VERTICAL CAVING GEAR IN ACTION

ALAN WARILD*
University of New South Wales Speleological Society

Abstract

As well as being mentally and physically taxing on individuals, any expedition is also the ultimate test of caving equipment. The ATEA '78 expedition which spent two months in the mud of New Guinea's Muller Plateau was no exception.

This paper will attempt to show some of the weaknesses and strengths of the gear which was used on the ATEA '78 expedition.

INTRODUCTION

As Equipment Officer for ATEA '78 I was in charge of collecting, choosing and often resurrecting most of the group caving gear which went to New Guinea. Actual caving time in the field was about six weeks. Most of the gear was air-dropped except for easily damaged items such as karabiners and Jumars, which were either carried in or flown in by helicopter.

1. GROUP GEAR

(a) *ROPES*

A huge range of types and lengths of rope were taken, the main reason being that these were what could be borrowed cost free from people, the only exceptions being the 600 m of 8 mm polypropylene and the 1000 m of 8 mm polyethylene "Ski Rope".

Polyester (terylene) ropes

Most of the ropes taken were polyester with a 16 plait sheath and 10 mm or 12 mm in diameter: Marlow 12 mm staple; Marlow 10 mm staple; Kinnears 12 mm staple; Downs 12 mm staple and Downs 10 mm multifilament (smooth).

Comments. The Marlow 12 mm was too thick for easy prusiking and very heavy to carry, especially when wet (one person actually complained that it squeaks when you prusik on it). None of it sustained any damage.

Marlow and Downs 10 mm were generally preferred as exploration ropes because of their ease of packing. carrying, prusiking and low water absorption, althougn they did make difficult handlines when muddy. The Kinnears 12 mm spun badly and was very bouncy while the Downs 12 mm was excellent - being a denser weave it absorbs less water than most 12 mm ropes and also has better abrasion resistance but some problems with sheath slippage may be encountered with a new rope. Twelve mm rope was usually used for the long pitches, and heavy use pitches because of the safety factor. Four ropes were cut on the expedition. Two were Marlow 10 mm, one was 30 m down a 100 m rope at an unprotected lip, while the other was on a short handline which was so muddy that the cut was not detected until the rope was removed and washed.

*Flat 15/2 Mary Street, GLEBE. N.S.W. 2037

Nylon ropes

Those taken were: Bluewater II; Bluewater III; Edelrid 10 mm static; Edelrid 11 mm dynamic and Interalp 11 mm dynamic, the latter two being climbing ropes.

Comments. The Bluewater II had stiffened with age and was extremely unmanageable, hence hardly used, while the new piece was both stiffer and heavier than polyester. The Bluewater III was easier to handle and fairly bouncy (up until the time it was dropped down the doline wall and into the riverway and never seen again!).

The Edelrid static was quite popular as short, light "handy rope" for exploration trips. Abrasion resistance is excellent although stretch is astronomical. The two 11 mm climbing ropes performed well and if they had less stretch they would make excellent prusik ropes. A most spectacular rope cut occurred in a short length of Edelrid 10 mm which was used as a handline. The sharp and unprotected lip at the top stripped the sheath completely off for a length of 30 cm.

Float rope

The ropes taken were: Downs 8 mm 8 plait polypropylene; Downs 12 mm laid polypropylene; Kinnears 8 mm 8 plait polyethylene and Millers 12 mm laid polypropylene.

Comments. The Downs 8 mm was bought specifically as a handline for long swims and it performed well, being easy to see and hold although it abraded very easily and in one instance actually cut in two on a sharp rock in the streamway. The polyethylene was cheap and abrasion-resistant but very slippery and had to be used at least double thickness on handlines. It is also hard to hold when swimming but makes excellent clotheslines.

(b) *RIGGING GEAR*

Karabiners

One hundred and thirty four were taken, all aluminium alloy and 75 of them with locking gates. Most were Hiatt small Ds with a 2000 kg rating. The rest were survivors from previous expeditions. There were no problems encountered except for mud clogging up the gates and making them hard to open. For some reason the locking krabs were more prone to this than the non-locking ones. The loss rate was quite low. Of the 100 new Hiatts taken (50 locking, 50 non-locking), 52 locking and 45 non-locking krabs returned. On arrival in Sydney, 50% of locking krabs and 30% of non-locking krabs were jammed, but a few hours work with WD40 (penetrating oil) returned them all to as-new condition.

Bolts*

About 120 Ramset Terrier self-drilling expansion anchors in sizes ¼" and ⅜" and both Flush End and Snap Off styles were taken. Bolts for the anchors were ¼" and ⅜" by ¾" long hi-tensile steel and brackets of 4 mm structural grade aluminium. Some 2½" x ¼" Dynabolts and drills to suit were taken for soft rock but were not needed (Plate 1).

