

I. INTRODUCTION A. History

1. ~~In the 1800s~~ During most of man's history, mountains were regarded as places best to be avoided, with strange and beasts and dangers ~~and~~ lurking.
2. In the 1800s, more and more began to view the mountains as places of beauty, to be explored, and conquered, and most important, to be ~~appreciated~~ ~~enjoyed~~.
3. With changing attitudes came professional climbing guides. Since these ~~climbers~~ ^{guides} were paid not by their time, but by successful ascents by a client, the guides began using ropes to "assist" hesitant clients up difficult pitches.
4. The idea evolved of "braying" the rope around a tree or rock should a fellow-climber fall. Unfortunately, this theory seldom works out in practice, ~~and~~ this type of braying is found today only in snow climbing, where climbers may stop themselves (and others on the rope) with an ice axe. Self-arrest, and is practiced by some European climbers and guides.
5. Braying has evolved into a system whereby one climber is stationary while the other climbs. The stationary person, or brayer, takes up or pays out rope, so that a minimum of rope is between the brayer and climber should the brayer fall.
6. In the early days of climbing, a technique known as "abseiling" or "roping down" evolved, where the climber anchored a rope end and slid down the rope, with it wrapped around his body to provide friction. Called "rope lining" by Americans, this usually, the middle of the rope would be put around an anchor, so the rope could

BE PULLED DOWN AFTER THE ABSOL (A "PULL-DOWN" ABSOL). THE TECHNIQUE HAS BEEN ADOPTED BY AMERICAN CLIMBERS, WHO ~~USE~~ MAKE EXTENSIVE USE OF MECHANICAL DEVICES AND CALL THE TECHNIQUE RAPPILING.

7. IN ABOUT DR. YAKL WILHELM PRUSIK OF INVENTED (OR PATENTED PERHAPS) A KNOT WHICH HAD AN INTERESTING PROPERTY - IT ~~WOULD HOLD~~ WHEN TIED ONTO A STANDING ROPE, IT WOULD HOLD WHEN WEIGHT WAS SUSPENDED FROM IT, BUT COULD EASILY BE MOVED WHEN WEIGHT WAS REMOVED. THUS WITH THE USE OF THESE KNOTS, IT WAS POSSIBLE TO ASCEND DIRECTLY UP A FLEXIBLE LINE WITHOUT THE NEED FOR MULES OR CAMELS. THIS BECAME KNOWN AS ASCENDING, OR MORE COMMONLY, "PRUSIKING".

8. ~~THESE THREE MAIN ROPEWORK TECHNIQUES - BEARING, RAPPILING, AND ASCENDING.~~ IN RECENT YEARS, CLIMBERS IN PARTICULAR HAVE ADVANCED THE ART OF RAPPILING AND ASCENDING, OR 'SINGLE ROPE TECHNIQUES', ~~AS IT IS KNOWN TO~~ TO A VERY SOPHISTICATED POINT. ORIGINALLY, CLIMBERS USED CABLE LADDERS, WHICH ARE STILL IN USE FOR SPECIAL CIRCUMSTANCES. SINGLE ROPE TECHNIQUES HAVE ALLOWED THE WEIGHT AND BULK OF ~~SAV~~ VERTICAL CAVING EQUIPMENT TO BE MINIMIZED, AND SPEED, EFFICIENCY, AND SAFETY TO BE MUCH IMPROVED.

9. AS A BASIC MEMBER OF THE BRMRG, YOU WILL BE EXPECTED TO BE ABLE TO Belay WELL, TO RAPPAL PROPERLY WITH SINGLE RAPPERS, AND TO ASCEND WITH A VERY BASIC ASCENDING RIG. IT IS IMPORTANT THAT YOU ^{BE WELL PRACTICED} ~~BE ABLE TO~~ PERFORM THESE TECHNIQUES, AS YOU MAY BE CALLED UPON TO PERFORM THEM UNDER CONDITIONS WHICH MAY BE UNFAMILIAR CONDITIONS OF WEATHER, FATIGUE, OR OTHER STRESSORS.

