



# UNDERWATER SPELEOLOGY

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Mary Van Soeren in Crystal Cave, Bermuda. Photo by Rob Power. See article, page 7.

# CAVE DIVING SECTION OF THE NATIONAL SPELEOLOGICAL SOCIETY, INC.

P. O. BOX 950, BRANFORD, FLORIDA 32008-0950

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**THE NSS AND CAVE DIVING**

Founded in 1941, the National Speleological Society joins together thousands of individuals dedicated to the safe study, exploration, and conservation of caves. The first cave-diving information ever published in the U.S. was in a 1947 *NSS Bulletin*. In 1948, NSS divers were responsible for the first cave dives in the U.S. using scuba. Prior to 1973, cave diving within the NSS was on a purely local level. That year saw the creation of the NSS Cave Diving Section to provide a vehicle for information exchange. Today, with over 400 members, the Cave Diving Section promotes safe cave diving through semi-annual workshops; cavern- and cave-diving training programs; warning- sign installation; search, rescue, and recovery through the National Cave Rescue Commission; cave exploration and mapping; several texts and publications on cave diving; and the bi-monthly newsletter-journal, *Underwater Speleology*, that you are presently reading.

**MEMBERSHIP**

The National Speleological Society welcomes the interest of anyone who has a sincere concern in the safe study, exploration, and conservation of caves, wet or dry. You may join the NSS either by writing to the NSS main office directly (National Speleological Society, Inc., Cave Avenue, Huntsville, AL 35810) or to the Cave Diving Section (NSS Cave Diving Section, P.O. Box 950, Branford, FL 32008-0950). Regular NSS Membership is now \$22.50 per year, and entitles the member to monthly issues of *NSS News* and a semi-annual technical journal on speleology, voting privileges, and discounts on publications, convention fees, etc.

As a sub-organization or "section" of the NSS, the Cave Diving Section is subject to the by-laws and ethics of the NSS. Membership in the Cave Diving Section is open to anyone who is a member in good standing of the NSS. Regular membership is \$5.00 per year, and we also offer a CDS Family Membership for \$1.00 for family members (who are also NSS members) of regular CDS members. Membership in the Cave Diving Section includes subscription to our bi-monthly (6 issues/year) newsletter, *Underwater Speleology*, voting privileges, discounts on publications items, workshop registration fees, etc.

**NEWSLETTER SUBSCRIPTION**

If you do not wish to join the Cave Diving Section, but would like to keep current on cave-diving events, exploration, and technology, you are invited to subscribe to *Underwater Speleology* for \$10.00 per year.

**WHAT THE NSS-CDS HAS TO OFFER**

The NSS Cave Diving Section sponsors two Safety and Information Exchange Workshops each year, traditionally held in Branford, Florida over the

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Cavern Manual ..... Dr. John Zumrick  
Joe Prosser  
H. V. Grey  
Bill Wilson  
Wayne McKinnon

Memorial Day and New Year's Day weekends, although exact dates and formats vary. This year's WINTER WORKSHOP will be held at the Branford High School on Jan. 2-3, 1988. The SPRING WORKSHOP will be conducted on May 28-29, 1988. Information and pre-registration materials are published in the newsletter and can be obtained by writing to the NSS Cave Diving Section (P.O. Box 950, Branford, FL 32008-0950).

Information on cave-diving books, back issues of *Underwater Speleology*, T-shirts, Maps (available only to people with a cave-diving certification from an accredited agency such as NSS-CDS, NACD, YMCA, or NAUI), and free safety brochures may be obtained by writing to NSS-CDS Publications Coordinator (NSS Cave Diving Section, P.O. Box 950, Branford, FL 32008-0950).

Information on cavern- and cave-diving training can be obtained by writing to the NSS-CDS Training Director (NSS Cave Diving Section, P.O. Box 950, Branford, FL 32008-0950).

**IMPORTANT! - CHANGES OF ADDRESS**

Members and subscribers are urged to report any change of address in writing immediately to the Section in order to insure continuity of newsletter receipt. Membership/subscription status, applications, and general information may be obtained by writing to the Secretary-Treasurer c/o the Section's permanent address:

Secretary/Treasurer  
NSS Cave Diving Section  
P.O. Box 950  
Branford, FL 32008-0950

All current news items, reports, articles, photographs, negatives, slides, cartoons, or other submissions for the newsletter should be sent in directly to the Editor:

H.V. Grey, Editor, UWS  
P.O. Box 575  
Venice, FL 34284-0575

**CALENDAR**

Oct. 31 - Nov. 1 - NACD Cavern Workshop for Open-Water Instructors, Dive Masters, and Advanced Divers; Manatee Springs (Chiefland, FL) and Ginnie Springs (High Springs, FL). For registration information contact the Workshop Chairman: Steve Gerrard, NACD President, 5714 Ed White Ct., Tallahassee, FL 32301, (904) 877-8196.

Jan. 2 - 3 - NSS-CDS Winter Cave Diving Workshop. Lectures, seminars, slide and video presentations. Branford High School, Branford, FL.

May 28 - 29 - NSS-CDS Spring Cave Diving Workshop.

**NATIONAL SPELEOLOGICAL SOCIETY  
CAVE DIVING SECTION  
Membership/Subscription Application**

First Name	Initial	Last Name
Address		
City	State	Zip
Business Phone	Home Phone	
NSS# (if applicable)	NSS# (expiration date)	

Make check or money order payable to "NSS-CDS" and mail with application to: Secretary/Treasurer, NSS Cave Diving Section, P.O. Box 950, Branford, FL 32008-0950.

NSS membership	\$22.50	_____	
CDS membership	5.00	_____	(must be NSS member)
CDS family mem.	1.00	_____	(give name & NSS number of family member)
Newsletter only	10.00	_____	
TOTAL		_____	

## WINTER WORKSHOP

Because Christmas and New Year's Day both fall on Friday, it was decided that this year's Winter Workshop should be held Saturday and Sunday, January 2-3, 1988. Registration will begin at 8:00 am Saturday at the Branford High School in Branford, Florida.

A full program of interesting lectures and slide presentations on recent exploration, technical advancements, and cave science will be featured, along with afternoon classroom seminars, video presentations, and manufacturers' displays.

We will be mailing out a pre-registration package to CDS members and subscribers, which will offer a discounted price for the workshop and catered picnic lunch.

## SUPPORT THE FEDERAL CAVE RESOURCES PROTECTION ACT - Prepared by the NSS Conservation Committee, Janet Thorne, Chairperson

America's federally owned caves are being destroyed. Vandalism, pollution, unregulated use and increasing pressures threaten thousands of our finest wild cave resources. The proposed Federal Cave Resources Protection Act offers an inexpensive and effective solution to providing better protection and management of these caves.

Why is the Federal Cave Resources Protection Act needed? Due to a number of gray areas in current laws and regulations, cave management is subject to a variety of inconsistent and arbitrary interpretations in regard to how and when to apply those statutes and rules to these fragile and non-renewable natural resources. At the present time, thousands of wild caves located on the public domain cannot be properly protected, even when an agency decides to try.

How will the Federal Cave Resources Protection Act help?

1. It will give caves and their contents a legal definition, removing the gray areas surrounding their status.
2. It will require that caves be considered in land-use planning.
3. It will place a major portion of the burden for management on the caving community by emphasizing the use of volunteer contracts and cooperative management programs.
4. It will allow federal Land Managers to withhold information on sensitive caves' locations.
5. It will statutorily exempt speleothems from mining claims.
6. It will protect cave life and habitat.
7. It will protect the American taxpayer from liability suits against the federal government which arise from recreational use of public wildlands.
8. It will require that money collected for special-use fees or civil penalties be returned to the agency for use in administering management programs and for restoration projects.

You can help! Write your federal representatives and ask them to support the introduction and passage of the Federal Cave Resources Protection Act, Senate Bill 927, House Bill 1975.

Encourage your friends, fellow cavers, and other conservation organizations to write letters of support to your state's federal delegation. Become an NSS Support Campaign Chairman for your area or state.

For more information write:  
Philip Lucas, Chairman  
NSS Cave Law Project  
4411 Fallen Oak Drive  
Chantilly, VA 22021

Do your Representatives' names appear on this list? Congressmen: Chester G. Atkins (MA), Frederick C. Boucher (VA), Jack Buechner (MO), Larry E. Craig (ID), George Darden (GA), Tim Johnson (SD), Jim Jontz (IN), Joe Kolter (PA), Sander M. Levin (MI), Bob Mrazek (NY), Melvin Price (IL). Senators: Tom Daschle (SD), Larry Pressler (SD).

