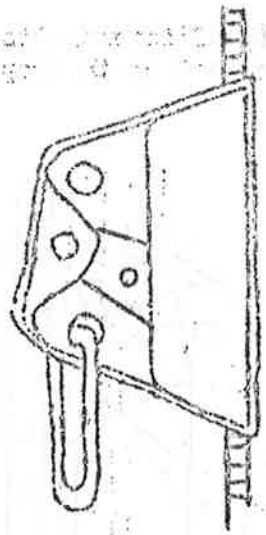


Fig.36 Clogger

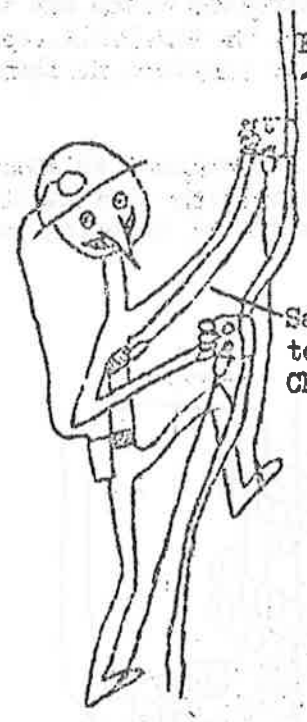


Fig.37 Yosemite Method

b)Frog Method -diagram

his is probably the best of the prussiking echniques, especially for long pitches ince it is very comfortable to rest in by itting back in the diaper sling and the ork is being carried out by both legs at nce. One prussiker is attached to a diaper ling and a small sling is attached to the op of the prussiker is looped over the neck. he other prussiker is attached by a long ling to one or both boots. The technique s:- Stand up in the foot slings, the waist russiker will slide up the rope. Sit back n the diaper sling and move the foot russiker up - then stand up etc. When gainst a rock wall one foot is removed rom the sling to prevent cracking the knee s the feet are brought up. Always attach iaper prussiker with a screwgate krab.

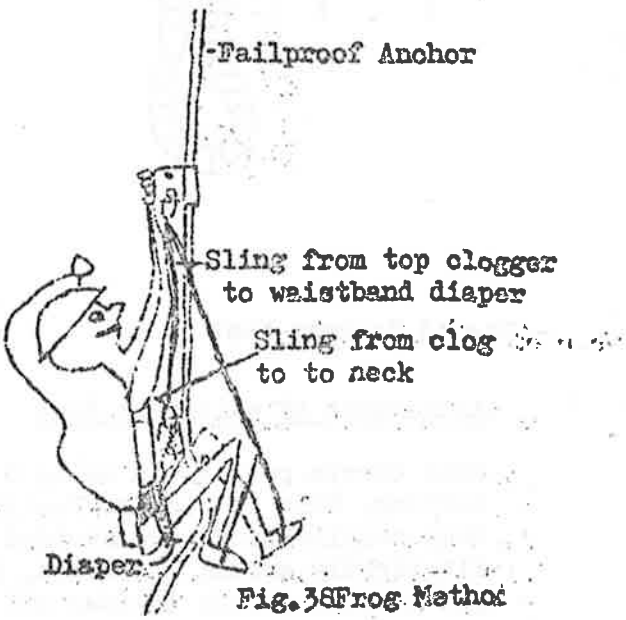


Fig.38Frog Method

sling attached from the waistband diaper krab to the upper prussiker adds o

security since it means the waistband is attached to both prussikers. Also thi sling is essential for prussiking over knots.

