

VERTICAL CAVING EFFICIENCY: A CASE STUDY

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Abstract

This paper uses a recent exploration of a world-renowned, sporting, vertical cave in New Zealand as a case study to illustrate the factors to be considered in vertical caving. Single rope techniques were used. No account is given of personal techniques but rather this paper treats the exploration party as a team operating to maximise exploration efficiency. Outlined in the paper are the necessary considerations to be taken into account in explorations of this nature.

INTRODUCTION

In Australia multi-pitched caves are little known and rarely visited except by the more dedicated enthusiast. Even at Bungonia which is a predominantly vertical area, few cavers tackle more than one pitch in a cave. The cavers that do tackle these caves use S.R.T. because it reduces the amount of gear that needs to be transported through the cave.

Greenlink Cave, N.Z., was at the time of our exploration 283 m deep with 18 pitches ranging in size from 3 m to 20 m. The cave swallows a small stream which is a tributary of a much larger stream that is met after only three pitches have been negotiated. The cave temperature is around 12°C.

Due to the sporting nature of the cave and its cold temperatures a caver is losing energy at a rapid rate from the time he enters the cave. A major factor to be considered in explorations of this nature is vertical caving efficiency such that these undertakings have an acceptable safety level.

EFFICIENCY

Efficiency does not necessarily mean speed; however, it is often the best measure of efficiency. Efficiency refers to the smooth transportation of cavers and gear through the cave such that problems do not arise or are eliminated, and such that each caver's workload is minimised.

It is clearly inefficient for one unfortunate person to be ferrying gear back and forth between pitches or worse, up and down a particular pitch because of the energy involved in performing these tasks.

If workloads are minimised and problems eliminated then speed can be increased (and thus efficiency could be measured) such that individual cavers are not exposed to a hostile environment for longer than necessary.

PERSONAL EFFICIENCY

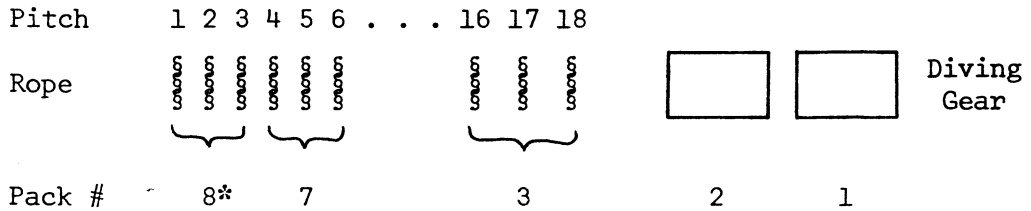
For the team to work efficiently during an exploration each member must be self sufficient and efficient within themselves. Any factor which hinders

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Figure 1. Greenlink - organisation of packs.

Tackle required



Rope packs are packed in reverse order.

*Pack # 8 will be the first pack needed in the cave.

an individual's performance inconveniences the whole party and slows the rate at which gear is transported through the cave. Each person should have:

- o adequate dependable lighting.
- o a well-constructed rope pack for gear carrying.
- o an operational descender and prusik rig which can be used competently and rapidly with a minimum of fuss.
- o sufficient warm clothing to enable comfortable movement through the cave.

In Greenlink we used carbide lights because they are easy to operate and can be continually refilled to yield many hours of lighting. These were backed up with dry cell electrics for the wet pitches. Wetsuits were worn by all. These were covered with a pair of Busy Bee water-resistant overalls to save abrasion. These also have a hood which makes for more comfortable prusiking under waterfalls.

PRE-TRIP ORGANISATION

The aim of the trip was to give a local diver, Keith Dekkers, an opportunity to dive the -283 m sump. Rope packs were used to transport gear through the cave. Eight people were required to carry this gear which consisted of six packs of rope for the eighteen pitches and two packs of diving gear.

Keith had been to the bottom of the cave several times and knew the rigging requirements of the cave. Ropes of suitable length for all the pitches were chosen and the rigging gear affixed. The ropes were then organised in the required order (see Fig. 1). Rope for the bottom pitch was packed first, on top of it was placed the rope for the second last pitch, etc., until this pack contained one sixth of the rope needed for the cave, almost a full pack load.

The last rope packed was that required for the first pitch. Spare space in the packs was filled with spare carbide, a chocolate and each caver's prusik rig which would not be required until the journey out.