If not, your Representatives have not yet agreed to be co-sponsors for the FCRPA. Try calling their offices in D.C. (Capitol Switchboard: 202-224-3121). Ask to speak with the Legislative Assistant responsible for environmental issues and ask for the Representative's support. Follow up with a letter written directly to the Assistant, remind the LA of your call and again requesting support. In a couple of weeks, call that person again! Try to keep up this cycle of calls and letters until you get a positive response. Now is the critical time--write or call your Representative today!

## SAMPLE LETTER:

Date

The Honorable (Legislator's Name)  
U.S. Senate (or House of Representatives)  
Washington, D.C. 20510 (or 21515 for the House)

Dear Senator (Congressman) X:

Your support is requested for S. 927 (or H.R. 1975 in the House), the Federal Cave Resources Protection Act, which was introduced on April 7. This important legislation provides an increased level of management concern for cave resources which are located on lands under the jurisdiction of the Departments of Agriculture and of the Interior. It will direct agencies to initiate consistent, responsible, and long-term management for those resources.

I have been a caver for X years and during that time have seen the deterioration which has occurred to these non-renewable resources because of pollution, vandalism, and lack of proper management. Caves are an important national resource, providing habitat for many unique species, containing underground rivers which serve as the water supply for many rural areas, and serving as controlled-environment laboratories for many scientific investigations. The unusual mineral formations found in caves can take centuries to be created but can be destroyed in seconds by carelessness or deliberate vandalism.

The FCRPA does not require additional funding for agencies. Instead, it directs agency personnel to recognize caves as important national resources and to consider the proper use of those resources in land-management planning.

I urge that you support passage of the FCRPA and, if possible, become a co-sponsor of the bill. I shall appreciate hearing whether you will do so.

Very truly yours,  
Your name (and address, if not above)

## FLORIDA STATE PARKS DIVING POLICY

August 27, 1987

Dear Sirs:

We recently read the article entitled "Manifold or K-valves" by Roger Werner in your May 5, 1987 issue of Underwater Speleology.

At the end of his article Mr. Werner refers to the Florida Park Service policy which included an equipment list for cavern or cave divers. This is to inform your organization that we have recently revised our cave-diving policy and no longer have an equipment list. A copy of the new policy is enclosed for your file and use.

Should you have any questions or comments concerning the new policy, please feel free to get in touch.

Sincerely,  
George E. Apthorp  
Special Assistant  
Florida Park Service  
State of Florida Dept. of Natural Resources  
Marjory Stoneman Douglas Building  
3900 Commonwealth Boulevard  
Tallahassee, FL 32399

### POLICY - DIVING IN SPRINGS - FLORIDA STATE PARKS

The Florida Department of Natural Resources, Division of Recreation and Parks does not promote nor encourage spring diving because there is inherent personal danger involved in this activity. Therefore, upon granting permission to dive in any spring within the state park system, the following rules and regulations will be STRICTLY adhered to.

1. Each diver must register at the park entrance station and present his/her Divers Certification Card which shall be retained by the park until completion of dive.
2. All student divers must register under instructor's certification.
3. Each diver must dive within limits of certification.
4. Dives must be conducted only in those areas designated.
5. Open-water divers are prohibited from carrying lights.
6. In certain areas, only cave diving will be permitted.
7. A dive party must consist of at least two and no more than four divers.
8. Each state park where spring diving is allowed has the authority to set a maximum number of persons that can dive in the spring at any

given time. However, normally there shall be no more than one dive party (two to four divers) in the spring shaft or cave at any given time.

9. Fossils and artifacts shall not be disturbed or removed. Aquatic plants shall not be trampled or disturbed.

10. A minimum distance of 50 feet between divers and manatees must be maintained at all times.

11. Divers must pick up their Certification Cards immediately after dive is completed and before 5:00 pm.

It should be fully understood that the Department of Natural Resources, Division of Recreation and Parks **DOES NOT**:

(a) Officially offer nor endorse spring diving as a recreational activity.

(b) Accept any responsibility for the diver's safety.

(c) Assume any responsibility for the equipment a diver should or should not possess.

(d) Accept any responsibility for diving conditions or other hazardous conditions the diver may encounter at any given time.

Each diver must acknowledge in the space provided below that he/she understands and agrees to abide by this policy and will not hold the Department of Natural Resources or its employees liable in any way for any accidents, personal injuries or death that might occur as a result of the diving activity.

[WAIVER follows.]

## CANADIAN CAVE DIVING CAMP - by Keith Sawatzky, M.D.

From the 9th to the 16th of August, three Canadian cave divers (John Pollack, Kirk MacGregor, and myself) and one American cave diver (Jeff Forbes from Seattle) gathered on Vancouver Island for a week of diving, and sharing of ideas, experience and techniques. The week started with my making a brief dive into the upstream sump in Home Lakes Lower Main Cave. After only 25 feet and at a depth of 15 feet, progress was halted by gravel fill. With John Pollack singing the praises of diving in the caves on the north end of the Island, our group continued north.

On 10 Aug., John cracked the first sump in Mystery Cave (200 feet long and 17 feet deep) to what seemed to be an air bell, while Kirk MacGregor did a dive checking small side leads. The next day, I finished the side-lead checking and then proceeded with John to the supposed air bell. The passage on was soon found above water and the 250 feet of passage to the next sump, quickly explored. About 300 feet of side leads were pushed and I dove through Sump 2 (75 feet long and 20 feet deep). About 300 feet of air-filled passage was explored to three tricky climbs. This was more like it!

The next day we moved to Reappearing River. John and I had buoyancy problems with the rental tanks, while Kirk and Jeff Forbes pushed through the first three sumps. These sumps had been previously passed but the line had washed out in the spring floods. On 13 Aug., John and I pushed on through Sump 4 (225 feet long and 45 feet deep) to discover "Never Never Land," and air-filled passage 700 feet long and up to 30 feet in diameter with several hundred feet of side passages. The far end of the passage was yet another sump. Kirk did a push dive in this sump the next day and discovered the cave continuing as canal passage after a few hundred feet underwater. The new passage was quickly surveyed and group moved on to a new cave for the last day.

Double Ender had been discovered the weekend before and the local cavers were very eager to see both sumps pushed. John and Jeff tried the upstream sump and penetrated only a short distance before they encountered a steeply descending, constricted passage with a loose sand floor and aborted the dive. Kirk had better luck and after several hundred feet in the downstream sump surfaced in a nearby spring (Rainbow).

Thus ended the first Canadian Cave Diving Camp. Plans are already under way to get back together on the Island next summer.

## PIONEER CAVE DIVER GEORGE BENJAMIN HONORED - by Jill Yager

Speleonectes benjamini is the name of a new species of the crustacean class Remipedia. The description of the new Bahamian remipede appears in the May 1987 issue of the Biological Proceedings of Washington, Volume 100. The paper reads as follows: "This species

is named in honor of the pioneer of Bahamian cave diving, Dr. George Benjamin, in recognition of his enthusiastic exploration of Bahamian ocean blue holes as well as his innovative design of safe cave-diving equipment."

My first encounter with George Benjamin was when he was the feature speaker at an NACD meeting organized by Gene Melton back in 1977. At that meeting George showed movie footage of his early diving in Bahamian caves. He also had on display some of the first dual-valve manifolds invented for the sport. George is responsible for the exploration and discovery of many blue holes on Andros. (See National Geographic Magazine, 1970, Volume 138, "Diving into the Blue Holes of the Bahamas," by George Benjamin). He brought them to the attention of Jacques Cousteau, who later made a film about blue holes for his television program.

To make certain he had no objections to having a crustacean named after him, I called George this past winter. He informed me that his cave-diving days were over, as he had suffered from a bad stroke about five years ago. He said he has switched from physical to cultural pastimes, especially tasting his fine collection of wines. Although he once had a dog named after him, he thought that a crustacean would be all right, too! I hope to talk George into taking the time to write up a bit of his Bahamian cave-diving history for Underwater Speleology.

## BOOK REVIEW - Karst in Florida by Ed Lane, Special Publication No. 29, Florida Bureau of Geology, Tallahassee, 100 pp., 59 fig., 4 tables. Reviewed by William L. Wilson

Florida is world famous for its karst features, but until recently a single publication devoted to an overview of the subject was not available. Karst in Florida, by Ed Lane, is the first book in which any author attempts to summarize the character of the Floridan karst. Dealing with such a broad and diverse topic is a formidable undertaking, so the book is necessarily generalized, and contains descriptions of only selected karst features.