(c) Inchworm Method

This method works well on free drops but is not so good up a wall. If part of an otherwise free hanging pitch involves going up a wall, it is best to slip one foot out of the footloop and have it hanging free. The top jumar is threaded onto the chest harness before it is tied up. The bottom of this jumar is clipped into the sit harness. The chest harness must be so tight that the jumar cannot be pulled out from the chest. The bottom jumar has two foot loops dangling from it. The loops should be long enough such that when standing up the bottom jumar is just within reach. To use the system, hang on the top Juma and pull the bottom Jumar up with the left hand. Stand up in the footholds, steadying yourself with your right hand on the main rope above the top Jumar. The top Jumar will slide up the rope as you stand up and the above process is repeated. If the chest harness, waistband and sit harness are all rigged prope you should not have to sink back into the harness before pulling up the bottom Jumar. The advantages of this system are that you are pushing up with both fee at once. If the chest harness is tight enough, it is not tiring on the upper a It is possibly slower than other methods but it is comfortable and not strenuo An improvement could be to add an elastic shock cord (e.g. octopus straps). If this were connected between the two Jumars, it would not be necessary to pull the lower Jumar up by hand as the elastic cord would pull it up automatic A further variation to this system would be to have the bottom Jumar strapped to one foot with a loop for the other foot.

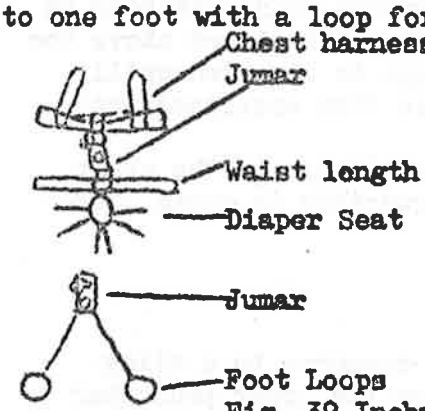


Fig. 39 Inchworm System

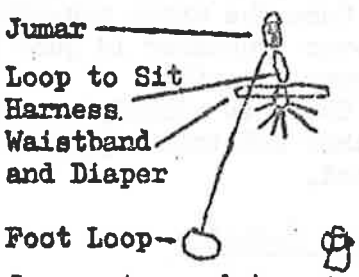


Fig. 40 UNSWSS System

(d) U.N.S.W.S.S. System

This system has a number of variations. In the basic system, one Jumar is str directly to the left foot and the other Jumar has a footloop going to the othe foot and a short loop conecting it to the sit harness. To use the system, star up on the left foot and push the top Jumar up the rope with the right hand, using your left hand to keep you vertical. Stand up on the right foot, lift th left leg and repeat the above procedure. In this method do not sit back into sit harness except to rest. This method is faster than the Inchworm system but is tiring on the upper arms on long drops. It works well up a wall where the strain on the upper arm is not so great. An improvement is to loop a shock cor from the upper Jumar around your neck to pull the Jumar up automatically. Wher the bottom Jumar is strapped directly to your foot, it can be painful on the ankle and sometimes will not slide up the rope cleanly. This can be avoided by

ng a footloop around your foot and attaching the Jumar to the top of it with rab. An elastic shock cord is then connected between the top of this Jumar your sit harness. A further variation is to do away with right footloop and e both feet attached to the bottom Jumar.

best way of learning to prussik is to try the basic systems, observe what do not like about them and then look for improvements.

ABSEILING & PRUSSIKING OVER KNOTS

ssiking over Knots

umar can easily be unclipped and moved over the knot. A clogger however can dropped because the krab has to be removed to get the clog off the rope. way out of this is to remove the krab from the bottom hole and place it in top hole of the clog, the clog can then be removed and placed on the rope ve the knot, then the krab repositioned in the lower hole.

ssiking over knots is fairly easy. Its just a matter of having your gear ged properly.

Yosemite Method

ically a sling from the waistband diaper or chest harness holds the body on lower prussiker while the upper prussiker is unclipped and placed above the t. Once the upper prussiker is above the knot the rope is ascended until lower prussiker is just below the knot, the sling is then unclipped from lower prussiker.
E: There is already a safety sling from the waistband diaper to the upper ssiker and this supports the body while the lower prussiker is moved above knot.

Frog Method

upper prussiker can be moved over the knot without resource to a sling ce the body is supported by a waistband diaper. When the lower prussiker being moved the sling from the waistband diaper to the upper prussiker pports the body.

