



C.D.A.A. Newsletter

# GUIDELINES

No. 43 - APRIL 1992



**CAVE DIVERS ASSOCIATION OF AUSTRALIA**

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Cave Divers Association of Australia  
P.O. Box 290, North Adelaide, 5006

Front Cover: Florida

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## EDITORIAL

Greetings people. Well its been a very busy 3 months - what with access arrangements to a couple of new sites nearing completion, and penetration and Instructor courses being organised, the Directorate haven't had a lot of time to go diving - but, hey, they say once you take on an official position in the Association you hang your gear up for the duration. Hmmmm! The big news is contained in the middle pages of this issue. For the first time in the history of the Association we have organised an overseas guest speaker to come to Australia and do a series of lectures, and we have definitely started at the top.

Virtually every cave diver has heard of Sheck Exley. He holds almost every record ever attained with our sport, among them a record depth on open circuit scuba of 867-881 feet, and numerous penetration records - including the world's longest underwater cave in his own back yard. He like it so much he bought the property! Sheck not only leads the way in the caves, but also in cave diving education. An untiring effort has produced over 100 articles and 10 books on the subject. He is an inherent explorer, whose true passion is to go where no one has gone before, and this has been his driving force for over 23 years. At 39 he remains a forerunner with visions yet to conquer.

Sheck will be doing a series of talks, along with our own Andrew and Liz Wight. There will be only one show in each venue, allowing each and every one of you the opportunity to see this stunning production. Andrew and Liz Wight, as the "Deep Probe" team, have joined forces with Beyond International, makers of "Beyond 2000", to produce a series of exciting underwater adventure films, and have recently returned from Florida, where they explored the intricate and beautiful subterranean waterways of the Floridan Aquifer. Andrew and Liz will premier their new 1 hour film entitled "Window to a Hidden World", this stunning film following on from the international success of their 1988 Pannikin Plains cave diving expedition.

We have put a huge effort into organising the lectures, and I for one would like to see each and every one of you attending. If the tour proves a success, then we will look at organising a similar event annually. If not, then this will be the only time it happens.

With the small cost involved, I urge all of you to purchase tickets - talk to all your diving friends and get them to come along. It will definitely be a show not to be missed.

For those of you involved in clubs or shops, contact me for details on special discounts available.

On a different note, the book "The Darkness Beckons" is again available through the CDAA. The price has risen, but is still \$10 below what it is in the shops, if you can find it. Only limited numbers are available, so order fast.

That's it for another issue, Safe Cave Diving,

*Tony Davis*

## NATIONAL DIRECTOR'S REPORT



Over recent years, much discussion has revolved around the CDAA operating nationally and developing International cave diving standards, techniques and approaches. 20 years ago, Australian cave divers began the Nullarbor exploration phase of our sport. 15 years ago, I made the first

overseas cave diving trip by an Australian, diving in Britain (Wookey Hole and other places) and North America. I arrived in the USA knowing nobody and made a phone call from San Francisco to Florida, introducing myself to a bloke called Sheck Exley, whom I'd heard about.

In his southern drawl, Sheck said, "Hey, y'all come on down south for some daavin!" and I did! Much later I realised that the dives

*Continued overleaf*

## NATIONAL DIRECTOR'S REPORT

*Continued from previous page*

we did together gave Shek an opportunity to gauge Australian cave diver quality, and I obviously represented us all well. We did some excellent diving and quite a number of CDAA divers have since been hosted by Shek and Mary Ellen (herself an outstanding cave diving Instructor and achiever).

Finally, we in the CDAA who have benefited from such good treatment by the

Yankees can repay the compliment. Personally I find this very satisfying, as well as an unmatched chance to gain further insight into cave diving developments right at the cutting edge. Our guests are fine people. Please make them most welcome and enjoy their company. Then save up your dollars and go cave diving Internationally - USA, South East Asia, Mexico, Mediterranean, South Africa, New Zealand - there's a world of caves and sinkholes out there!

Regards to all of you,  
*Ian Lewis*

## STANDARDS DIRECTORS' REPORT

*by Glen Harrison*

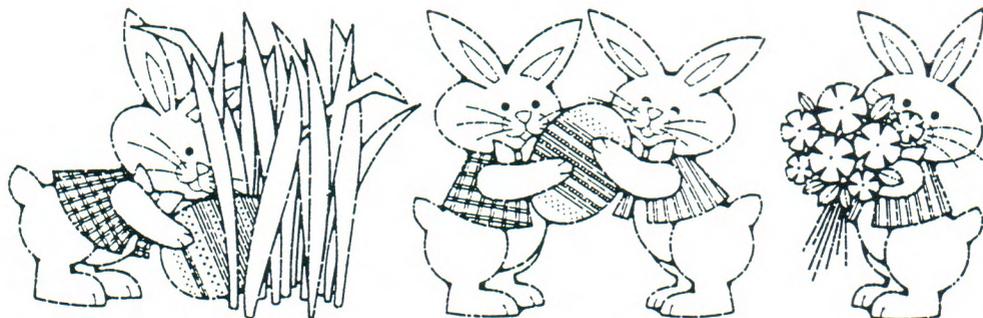
Since the last issue of Guidelines the Standards Directorate has been involved in a number of projects. The first of these involved the NSW region and dealt with an accreditation workshop for Non-CDAA Cave divers. I wish to thank all those who participated, and special thanks must go to Neil and Lyn Vincent for a well planned and organised weekend. The other main area of activity has been in the development of an instructor guide/outline for the Penetration Diver Award. This document is almost complete and will be distributed to various members of the Standards Review Group for comment as soon as possible. Once the format and outline has been accepted, work will commence on instructor guide for all other levels.

All members who have not attended a Cross-Over should have been notified by mail. If you received a letter, but believe you

have met the requirements for crossing over, please contact the Records Officer for clarification of your current status. Please note that any member who does not cross over will have their CDAA rating reduced by one level. Penetration in-water workshops have also been scheduled in all regions for those members wishing to bridge the gap from their old Cat. 4 to the new Penetration Award. Again, those members requiring to cross-over have been notified by mail.

Response to the Penetration Programs advertised in last Guidelines has not been good. In fact, the first Melbourne course has been cancelled due to lack of numbers and the Adelaide course has just the bare minimum to proceed. Dates and relevant details for the next Penetration Courses can be found in this issue of Guidelines.

That's all from me now. Safe cave diving.



## CDAA EXAMINERS

INSTRUCTOR	Cavern	S'hole	Cave	State	Telephone (h)
Ron Allum	•	•	•	NSW	(02) 398 4610
Stephen Arnel	•			VIC	(055) 26 5230
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Chris Brown	•	•	•	SA	(08) 379 1445
Marilyn Boydell	•	•	•	WA	(09) 349 5646
Stan Bugg	•	•	•	VIC	(03) 379 8791
Greg Bulling	•	•	•	SA	(08) 265 4978
Gary Bush	•			WA	(09) 521 8121
Scott Carpenter	•	•	•	VIC	(056) 25 2508
Paul Cavanagh	•			NSW	(02) 804 7888
Brian Cornell	•			VIC	(059) 85 2514
Terry Cummins	•	•		NSW	(02) 888 5899 (w)
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Ian Gothard	•			VIC	(03) 481 0474
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Carol Wright	•			NSW	(066) 53 6087
Frank Ziegler	•	•	•	VIC	(055) 26 5288

## THE DARKNESS BECKONS

This outstanding publication on the history and development of our sport is again available through the CDAA. To order, send \$55 (cheque or money order made payable to Cave Divers Association of Australia) to: **CDAA PUBLICATIONS,**

**Limited quantities available - order early!**

**P.O. Box 290  
North Adelaide, 5006**

Allow 14 days for delivery

## THE SHAFT – ACCESS ARRANGEMENTS 1992

As per standard arrangements now, there will only be a roster of dates for diving – one weekend per month. It is up to the Dive Leader to organise a guide who is available for the weekend they wish to dive, from the list detailed here.