The author has filled the text with an impressive amount of data and factual summaries that are presented in a direct, easy-to-read style. The overall tone and content of the book are suitable for persons who are non-geologists, but have a college degree. Undoubtedly, Karst in Florida will be popular with the public as an introduction to the subject.

Lane covers introductory material such as the hydrologic cycle in karst areas, and the evolution of karst terrain, then describes selected examples of sinkholes, caves, and springs. The karst features receiving the most attention are: the Winter Park Sinkhole, Big Dismal Sink, Natural Bridge, Wakulla Springs, Florida Caverns State Park, Falling Waters State Recreation Area, and Little Salt Spring. Lane includes a discussion of deep zones of high transmissivity in the Floridan Aquifer, and wraps up the book with a discussion of geophysical means of detecting sinkholes and cavities. The discussion of the geophysical techniques are clear, factual, and concise. Lane should be complimented for including ground-penetrating radar, which works very well in much of Florida.

Despite the high information content and readability of Karst in Florida, there are a few problems with its organization. Lane is a geologist with the Florida Bureau of Geology in Tallahassee, but he is not a karst specialist. This leads to a bit of imbalance in the treatment of the subject, and the diverse aspects of the Florida karst are not synthesized into a unified body of knowledge.

The book contains no section on the stratigraphy and structure of the Florida Peninsula. Without this information there is little basis for understanding the distribution and character of karst in Florida. Lane does not identify the physical karst regions of Florida and does not compare or contrast the geology, physiography, or hydrologic function of various regions. An overview and comparison of the karst regions would have strengthened the book.

The selection of karst features that receive detailed descriptions is extremely brief and geographically biased toward the panhandle region of Florida. A large number of very significant karst features are completely ignored. For example, there is no description of the Devil's Millhopper, a large collapse sinkhole near Gainesville that is a designated state geologic site. Warren's Cave, Florida's longest air-filled cave (3.45 miles), near Gainesville, should have been mentioned.

Also, the book seems incomplete without a discussion of at least one of the noteworthy spring caves in north-central Florida, such as Peacock Springs Cave, Devil's Eye, or Cathedral Cave. Embayments

associated with freshwater springs, such as Crystal River, along Florida's central-west coast, are important geomorphic features that should have been included in an overview of karst in Florida. The section on sinkholes is too brief to fully describe the mechanisms by which sinkholes form. Excessive emphasis is placed on loss of buoyant support when the water table is lowered. This mechanism does not apply to the thickly mantled karst areas over much of Florida. Increased differences in head between the surficial aquifer and the Floridan, and increased sediment transport by water flowing faster along steepened gradients, are the more important causes of sinkholes.

An omission occurs in the table of first-magnitude springs (Table 3, page 56), where there is no entry for the rise of the Santa Fe River along the Columbia-Alachua County boundary. Available data indicate the average discharge of the rise is probably in excess of 576 cubic feet per second, making it the 6th largest spring in Florida. Numerous other papers have made the same omission.

The topographic map of Big Dismal Sink (page 33) and the photographs of speleothems on pages 44-6 and 48-51, are very poorly printed. Much better quality photos were easily available and should be expected.

Karst in Florida is not a thorough treatment of the subject; however, it is a useful introduction to the topic for the non-geologist, or even the geologist who is unfamiliar with karst. It is a handy compilation and summary of information on a wide range of karst-related topics pertaining directly to Florida. What we need now is a more comprehensive description and synthesis of the Florida karst—a book that explores the unique hydrogeologic history of the peninsula and integrates the information into a coherent whole.

## SUMP DIVING IN THE NORTHEAST - PART I: SIDE-MOUNTS - by John Schweyen

Over the past couple of years, I've been approached by several newly certified cave divers, who, having missed the springs down in Florida, or having heard about some of the recent exploration in this area, have decided to check out some of the local sumps. (As a side note, let it be known that there are many sumps in this area; it just takes a little poking around to find them.) Most, since they are open-water divers also, are not surprised to learn that, in general, the water is colder and the visibility is lower than what they experienced down south. What does surprised them is the fact that most of the exploration in this part

Figure 1

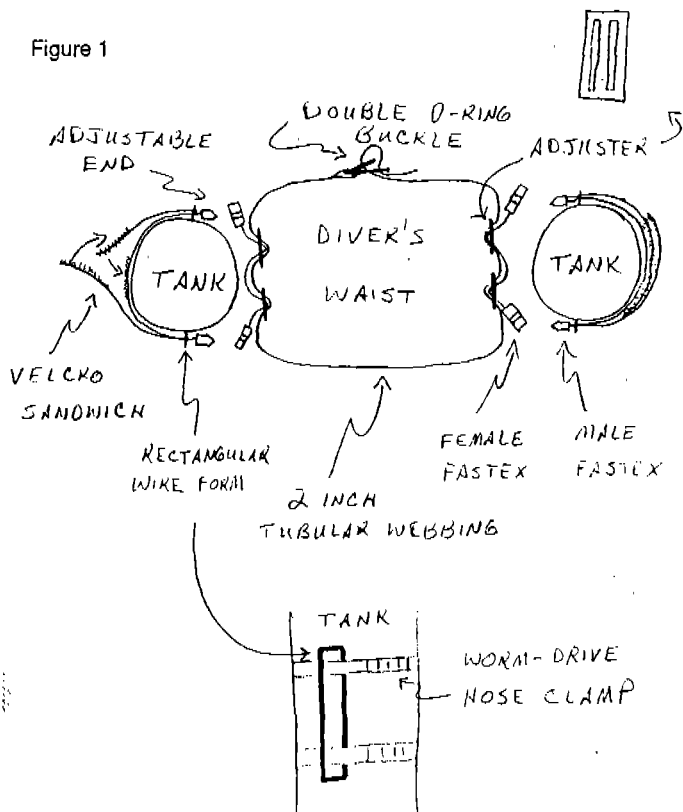


Figure 2

of the country has involved solo diving and that the dimensions of the majority of sumps in this area preclude the use of back-mounted tanks. I'll save my thoughts about solo diving, cold water, and chocolate milk for later. In this article, I am going to say a few things about what a sump jumper might wear when it comes time to wiggle through difficult passage and then I'll describe what I consider to be a good side-mount configuration.

First of all, I make no claims that this discussion is relevant to conditions other than those found in the northeast. In particular, I'm assuming that we have a solo diver who is wearing a dry suit and neoprene or dry gloves. With many of the sumps averaging about 7 degrees C and sometimes reaching as low as 3 degrees C in the winter, as a rule, wetsuits are inadequate for all but the shortest excursions.

Given that back-mounts are out of the question for a particular sump the diver is left with two options: push the tanks ahead, or use side-mounts. I consider the first option to be useful only for short distances where the passage is both low and narrow. Pushing tanks ahead ties up at least one hand and the diver must also pay attention to the low pressure hose if a dry suit is being used. This option is also impractical when diving in vertical fissures such as are found at Bogardus Spring and the Little Venice Sump in South Bethlehem Cave. In most cases restricted passage is low but wide so that the diver should be concerned more with the profile as viewed from the side rather than head on.

This leaves us with the second option. Now, in the context of diving in the northeast, wearing side-mounts is more than just clipping a tank on to your side with carabiners or snap hooks. This may be fine for the easier sumps of the Tytoona-Arch Spring System, but you'll look like a wounded pelican and you'll definitely have problems in some of the neighboring caves. I also have difficulty with the British configuration where the tanks are strapped to the side but the valves are pointing slightly forward. This prevents flopping of the tank from side to side but it's still free to pivot forwards and backwards. In restricted passage, the valve and first stage assembly snag on rocks or dig into the mud, which means the tanks are stuck on one or both hands to free them up and feed them through while negotiating the restriction. This is tolerable unless one is diving in consistently tight passage. Upstream Flemings' 1 and Southeast Passage of McFail's come to mind. In both of these, it will be stop and go as the diver with sloppy tanks extracts the valves



Figure 3

from the mud. When it comes time to back out, the bottoms of the tanks, which are angled upwards, will ratchet against the ceiling.

After many a sump dive in this area, I've reached some conclusions about what makes a good side-mount system; the following are considerations I keep in mind when rigging up something to push the tight ones.