B. RISKS AND SAFETY

1. SOME PEOPLE WILL PUT THEMSELVES IN POSITIONS OF DANGER THAT OTHERS WOULD REFUSE TO ENTER. THE 'LEVEL OF RISK' ONE IS WILLING TO ENDURE IS THE RESULT OF PERSONAL DECISIONS, AND IT IS MY OPINION THAT WE SHOULD NEVER CRITICIZE OTHERS FOR THEIR CHOICE OF AN ACCEPTABLE LEVEL OF RISK. CRITICISM FOR OVER OR UNDER-ESTIMATING DANGER IS QUOTE APPROPRIATE, HOWEVER.
2. IN THE MOUNTAIN RESCUE BUSINESS, WE ~~MUST~~ CERTAIN RISKS THAT WE WOULD TO LOCATE AS INDIVIDUALS ARE NOT ACCEPTABLE. WHY? I THINK THAT'S APPROPRIATE ENOUGH BY THE OLD SAYING "A DEAD RESCUER NEVER DO ANYONE ANY GOOD". TO GO FURTHER, CONSIDER THE PROBLEM OF AN INJURED RESCUER -- HE OR SHE IS IN EFFECT SIGNIFYING OFF EVERY OTHER RESCUER, KNOWING THAT IS SUPPOSED TO BE DIRECTED TO THE VICTIM. ON A COMPLETELY PRACTICAL LEVEL, IT WOULD BE BAD PRACTICE TO LOOK OUT OF YOUR OWN NUMBER OF A MOUNTAIN.
3. BECAUSE THIS RISKS A MOUNTAIN RESCUER MUST FACE MUST BE MINIMIZED, AND BECAUSE RESCUERS MUST ~~OPERATE~~ OPERATE IN CONDITIONS ^{FROM WHICH} SPORT CLIMBERS WOULD "BALL OUT", SAFETY RULES ARE A MOST IMPORTANT PART OF MOUNTAIN RESCUE. GENERAL SAFETY RULES INCLUDE:
 - a. DO THINGS IN A NEAT, ~~AND~~ PROPERLY, CALM WAY.
 - b. USE SAFETY EQUIPMENT SUCH AS HELMETS AND LEATHER GLOVES WHEN APPROPRIATE.
 - c. WHEN ~~PERFORMING~~ A TASK PERFORMING ANY ~~PER~~ ~~TECHNICAL~~ VERTICAL TECHNIQUE, MAKE A FORMAL DOUBLE CHECK EVERY TIME -- NOW IS THE TIME TO BUILD GOOD HABITS FOR A HYPOTHERMIA-WEATHER RESCUE.
 - d. ~~WHENEVER POSSIBLE~~, GET ANOTHER PERSON TO RE-CHECK YOUR CROCKING ^{LEAD} UNLESS CLEARLY INAPPROPRIATE

NOTE: DO NOT COMPARISON 'LEVEL OF RISK' w/ MISUNDERSTANDING! RAPPACING IS A SMALL RISK IF DONE CORRECTLY, BUT MAY BE REQUIRED BY SOME OTHERWISE 'FOOLHARDY' PEOPLE. WHY? THEN DON'T UNDERSTAND THE ACTUAL LEVEL OF DANGER OF RAPPACING.

4. A FINAL COMMENT ABOUT SAFETY -
 SOMETIMES A COMBINATION OF DANGERS MAY
 MAKE IT SAFER TO AVOID SAFETY RULES.
 AN EXAMPLE WOULD BE DOWNCLIMBING A MOUNTAIN
~~WANT QUICKLY~~ MORE QUICKLY THAN IS SAFE, IN
 ORDER TO AVOID AN ELECTRICAL STORM. THIS
 TYPE OF EXCEPTION TO THE RULES IS KNOWN
 TO EVERY EXPERIENCED OUTDOORSPERSON, BUT
 STILL DOES NOT INVALIDATE THE GENERAL
 TRUTH OF SAFETY RULES. IT TAKES EXPERIENCE
 AND JUDGMENT TO DECIDE WHEN AN EXCEPTION
 IS USUALLY APPROPRIATE.