It is recommended you start to organise a guide at least 4-6 weeks in advance, in case you have trouble finding an available guide.

It must be stressed that it does not matter if you do not know the guide personally. If you fulfill the entry requirements and wish to dive the Shaft, then start phoning the list of guides provided.

<b>Rostered Dates 1992:</b>	July 11/12
February 8/9	August 8/9
March 14/15	September 12/13
April 11/12	October 10/11
May 9/10	November 14/15
June 13/14	December 12/13

<b>Shaft</b>	Ron Allum	(02) 534 6615
<b>Guides:</b>	Paul Arbon	(08) 265 2098
	Chris Brown	(08) 379 1445
	Tony Carlisle	(08) 278 7429
	Ian Lewis	(055) 21 7608
	Phil Prust	(08) 370 6000
	Peter Rogers	(03) 527 7969
	Peter Stace	(085) 82 2426

## COMING NEXT ISSUE ...

- ◆ Sheck Exley/Deep Probe Lectures – Review
- ◆ Keeping Cool in “Pale Ale”

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## ➔ AVOID ➔ DISAPPOINTMENT

Order your Sheck Exley/Deep Probe tickets today – see centre page lift-out for details and Order Form.

## MEMBERS MANUAL:

All orders for the CDAA Members Manual are now \$20, due to severe postage increases.

To secure your copy of the Members Manual, complete the order form on page 14 in this issue of Guidelines, and send, with cheque for \$20, to

**CDAA Members Manual**  
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# DEEP DIVE PLANNING

by John Vanderleest

Many of us know from experience approximately what size tank to use on a deep dive. Generally, we first learnt this from somebody else who would enlighten us with highly intellectual comments like "Ohh? I think you'll need a 63 for this one!" or little gems such as "Take a big tank, I'm not sure how much air you'll need!". With this extensive education in dive planning, many of us fumbled our way through our diving history with never a thought of more detailed planning, particularly in the area of air consumption requirements. Anyway, what's it matter, you've got a buddy with plenty of air if you run out. You can use their air.

All too often, people are very blasé about planning deep dives. Just because they have survived a few dives (yes, I meant survived) they believe that planning is no longer required. Based on that logic, if I survive driving my car over .05 a few times, it must mean I was in control of the situation and I am capable of doing it again.

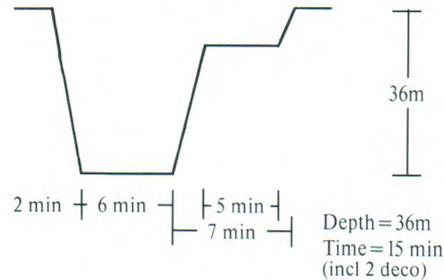
One of my most favourite questions for people who actually do plan a deep dive is to ask them how many litres of air the dive will require. "Who cares?" I hear you say. "If I'm using the 1/3 rule what does it matter?". Read on ...

In order to do any air consumption calculations, we first need to know our surface breathing rate (SBR). Fortunately, this is usually taught during or about our first dive course (well, it should be!). Unfortunately, many of us never recalculate our surface breathing rate once we finished

the course. Do you know yours? What is your SBR in the cold sinkholes of Mt. Gambier? Does it increase in winter? Does it increase in your second dive for the day, when you started with a cold wetsuit? If you can't answer these questions then perhaps you have some calculations and tasks to do.

Let's plan a dive and calculate our air requirements.

The Dive profile is:



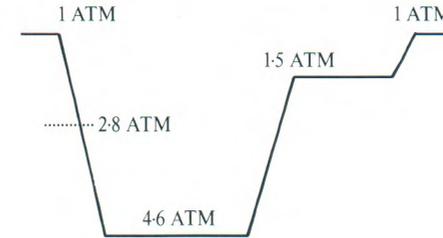
The Air Requirements Formula is:

$$\text{Air Required} = \text{SBR} \times \text{Time} \times \text{Absolute Pressure}$$

Let's assume for arguments sake that our SBR is estimated to be 25 litres per minute.

The pressure can easily be calculated from our dive profile. We won't be pedantic and worry about the differences between fresh and salt water. The pressure during descent and ascent is not consistent, therefore we will use the average pressure during this time. Remember, absolute pressure = water

pressure plus air pressure; thus a 25m dive has an absolute pressure of 3.5 atm. So let us look again at our dive plan, this time with pressures added.



The Dive Pressure Profile is now:

- A. Descent 2 minutes at 2.8 atm
- B. Bottom 6 minutes at 4.6 atm
- C. Ascent 2 minutes at 2.8 atm
- D. Deco Stop 5 minutes at 1.5 atm

Now let's work out how much air will be consumed. Remember the formula:

$$\text{Air Required} = \text{SBR} \times \text{Time} \times \text{Absolute Pressure}$$

- A. Descent  $25 \times 2 \times 2.8 = 140$  litres
  - B. Bottom  $25 \times 6 \times 4.6 = 690$  litres
  - C. Ascent  $25 \times 2 \times 2.8 = 140$  litres
  - D. Deco Stop  $25 \times 5 \times 1.5 = 187.5$  litres
- TOTAL: 1157.5 litres

This is the amount of air we will require to complete this dive providing there are no hiccups.

"No Problems" I hear you say. "My tank holds, now let's see ... WC x Gauge Pressure in atm??? It holds about 2300 litres of air. Using the 1/3 rule that's about 750 litres in and 750 litres out. That's 1500 litres I need for the dive. Heaps!!!"

Well, I'm glad you feel that way. Now let's have a look at some of those hiccups I was talking about.

1. Generally we use about 100 litres of air to test our regs, BCD and jumping in the water.
2. Once in the water our tanks begin to cool in the cold cave water and we lose another 100 litres of air (remember your physics, pressure is related to temperature). We're now down to 2100 litre of air and we haven't been underwater yet.
3. If we are conservative divers, we probably ascent at 9m. (30 ft) per minute. Thus our ascent time is 4 minutes adding another 140 litres to our air requirements.

Now it's been claimed that Murphy loves a cave diver and more importantly, he loves us most at the furthest point of penetration. So what are the hiccups now?

4. Stress level will automatically increase making your SBR 35 litres per minute. This will increase your air requirements for ascent by 112 litres (assuming you are still ascending at 9m per minute) and 75 litre for deco.
5. Two people breathing off one tank will require another 392 litres for ascent ( $35 \times 4 \times 2.8$ ) and 262.5 litres for deco.
6. Establishment of shared air ready for ascent - 1 minute. Thus 2 people at 36m ( $70 \times 1 \times 4.6$ ) requires another 322 litres of air.

So far we require 2661 litres of air .. hold on .. isn't this a lit more than we have in our tank? Perhaps we can suck some air out of our BCD. What about all that lovely air inside our mask? There's a small bubble inside your buddies ear canal! Perhaps we can give each other underwater EAR, after all we only us a couple of percent of the oxygen in the air we breath!

Why does the Shaft require twin tanks?

Why do most of the Penetration divers wear twins in Sinkholes as well as Caves and Penetration sites?

Why am I finding it hard to breathe at the moment?

See you in the pot!