Two tanks are better than one, especially when diving solo. Even a non-diver can tell you what happens when a critical O-ring fails. For more on this, see the articles by Roger Werner on O-rings and valves in Vol. 14, No. 3 of UWS. In addition, with two tanks, the diver has better trim underwater. Yes, I know, this is the northeast where the vis is zippo, so why worry about trim and anti-silting technique? I'll just say that one or two feet is better than true zippo, so if there is a way to avoid getting into chocolate milk, it should be considered.

Ability to don/doff in restricted passage and underwater: I have been at several sumps where I've had to put on tanks while maintaining some unnatural positions.

No-look capability with gloved hands: Sometimes it is desirable to kit up either partially or totally submerged in low visibility water, i.e., upstream end of the fourth sump of Schoharie Caverns. In some caves, your hands will get cold even out of the water and you may not wish to remove your gloves.

Quick removal/replacement: This is critical when gearing up in the water at a downstream sump or manipulating gear underwater.

Ease of transport between sumps: Tanks and related hardware which are uncomfortable or which are awkward when traveling through dry passage dampen enthusiasm. (One big advantage of most side-mount systems over back-mounts is that the diver has more overhead clearance in low dry passage so that stoop-walking may be possible instead of hands-and-knees crawling, and hands-and-knees may be possible instead of belly crawling.)

One waist strap for tanks and light: This requirement may be difficult to appreciate unless you've tried a strap for each tank and another for your electric caving light and yet another for weights-buckles all over the place. One very important advantage to having both tanks fixed on one strap is that they counterbalance each other even when out of the water. Try crawling on your hands and knees without the tanks counterbalanced and they will soon be up front between your legs. This is not only embarrassing, but it makes crawling more difficult. This is an important consideration when negotiation unpleasant passage like the third chamber in Schoharie.

Sturdy, low-cost hardware: As in the case with other caving gear, tanks take a beating, so one should avoid fragile, expensive parts.

And finally, well-behaved tanks: Having to coax your bottles through tight passage is inefficient and time-consuming. When diving in low, muddy passage, it is important to stay ahead of that cloud of silt. The alternative is exploration by touchy-feely, which can be risky when dealing with restricted passage where the walls cannot be followed or where the rock may be loose. In a tight vertical fissure with scalloped or jagged rock on front and back, penetration distance may be limited severely by ratcheting tanks. For a while, this was the major impediment to exploration at Bogardus Spring. Most of the side-mounts I have seen suffer from badly behaved tanks which flop from side to side or which rotate forwards and backwards. Ideally, side-mounts are aligned with the diver's body whether the diver is horizontal or vertical. When the diver is viewed in silhouette from the side, the tanks should not be conspicuous.

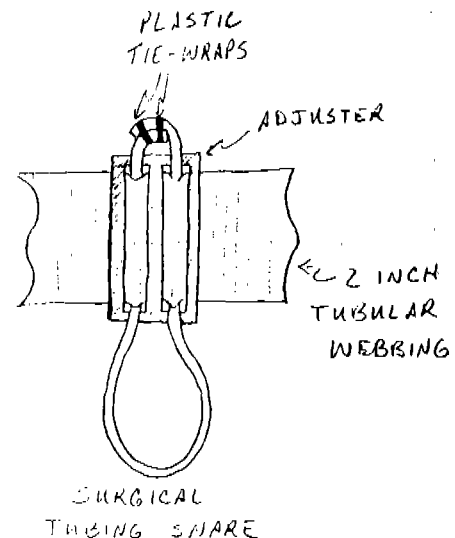
The side-mount design I currently use is centered around the Sherwood 40's. Two-inch tubular nylon webbing is used for the waist strap, tank straps and chest harness. This stuff is easier to deal with than the traditional stiff webbing that most divers use. It is also compatible with double D-ring fasteners and Fastex buckles which I have found to be more reliable and of a lower profile than the standard scuba diver's buckle. The waist strap is just a piece of webbing with two large stainless-steel D-rings sewn into one end. It should be long enough to thread the D-rings easily in full dive dress.

To this, two short pieces of webbing are attached with two standard metal adjusters (slides, keepers, etc.). The size of the adjusters should be such that leaving two pieces of tubular webbing is easy; but once this is done, they should not slip without difficulty. On each end of the short pieces of webbing is sewn the female half of a two-inch Fastex buckle (Fig. 1). These short pieces of webbing form part of the tank straps. The other part of the tank strap consists of another piece of webbing with a male half of a buckle on each end. One of these is sewn in permanently; the other is attached so that it can be adjusted with the tank in place. The loose ends of the webbing are secured using a velcro sandwich. This part of the strap is held in place with two rectangular wireforms (ovals can probably be used instead) which are fastened to the tank with large all-stainless-steel hose clamps. The rectangles are positioned so that the strap does not slide around the tank too much and so that there is clearance for adjustment of the strap.

The waist strap is meant to be worn throughout the trip whether or not the tanks are in place and can be used to carry a battery for a helmet light. To attach a tank, the velcro sandwich is undone, the buckle towards the back of the diver is fastened, and then the buckle towards the front is fastened and adjusted. The velcro sandwich is then secured. To remove a tank, simply unclip the two buckles.

This waist-strap/tank assembly resembles the usual side-mount configuration; however, a significant improvement can be made by adding a chest harness and elastic snares to hold the valves in place and keep the tanks aligned. The harness is shown in Fig. 2 and 3, and is basically the same as that commonly used with a Simmon's Roller in a rope-climbing rig. The buckle in front is of the double D-ring type, only

Figure 4a

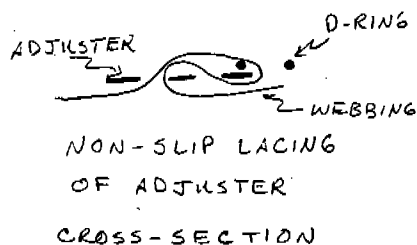


rectangles are used instead since they have a lower profile. On each side of the chest harness under the armpits and slightly to the back, surgical tubing loops or snares are attached with adjusters and plastic wire ties (tie wraps); see Fig. 4a.

These snares are stretched over the regulator-valve assembly to hold it in place. They should be fairly snug but not so tight that pressure gauges cannot be read or valves turned by pulling this end of the tank forward. As usual, large D-rings can be placed on the shoulder straps and can be used to distribute some of the tank weight when walking through dry passage by clipping in with a snap hook attached to the neck of the tank. If it is not desirable to sew these in permanently, the adjusters can be laced in such a way to avoid slippage as shown in Fig. 4b. These D-rings can also be used for attachment of other items if passage size allows.

This set-up satisfies most of the requirements outlined above. The tanks can be removed very quickly with gloves. Putting them on quickly requires a little practice, but after that, they go on at least as fast and easy as any other method I've tried. This set-up is completely adjustable except for tank size. I'm a little apprehensive about using plastic parts for this application. However, if one of the Fastex buckles should break, the tank can still be attached to the side, only it will flop around. In practice, the webbing on the tanks should be removed during transport to a sump if there is a danger of breakage or clogging with mud. This just means undoing the adjustable end and pulling the strap through the rectangles.

Figure 4b



One disadvantage of this system is that it is slightly more difficult to operate the valves on the tanks and if short pressure-gauge hoses are used it will be more difficult to read the gauges. The top of the tank must be pulled forward a couple inches to perform either of these operations. One alternative to the readability problem is to wear the pressure gauges on the arms like some of the Brits do. However, pulling the tank forward is not difficult and I've had little problem in reading gauges or operating valves. Another disadvantage is that the diver ends up with left- and right-handed tanks; although they can be switched, kitting up will be more difficult.

The most important advantage of this configuration over others I've tried is that the tanks are very well-behaved with the valves directly under the arms. I've used this system in some of the most restricted sumps known in this area without having to touch the tanks. A refinement of this design which was based on pony bottles was instrumental in the recent breakthrough at Bogardus Spring, a difficult vertical fissures.

So, to all those ectomorphic cave divers out there, major restrictions should no longer prevent you from getting to the end of the line!

## LETTER TO THE EDITOR

August 25, 1987

Dear Editor,

I have recently received my May UWS, which was a really good issue. I agree totally with Wes' letter to the Editor; it's a pity more of the front-line divers don't put pen to paper and let us all know what is going on! There must be a lot of new finds, extensions, etc., which could (and should) be reported on.

Those of us in the sticks would, I am sure, like to read more about new explorations, equipment, new techniques, etc., even if they are common knowledge in Florida.

The British Cave Diving Group newsletter carries detailed reports on many dives done in the U.K. and whilst I would not suggest UWS follow the same format by getting reports from members, I do think we

should encourage divers to report new finds, extensions, line alterations, other changes, etc. to UWS for publication. Same with new techniques or equipment ideas.

