

SPEAEOLOGICAL DIVING IN THE UK - SOME PROBLEMS AND FATALITIES

(This article is based on reports printed in the Cave Diving Group Newsletter and made available by Dr Oliver Lloyd. The Editor)

The type of diving undertaken by members of the Cave Diving Group bears no resemblance to that undertaken in the Florida or Mount Gambia freshwater shafts and caves. The first and most significant difference lies in the motivation, the second in the type of spaces entered. These people are intent to continue their exploration of underground passages beyond the point where a water block is encountered and regard their breathing aid as a tool for this purpose. They are not, it would appear, divers who are desirous of a new experience but cave explorers who refuse to be thwarted. They hope to find new caverns or establish a physical communication between different underground water-formed passages. They are, hopefully, used to making a cold wet, dark way through narrow passages where their personal skill and expertise is constantly under test. Though a certain reliance on others may be present the most successful have been described as "thrusters", a personality trait that may assist survival under difficult circumstances yet predispose to an early death. Accidents in this sport, as in general, are frequently the result of a number of factors occurring sequentially with unpleasant consequences. That such "divers" suffer fatalities is less surprising than the undoubted fact that so many survive! The stress limits of the human body, and spirit, are high indeed. The naming of one locality "the Rectum Passage" may indicate to readers something of the flavour of this sport and recreation.

In 1964 the Cave Diving Group (CDG) newsletter published suggested guidelines for their members. It was advised that there should always be a stand-by diver ready at base to offer assistance, that the diver must have a line connection with his base and have a 100% safety margin of air. Time and experience have shown the impracticability of the first when exploring narrow passages, for there is no way in which the second diver can give the leader assistance. It was suggested that diving be by pairs, a spare breathing set be carried and two-way telephone speech communication be set up between diver and base. Only the second suggestion is honoured, and then only when specially long dives are planned. There is a high risk of grit entering the mouthpiece of the reserve set, one cause of downstream valve leak. The limitation of the buddy system was illustrated by a quoted case where the first diver was slimmer than his companion. This diver squeezed through a narrow opening and then suffered a downstream valve leak. Luckily, although only a trainee, he was able to control it by having one hand on the bottle tap: lucky, for the instructing diver could not get past the narrow section. Self reliance is indeed a necessity!

The first attempts to pass water barriers were by breath-holding duck-dives, a form of heroism most would eschew. The introduction of small scuba air bottles to civilian uses enabled longer barriers to be forced. Such air sets are often hand-held, for there is often too little room for the diver himself, let alone one wearing a tank and backpack. The personality profile of anyone who wishes to undertake this type of risk will rarely include a liking for regimentation, so it is not surprising that many appear to learn by experience rather than through the slow-but-thorough methods of the BS-AC. It is arguable that they intend a somewhat different use of their diving skills and are in fact constrained so strictly by their environment that they are bottle users rather than scuba divers. Nevertheless at least one of those killed was a qualified and experienced diver as well as being one of the most admired cave divers of these days. The following Incident Reports illustrate that notwithstanding the differences, there are similar general safety principles operative as in open water diving.

Case 1 Alan had 6 years of cave exploration experience but this was his very first attempt to dive. He bought his gear on the Friday afternoon and on the Saturday afternoon jumped into Keld Head, lost the line after 30 feet and came out very shaken (125 ats down to 110 ats). He had a fag with his mates and went in again. Movement on the line was felt for 20 minutes. After 30 minutes the *CRC* was called. There were no cave divers present but there were two sub-aqua types there who went in for about 30 feet to look. Wooding was the first active diver there and he immediately checked the first air-space. The line was very slack and had got very tangled. He prepared for a second dive and found on checking that the line was in fact dead slack, so pulled it out. The end appeared to have been freshly cut with a knife, but this was not certain. He then dived on the old line, which ended up in the first air space again. Despite prolonged searching by several divers the body was never recovered. The victim was aged about 21 to 24 years.

Case 2 Steve had the unfortunate honour of being the fourth drowning in this cave (Perth yr Ogof). He was one of a party of four University students which approached the resurgence from within the cave. Only the leader was wearing a wet suit. He and No. 2 decided to swim through the resurgence, while No. 4 decided not to. It is not certain whether No. 3, the victim, had decided to swim or not. It is not known whether he could swim. When Numbers 1 and 2 had emerged they looked back and saw the light of No. 3 under the archway in about 15 feet of water. No. 1 tried to reach him but the buoyancy of his wet suit prevented him from diving sufficiently deeply.

The alarm was given and some members of the CDG, who had been diving in another cave, arrived about 50 minutes later. One donned weight belt and mask and reached the Steve's body, tying a line to an ankle. He was lying in clear water on his right side, facing upstream. There was no entanglement. The victim, aged about 19 years, was wearing old clothes, a boiler suit, a good helmet and an Edison cell for light. He had been down a cave once previously.