## AN EVENING WITH SHECK EXLEY AND THE DEEP PROBE TEAM

Join the world's most experienced cave diver and Australia's own Andrew and Liz Wight for an evening of stunning slide images, superb video footage and some interesting information as well! See coloured insert this issue of Guidelines for full details and ticket order form.

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## PENETRATION EDUCATION PROGRAMS

by Peter Horne

Members who held (or hold) the CDAA's previous Category 4 rating will know that complete cross-over to the new Penetration rating is presently possible through attending an Update Seminar and demonstration their advanced cave diving skills in-water at a suitable venue. Originally, it was envisaged that Cat. 4 divers only had to attend one theory seminar to become a Penetration Phase I diver, which meant that they could dive in the present Cat. 4 holes but not some of the new sites which involve major restrictions and/or fixed-line techniques ... the highest rating of Phase II could only be held by those divers who had attended a practical assessment/demonstration day as well.

However, this stance has now been modified because it has become apparent that Cat. 4 members cannot update their skills sufficiently by just attending a single theory seminar ... IN-WATER practice with new equipment and techniques is also very much required.

Why is it deemed to be so necessary to ask all members to participate in practical days now? Basically because the theoretical and practical components of cave diving activities have changed very significantly during the past 5 years and because the CDAA needs to ensure that our top rating is recognised internationally as an award of the highest level ... something which was not possible before.

It is important to understand that this in-water requirement is NOT a TEST! It is really a useful opportunity to discuss the new ideas (and gain some experience through practice) with other experienced divers, and having been involved in such a day in early January I would like to say it was very enjoyable as well!

Our group tackled a variety of techniques dealing with safety using the new fixed-line system; aspects which have NOT been addressed in any detail in the past but which can affect every member. We practiced how to use "gap reels" to jump from one fixed line to another, placing line arrows to indicate the way out; following our placed lines and

reference arrows "out" of the cave in zero-visibility (without using tether-lines); locating a "lost" guideline by feel, using a gap-reel as an emergency reference line; and practicing how to safely inter-connect a gap-reel with a fixed line which had become severely entangled in our tanks, requiring a line-cutting manoeuvre ... techniques which are essential to know at this level and which were practiced in just 8 metres of water whilst wearing twin tanks and normal cave-diving gear.

So, if you are a Penetration Phase I diver (or Cat. 4 diver) who HASN'T participated in an in-water Penetration Education Program, you had better think about contacting the CDAA in the near future ... because these programs are intended to cease at the end of this year, and divers who haven't done this practical component will NOT hold penetration ratings.

I'm sure that, like me, you will all find such days very interesting and worthwhile ... and generally good fun as well!!!



(left to right)

Backrow: Greg Bulling, Chris Brown.

Front Row: Glenn Harrison, John MacKenzie, Trevor McCanne, Peter Horne, Michael Weeks.

Penetration Diver Education Programme - Thorndon Park, S.A.

# NITROX AND SPORT DIVERS

by Dick Rutkowski

*"Mother Nature provides the planet Earth with a NITROX atmosphere known as air. She never said that air was the best breathing medium for divers. Here, as in many other fields of endeavour, human beings have used their knowledge of natural laws to go one step beyond what Nature has provided for them".*

J. Morgan Wells, PhD.  
Director, National Oceanic and Atmospheric Administration  
Diving Programme

NITROX is any combination of nitrogen-oxygen. The first breath we took coming into this world was NITROX. In fact every breath we have taken since has been NITROX. The first dive we took using compressed air was NITROX.

Compressed air is 79/21, meaning 79% nitrogen and 21% oxygen. At atmospheric this is called a normoxic nitrox mix. Normoxic meaning normal oxygen pressure.

Decompression obligation is dependent on the quantity of nitrogen absorbed by the body during the course of a dive. Both the rate of nitrogen uptake, and the total quantity of nitrogen which can be taken up in the body, is determined by the nitrogen partial pressure in the breathing gas. If we reduce the nitrogen content of the breathing gas by diluting it with oxygen, which can be metabolized away by the body, we can reduce the nitrogen content of the breathing medium, and thereby reduce the rate of nitrogen uptake.

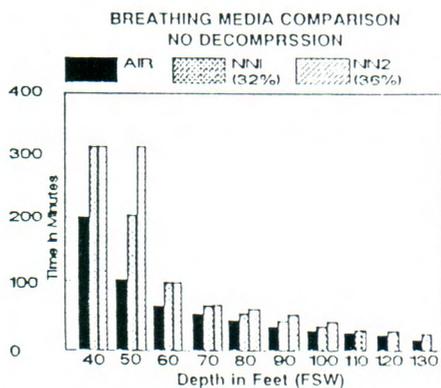
NITROX mixtures with greater than 21% oxygen, commonly called ENRICHED AIR NITROX (EAN) can offer significant advantages to many types of diving.

NITROX (oxygen enriched air) was in use before most divers in this country were born. For decades, the US Navy, the Royal Navy, the Royal Canadian Navy, the Royal Australian Navy, most foreign navies and commercial diving companies around the world have successfully used NITROX mixtures for increasing diving efficiency. More than a decade ago, the National Oceanic and Atmospheric Administration (NOAA), the US Federal Government Agency responsible for the management and protection of the ocean and coastal zone, recognized the significant advantages

obtained by the use of NITROX, and published tables and procedures for its use in the 1979 edition of the NOAA Diving Manual.

Only within the last five years has the scientific and advanced level sport divers community overseas begun to take advantages of the numerous benefits of NITROX, (increased bottom times, reduced residual nitrogen times, reduced nitrogen narcosis, shorter surface intervals, and safety). Why safety? Simply, the existing NITROX Decompression Tables are more conservative than the US Navy Air Decompression Tables upon which they are based. Scientists from over a dozen universities around the world have safely performed thousands of NITROX dives, as have progressive sport diving groups.

Air has been used as a breathing gas by divers since the beginning of diving. Its principal advantage is that it is readily available and inexpensive to compress into



cylinders or use directly from compressors with surface-supplied equipment. It is not the "ideal" breathing mixture because of the decompression liability which it imposes. Since decompression obligation is dependent on inspired nitrogen partial pressure and time, not "depth" and "time", this obligation can be reduced by reducing the nitrogen content of divers breathing gas and substituting for the removed nitrogen a gas which is metabolized away by the body, i.e. oxygen.

The toxic properties of oxygen at elevated pressure limit the depth and time to which it can be breathed pure or as a component of a nitrogen-oxygen (NITROX) mixture. If both the toxic properties of oxygen and its decompression-obligation-reducing properties are taken into account, an "ideal" gas mixture for any depth/time combination can be produced. Such a mixture would offer the maximum decompression advantage without the risk of oxygen toxicity. Advantages of such a mixture relative to air are:

- 1) extension of "no-decompression" time limits.
- 2) reduction of decompression time if no-decompression limits are exceeded, and
- 3) reduction of residual nitrogen in the body following a dive.

The latter would either increase the time allowable on repetitive dives or reduce the surface interval required to make repetitive dives, or both.

The decompression procedure which must be followed when NITROX is used is based on the concept of "equivalent air depth" (EAD). This procedure equates the inspired nitrogen pressure of a NITROX mixture at one depth to that of air at another depth, the EAD. This procedure has been used for over 20 years with semi-closed and closed-circuit mixed-gas underwater breathing apparatus. Such equipment is both very expensive and complicated.

## THE FUTURE

NITROX will be the breathing gas of choice for divers between 12 and 45 metres.

Dive computer capabilities will be expanded to be used with several NITROX mixtures.

Dive shops will provide several NITROX mixtures.

All divers breathing gas (air and NITROX) will be routinely analyzed for safety and efficiency.