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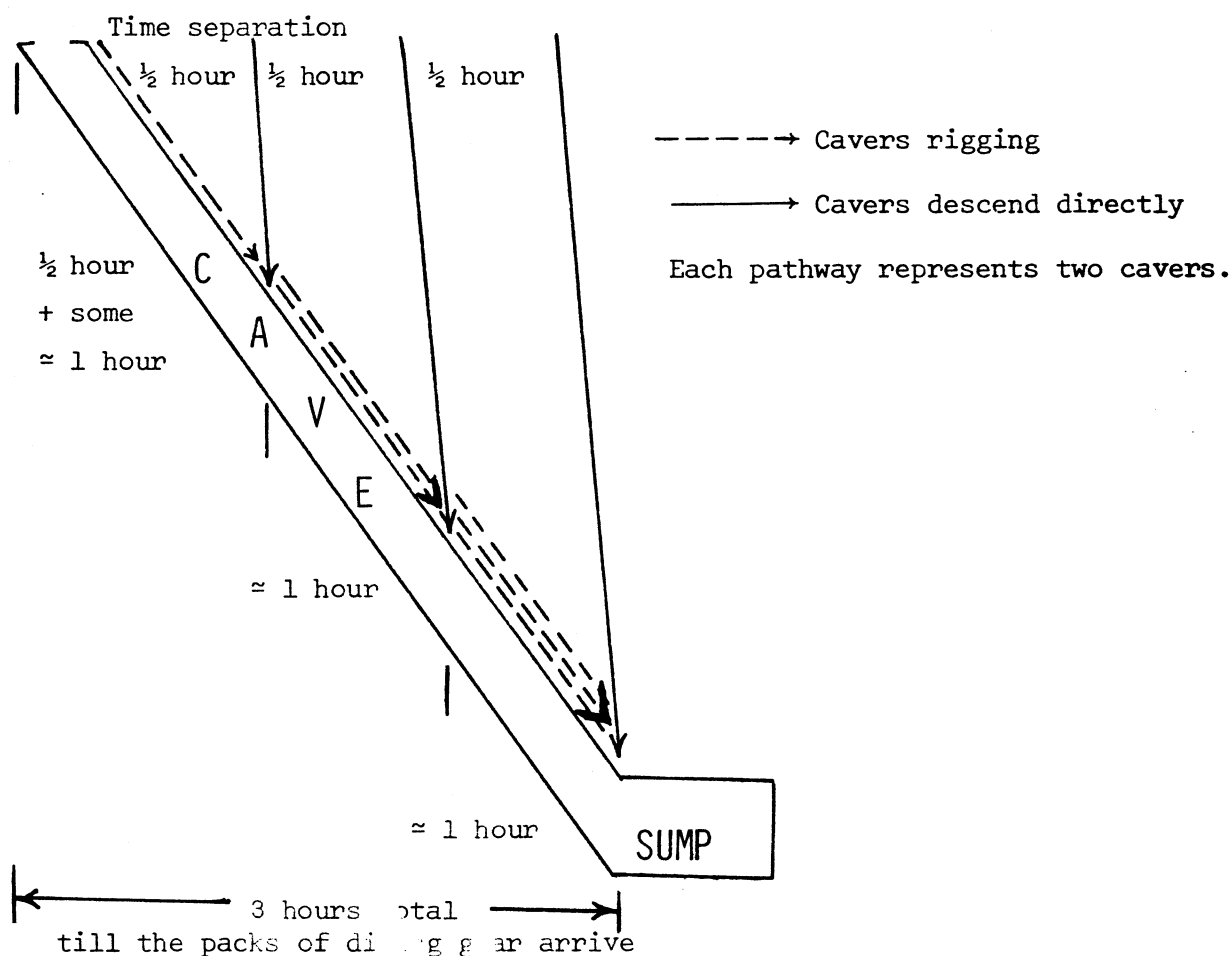
LOGISTICS

Rigging. We intended to tackle the cave as four parties. Each party would delay themselves half an hour behind the party before them. The total separation between parties would be an hour and a half. Thus the total time afforded for the rigging of the cave was one and a half hours plus about another one and a half hours it would take for the last party to negotiate the cave and catch up to the first.

The first party would enter the cave rigging the first bracket of pitches and then be met by the second party just as they ran out of rope (a little over half an hour later). The second party would be carrying the rope to rig the next bracket of pitches. As these cavers exhaust their rope supplies they would be met by the third party with the ropes to rig the last bracket of pitches.

The last party would carry the diving gear straight to the bottom without any delay en route (see Fig. 2).

Figure 2. Greenlink logistics - rigging.



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Derigging. After the diving operations at the bottom of the cave the parties would exit as soon as they had full rope packs. Those that entered first would take the diving gear directly to the surface. As other packs were filled these cavers would also head directly for the surface.

In this way the actual time spent underground by any member of the group would be minimised.

THE ACTUAL EXPLORATION

It took the cavers carrying the diving gear one and a half hours to bottom the cave. By this time the first party had spent three hours underground. Three hours were spent at the sump while Keith was diving (his dives were successful). It was then another six and a half hours before the last caver emerged from the cave after a total of ten hours underground. This was the maximum time any caver spent in the cave.

The last de-rig party will always spend the longest time underground because they must ascend a pitch, remove the rope and give it to some-one else to fill their rope pack. Eventually this person will have a full pack and make for the surface. It is only after all the other rope packs are full that this last party starts its share of the de-tackling.

To overcome this obvious bottleneck situation we initiated a leap-frog situation. The cavers in the third and fourth parties went on ahead to wait and rest in a more comfortable, less wet, less draughty place till the first de-rig party had taken their quota of ropes.

The first party to enter the cave, who were exiting with the diving gear stopped to investigate the upstream mainstream sump. This was done without interfering with the de-rigging procedures.

THE NEED FOR EFFICIENCY

After personal S.R.T. skills have been mastered and the logistic problems of multi-pitched caves appreciated and solved, the scope for exploration is boundless. By using plans similar to that which I have outlined above it becomes possible for small teams of very fit cavers to tackle some of the world's deepest caves with maximum safety.

As a response to more realistic considerations by minimising the time spent underground, the danger of exposure is lessened and mistakes and dangers arising from fatigue are eliminated.

CONCLUSION

Explorations of this nature provide a challenge to the skill and stamina of sporting cavers now and in the future. Cavers can justify to themselves the extending of their limits such that they improve themselves in response to new-found challenges. This has prompted the rise in expedition caving in Australia. Cavers should feel confident in themselves when undertaking such explorations, though possibly a little reserved. Nothing will surpass their feeling of achievement once such an exploration has been successfully completed. The only danger is in over-extending oneself. Realistic

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appraisals of one's ability and a knowing of oneself is all part of sporting caving.

One may argue that in rapid caving the caver "sees" nothing and does not stop to appreciate anything. Sporting cavers may state that they "get a feeling" for the cave, and they appreciate it in that sense.

I will state that Greenlink Cave is the most impressive vadose streamway I have ever seen!