I am well aware of the need for secrecy in the early days of exploration and how difficult it can be to extract info from cavers and cave divers. Even if info is relatively out of date when printed it is still going to be news to many of us.

I enclose an article, survey and some photos on one of our cave systems, which may (or may not!) be of interest for publication in UWS. [Etc.]

Kind regards, Rob Power, Hamilton, Bermuda

## WALSINGHAM CAVES: A BRIEF HISTORY OF THEIR EXPLORATION - by Rob Power

600 miles from the east coast of the USA lies a small group of islands--Bermuda, home to 52,000 people and 150 caves (so far). The island's volcanic rock is capped by a layer of aeolianite, or dune-derived limestone, up to 100 feet thick in which the caves were formed. This took place when the sea was approximately 300 feet below its present-day level, and as the ice caps melted and retreated so the sea level rose, gradually submerging many of the caves. The water in the pools, lakes and underwater passages is tidal saltwater. Because seawater is already saturated with calcium, the formations have remained intact--making for some interesting diving, combined with the clear warm water.

Walsingham Cave has been a local landmark in Bermuda for literally hundreds of years. The large, airy cavern with its clear blue lake was visited by tourists as long ago as the early 1800's. Their burning torches made from palmetto leaves left soot marks on the roof and

Rob Power in Wonderland Cave. Photo by Mark Aspery.





Mark Aspery in Wonderland/Crystal Connection Passage. Photo by Rob Power.



Paul Hobbs preparing to dive Walsingham Cave. Photo by Rob Power.



Steve Turpin in Wonderland Cave. Photo by Rob Power.



Mark Aspery in Wonderland/Crystal Connection Passage. Photo by Rob Power.

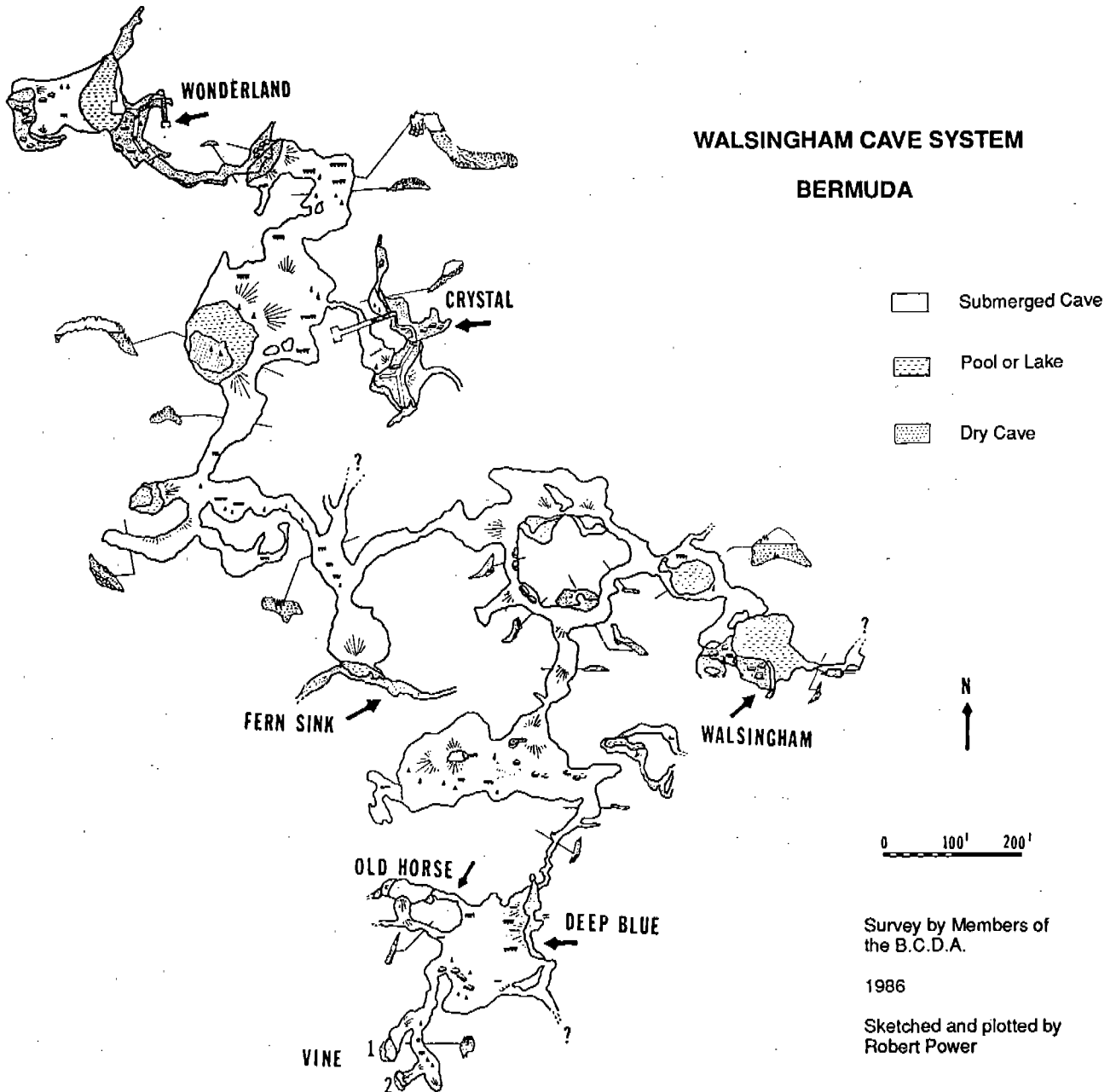
speleothems, which are still visible today. The lake prevented further exploration until the 1970's when a few tentative dives were carried out to an air-filled room. It was only in 1980 that the two local divers, Dr. Tom Illiffe (from the Bermuda Biological Station) and Paul Hobbs, received their NSS/NACD certifications. Together with their instructors, Paul Meng and Barry Warner, they started the first serious underwater cave exploration, with Walsingham being high on their list of priorities. Several more air rooms were soon found by Tom and Paul together with some huge water-filled chambers.

A quarter of a mile away lies a long narrow pool, below the surface of which can be seen huge stalactites. This pool (called Deep Blue) is the entrance to a spectacular underwater room with a diameter of over 170 feet. The view of the daylight entrance from the back of this cavern is quite stunning--visiting NSS diver Dennis Williams likened it to a "religious experience"! Several passages leading from this room

to other entrances were followed, sometimes surfacing in small caves in the dense undergrowth. One narrow twisting passage with a major restriction remained unexplored until 1981 when Sheck Exley and Barry Warner made the connection from the Walsingham end following a superb dive via a huge decorated room. After a dive excavating the solid-mud restriction, Barry and I made the through trip the following day.

Two other caves in the area were made into show caves with electric lighting, concrete walkways and entrances suitable for Edwardian ladies in their long dresses. Wonderland Cave was open during the 1930's and 40's, and Crystal Cave remains a major tourist attraction today. Tom, together with visiting Brit cave diver Alf Latham, dived into a huge, beautifully decorated air-filled room in Crystal Cave. This was reported "not to go."

An inviting-looking pool inside a newly discovered dry cave, Fern Sink Cave, was dived by Tom Illiffe and myself in 1982. Even using





Rob Power and Tom Illife in Walsingham Cave. Photo by Mark Aspery.

single 70's, getting to the water was hard work. Tom's remark, "You know, I hope this cave doesn't go, because bringing in double 100's will be a real bear!" was asking for trouble. The cave "went"--spectacularly so. Thus it was indeed back with the double 100's as we had turned the dive in a beautiful room hung with large white stals in pristine condition.

On our second dive, Tom and I were accompanied by Mary Van Soeren, and together, the three of us dived through the proverbial railway-sized tunnels before surfacing in the large air room, near Crystal Cave--the one which had been reported not to go! Recognizing the passage leading to the commercial section of Crystal Cave, Tom signalled to us to switch off our lights. Drifting upwards, we lay under a ledge watching the unsuspecting tourists on the floating, wooden walkway 20 feet above.

The jigsaw puzzle was gradually being pieced together, but one major link was still missing. The connection between Walsingham and Crystal Caves eluded us, even though we knew it must exist. Many dives were spent looking at various corners of the Walsingham system, but the most promising of these pinched down to less than 12 inches high, but with a strong tidal flow. Dye tracing is impractical in Bermuda

Rob Power emerging from Fern Sink Cave. Photo by Derek Gibbons.