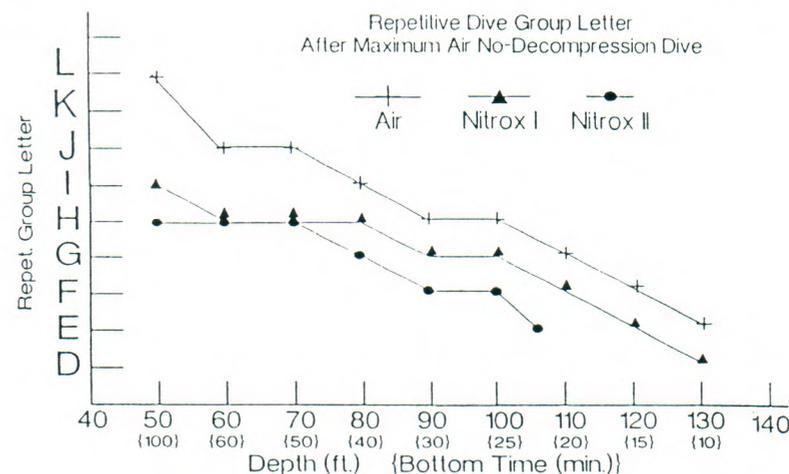
Divers will be more informed and better trained.

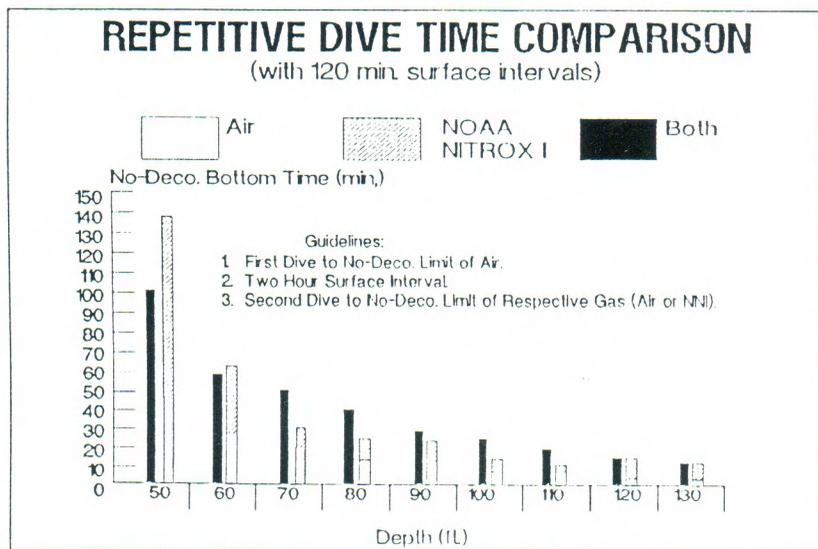
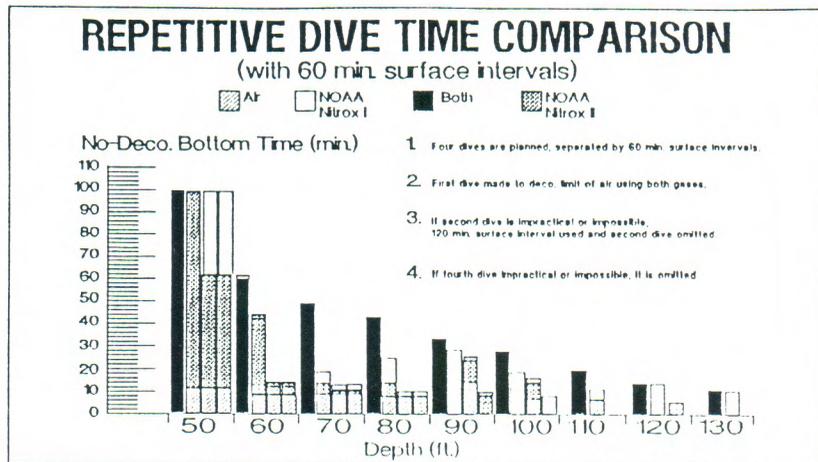
Oxygen generation (air separation) technology will improve the efficiency, and reduce the cost of breathing gas preparation.

TRIMIX (nitrogen/helium/oxygen) diving will become routine for moderate/deep diving.

Safe and effective methods for in-water NITROX and oxygen decompression will be developed.

Improved statistical data and analysis will identify problem areas and combat to





advantages in methodology.

Advanced training and technology are necessary to safely and effectively conduct NITROX diving operations. The benefits more than justify the requirements.

Dick Rutkowski served as Director or NOAA Diver Training since 1965 and Deputy Diving Co-ordinator and Director of the NOAA Diving/Hyperbaric Training and Diver

Treatment Facility from 1973 to 1985.

He has acquired vast knowledge in diving life support systems and gases and formed Hyperbarics International to continue advanced diver training in physics, physiology and medical implications of hyperbaric medicine and gas diving. He is a founding member of the International Association of Nitrox Divers.

FLORIDA - this word to most people conjures up thoughts of the Miami Beach skyscrapers, space shuttles launches from Cape Canaveral, the tropical Keys, Walt Disney World, and a balmy tropical climate, with palm trees swaying in the breeze. This, and more, is all true - the result being that Orlando, in central Florida, is one of the world's busiest tourist destinations, attracting millions of people annually. As an indication, the Orlando area is serviced by over 70 car rental companies, the larger ones having fleets in excess of 2000 vehicles.

However, for those of us with a more subterranean outlook on life, Florida means springs and water filled caves, dozens of them, providing some of the best freshwater diving in the world. Names such as Peacock, Branford and Ginnie all hold the promise of a unique adventure. At least that was the expectation as I recently prepared for a visit to the USA, which although primarily to other states, for other purposes, certainly included Florida for diving on the agenda.

The reality actually turned out to be a little different. "The diving here at present is the worst it has been for almost ten years", the voice informed me over the phone as I made some initial enquiries. Exceptional amounts of rainfall had resulted in high river levels, which in most cases turns springs into siphons and fills the cave systems with river water. However, Ginnie Springs had escaped this fate, and was "open for business".

Ginnie Springs is a commercially operated diving resort, on the banks of the Santa Fe river near Gainesville. It is well developed for picnicing, swimming, and camping as well as diving, and is in a most desirable setting amongst thick cypress forest. This explains the fact that on the weekend chosen to visit, at least 50 other divers had done likewise, and the line up to check-in extended well out of the door of the on-site dive shop/training facility/store. The \$20.00 per day diver entrance fee receives no complaints however due to the facilities provided such as toilets/showers, shelter sheds, BBQ's and wooden decking on the edge of the springs with easy step access to the water.

Ginnie Springs itself is the most popular dive site, as it is accessible to open water divers, so long as they conform to the "no torch" rule. It comprises of a pond, not unlike the third pond of the Ewens chain, with a multitude of plant and animal life. There is also no shortage of human life as well - with often 40-50 people swimming in its crystal clear 72 degree F water. An opening about 3 metres in diameter in the centre of the pond gives access to a chamber of generous proportions, about 20 x 10m comprising craggy limestone walls, and a rocky/sandy floor. It is one wall of this cave that contains the outlet of the spring, which flows 5,000,000 gallons a day through a grate opening 2 x 1.5m in size. It was quite a struggle to retain ones grip on the grate whilst peering into the opening, as the enormous flow of water buffeted you around, clawing at your mask. It is an awesome display of natures energy.