C. ROPE, HARDWARES, PERSONAL EQUIPMENT

1. ROPE AND WEBBING

- a. MATERIALS (SEE TABLE 2-1)
- b. CONSTRUCTION (SEE TABLE 2-2)

2. CARE OF (NYLON) ROPE & WEBBING

- a. TO CUT NYLON ROPE OR WEBBING, THE POINT
 TO BE CUT SHOULD BE WRAPPED WITH PLASTIC
 TAPE, CUT WITH A SHARP KNIFE, AND THEN
 THE ENDS SHOULD BE MOLDED WITH A IRON

- b. ENDS OF ROPE OR WEBBING MAY BE WRAPPED
 WITH COLGAL COOL TAPE (USUALLY MADE FROM SYNTH
 VINYL TAPE). A SLIGHT AMOUNT OF HEAT
 AND SOME FIRMER PRESSURE WILL MOLD THE
 TAPES TO THE NYLON AND THE TAPES WILL
 LAST LONGER. SOME CLIMBERS RIP THE ENDS OF THEIR ROPES IN
 ABOUT ONE INK IF MARKING THE MIDDLE OF

- c. A ROPE, USE ONLY TAPE OR AN INK RECOMMENDED
 BY THE MANUFACTURER - OTHER INKS MAY
 SERIOUSLY WEAR THE ROPE

- d. ROPES ARE USUALLY STORED IN A COIL FOR
 NEATNESS. HOWEVER, IF A ROPE IS USED DIRECTLY
 FROM A COIL, TANGLES WILL RESULT. THE COIL
 SHOULD BE UNTIED, THEN THE ROPE SHOULD BE
STACKED. THIS MEANS PLACING THE ROPE IN A

- HARD
 LAYED ROPE (E.G. MOUNTAIN-CAT
 COOLING) MAY BE
 TWISTED OVER TO IMPROVE
 THE COMFORT OF THE ROPE
 THIS CANNOT BE DONE
 WITH KERMANTHANE ROPES
 - LAYED ROPES LOSE STRENGTH
 QUICKLY AT FIRST UNDER
 ABRASION (ALL FIBERS ARE
 LONGER THAN) BUT BECOME
 "FUZZY" FROM ABRASION. FIBER ENDS
 THIS FUZZ PROTECTS THE ROPE
 AGAINST FURTHER ABRASION.
 - KERMANTHANE ROPES LOSE
 MORE STRENGTH
 AT FIRST, SINCE THE
 SHEATH CAN BE CUT
 EASILY. ONLY THE SHEATH
 IS CUT. THEREAFTER, HOWEVE,
 THE CORE APPROX
MAINTAINS STRENGTH
15-25%

RANDOM PILE ON THE GROUND. A RANDOM STACK WILL PAY OUT EASILY FROM TOP OR BOTTOM.

d. COLLING

- Q. WHEN ~~ROPE~~ ~~ROPE~~ FINISHED WITH A ROPE, IT SHOULD ALWAYS BE COILED. IT MAY BE COILED AROUND INSIDE AND KNOTS (OR BOTH INSIDE AND KNOTS FOR A LARGER COIL), OR AROUND THE KNOTS SITTING TAILOR-FASHION. AS A ROPE IS COILED, IT IS ALWAYS INSPECTED VISUALLY AND BY HAND FOR BUMPS, NICKS, OR ABRASION. THE COIL IS TIED OFF AS SHOWN:

IT IS IMPORTANT TO HAVE ENOUGH WRAPS AND TO HAVE THEM QUITE TIGHT.

e. RESCUE COIL

- Q. ~~TH~~ IT IS POSSIBLE TO COIL A ROPE NEATLY USING THE END OF A D-RING (ARMY) STRUCTURE, TRY TO TIE OFF AROUND THE CENTER. THIS IS A MODIFIED TYPE OF SKIN COIL, CALLED A RESCUE COIL IN THE CIVIL AIR PATROL. IT IS ONE OF THE FEW COILS THAT WILL PAY OUT NEATLY WITHOUT STACKING.

- f. IT IS ALSO POSSIBLE TO CHAIN COIL ROPES OR WOBBLING BY FORMING A GRIP HITCH IN THE CENTER, PUSHING A LOOP OF DOUBLED WOBBLING THROUGH, PUSHING A LOOP OF DOUBLED WOBBLING THROUGH THE NEW LOOP, ETC. UNTIL THE END IS REACHED, WHEN THE TWO ENDS ARE PUSHED THROUGH.