Inchworm and U.N.S.W.S.S. Methods

is club has not experimented much with these methods and I have not been able find any references in southern journals about negotiating knots. It would pear from our limited experience that a chest harness with a single karabiner be a fairly efficient method. Prussik up to the knot leaving the legs flexed, ip the krab mentioned on to the rope. The body is supported by the chest harness the feet on the lower prussiker while the upper prussiker is unclipped. raighten the legs and reposition the prussiker above the knot. Ascend the e till the lower prussiker is at the knot, the body is now held by the upper ssiker while the lower prussiker is moved.
prussiking downward over a knot the above procedure is reversed.

Abseiling over Knots

Abseiling past knots tends to be more difficult than prussiking. Some cavers manage with only one prussiker and a short sling; however such short cut techniques can lead to trouble. It is very easy to find oneself jammed on a or unable to get your weight off the prussiker so that the cam can be releas

Lets consider the suitation - if you have to abseil over a knot the most lik reason is the descent of a long pitch, the ascent of which will most likely by prussiking. Thus you will be carrying your prussiking gear and the best m to get over a knot is to prussik over it. The following procedure is probabl best wether using jumars or clogs and will prevent a caver becoming jammed, below or around the knot in question.

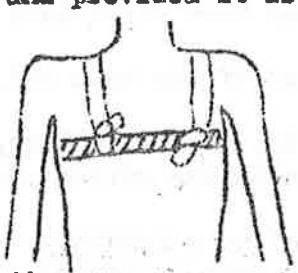
1. Abseil down to just above the knot and
2. Attach upper jumar to rope above the abseil device (ensure that you leave sufficient space between the knot and the abseil device to remove it from th rope)
3. Attach the other jumar and jumar down the rope until the top jumar is bel the knot.
4. Remove the lower jumar.
5. Attach the abseil device to the rope as high as possible but below the up jumar. The device should not be attached to the waist harness at this time.
6. Stand up on the upper jumar and clip the abseil device onto the waist har When you now sit back your weight will now be on the abseil device and you s be holding your weight thereon by clamping the rope with your left hand.
7. Reach up with the right hand and unclamp the upper jumar. There should be weight on it if you have carried uot the above procedures properly.
8. Continue your abseil.

THE CHEST HARNESS

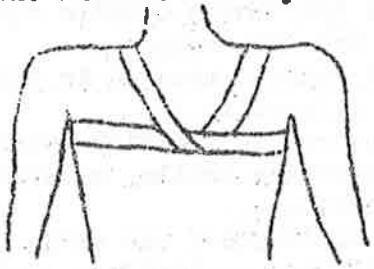
Specialized chest harnesses can be purchased, however, considering the fact that in this club the chest harness is not used that frequently, it would b best to know how to rig a secure chest harness using normal caving gear.

Using a Waistband

Two turns of the waistband are taken around the body under the arms and tie a tape knot. The long free end is then taken over one shoulder under the tu around the body and up over the shoulder, where it is then tied around the turns with a tape knot. The shoulder harness prevents the main chest harnes slipping and provided it is tied tightly, the harness is very secure.



Front

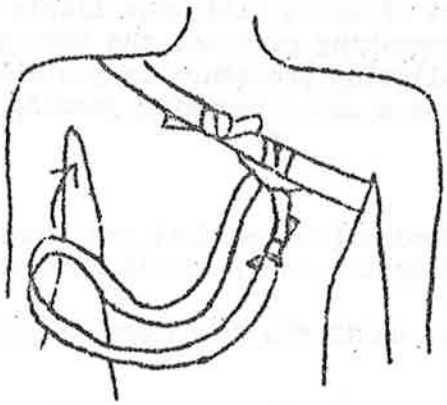


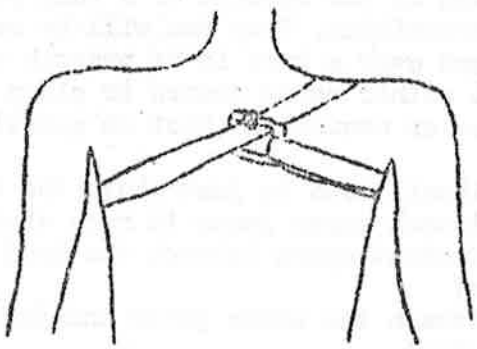
Back

Fig. 41

ing Slings

important item of general caving equipment is the sling made of a 5ft. lenght 1" tape tied with a grapevine knot. Two such slings can be joined to form secure chest harness as in the diagrams; for female members of the club, two orter length slings may have to be made up. It is important that a chest rness fit snugly so that it is impossible to slip out. This form of harness s the important advantage of ease and speed of assembly.