Comments. The bolting system was tested at Bungonia by two methods.

(i) Ripping them out with a car. In all cases the ¼" bolts snapped off flush with the anchor although the car (Toyota Corona) needed a 2 m+ running start to do it. The ¼" bolts could not be removed from a standing start. The ⅜" bolts could not be removed with a 4 m+ running start and the driver was unwilling to try harder.

*Expansion anchors have been used for many years in U.S.A., U.K. and Europe.

(ii) Slowly pulling them out with an hydraulic Porta-Power. Only ¼" bolts were tested and in all cases they failed when the casing snapped where it protruded above the rock surface. The weakest bolt failed at 1100 lbs. The brackets survived undamaged and were later found to break at 2000 lbs although a steel keyhole bracket distorted severely under load.

In practice, people did not like the look of the snap-offs, so did not use them. Of the 15 bolts placed, there was only one failure and that was where the rock into which the anchor was being put broke in half. Because our brackets turned out to be 4 mm instead of 6 mm, the ¼" by ½" bolts were slightly too long for the anchors and so poked out too far giving the bracket a slight amount of leverage on the bolt. Otherwise the bolting system seemed perfect, with ¼" for exploration, aid climbing and retreating and ⅜" for heavy use pitches.

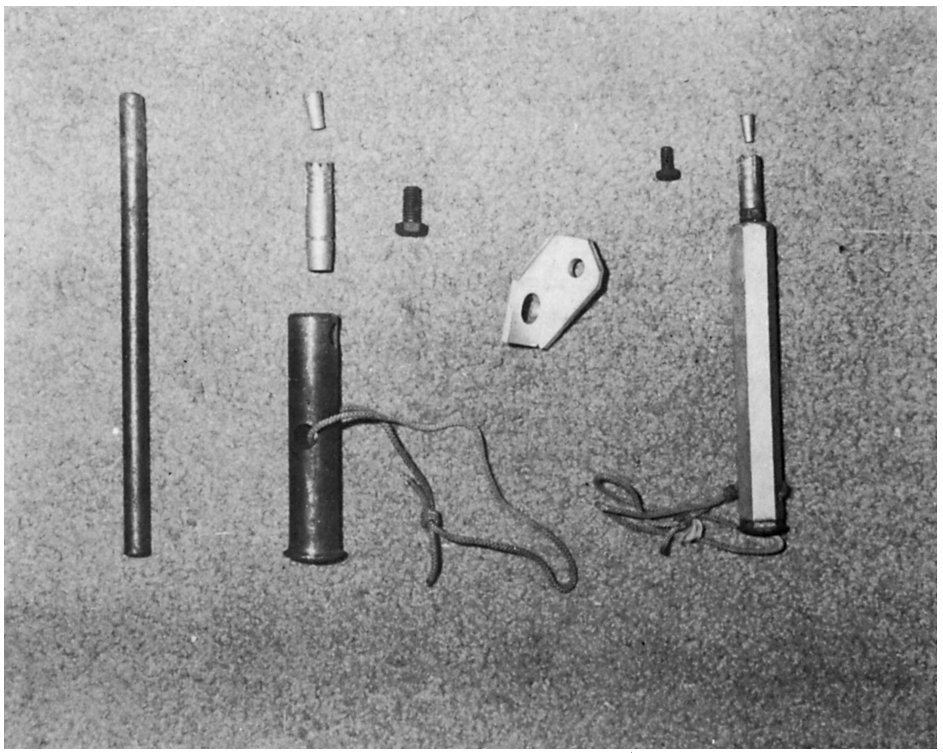

Plate 1. Terrier expansion bolt system.

Shown are a ⅜" Snap Off anchor, driver and tapered drift, ⅜" bolt and bracket, and a ¼" Flush End anchor on driver plus bolt.

Pitons and chocks

Most of the pitons were Chouinard with some Clog and Hiatt models as well. All the chocks were Chouinard. Pitons ranged from the smallest angles and short knifeblades through to a few bongs of various sizes, and nearly two full sets of leepers.

Comments. As expected, the most popular pegs were the small to medium angles, long angles and leepers. The chocks were of limited use, rarely carried and although handy for climbing they were certainly not necessary. As for "bad" pegs, two "popped" under load because of bad placement, one came loose and nearly fell out for the same reason and one small Hiatt angle actually snapped across the axis about 3 cm from the tip while under load.