- f. IT IS POSSIBLE TO CHAIN COIL WOBBLING OR ROPES. A CHAIN COIL IS VERY EASY TO UNDO, AND IS OFTEN USED TO STRAP SLINGS ON A RACK OF EQUIPMENT.

g. CASTING

- g. WHEN CASTING A ROPE, THE END SHOULD FIRST BE TIED OFF, THE ROPE STACKED, AND ABOUT 30 FEET OF THE ROPE MAY BE SPEED COILED IN A HAND, THEN THROWN

IF THE ROPE IS GOING OVER A SHARP EDGE, A ROPE PAD SHOULD BE USED.

OVERHAND. THE CALL "ROPE!" SHOULD SOUND TWICE BEFORE CASTING ~~THE~~ IT. OF COURSE, CARE MUST BE TAKEN THAT THE PERSON CASTING THE ROPE DOES NOT ACCOMPANY THE ROPE ~~DOWN~~ ^{DOWN BY THE DROP.} WHEN THE ROPE MUST BE THROWN DOWN THROUGH A NARROW WINDOW, THE MIDDLE MAY BE THROWN DOWN FIRST, OR A "MONKEY'S POST" MAT BE MADE (A BALL OF ROPE AS THROWN)

NYLON

h. ROPES ARE STRONG, BUT ~~DIFFER~~ EASILY DAMAGED. DIRT INSIDE THE ROPE MAY ABRAS FIBERS BY ^{THE} TWISTING AND PULLING OF THE ROPE, AND ESPECIALLY BY PEOPLE STEPPING ON THE ROPE; STEPPING ON THE ROPE ~~WILL~~ DAMAGE THE ROPE DIRECTLY BY CUTTING IT ON A SHARP ROCK UNDERNEATH, SO

DON'T STEP ON THE ROPE!
(ESPECIALLY WITH CRAWPONS ON)

A ROPE ^{CORE} MAY BE DAMAGED BY ROCK FALL WITHOUT CUTTING THE SHEATH. OFTEN THIS WILL BE FELT AS A "BUMP" WHEN COILING THE ROPE, BUT WILL NOT BE APPARENT TO VISUAL INSPECTION. THIS IS A GOOD ARGUMENT FOR THE USE OF LEAD ROPES.

ALTHOUGH GAS AND OIL DO NOT DIRECTLY DAMAGE A ROPE, THEY MAY ATTRACT AND HOLD DIRT, WHICH DOES CAUSE DAMAGE. ACIDS AND ^{SOME} ORGANIC SOLVENTS MAY SOMEWHAT DAMAGE A NYLON WITH JUST MINIMAL EXPOSURE; TRACES OF BATTERY ACID IN ^A CAR TRUNKS ^{IS A} NOTORIOUS ROPE KILLER.

ROPES SHOULD BE IN A ROPE BAG WHEN IN A TRUNK, AND HUNG UP IN A COOL, DRY PLACE AT HOME.

ALTHOUGH SUNLIGHT CAN DAMAGE ROPES, IT IS USUALLY ONLY SIGNIFICANT OVER LONG PERIODS. THE HEAT IN A CAR TRUNK OR BACK WINDOW LOOKS ON A HOT DAY MAY EASILY DAMAGE ROPES (\rightarrow IS SUFFICIENT TO CAUSE DAMAGE)

ROPES CAN AND SHOULD BE WASHED WHEN NECESSARY. THEY MAY BE CHAIN COILED OR PLACED IN A NET BAG (TO PREVENT TANGLING), OR WASHED ^{IN A WASHING MACHINE WITH} WITH A MILD DETERGENT WITH A SPECIAL ROPE WASHING. ROPES MAY BE WASHED (WET) DRIED IN A DRYSER; MEMBRANE SODIUM-CELLS MAY BE ADDED TO IMPROVE FLAME-RETARDANCE.