Case 3 This victim, Paul, was a 19 year old University student who excelled at all water sports and was a particularly good swimmer. He had achieved the Diploma of the Royal Lifesaving Society and taken up diving about three years ago, logging a total of over 80 dives. He was President of the Underwater Club at his University at the time of his introduction to cave diving. His underwater confidence is attested to by two incidents; in the first he managed underwater vomiting in a calm manner, while in the second he made a successful return after following tangled lines up a blind passage underground in nil visibility. In the few months he cave-dived (August 1970 till February 1971) he became recognised as an outstanding Cave Diver, experienced in solo exploration under difficult and extremely adverse conditions. The fatal dive was made only after careful briefing, but he made one mistake. He started upstream using a single 40 cu ft bottle with an empty line reel to take in loose lines which abounded. He committed the error of having the line he was following, which would have led him home, for one whose upper attachment had come loose (or been cut loose by vandals). He apparently had used most of his air before realising the line was not leading him to an exit. When found he was still in a swimming position, holding the line with his left hand and with the mouthpiece firmly held in his mouth. He was still in this position a week later. The force of the current and the narrowness of the passages made body recovery impossible.

Case 4 Shaq is reported to have been a very good swimmer and to have done some open water diving. His cave diving experience however was quite small and he was possibly pressing his luck in at tempting a difficult sump ... but inexperienced divers by definition cannot know their limitations and unless they are pushers will not reach

them. Apparently he had dived into an unexplored tight static sump at 3 pm, leaving his "sherpas" at the entrance. They received three line pulls, to say that he was through, after 15 feet of line had been used. The line was tied round his wrist and base fed. He did not return and the line appeared to be tied off so in due time the alarm was raised. He had entered the sump feet first, without a weight belt because the passage was extremely tight. The body was reached some five hours later - a task requiring thrutching while holding a 60 cu ft bottle. It was 15 feet in, mask and mouthpiece out of position, lying face up with mouth closed. The bottle, a 14-20 cu feet fire extinguisher type one, was empty. It was stated later that the demand valve had a ruptured diaphragm, though this is questioned. His light and helmet were missing so it is surmised that his light had failed after passing the sump, for "it was a bit dodgy when he went in", and he had attempted a return in the dark. As he was under weighted he may have scraped the roof and lost his mask, an unsettling occurrence even in an experienced swimmer. The line was attached to his wrist at the time of recovery.

Case 5 Roger first became interested in cave exploration in 1962, an interest that developed greatly and extended into cave diving when he later went to University. He organised many difficult surveys of cave systems and it was in furtherance of this activity that he died. The dive had been carefully planned and all the equipment brought up in preparation for an attempt to force what appeared to be an easy sump. Both divers involved were highly experienced and used to working together. They took three cylinders each, a line reel and a pair of boots. The tads were deposited in the airbell between sumps 2 and 3 for use on the dive out and they then continued into sump 3 with full bottles. Their progress was uneventful. After donning the boots an arduous way was made along an often deeply incised, narrow and watery trench in the floor of a large passage. Half an hour later the objective, sump 4, was reached. It was decided to dive together, yet independently if at any point either diver felt uncertain and wished to turn back. They swapped main valves onto two full bottles, retaining the others in reserve. Roger had two positively buoyant bottles, and was underweight, while his companion's were negative. From here on they were in previously unexplored territory.

Roger set off first, laying the line from a 400 foot reel while the other followed a few feet behind with a 1,000 foot reel. The passage was spacious, about 20 feet wide and 10 feet+ high; visibility was 12 feet. The dip, in excess of 50 feet, was clearly noticeable at the sump pool and was maintained if not increased within the sump. On several occasions Roger had difficulty in clearing. At the end of the reel the depth was estimated to be 50 feet and showing no sign of surfacing. After consulting his gauge the second diver tied on the second reel and assumed the lead. Roger at this point cut his reel free from the line and attached it loosely via a short "jump line" back to the line. After about 100 feet a sharply ascending gravel bank was encountered. The passage here was about 10 foot wide and 5 foot high. A glance at the rear showed no sign of Roger but a little later he was seen and contacted and the signal given to start the return. The buddy reached the pool safely and was then incapacitated for a time with an acute head pain. The failure of his friend to return gave him alarm, especially when he found that the line had become slack. The line pulled out easily and it was seen that it had been cut at a point 30 feet beyond the junction of the lines and no longer had any reel attached. Feeling shocked by this discovery the survivor made his return to the surface, finding that nobody had remained at base. A search was then organised in the hope of finding the body, with only the faintest chance that Roger had survived in an air pocket. However no trace of the victim was found.