g. 42 Front Back

FAILSAFE ANCHORS

don't intend to go into this in any depth except in the case of bolting. st cavers in this club do not carry pitions or crakers, thus, if these are on trip the person who owns them will know how to place them. In most cases ropes e tied around trees or slings slung over rocks bosses or columns. In such ses the only advice to follow is to pick a substantial tree (alive not dead) d give it a shake to test it, for rock projections and columns ensure it is irly substantial and check there are no obvious cracks that would seriously aken it.

BOLTING

tis article I do not propose to mention the expansion bolt type of anchorage ch as Loxins and Terriers.
e technique is as follows,

1. A hole 1 - 1½" in depth is drilled using a ¼" diameter masonry drill and a pition hammer.
2. A 5/16" high tensile steel bolt which has been filed down is hammered into the hole.
3. A keyhole bracket is fitted over the head of the bolt and a karabiner clipped to it.

e gear required is a pition hammer, several drills, a drill holder, a wedge r remiving broken drills, several feet of plastic tubing several bolts and yhole brackets.
e drills, drillholder and wedge may be purchased from a hardware store. Two pes of drill are available:- a star type drill is made by Rawlplug and an

ordinary corkscrew type drill is made by Sabco. Neither drill seems to drill faster but the Sabco tends to break more often because of its lower cross-sectional area.

Bolts required are one and a half, and two inches long, with 5/16" diameter. They should be high tensile bolts. Mild steel bolts are easier to file but will tend to bend more often, when being inserted. Before use, they must be tapered with a file to within a quarter of an inch of the head

It's a good idea to have slightly different tapers on the bolts. In good hard limestone, the hole will be almost cylindrical; but in typical Junee type muck the hole will have more of a taper.

The keyhole bracket is cut from $\frac{1}{8}$" mild steel with the dimensions as indicated. After machining, it is bent through an angle of thirty degrees at the dotted line. In use the bracket is fitted onto the bolt by putting the large hole over the head of the bolt and sliding the bracket down. If a krab is clipped through the hole, the bracket cannot be removed without first removing the krab.

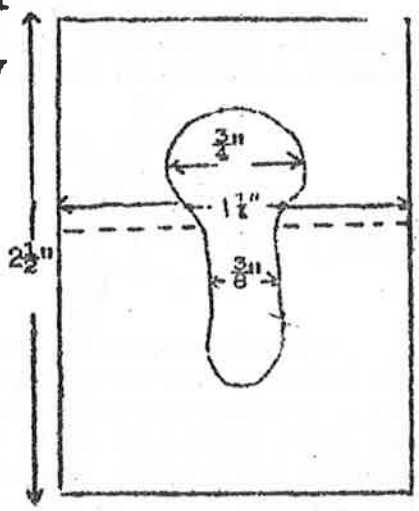


Fig. 43 Keyhole Bracket

Putting a bolt in.

The site for the hole should be such that the bracket can be fitted over the bolt when it is in place, i.e. the hole should not be in a hollow in the rock.

The hole should be inclined so that the bracket will sit against the rock not hang off the head of the bolt.