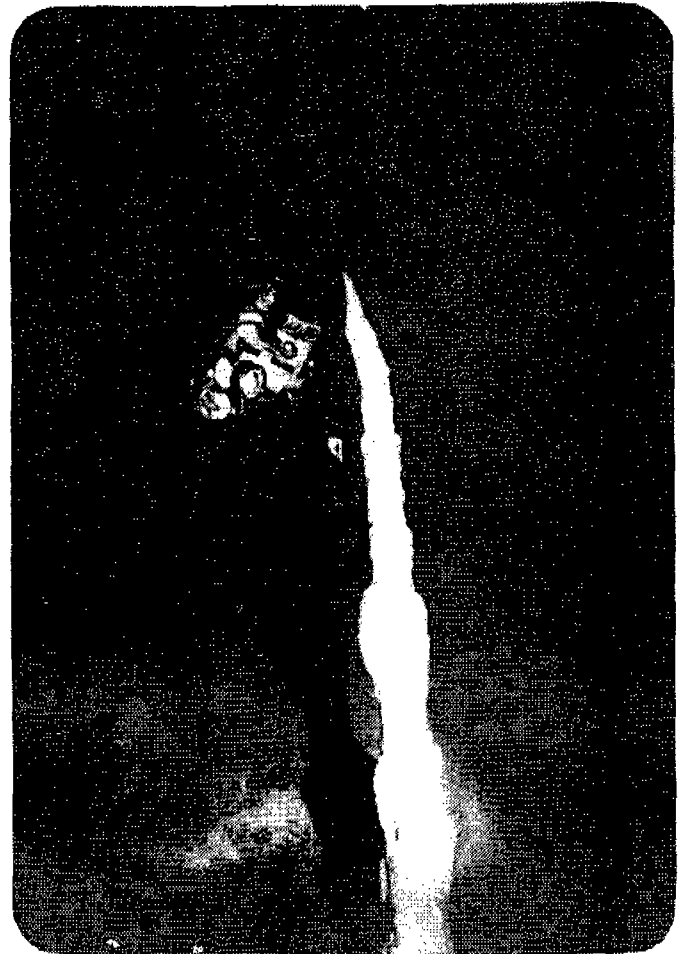


because of the to-and-fro nature of the tides and also their slow movement through the huge underwater rooms. Side-mounted tanks have always been used by a few of us and even this technique failed to reveal much within this particular cave system.

In 1984 we turned our attention to the other old commercial cave, Wonderland, which had been closed down for thirty years or more. A large clear lake was dived but this only went to two unstable air rooms. The cave, however, contains a somewhat arduous wild dry section consisting mainly of flat-out crawls and various thrutches [sic] before it emerges in a sizeable chamber with--surprise--another lake. Mary Van Soeren was the first to dive this in what was, by our standards, a hard day's caving. Assisted by "sherpa" Paul Stedman, she used a single side-mounted 30 cu. ft. tank to dive the pool. Mary reported that it reached a depth of 70 ft. before levelling out and before she hit turn-around, but that it looked very promising.

Being a lazy bunch, the rest of us didn't relish the hard work involved in a repeat trip and it was not until the fall of 1986 when Mark Aspery and I decided to check it out, with help from local cavers Steve and Tina Turpin. Using 30's again, a way through an underwater forest of stals was soon found, leading into a large room with a gentle slope tempting us onwards and upwards. Un-

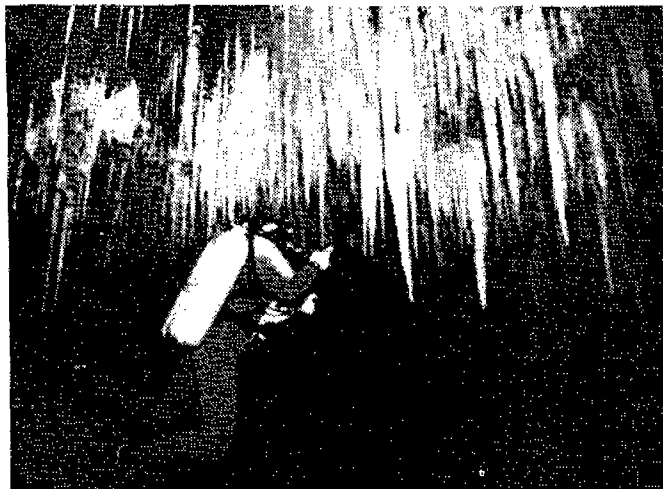
Mary Van Soeren in Crystal Cave. Photo by Rob Power.





Mark Aspery in Wonderland Cave. Photo by Rob Power.

fortunately, turn-around forced a hasty retreat through the forest. This was perhaps the most beautiful section of cave either of us had ever seen, and because of its remoteness it is likely to remain so for a long time. The following week Mark and I returned, each using double side-mounted 70's, prepared for a longer dive. However, the connection to Crystal was quickly completed. As the show cave was closed we had



Mary Van Soeren in Crystal Cave. Photo by Rob Power.

return the way we came in, emerging in daylight after a 9-hour trip. Great!—but we still had to find the elusive connection with Walsingham Cave itself. Intense scrutiny of our surveys followed before we decided upon an area to push. On our next dive in a remote corner of one of the Walsingham rooms, Mark and I ducked under a low ledge and saw a line tied to a stalactite leading onwards. "Sod it, the line's broken," was my first thought, before realizing that the line was in fact the other end of one laid by Tom and myself during an exploration dive in a low silty side passage in Fern Sink Cave a few weeks before. This was an important connection to us, being the latest link in the system and, ironically, it was the first we had endeavored to find years previously.

That is where we stand today with this intricate cave system. Further connections remain to be made—the most obvious one being to the equally extensive Palm Cave system—but that is another story.

## GEAR FOR SALE

USED PRIMARY LIGHT: Gel-cell canister light, 12-amp-hour, 6-volt, sealed-beam head, 30-watt. With charger. CONTACT:

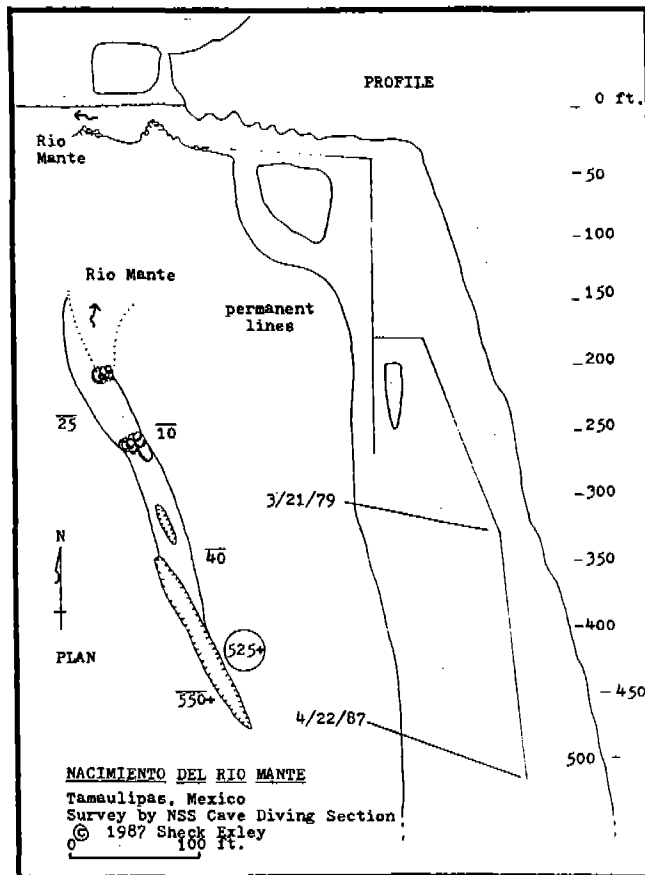
Yvette Cardozo  
10928 S.W. 112 Ave.  
Miami, Florida 33176

## NEW DEPTH RECORD IN MEXICO - by Sheck Exley

On April 22, 1987, I made a dive in the Nacimiento del Rio Mante, a huge spring in the Sierra Madre of Oriental Mountains in northern Mexico. I was able to attain a depth of 520 feet, establishing a new American cave depth record. The dive also broke my 16-year-old American depth record for scuba diving of 465 feet. The only cave dive or scuba dive (surface to surface without a submersible) deeper is Jochen Hasenmayer's phenomenal 1983 dive in France's Vaucluse to a depth of 656 feet.