Tape and traces

Fifty metres of 5 cm wide and 50 m of 2.5 cm wide nylon seatbelt tape was taken. The 50 wire traces with thimbles in each end to take krabs were in two sizes (1.5 m and 3 m) and were of 6 mm galvanised wire rope with aluminium swages.

Comments. The tape was very popular, especially amongst those who had forgotten waist loops, prusik rigs etc. The 2.5 cm tape was so popular that almost none was left for rigging. The traces were a little thick at 6 mm which made them heavier to carry but at least people were confident in them (unlike a few of the 3 mm and 4 mm ones around). Both lengths were handy but the 3 m ones were definitely the most useful. The thimbles could have been larger such that the screw gate of a krab could pass through them.

Rope protectors

Eighty-one of the Jerry Protector design were taken. They were made of Agrifab, a heavy P.V.C. coated terylene. Thirty or so split hose protectors were taken on the off-chance that all of the Jerry Protectors were lost or used.

Comments. About 50 rope protectors were used and there were no problems due to protector failure although at least one had a hole rubbed right through it. In very muddy areas the velcro became clogged and protectors were replaced by hessian sacks. The plastic hose protectors were burnt in preference to carrying them out. Only four cloth protectors were lost.

(c) *ROPE PACKS*

Thirteen group and several personal rope packs were taken, all made of Agrifab and in two basic designs. They were typically small, simple sacks 25 cm in diameter and 50 to 60 cm long with standard design shoulder straps and drawstring tops. The newer ones also had an extra drawstring closing throat, and all packs had paired 1" tape hauling tabs on the top. All performed well, but the older design with straps towards the front were easier to carry at the expense of having corners on the bottom which tended to wear through faster than the new models with their rounded bottoms. A slightly worse-for-wear version of the new design is shown in Plate 2.

2. PERSONAL GEAR

(a) *DESCENDERS*

The choice of descenders was restricted to Whaletails - both machined and cast, and a wide variety of Rappel Racks. In most cases wear was considerable with some whaletails being worn down to the centre-screw and many brake-bars being thrown away as useless. It is interesting to note that very little vertical work was done, and had the caves been vertical instead of horizontal the wear on descenders would have been quite a problem. The only device that did not wear excessively was the author's rack which had steel bars (¾" waterpipe in fact) instead of the usual aluminium.

(b) *ASCENDERS*

Types used were: Jumars; Cloggers; Gibbs and Petzel.

Jumars were by far the most popular and worked quite well except on very muddy ropes when one had to push upwards on the cams to gain any grip. It was found that a smooth multi-filament rope was slightly better than either thick or thin staple (furry) ropes. Wear on Jumar teeth was noticeable but not excessive.

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Plate 2. Warild design cave sack.

Note drawstring closing top and throat with cordgrips and hauling loops (with krab in one).

Cloggers were used almost exclusively by the few British cavers on the trip, their theory being that Cloggers are more robust than Jumars and could handle much more abuse. The availability of cheap factory seconds in Britain also may have had something to do with the choice of Cloggers. Despite their low cost, Cloggers had many disadvantages: they suffered from worse slip on muddy ropes than Jumars and were prone to jamming when they were supposed to be sliding up the rope, not to mention the handling problems associated with getting them on and off the rope.

Gibbs ascenders were used by a few, and then only rarely. They were unsurpassed on the muddiest of ropes but because of their intricate design they were quite difficult to assemble in the sticky mud and generally proved to be a slower but safer alternative.

Petzels were used by very few people. Although they were quite easy to get on and off the rope, they seemed to suffer the same slip/jam problem as the Cloggers.

(c) *LIGHTING*

Small brass carbide lamps were the usual form of underground lighting. Many problems were encountered after filling them with muddy water. A useful modification was to replace the inadequate felt filter with a piece of Scotch-