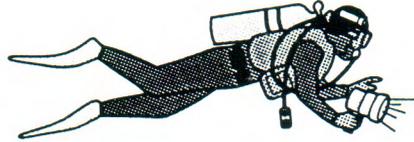
The real reason for visiting the area is a short drive through the forest, still on Ginnie Springs property, the Devils Eye and Devils Ear system. I was fortunate to have befriended Steve Foreman as a buddy, a cave diving instructor of some years experience, with in excess of 500 dives in the Devils System, many of them exploratory.

The system comprise of a complex honeycomb of passages, again all containing crystal clear 72 degree F water. A system of fixed lines is in place throughout. Entry onto the Devils Ear is quite an experience as it is located in the bed of the Santa Fe river, which at the time was the colour of strong black tea due to the tannin contained in the land run off. Leaving the bank it was necessary to navigate through this low visibility area until one comes across the blast of clear water coming from the entrance chimney, an opening approximately 3 x 2 metres descending 10-15 metres. On entering the outlet one needed to claw along keeping close to a wall until reaching an initial chamber at which point you were presented with a choice of passages. At this stage there were a number of signs posted including pictures of the grim reaper saying "Do not

Continued on Page 00

**AT LAST IT'S HERE**

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## VETERAN AMERICAN CAVE DIVER DIES IN FREAK ACCIDENT

by Peter Horne

(Summary of article in NSS/CDS "Underwater Speleology", Vol 18 No. 6)

Many members will know that waterfilled caves in America have claimed the lives of several hundred cave explorers since the 1960s. Accident analysis has repeatedly highlighted such aspects as a lack of appropriate training and/or equipment, and general inexperience, as being the key factors in the best majority of cases. In fact, until the late 1980s, only a couple of victims were certified cave divers (and they also died as a result of exceeding their limitations or disregarding established safety procedures). CAVES didn't kill people ... divers generally drowned as a result of HUMAN error or interference – their own or someone else's fault – or gear failure.

The tragic death of Parker Turner – one of America's most experienced and very active cave divers – a few months ago is an exception to every other accident known to date.

According to the accident report, Parker and his dive buddy, Bill Gavin, were diving as part of a group of six in Indian Springs, near Tallahassee, Florida on the evening of 17th November. Four of the team had completed their dive and were decompressing near the mouth of the cave while Parker and Bill were still some 300 metres into the system, heading out, after a 7-hour dive.

Without warning, the mouth of the cave suddenly silted up as the normally "5th magnitude" spring, for the first time in the 15 years it has been known by the cave diving community, SUDDENLY REVERSED ITS FLOW and became a SYPHON, sucking in an enormous amount of rubble and debris which poured down the slope of the basin and into the entrance cavity, and lowering the water level in the surface lake by almost half a metre in just 15 minutes!

Parker and Bill needed to negotiate a 30 metre long area of passage which was very low and wide just a short distance from the entrance, and it was into this area that a large amount of debris settled. In the now zero-visibility water, the returning divers

discovered that their line was completed buried in the now extremely low and difficult "flattener" passage, so they deployed a backup safety line which they attempted to use as a reference during their search for the way through.

However, as they slowly negotiated the nightmarishly-tight restriction, Bill and Parker became separated, and despite Parker's apparent attempts to cool-headedly negotiate the restriction by pushing his tanks in front of him, he tragically ran out of air before he could find the decompression tanks or be rescued by the surface party (who went back into the cave, in low visibility, to search for them).

This sudden and extremely forceful flow-reversal phenomenon at Indian Springs was believed to have been caused by a massive geological disturbance deep in the Woodville karst area, even disturbing the River Sinks system some 12 kilometres away.

Tragic as Parker Turner's death was, it is considered nothing short of a miracle that the OTHER five divers were not all caught deep in the system when the awesome phenomenon occurred!

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# SOME THOUGHTS ON EQUIPMENT CHECKS AND AIR SELF SUFFICIENCY

by Tony Richardson, Cave Diving Instructor

A resumé of recent cave diving "incidents" in Guidelines made interesting reading. It appears that a number of these incidents could have been avoided by conducting thorough equipment checks before the dive.

The purpose of this article is to detail what I consider should be standard equipment checking procedure on all types of cave dives.

Naturally equipment will be checked by a diver as it is assembled before the dive. Some may consider this is the end of the procedure - I consider it to be only the start. Once in the water with your buddy, the real equipment checks begin - some equipment problems can only be detected in the water!

**1. Air Supply.** Breathe from both second stages with your head in the water while watching the SPG. This will check inhalation/exhalation of regulator, whether regulator is breathing wet, tank full, valve correctly opened (no fluctuation on gauge).

**2. B.C.** Inflate and deflate to check operation.

**3. Lights.** Switch on primary light and then back-up lights in turn, pointing them at your buddy. This checks for operation and accessibility.

**4. Bubble Check.** Submerge about a metre under water and slowly rotate as your buddy checks you for air leaks from air supply and B.C.

**5. Dangle Check.** Lay horizontal in your normal swimming position while your buddy checks you for possible snagging points or gear that has come adrift.

**6. Ancillary Equipment.** Quickly note that you haven't forgotten anything - watch, depth

gauge, computer, deco tables, slate, compass, knife, tether clip and reel.

**7. Dive Plan.** This is the final step where you briefly review your plan for the dive. Easily remembered by SADDDD: Sequence (who is leading), Air turnaround, Depth, Duration, Decompression, Distance of penetration.

With practice, the whole procedure takes only a few minutes (probably less time that it takes you to read this article). In any case, a few extra minutes is always worthwhile to increase the safety and enjoyment of a dive.

Remember in all forms of cave diving we carry far more equipment and face greater potential hazards than in open water. Open water procedures are, therefore, usually not relevant.

In the U.S.A., cave divers take one further step and practice sharing air with their buddy before the dive. "Those bloody Yanks are over the top ..." I can just hear you saying. Well, can you rely on your buddy to correctly and efficiently supply you with air if needed in an air emergency? Or, vice versa, could you assist your buddy? Sure, you were taught all this in your course and carry all the equipment to do it, but when was the last time you tried it? How often do you dive with different buddies with whom you have never practiced air sharing. In an overhead environment and with a single tank you have no other options but to rely on your buddy.

If you are not prepared to practice air sharing with your buddy, you (and your buddy) need to become equipped with twin independent cylinders and learn to become "solo self-sufficient" divers. This doesn't mean you dive alone, but implies that you yourself can deal with any problems you encounter on the dive. Maybe more about this in a later article.

# TABLES REVIEW

by John Vanderleest

The Defence and Civil Institute of Environmental Medicine (DCIEM) sport diving tables were developed in Toronto, Canada. Hence, they are often referred to as the Canadian Tables.

Although at first glance, the tables appear to be a rehash of other tables such as the NAUI and PADI, it soon become evident that there is a lot of difference in these tables.

Like other sport diving tables, they use repetitive groups (A to M), however these letters must be converted to a number in the range 1.0 to 2.0 before they can be used for repetitive dive calculations. Therefore the system of following a line while flipping your plastic tables over and over is not used. You are expected to do a bit of mathematics along the way, hence making the tables not quite as idiot-proof as the NAUI and PADI sport diving tables.

Let's take a sample day's diving.

*1st DIVE. SINKHOLE. 35m for 10 min.*

*According to the tables (36m for 10 min.) this will make us a "C" diver at the end of the dive.*

*The tables suggest an ascent rate of 18m/min. and a precautionary stop at 3m for 3 min.*

So far the tables aren't any different from most other tables but here is where the similarities finish.

If your bottom time or depth is exceeded, then decompression stops at 3 and 6 metres are clearly marked.