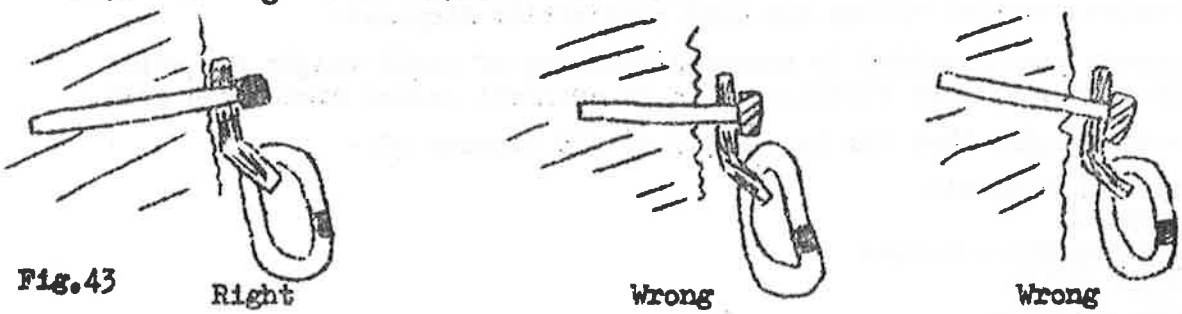


Fig.43

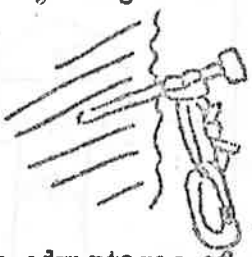
In B, the bolt will tend to bend where it touches the rock; and in C the bolt could be pulled out. Two inch bolts are preferable where the pitch is long, the placing awkward or where the bolt cannot be tied back to another anchorage.

The hole is made by alternately hitting the drill and then twisting it

slightly. When some dust has accumulated in the hole, it is removed by blowing through the plastic tubing. Having drilled the hole, the bolt with the best taper to match the hole should be selected and hammered into the hole. Be careful not to over drive the bolt, and hit it squarely to avoid either bending the bolt or fracturing the head.

Having hammered the bolt in, you will sometimes find that it will not go all the way, and the head is sticking out too far. There are two solutions for this. One is to tie the bolt off using a hero loop, and the other is to tie a knot with some tape, between the bracket and the head of the bolt, so that the bracket cannot slide out and place undue strain on the bolt. A hero loop is a short loop of half inch Tiger webbing tied with a tape knot.

Hero loops are useful also if the placement is such that a bracket cannot be fitted over the bolt. The second method is preferable when you haven't anything to use as a hero loop with you.



g.45
ro Loop

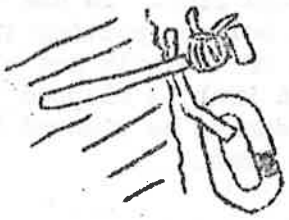


Fig.46
Knot between Bracket and Bolt Head

The advantages of this method over Loxins is the comparative weight. the bolting gear required for the above can be carried on every exploration trip, whereas the weight of gear required for putting in Loxins does not encourage taking it every time. I do not have any comparative strength details but a Loxin tends to be more psychologically satisfying and does not require quite so much care in placement.

ESCUE PROCEDURES

It is not the aim of this club to lavishly equip all its trips with a great deal of rescue gear. If a major accident requiring complex gear ever occurs Federation Mountain Rescue has such gear at its disposal.

The rescue gear provided is uncomplicated and of small weight but will enable a rescue to be carried out if an accident occurs during the trip.

It is my opinion that the Rescue Kit should consist of:-

1. Block and Tackle
2. Pulleys
3. Bolting Kit + Hammer
4. Edge roller
5. Two whistles
6. One collapsible stretcher used for carrying above ground.

Personal and club equipment will provide the other gear such as ropes, pitons, crackers, slings and prussik gear needed during the rescue - so always throw yours in the car just in case.

Telecommunications during rescues has proved very advantageous. The

telephone headsets used by Federation Mountain Rescue certainly make signalling very precise. Such equipment is warranted for a rescue organisation based in Brisbane, but is a little complex and heavy for equipment carried on club trips in the event of a rescue.

Rely on voice and whistle signals. See section of Safety and Training.

USE OF RESCUE PULLEYS

Included in the gear that trip leaders should always carry on trips is a block and tackle to be used for rock hauling and more importantly for rescue work over verticle pitches.