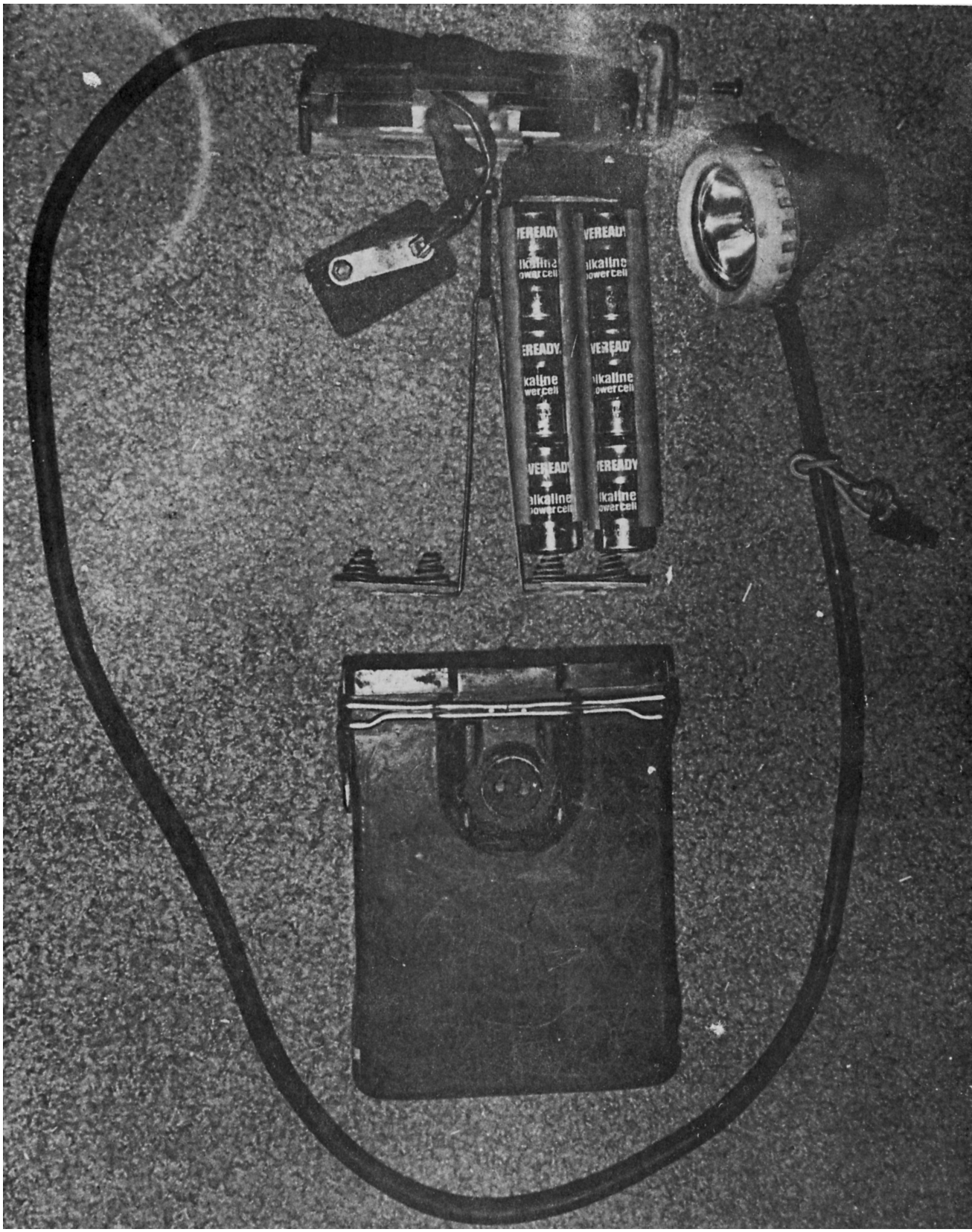

Plate 3. Rothery converted lead/acid.

Shown are six of the twelve C cells in place in PVC holders, and alligator clip for connection to each "half" of battery.

brite plastic scourer. Some lamps had their mounting brackets broken off after too many collisions with the roof of caves but these were easily fixed with a large pipeclamp.

Electric lighting was a much more complex problem than those associated with even the worst carbide lamp. Almost everybody used the Dave Rothery converted miners lights. These have had the original lead/acid plates removed and replaced with twelve C cells stacked in four rows of three in series (Plate 3).

Additionally, the cells were wired into two groups such that only six can be used at any one time, giving a reserve supply of the other six cells. The main beam bulb was replaced by a 3.6 volt bulb which gave adequate light for much longer than the standard bulb. These lamps performed extremely well under the conditions but they were high maintenance units and had to be dried out and often repaired between trips. Two other types of electric light were used. Julia James had a perspex battery case containing nine D cells (three rows of three in series) which worked well except when the cells jammed because the case was too tight. The author's unit consisted of three D cells in series, crammed into a P.V.C. junction box to make a light compact unit which was not as cumbersome as the other lighting systems. Apart from one minor short circiut it performed perfectly. Both the James and the Warild lights used standard lead/acid headpieces and bulbs.

CONCLUSION

ATEA '78 was not as technically difficult as expected, but it did give some of the equipment a hard time. Had the Atea been a deep vertical system many people may have had their gear dangerously worn.

Nevertheless, the basic trends of gear destruction were the same and expedition members were saved from nasty moments which pushing equipment to the limit can cause.