An interesting side line is that regarding omitted decompression stops. The DCIEM tables have retained in-water recompression (providing no symptoms of DCS are present). Unlike the old 1/4 time at 40 feet, 1/3 at 30 feet, etc., (incidentally, no longer taught by many sport diving instructional agencies), the DCIEM tables recommends the recompression starts at 3m (10 ft) deeper than the first missed stop - i.e. if a stop was required only at 3m then recompression would start at 6m (20 ft). The time spent at this depth should equal the time of the first missed stop. After this, the decompression stops should continue as originally required.

After the first dive is completed, the surface interval calculations give you a number in the range 1.0 to 2.0. This value, although different

in appearance from other sport tables, is still used to represent your residual nitrogen level.

After a surface interval of 2 hours, the tables clearly indicate that we have a REPETITIVE FACTOR (RF) of "1.2". The new NAUI sport diving tables would have given us a letter of "C" after this surface interval. Using this repetitive factor, a third table is used to find the new No-Decompression Limits (NDL) for a repetitive dive. Therefore, a dive to 30m for a diver with an RF of 1.2 has a NDL of 11 min.

It sounds easy so far, just a little different. But, this is where the fun stops and the calculators come out. In order to find your repetitive group letter, after completion of the second dive, you'll need to multiply your actual bottom time (11 min.) by the RF of 1.2 to give you an effective bottom time of 13.2 minutes. If you exceed your NDL or planned depth, you better be good at maths because you are going to have to do this underwater.

Let's say you actually dived 12 minutes instead of 11 minutes. Your effective bottom time would now be  $1.2 \times 12 = 14.4$  minutes, consequently requiring a decompression stop for 5 min. at 3m.

If you are not good at mental arithmetic, then by now you are probably saying that these are not the tables for you or it's the best argument you've seen for purchasing a dive computer. The one thing it does do is make you plan your dive a bit better than what you are probably doing now and then stick to the plan. Unfortunately, in cave diving, this is often easier said than done.

If you can overlook the maths involved, the tables offer some attractive features for cave and sinkhole divers.

The fourth section (Depth Corrections) is offered for altitude diving i.e. anything over 300m (100 ft). This is a simple-to-use table that converts your actual depth to an effective depth relative to the altitude. It even contains figures that compensate for deco stops at altitude.

The next attractive feature of the tables is their multi-level diving. I say "attractive" because there is only a few tables on the market that have actually been designed for use in multi-level diving.

Now whether you believe in multi-level diving or not is a different issue. In cave diving and in many sinkholes, there are times when it

*Continued overleaf*

**TABLES REVIEW continued**

Continued from previous page simply cannot be avoided. Calculating a multi-level dive is quite simple. Let's look at an example.

*A planned dive to 27m for 10 min, then 18m (60 ft) for 20 min.*

*After your 20 min at 27m, you would be a "B" diver. Now you simply move to 18m on the tables and find the equivalent time for a "B" diver (20 min) and add this to your actual time at 18m (20 min) to give you an effective bottom time of 40 min at 18m. This is within the NDL for that depth so it is a safe dive plan.*

This method of calculating multi-level dives has been in use for many years by divers using

a variety of tables, however the practice has never been condoned by the table manufacturers as the tables have never been designed with practice in mind.

The DCIEM sport diving tables are highly recommended by the Adelaide Hyperbaric Unit due to its excellent safety record overseas. For copies of the tables contact:

Australian Patient Safety Foundation  
G.P.O. Box 400,  
Adelaide, 5001  
Phone: (08) 224 5544  
or (08) 224 5116  
Fax: (08) 232 3283.

Prices are \$18.50 each or \$10.20 each for 5 or more.

**DCIEM SPORT DIVING TABLES**

**A: AIR DECOMPRESSION**

Depth	No-Decompression Bottom Times (minutes)		Decompression Required Bottom Times	
	30 A	60 B	30 A	60 B
20' 6m	150 E 180 F 240 G 300 H	360 I 420 J 480 K 600 L	720 M	∞
30' 9m	100 E 120 F 150 G 180 H	190 I 210 J 240 K 270 L	300 M	360 400
40' 12m	60 D 80 E 100 F	90 G 120 H 150 I	150 J	160 K 180 M 200 215
50' 15m	30 C 40 D	30 C 40 D 50 E 60 F	75 G	85 H 85 I 105 J 115 K 124 L 132 M
60' 18m	15 A 20 B	25 C 30 D	40 E 50 F	60 G 70 H 85 J 92 K
<b>Decompression Stops in minutes at 10' 3m</b>				
70' 21m	12 A 15 B	20 C	25 D 35 E	40 F 50 G 60 H 66 J
80' 24m	10 A 13 B	15 C	20 D 25 E	29 F 36 G 48 H 52 I
90' 27m	9 A	12 B	15 C 20 D	23 E 27 F 35 G 40 H 43 I
100' 30m	7 A	10 B	12 C 15 D	16 D 21 E 25 F 29 G 36 H
110' 33m		6 A	10 B 12 C	15 D 18 E 22 F 26 G 30 H
120' 36m		6 A	8 B 10 C	12 D 15 E 19 F 25 G
130' 39m			5 A 7 B	10 C 13 D 16 F 21 G
140' 42m			5 A 7 B	8 C 10 D 14 F 18 G
150' 45m			4 A 6 B	8 C 10 D 12 E 15 F
<b>Decompression Stops in minutes at 30' 6m</b>				
			5	10

- **ASCENT RATE** is 60' (18m) plus or minus 10' (3m) per minute
- **NO-DECOMPRESSION LIMITS** are given for first dives
- **DECOMPRESSION STOPS** are taken at mid-chest level for the times indicated at the specified stop depths
- Table B for **Minimum Surface Intervals** and Repetitive Factors
- Table C for **Repetitive Dive No-Decompression Limits**
- Table D for **Depth Corrections** required at Altitudes above 1000' (300m)

The Department of National Defence (Canada), Defence and Civil Institute of Environmental Medicine (DCIEM), and Universal Dive Technics, Inc. (UDT) disclaim any and all responsibilities for the use of the DCIEM Sport Diving Tables and procedures.  
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**UPCOMING PENETRATION COURSES**

The C.D.A.A. has scheduled the following dates for Penetration Courses to be run in Adelaide and Melbourne.

**ADELAIDE COURSE 2**

10/8/92	Theory	To be advised
11/8/92	Theory	To be advised
13/8/92	Theory	To be advised
14/8/92	Theory	To be advised
15/8/92	Training	Thorndon Park
16/8/92	Training	Thorndon Park
22/8/92	Supervised Dives	Mt. Gambier
23/8/92	Supervised Dives	Mt. Gambier

**MELBOURNE COURSE 2**

5/10/92	Theory	To be advised
12/10/92	Theory	To be advised
17/10/92	Training	To be advised
18/10/92	Training	To be advised
19/10/92	Theory	To be advised
26/10/92	Theory	To be advised
31/10/92	Supervised Dives	Mt. Gambier
1/11/92	Supervised Dives	Mt. Gambier

**ATTENTION ALL MEMBERS**

All members who have not yet attended a formal cross-over program will receive a letter in the near future detailing the procedure for crossing over to the new levels. People who fail to reply to this letter will automatically drop one level in the new system.

**APOLOGY**

During the Christmas/New Year break, certain allegations were made against the following CDAA members - Paul Marlow, Michael Weeks and John Armstrong. The allegations concerned "illegal" diving practices in Englebrechts cave, and subsequently proved to be completely unfounded and incorrect. I wish to personally apologise to these members for the way I handled this investigation and trust that not too much inconvenience has been caused.