Four practice dives were made in preparation for the record attempt: helium dives to 135 feet and 260 feet in Florida's Cathedral Canyon and Holton Spring, an air dive to 280 feet in Eagle's Nest to check out the dive configuration, and an air dive in the Mante to 320 feet two days before the record to install 5 decompression tanks and check out the condition of the 8-year-old guideline.

The dive had a bottom time of 15 minutes and a total time of 7-1/2 hours. To minimize narcosis and maximize decompression safety, four different breathing mixtures were used. The deep mix was 50% helium, 40% nitrogen, and 10% oxygen. Air was breathed to 240 feet. The tables used were mathematical extrapolations from secret commercial diving tables, which give a more conservative schedule than the Buhlman/Keller tables. Several additional decompression safety factors were used. Despite these precautions, several possible symptoms of decompression sickness and/or oxygen toxicity were experienced during the ascent.



One interesting observation on the dive was that of an albino cave crayfish at a depth of 480 feet, greatly extending the lower known limits for aquatic cave life. The extreme depth also had interesting effects on my equipment, though a primary light designed by Lamar English functioned perfectly.

I will happily share my dive procedures with any qualified divers contemplating deep cave diving. While the existence of adequate U.S. Navy tables to a depth of 380 feet makes helium dives to that depth very safe, it should be stressed that the deeper dives entail a high degree of risk. Oxygen decompression in water should be approached with special caution.

I would like to express my deepest thanks (no pun intended) to all those NSS divers who provided advice and assistance without which the dive would have been impossible: John Harper, John DeLaney, Bill Stone, Paul DeLoach, Wes Skiles, Rob Anderson, Lamar English, Dale Sweet, Terry More, Jochen Hasenmayer, and especially Mary Ellen Eckhoff. Thanks also to Arwin Carr of Spring Systems Dive Resort.

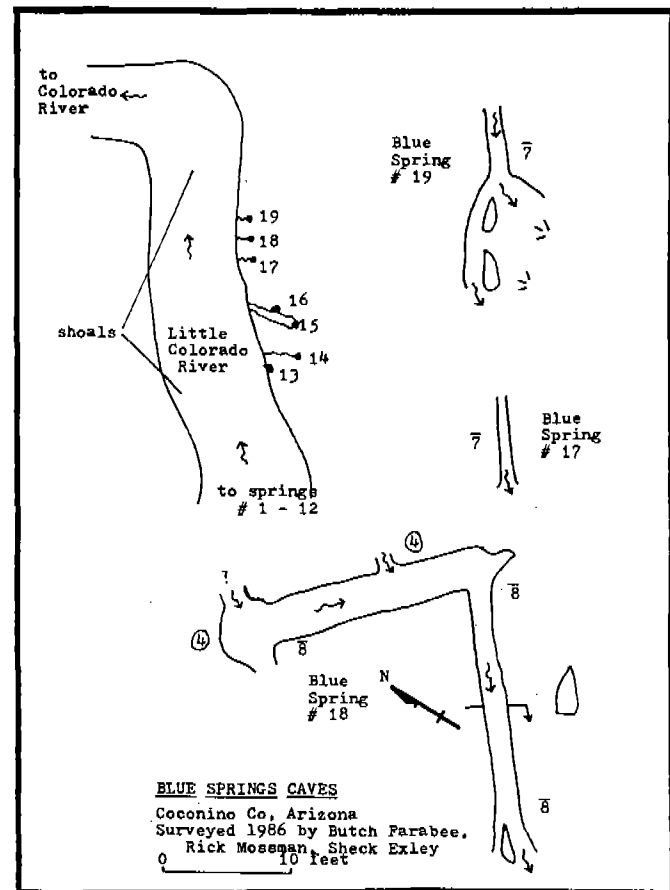
## BLUE SPRINGS CAVES - GRAND CANYON - by Sheck Exley

[Due to Editorial Idiocy, Sheck Exley's survey maps for his article "Cave Diving in the Grand Canyon," which was published in the last issue (UWS 14:4), were omitted. The Editor would like to apologize to both the author and readers for this oversight.

To recapitulate briefly, Sheck described a grueling rock-climbing expedition with Butch Farabee (who is in charge of all diving operations in the Grand Canyon) and Park Ranger Rick Mossman, to explore for underwater springs along a stretch of the Little Colorado River.]

"...Blue Springs is the headwaters of the Little Colorado in the dry season, and I estimated the combined flow of all the springs to be 200-300 cubic feet per second. The spot is so beautiful that it is sacred to the Navaho tribe, and permission from the Navaho must be obtained before entering.

"We located 19 springs along a half-mile stretch of the river (see map!!). Numbers 1-12 were on the river left (facing downstream) and



numbers 13-19 were on the right. All were crystal clear, 70-75 degrees F, silt-free, and entered the Little Colorado at or within 5 feet of the surface of the river. We saw small dry caves and rock shelters in the canyon walls just about the springs, some of which may be former spring vents and may even connect with the springs.

"The three of us took turns diving the most promising springs. Small underwater caves were entered in #3, #6, #13, #7, #18, and #19. #8 may also be good, but to dive it required a crawl over some sharp-looking rock so we passed it up.

"#18 was the best. Wearing the pony bottle on my side like I had been taught to do at Wookey Hole in 1980, I wiggled into a 20-foot-long

passage 18 inches wide and 3 feet high. The depth was 8 feet, and the strong flow kept the floor clean of silt.

"The passage turned to the left and opened into a 5-foot-diameter room with a height of 4 feet, then after another 20 feet turned to the right again. I figured that this was far enough with my tiny air supply and backup light, so surveyed out from that point....

"...Blue Spring #18 definitely needs another look. Butch says the geology is right for a cave of considerable size, and because of its shallow depth, it could get into air passage...."

## NEWS FROM BELIZE - by James G. Coke

The Quintana Roo Expedition to Belize resulted in a very rewarding and exciting trip this July. As in the past, many eyebrows were raised as our 1967 Chevy Pickup crossed the Belizean/Mexican border. Infinite attention was given to the sets of double 80's, and coolers full of diving and camera gear. Customs officials, however, were keenly interested in our Dive-Rite lighting systems. After assembling and operating our "flashlights for night diving," our thorough customs officials seemed relieved with these explosive-looking devices. After this small delay, we were allowed to temporarily import our truck and diving gear after promising that we would not sell any of these items. The agents assured us that heavy import tariffs would result from the sale of our goods. No problem! Neither of us wanted to walk back to Mexico.

Our arrival on Caye Caulker proved uneventful and subsequent penetrations into Giant Cave went very smoothly. Giant Cave, to digress for a moment, is truly a very large and dark cave. It is decorated somewhat like the caves in Quintana Roo, yet the speleothems

Johanna de Groot in Giant Cave. Photo by Jim Coke.





Johanna de Groot in Caye Chapel. Photo by Jim Coke.

are...giant! It is a tidally affected cave system estimated to hold one room some 2000 feet by 2000 feet, all completely submerged in saltwater. Average depths of 80 to 100 feet are consistent, although much deeper areas are easily found. Ceiling-to-floor space averages 30 to 40 feet; left and right walls can never be seen simultaneously.

Our proposed goal during July's activities was to begin the systematic replacement of the original permanent lines with larger, 1/4" braided nylon--durability and reliability being of key importance for a later survey effort. The original cave-diving expeditions to Giant Cave in the early 1980's (Mary Ellen Eckhoff, Sheck Exley, Sandy Fehring, Bill Fehring, Paul Heinerth, Shannon Heinerth, Steve Gerrard) left approximately 10,000 feet of #22 braided nylon.

A subsequent Italian (?) expedition also left an undetermined amount of permanent line in Giant Cave as well. Securing a preliminary line map during the December 1986 CDS Workshop (Thank you, Sandra and Bill Fehring!), I noticed discrepancies in present line positions in the cave versus what was recorded on the line map. Johanna de Groot and I had made numerous dives in Giant Cave prior to the CDS Workshop. The line map depicted orderly placement of line; in fact, existing line in the cave was extremely disorderly, if not downright confusing. Cave-diving chronology is non-existent for Caye Caulker at this time. Other divers were certainly in this system and were apparently ignorant of safe permanent line protocol. This became obvious when we stripped some unknown type of "dacron" from the cave.