The problem of rescue will be dealt with in three sections:-

a) Attachment of the victim

b) Care of rope over edges

c) Rigging of hauling Block and tackle

Attachment of the victim

Cave rescue suffers from the lack of a suitable stretcher, most of the good rescue stretchers being too bulky for many caves. This complicates attachment of the victim since any slings used for this purpose will not adequately support an injured person. This could have serious consequences for anyone with back or internal injuries, however, there appears to be no other way in caves too small for a stretcher. Because of the bulk and expense of a good rescue stretcher anyway, it is very unlikely this club will ever purchase one. Thus, a rescue stretcher will only be available for rescue work at Rockhampton, where it is kept by the police, provided of course they can fit into the cave in question. Kempsey also has one where it is kept by the Kempsey Speleos.

The attachment method we use should be adequate for any caver with peripheral injuries, i.e. broken limbs, and unfortunately will probably have to be used also on more seriously injured cavers.

The hauling rope is attached to the victim's hips by a diaper, diaper and waistband or if these are unavailable, by a bowline on a bight. (see knots). The upper torso is attached by a chest harness to the rope (see chest harness) by a non-slip knot so that the body does not sag. Make sure the chest harness is not attached too high. The weight of the body should be taken by the hip attachment. The chest harness's function is only to keep the body in balance.

A Jockey is needed attached to the rope with the victim to keep the victim from jamming during non-vertical hauls and to help prevent excessive bumping against the rock.

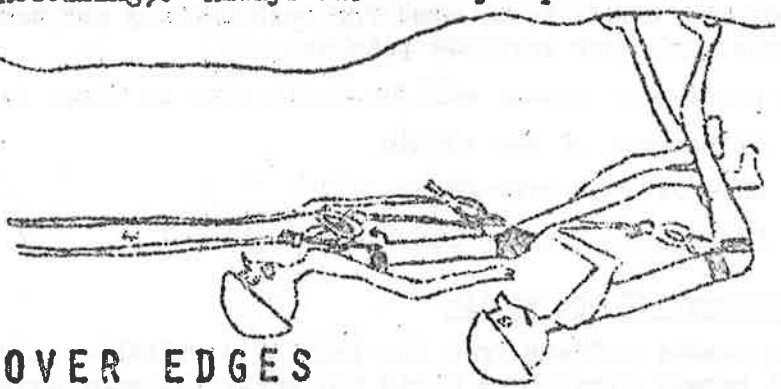
The Jockey is attached via a waistband and diaper and a long sling to the figure of eight loop the victim's chest harness is attached to. The sling must be long enough, in caves with tight vertical pitches, to allow the jockey to be suspended fully below the victim, thus avoiding the two jamming during the ascent. For pitches with ample room, the sling can be

ade shorter so that the jockey, being much closer to the victim, can xert much more control over the victim.

separate Belay rope is attached to the figure of eight loop for the ictim's chest harness in case the main hauling rope is cut. NOTE: Always ttach the belay rope to the highest point of attachment of the victim and ockey so that if the hauling rope is cut the belay rope can be then used o continue hauling.

or lowering the victim down a pitch the same setup is used. The hauling ope now becomes the lowering rope and is fed out through some friction evice (see Belaying and Abseiling). Always use a Belay rope as well.

47



ARE OF ROPE OVER EDGES

n the box with the block and tackle there are also two pulleys and a olting kit. In the majority of rescue situations we have found that it s possible to rig one or two pulleys so that the rope is held off the rock.

n most cases a piton or cracker can usually be placed to hold the pulley, or those instances where this is not possible the bolting kit can be used. see diagram)

t is conceivable that for some pitchs it would not be possible to rig ulleys this way (e.g. 2nd pitch Elyseum cave, Limestone Ridge). For uch cases this club badly needs an edge roller and perhaps we will be able o afford one this coming year. Federation Mountain Rescue have an edge oller which is kept in Brisbane. In most cases this would take far too ong to get hold of.

nce we get the edge roller the pulleys can be retired. For any sharp edges urther down the pitch rope protectors should be used to protect the rope. o not use the pulleys for any protection further down the pitch since it is ery difficult for the jockey to unclip them unaided with both the weight of he victim and the jockey still on the rope.

IGGING OF BLOCK AND TACKLE

he main hauling rope is led from the pulley through a clog or jumar which s attached to a fail-proof anchor.

he Block and Tackle is a 6 pulley unit of 7,000 lbs. breaking strain. he 6:1 reduction this gained enables one hauler to lift one victim quite asily. Thus a minimum of two haulers are needed for victim and jockey - ore haulers are desirable, however, since this enables an easier and moother ascent for the victim.