National Standards Director

**PENETRATION PRE-REQUISITES**

- Hold a current C.D.A.A. Cave diver award
- provide proof of a minimum 15 unsupervised cave dives totalling a minimum of 10 hours underwater, using a C.D.A.A. approved twin independent SCUBA system and showing a broad range of experience.
- Minimum age 18 years
- Current diving medical (12 months)
- Climbing experience recommended
- The Training Manager can reserve the right to deem if an individual's experience is insufficient to commence the course, even if the pre-requisites are met.

If you satisfy all pre-requisites, and are interested in making application, please contact the Training Manager, Greg Bulling on (08) 265 4978. Penetration courses to be run in other regions can be arranged by contacting the Training Co-ordinator for that region.

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**B: SURFACE INTERVALS**

Rep. Group	0:15	0:30	1:00	1:30	2:00	3:00	4:00	6:00	9:00	12:00	15:00
	0:29	0:59	1:29	1:59	2:59	3:59	5:59	8:59	11:59	14:59	18:00
A	1.4	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.0	1.0	1.0
B	1.5	1.3	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.0	1.0
C	1.6	1.4	1.3	1.2	1.2	1.2	1.1	1.1	1.1	1.0	1.0
D	1.8	1.5	1.4	1.3	1.3	1.2	1.2	1.1	1.1	1.0	1.0
E	1.9	1.6	1.5	1.4	1.3	1.3	1.2	1.2	1.1	1.1	1.0
F	2.0	1.7	1.6	1.5	1.4	1.3	1.2	1.1	1.1	1.1	1.0
G	-	1.9	1.7	1.6	1.5	1.4	1.3	1.2	1.1	1.1	1.0
H	-	-	1.9	1.7	1.6	1.5	1.4	1.3	1.1	1.1	1.1
I	-	-	-	2.0	1.8	1.7	1.5	1.4	1.3	1.1	1.1
J	-	-	-	-	1.9	1.8	1.6	1.5	1.3	1.2	1.1
K	-	-	-	-	-	2.0	1.9	1.7	1.5	1.3	1.2
L	-	-	-	-	-	-	2.0	1.7	1.6	1.4	1.2
M	-	-	-	-	-	-	-	1.8	1.6	1.4	1.2

Repetitive Factors (RF) given for Surface Intervals (hr:min)

**C: REPETITIVE DIVING**

Depth	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0
30' 9m	272	250	230	214	200	187	176	166	157	150
40' 12m	136	125	115	107	100	93	88	83	78	75
50' 15m	60	55	50	45	41	38	36	34	32	31
60' 18m	40	35	31	29	27	26	24	23	22	21
70' 21m	30	25	21	19	18	17	16	15	14	13
80' 24m	20	18	16	15	14	13	12	12	11	11
90' 27m	16	14	12	11	11	10	9	9	8	8
100' 30m	13	11	10	9	9	8	8	7	7	7
110' 33m	10	9	8	8	7	7	6	6	6	6
120' 36m	8	7	7	6	6	6	5	5	5	5
130' 39m	7	6	6	5	5	5	4	4	4	4
140' 42m	6	5	5	5	4	4	4	3	3	3
150' 45m	5	5	4	4	4	4	3	3	3	3

Repetitive Dive No-D Limits given in minutes according to Depth and RF

**D: DEPTH CORRECTIONS**

Actual Depth	1000'	2000'	3000'	4000'	5000'	6000'	7000'	8000'
	1999	2999	3999	4999	5999	6999	7999	10000
	300m	600m	900m	1200m	1500m	1800m	2100m	2400m
	599	899	1199	1499	1799	2099	2399	3000
30'	10	3	3	3	3	3	3	3
40'	10	3	3	3	3	3	3	3
50'	10	3	3	3	3	3	3	3
60'	10	3	3	3	3	3	3	3
70'	10	3	3	3	3	3	3	3
80'	10	3	3	3	3	3	3	3
90'	10	3	3	3	3	3	3	3
100'	10	3	3	3	3	3	3	3
110'	10	3	3	3	3	3	3	3
120'	10	3	3	3	3	3	3	3
130'	10	3	3	3	3	3	3	3
140'	10	3	3	3	3	3	3	3

Add Depth Correction to Actual Depth of Altitude Dive

10' 3m	10' 3.0	10' 3.0	9' 3.0	9' 3.0	9' 3.0	8' 2.5	8' 2.5	8' 2.5
20' 6m	20' 6.0	19' 6.0	18' 5.5	18' 5.5	17' 5.0	16' 5.0	16' 5.0	15' 4.5

Actual Decompression Stop Depths (feet/metres) at Altitude

## GUIDELINES Advertising Rates 1992

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¼ Page	\$75	\$65	\$50
⅛ Page	\$50	\$40	\$30

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### Booking & Enquiries to:

The Editor  
GUIDELINES Magazine  
C.D.A.A.  
P.O. Box 290,  
North Adelaide, SA, 5006

### FLORIDA

*Continued from Page 00*

proceed unless trained – people have died in here” and “There is nothing in here worth dying for”. Despite warnings such as this, cave diving deaths in Florida continue at the rate of 3-4 per annum, almost exclusively amongst open water divers and instructors who don't heed the warnings.

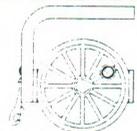
During the course of a 300 metre penetration into this system about 5 other groups of divers were encountered, with one pair occasionally having to wait to pass through a restriction. Tekna scooters were not uncommon – whirring off into the distance. Staging tanks were also seen, dropped by divers doing a deeper penetration. The system, because of its size, can easily handle divers in these numbers, and because of the substantial flow of water throughout, silting is not really an issue.

A couple of dives in this system were an experience not to be forgotten. Whilst doing a decompression stop at the mouth of the Devils Ear chimney, it was an amazing sight to look up and see the clear spring water mixing around and swirling with the black river water creating a kaleidoscope of patterns, with an occasional shaft of sunlight penetrating from the surface above. I could

only reflect back on the earlier comment over the phone, if this is the worst it's been in ten years – I think I could live with it!



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## TRADING POST

**For Sale:** Cave Diving Torch. Alpha Lite 2. 8 A/H Battery Pack with 50 watt compact head. 1.5 hour burn time. Complete with charger & neoprene cover. In E.C. Retails \$450, Sell for \$300 ONO. Wayne Wilson CDAA 1828. Ph: (03) 338 2975 A/H.

**Cave Diving Light:** 30 watt 12 volt system. Battery in perspex case and lamp in plumbing fitting head. \$150. Contact David Cowan CDAA 959. Ph: (08) 356 5187 A/H.

**Cave Diving Reel:** Enclosed type imported from USA. Professionally made with anodised alloy frame and perspex spool. In good condition. Retails over \$200, Sell for \$100. Tony Davis CDAA 1187. Ph: (03) 781 3280 A/H.

If you wish to sell any cave diving or scuba diving gear in Guidelines' Trading Post, post your details to The Editor – Guidelines, P.O. Box 290, North Adelaide, S.A. 5006, complete with descriptions, prices, and contact phone numbers.

# CDAA SITE ACCESS

Remember: Access is a privilege, not a right.  
Please be considerate of landowner wishes.