Case 6 A multiple tragedy occurred when a party of six cavers who had gone down Langstroth Pot, abseiling the pitches, attempted to exit by the three sumps in Langstroth Cave. These sumps are first, going downstream, one that starts at the foot of the last pitch (5.5 feet), then there is a short canal and the second sump (8.5 feet) and the third (11 feet). Between these, well over to the left, is an air bell in which the line is belayed. This measures 7 feet long x 2.5 feet wide x 4 feet high and has 3 feet of water. This air gets quickly used up by divers.

The leader of the party dived first and had some trouble locating the line in this air bell. He thought he was being followed by the others, so when no body came he gave the alarm. The Rescue and Recovery party located one body 8 feet inside sump 3 and a second just beyond. A third body was found in the small air bell, face down in the water. The rescuer, a Wallbank, dived yet again, expecting to find more bodies in the other two sumps; he was immensely relieved to find the other two cavers waiting at the bottom of the final pitch. Supplies were ferried through to the survivors to cover the time until the sumps could be pumped dry. The fifth diver had been pulled back by the last of the party when he was observed to be in difficulties with his attempt to reach the air bell. The rescuers noticed that the "bell" air tasted foul when the victims were reached.

Case 7 A CDG member on holidays in Spain was lost in a downstream sump. This was situated about 600 feet underground, 3/4 mile from the cave entrance. The victim apparently suffered an underwater blackout, it is presumed, in passing this 4 foot high x 10 foot wide sump. His line reel was found 150 feet beyond the obstruction. His buddy made unsuccessful attempts to locate him in the nil visibility conditions that prevailed, and later searching was no more successful.

These cases cover the 1971-1976 period and involve persons in no way related to the CDG in addition to their members. The CDG is alert to the need for assistance in case of underground accidents to cavers as well as to their own members. They have retrieved the body of a boy lost from a party and drowned in an underground lake, and ferried equipment and a stretcher to a caver who suffered a fractured pelvis, giving aid while the sumps were pumped dry. They have even persuaded "volunteers" to submit to being passed through a sump with "rescuers" holding the air bottle for the "victim" in the carrying sheet. Six feet must have seemed to stretch forever, for one of the volunteers had never dived before!

Dr Lloyd has commented that the cases illustrate that a number of factors seem to play a part in determining the fatal outcome, instancing cases 4 and 5 in particular. Shaq had little experience, and it is only with experience that little troubles can be overcome early and prevented from becoming big troubles. He lost his mask, he was underweight, the sump was tight. It is not comfortable to turn upside down and crawl along a roof as water in the face mask then runs all over the face and the valve doesn't deliver air so easily. In Roger's case there seems to have been a succession of little troubles: he was underweight, he had sinus clearing problems and finally he must have had a line problem, for he cut it.

Cavers and cave divers face risks few others would accept "for all the tea in China". Their bravery is unquestionable. Perhaps it is too great on occasions.

APPENDIX A - SUMP AIR

It needs to be remembered by all sumpers and not merely cave divers that sump air has a different composition from fresh air. Although it contains more (33%) oxygen it also contains a very high proportion of carbon dioxide (2.9%). This is because

sump air is in equilibrium with the air dissolved in the water. Therefore the gases are present in proportion to their solubility in water. Oxygen is more soluble than nitrogen, but CO2 is very soluble indeed and is present in a hundred times as great an amount as it is present in fresh air. When the CO2 level exceeds 3% it gives rise to discomfort. Where it rises above 5% it can make you flake out, regardless of how much oxygen is present. There is no question of the air being "used up". What happens that it gets poisoned with a lethal concentration of CO2.

APPENDIX B - SUCCESSFUL APPLICATION OF EAR TRAINING

A member of the CDG wrote to thank Dr Lloyd for the training in lifesaving he had received. The following incident report illustrates, in a possibly extreme form, some of the problems that may face the first aider:

"We were canoeing on a river and stopped for a quick beer. Suddenly on the other side there was a commotion and I saw them dragging a body out. I swam over and found about twenty youths just hitting the body around the face. That, I guess, is the one thing that one doesn't face in training, the difficulty of dealing with a number of panic stricken friends and relations. The victim had been under for between 5 and 10 minutes: no breathing; heart stopped (I actually remembered the signs); blood, water and mucus was pouring from his mouth. That is another thing that training cannot prepare you for, the sheer horror of being in that situation and how to prevent yourself vomiting while doing mouth to mouth. I managed to get his heart started and used a Holger-Nielsen respiration. He started breathing all right but didn't come round (do people normally regain consciousness quickly?) I then found that he had drunk a pint of 151 proof spirit before entering the water. It took half an hour for the fire service ambulance to arrive and when they did come they didn't seem to know what to do. Drowning and alcohol poisoning aside, he seems to have pulled through ... thanks to the instruction I received at the pool side in Bristol. I was surprised at the ease with which his heart restarted and his breathing came back. It's encouraging to know that these things really work, for I always had my doubts in training and the last time I had to do it for real the guy didn't recover.

Sincere congratulations are offered to the person making the above report.



"However can you dive,
dressed like that ?"