The block and tackle is rigged with a separate rope. One block is anchored to a failproof anchor, the other is attached by a sling to a clog or jumar which is put on the main hauling rope. When the block and tackle rope is hauled in the moveable block grips, the hauling rope via the clog or jumar and lifts the victim and jocky. Slack in the main hauling rope is immediatly taken in throug the clog or jumar attached to the failproof anchor. As soon as the two blocks come together this clog or jumar holds the victim and jocky while the clog or jumar attached to the moveable block is slid back down the rope so that haulin can be recommended.

Note that throughout the operation a seperate belay rope guards against a comp system failure in the hauling rope. Use a mechanical device for belaying since weight of two people will have to be held.

When the victim and the jocky reach the top of the pitch the weight of the jocky has to be taken off the hauling rope to enable the victim to be lifted The easiest way is to unclip the belay rope from the chest harness attachment and to clip it to the waistband diaper of the jockey. The jockey is then uncl from the victim and is held by the belay rope unattached to the victim.

NOTE: It is difficult for the jockey to unclip himself, having the jockey attached to the chest harness attachment allows the rescuers at the top of th pitch to unclip him. In cases where the jockey cannot take his weight off his attachment the clog or jumar can be unclipped from the hauling rope and put o the belay rope now attached to the jockey alone. The jockey's weight can now supported while his is now unclipped. The weight of the victim can now be tak by the rescuers at the top, some slack is let out in the hauling rope so that the pulley can be unclipped, and the victim is now lifted out. With an edge roller there is no need to worry about unclipping any gear at the top of the pitch. Although it is desirable to unclip the jockey so that the victim can b handled more easily.

Once the victim is out of the cave he can be placed on a stretcher (make one of poles and shirts or slings if necessary) for transport to the car or ambul

Quite frankly our rescue procedures are still far from ideal. Articles in Dow Under will keep members up to date as we gain experience during the coming ye

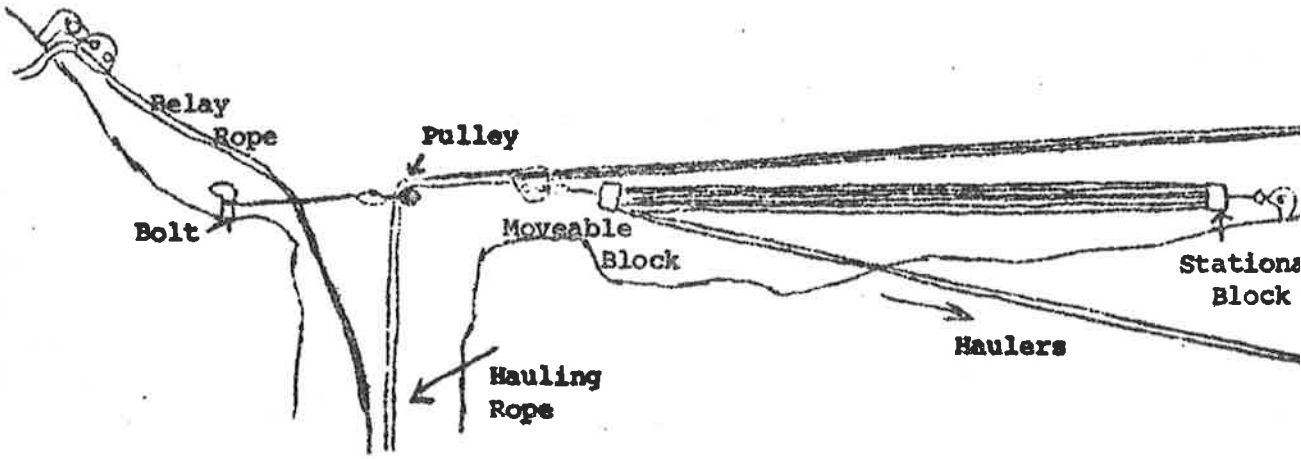


Fig.48