SITE	LEVEL	OWNER	ACCESS DETAILS
<b>MOUNT GAMBIER - SOUTH AUSTRALIA</b>			
<b>Ewens Ponds</b>	Nil	Dept. of Lands PMB 124, Mt. Gambier (087) 35 1111	Groups of 6 or more, phone/mail to Dept. of Lands. Smaller groups, no need. Ponds are closed 1 September - 30 November each year.
<b>Horse &amp; Cart Tea Tree</b>	CN CN	Mr. Don Telford PO Box 2629, Mt Gambier (087) 23 1519	By phone or mail, 1 week prior.
<b>Little Blue (Baby Blue)</b>	S	Port MacDonnell	Little Blue - permission not required - must carry card.
<b>Allendale</b>	C	Port MacDonnell	Obtain key from Mt. Gambier Tourist Information Centre.
<b>Gouldens 2 Sisters Fossil</b>	CN CN C	Dept. of Lands PMB 124 Mt Gambier (087) 35 1111	Contact Dept. of Lands by phone/mail prior to diving. Stay out of Gouldens when pump is operating.
<b>Ela Elap One Tree</b>	S S	Mr. Peter Norman Private Bag 67, Mt Gambier (087) 38 5287	By phone or drop in before diving. Accommodation also available.
<b>Swim Through</b>	C	Valerie Earl C/- PO Allendale 5291	Currently CLOSED pending new access arrangements.
<b>Piccaninnie Ponds</b>	S	NPWS 11 Helen Street, Mt Gambier (087) 35 1171	Permit holders by phone. Be aware of delicate vegetation.
<b>Hells Hole Pines Mud Hole</b>	S C C	Woods & Forests PO Box 162 Mt Gambier (087) 24 2759	Contact Woods & Forests (Forests Clerk - Lois Kettle) by mail or phone and arrange permit. No diving on total fire ban days.

SITE	LEVEL	OWNER	ACCESS DETAILS
<b>MOUNT GAMBIER - SOUTH AUSTRALIA continued</b>			
<b>Black Hole Ten Eighty Bullock Hole</b>	S S S	Mr. Colin Traeger, Manager, Barnoolut Estate PO Box 12, Mt Gambier 5290 (087) 26 6215	Contact CDAA Records Officer for diving deed THEN mail Booking Form to Colin Traeger 2 weeks prior, stating names/qual. of all divers, and time slot - 1pm Saturday, 9am or 1pm Sunday, or 8am (weekdays).
<b>Max's Hole</b>	C	Mr. Trevor Edwards PO Box 1319 Mt Gambier (087) 26 8277	Phone or mail 1 week prior to dive.
<b>Shaft</b>	S	Mr & Mrs Ashby	ONLY by contacting designated "guides" who will arrange access. Refer Guidelines Issue 42 - January 1992.
<b>Engelbrechts - East - West</b>	C P	Mt Gambier Council	Obtain key from Mt Gambier Tourist Information Centre.
<b>Three Sisters</b>	P	Millicent Council	Currently closed until new access arrangements completed.
<b>Iddlebidy (5L250)</b>	P	Woods & Forests P.O. Box 162, Mt. Gambier, 5290 (087) 24 2759	Open 1st and 3rd weekend of each month, only to penetration divers who have completed a practical in-water cross-over. Phone Forests Clerk, Lois Kettle, for bookings. 4 divers per group per weekend. Collect key from Lady Nelson. Must show permit. No permit - no key.
<b>NULLARBOR - WESTERN AUSTRALIA</b>			
<b>Cocklebidy Murra El Elyvn Tommy Grahams Weebubbie</b>	C P C C	Regional Manager C.A.L.M. 44 Serpentine Rd, Albany 6330 Ph: (098) 41 7133	Must apply for permission to dive at least 4 weeks in advance of trip.  Small dive site next to main chamber: Sinkhole
<b>NULLARBOR - SOUTH AUSTRALIA</b>			
<b>Warbla</b>	P	N.P.W.S. Ceduna	Currently CLOSED to all diving subject to draft management policy.
CN = CAVERN	S = SINKHOLE	C = CAVE	P = PENETRATION



## CDAA PRODUCTS

Please send orders, with cheque or money order ONLY, to CDAA, P.O. Box 290, North Adelaide, S.A. 5006

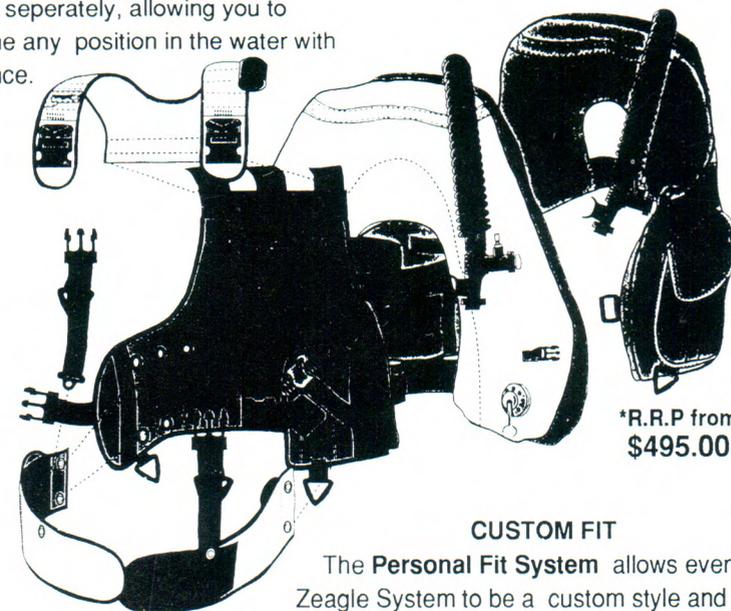
### BOOKS

	PRICE
<b>Cave Diving Communications.</b> A new manual from NSS-CDS dealing exclusively with all u/w communications used in cave diving. Including touch, torch & line signals, & use of line arrows & jump reels. A must for all cave diver's bookshelf.	\$12.00
<b>Cave Diving. A Blueprint for Survival.</b> By world-renowned cave diver Sheck Exley, this is a case study of a number of accidents that have occurred in the USA and how to avoid them.	\$10.00
<b>Basic U/W Cave Surveying.</b> The standard publication for anyone remotely interested in research and survey techniques used in water filled caves.	\$15.00
<b>Cave Diving - The Cave Diving Group Manual.</b> Completely new edition from the pioneers of the sport, the British. This is easily the finest reference manual on our sport currently available. Covers every possible aspect including sump rescue solo diving and advanced oxygen and mixed gas theory. Expensive but well worth it. As reviewed in Guidelines No. 37.	\$40.00
<b>Deep into Blue Holes - by Rob Palmer.</b> This is the project manual written about his trips to the Bahamas, diving some of the most advanced and spectacular caves in the world. As reviewed in Guidelines No. 35.	\$35.00
<b>CDAA Occasional Paper No. 2 - from Natitonal Conference 1981.</b> Includes topics such as Fossil Cave, Belay Techniques & Cocklebidy 1979	\$8.00
<b>S.R.T. Single Rope Techniques - published by the Sydney Speleological Society.</b> This is the definitive work on all aspects of vertical travel in caves. Should answer most questions on rope work for cavers and cave divers alike.	\$23.00
<b>DES Emergency Handbook - Revised 1990 edition by Lippmann &amp; Bugg.</b> Printed on waterproof paper this essential first aid manual should be part of every cave divers' kit.	\$15.00
<b>NSS Cavern Divers Manual -</b> The standard reference manual in Cavern Diving covering just about every conceivable topic. Also covers most principals behind safe sinkhole and cave diving.	\$15.00
<b>Research Handbook for Cave Divers - Peter Horne.</b> Written by our most experienced research diver, the book is a compendium of years of experience from various sources. A valuable addition for those interested in the other side of cave diving. As reviewed in Guidelines No. 36.	\$15.00
<b>CLOTHING</b>	
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