ROPES AND WEBBING SHOULD BE RUTINELY AND REPLACED WITH NECESSARY. THIS IS DETERMINED BY USE THE ROPE HAS RECEIVED, AND BY ITS APPEARANT CONDITION. SOME TYPES OF DAMAGE ARE APPARENT TO VISUAL OR TACTILE INSPECTION, BUT SOME TYPES, SUCH AS ~~DAMAGE~~ LOSS OF ENERGY ABSORPTION DUE TO CYCLIC STRESS, ARE NOT. LOGGING OF USE IS REQUIRED TO MONITOR THIS TYPE OF DAMAGE. RUTINELY ITEMS ARE MARKED WITH BLACK TAPE. DON'T USE BLACK AS PART OF A COLOR CODE.

3. CARRIBINOLS

a. MATERIALS

MOST MODERN CARRIBINOLS ARE MADE OF HIGH-STRENGTH ALUMINUM. IT IS STRONG AND LIGHT, BUT METHODS EASIER. STEEL CARRIBINOLS ARE RARE, BUT STEEL LOCKING 'D' CARRIBINOLS ARE OF UTTERMOST STRENGTH.

b. BIRDS ARE CLASSIFIED AS OVAL, D, OR MODIFIED D SHAPES; SOME COME WITH LOCKING SCREW CAPS.

THE GATE HAS A PIN WHICH FITS INTO A NOTCH IN THE MAIN PART OF THE BIRD; IT IS DESIGNED TO "LOCK" WHEN STRESS IS APPLIED; THE ^{DATA} STRENGTH IS EASY KNOWN, AND IF THE CAP IS OPEN, THE STRENGTH IS MUCH LESS.

c. BIRDS ARE RATED IN TERMS OF MINOR AXIS STRENGTH. D'S ARE STRONGER THAN OVAL IN GENERAL BECAUSE LESS STRESS IS PLACED ON THE GATE. MINOR AXIS STRENGTH IS VERY LOW, AS IS CROSS LOAD STRENGTH.

d. BIRDS SHOULD BE KEPT CLEAN AND DRY; THEY SHOULD BE RUTINELY INSPECTED LIKE ROPES AND WEBBING. E.G. SOME BIRDS USED FOR PAPERS MAY BE

8. A
DANGER APPROXIMATE; BIRMS PROBABLY OFF
A CLIP MAY DEVELOP ILLUSTRATIVE CRACKS.
BIRMS MAY BE LOOSELY LUBRICATED WITH
ANY OIL, BUT EXCESS OIL WILL ATTRACT DIRT.

4. SEAT HARNESS

a. ~~A PERSON ON A COIL MAY BE HELD TO
TIGHTEN; OR~~

b. ~~A PERSON MAY TIE INTO THE END OF A ROPE
OR CLIP IN A ROPED~~

IN MANY MTH. RSR SITUATIONS, A PERSON
MAY NEED TO ~~ATTACH~~ ~~HIMSELF~~ TO A ROPE,
LIFELINE, OR SOMETHING SIMILAR. IT IS
CUSTOMARY TO TIE INTO THE END OF A ROPE
WITH A BOWLINE ON A COIL, BUT A RECENT
RESEARCH PROJECT NOTES THAT IT IS POSSIBLE TO
STAY CONSCIOUS FOR UP TO MINUTE WITH PROS-
HANGING IN SUCH A SITUATION. OTHER TYPES
OF SEAT HARNESS ARE SAFER AND MORE
COMFORTABLE

a.

HARNESSES MAY BE FORMED FROM 1" TUBULAR
WEBBING IN SEVERAL DESIGNS. SOME IMPORTANT
CONSIDERATIONS:

a. FIT: MANY TIGHT HARNESSES FAIL TO TIGHTEN
ARREST WHEN WALKING, OR SLIP UP TO
KNEES AND THUMPKITS WHEN RAPIDLY.

b. SAFETY: HARNESSES ARE SUBJECT
TO SEVERE ABRASION. ~~HARNESSES WITH~~
SO MANY HARNESSES WILL FAIL TOTALLY IF
CUT IN ^{ANY} ONE PLACE.

c. COMFORT: LOOSE HARNESSES SHIFT, BIND,
AND ARE UNCOMFORTABLE.