All this line is also encrusted biologically (4 to 6 inches in diameter by a brown weed (?), including transparent sponges (?) resembling a species of tunicates found in open water), tending to sag alarmingly between the distant tie-offs. This biological infestation was also found later to be growing inside the old permanent line. Does this sound like a nightmare creating above normal stress levels? Indeed, during a previous expedition (October 1986), Johanna and I were put in the unique position of having to explore out of the cave due to a parted bit of line. New 1/4" nylon was installed without delay on our next dive.

After numerous dives, Stephen Decarlo and I had installed new knotted line paralleling the older nylon as closely as possible. Major sections of the Northern System main lines are now in new condition. The older nylon was stripped from the cave in order to reduce cave trash. Growth will certainly occur on these new sections, yet line integrity should not be a problem during cleaning processes. On our final dive in this cave, we thought we spotted what appeared to be a Remipede. We were not successful in capturing him, however, to our chagrin.

Two exploratory dives were also conducted in the Double Hole Cave off Caye Chapel. This cave system is very unlike the darker Giant Cave environment. This cave is tidally affected as well (spring-siphon), and visibility is a bit clearer. During the last exploratory dive a large number of Remipedia were observed at the 100-foot level. We were able to collect one, the first Remipede collected in Belize to my knowledge. He's since been sent to Jill Yager to be studied in hopes

that he will be different that his cousins found here in Quintana Roo.

Belize has quite a wealth of air and underwater caves. Rumors abound concerning virgin caves existing off the mainland and other Cayes. We've been lucky to explore three new ones in the Caye Chapel/Caye Caulker area. Transportation and equipment logistics still plague the explorer, yet things are easier now than in the past. Remember, too, you must obtain government permission prior to your trip to Belize in order to explore air or underwater caves. This permission can be obtained by writing:

The Ministry of Education, Youth, Sports, and Culture  
 Department of Archaeology  
 Belmopan, Belize CENTRAL AMERICA  
 Attn: Commissioner Topsey

Year-round dive services can be found on Caye Caulker through two operators. Belize Diving Services (owned by Frank and Janice Bounting) and Seeing is Belizing (owned by Jim Beveridge) are the two outstanding companies to contact. Without their services our explorations would have fallen far short of our expectations.

Johanna de Groot in Caye Chapel. Photo by Jim Coke.





Johanna de Groot in Giant Cave. Photo by Jim Coke.

## EXHAUST VALVE RECALL

Diving Unlimited International, Inc. (DUI) has asked us to print the following safety announcement:

GSD Sports Equipment in Genoa, Italy, the manufacturer of the GSD Exhaust Valve, has informed us that some of the outer rings, part number VO203, have to be replaced. Some of the rings (which hold the top of the valve in place) were made from an incorrect plastic material which may absorb water and change the dimension of the ring.

This water absorption could cause the valve to become easy to unscrew if not checked out by the diver in his pre-dive check procedures. Rest assured the valve manufacturer (GSD) has advised us that only a small number of exhaust valves were affected.

However, there is no visual difference between the plastics to make for easy identification. The new rings have been coded with two raised points on either side of the initials "GSD" to facilitate the replacement by making it easier to identify the rings needing to be replaced.

Since DUI is one of several manufacturers using this valve, we are assisting GSD in their replacing of the rings.

Quality and safety are of utmost importance, and to that end, we are requesting that all GSD Exhaust Valves have the outer ring replaced.

If you have purchased a GSD exhaust valve from any source, please let us know and we will be happy to send you replacement rings.

Please help our industry by assisting in the GSD request for replacement. Remember that valves are available through many sources, so check to see if you have a GSD valve and pass the word on to other divers.

An adequate number of rings are available together with instructions for replacement of the part. Contact DUI on their toll free number - (800) 327-8439 for immediate shipment.

## RESCUE/RECOVERY TEAM MEMBERS

Report any change of address or phone! NCIC: 904-633-4159.

## AIR RECONNAISSANCE OPPORTUNITY

"If anyone in the Section would like to share costs with me, I can grab an aircraft any time from Quincy Airport and we can scout new locations from the air. You should see Wakulla from the air, it's fantastic!" CONTACT:

David C. Young  
 c/o Quincy Aviation  
 Route 6, Box 13-A  
 Quincy, Florida 32341  
 Work Phone (Quincy Aviation) (904) 875-4642

## CONGRATULATIONS ARE IN ORDER

To Wes and Terri Skiles, the proud new parents of our newest cave diver, Nathaniel Allan Skiles, who was born on August 8th, weighing 8 lbs., 3 oz.

## FOR YOUR INFORMATION . . .

Joe Prosser reports that according to our records, as of May 31, 1987, the NSS Cave Diving Section had awarded 6,089 certifications. The breakdown is as follows:

CAVERN	2349
BASIC CAVE	1623
CAVE	1585
RESCUE/INSTRUCTORS	532

As of this printing, according to our Accident Analysis Files, no NSS-trained cave divers have ever died while cave diving. There have, however, been two instances of trained cavern divers dying while attempting to cave dive. The first instance occurred a couple of years ago and was a sump-diving incident where the diver's diabetes was implicated in the accident. The second occurred only a few days ago and involved a cave dive at 120 feet, clearly way beyond the 70-foot depth parameter prescribed for cavern diving (more information will be printed when available). In both instances the divers died while attempting a level of diving activity for which they were not trained. Be trained, and dive within the limitations of your training!

## WHAT ARE ONE THOUSAND SAFE CAVE DIVES? - by Bob McGuire

The conception of an award for "addressing public opinion" on cave diving is an excellent idea for a way of conveying how safe cave diving can be when certain rules are followed consistently. Note the word safe. Would dives conducted that violated the basic safety principles be considered as acceptable to the non-cave-diving community? What positive effects could be gained by reiterating those dives done in an unsafe manner?

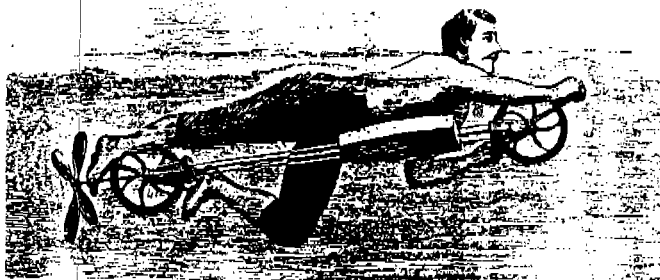
I prefer to consider the dives I made with a single tank, one light, etc., as an open-water diver surviving in the overhead environment, not as safe cave dives. Surely the cave-diving community would not want to present the public with a dive such as this: "Well, my only light failed, ... I had no guideline and had to feel my way out of the cave." Yes, a successful exit was made, but a dive of this type is more of an accident (even with no fatality) than a safe cave dive.

If the ISCDA [International Safe Cave Diver Award] is used to expound cave-diving training and safety rules to the public, let's recognize that the award is only valid if the recipient possesses training and follows safety procedures on each and every dive submitted for the award.

Also consider that the statement that the Abe Davis Award is one for "beginner divers" presents a distorted view of this unique award. An excellent article by Sheck Exley, UWS, Vol. 7, No. 5, made note of the quality of achievement of 100 safe cave dives and how it is more difficult to make 100 cave dives today than it was in the last two decades. Also, when counting 100 cave dives after being properly trained, the

Abe Davis becomes even more impressive. For example, my 100th cave dive was in Madison Blue, a double stage with a penetration of 3600 feet into the Courtyard. Not exactly beginner's stuff, just as the Abe Davis is not a beginner's award.

1000 exposures to the cave environment does not mean 1000 safe cave dives. 1000 exposures following rules derived from accident analysis does qualify as 1000 cave dives which can, without question, demonstrate the safety of the sport to the uninformed public. At the same time, note the gap between 100 and 1000 dives. How many divers will complete 1000 cave dives? To follow the lead of the NACD, with the recognition of 500 safe cave dives, would bridge the gap and provide a larger number of divers making a significant number of dives, to present to the public. It would also provide an attainable goal for a large portion of cave divers. This award could be called the R.W. Goodman award in recognition of Bob Goodman's cave exploration of Florida.



#### NEW HIRES/SKILES SCOOTER UNVEILED CRITICS SKEPTICAL

Courtesy of Joe Taylor

#### HEALTHY EQUIPMENT - by Kelly Brady

The health of your cave-diving equipment is directly related to your health in the overhead environment. Recently, I've become concerned about the reliability of regulators that several cave divers were using, after hearing of their experiences in having their regulators serviced at local dive stores.

I heard comments from cave divers such as "my dealer doesn't seem to want to service my regulator. I have to explain to them I want it serviced anyway because of the nature of cave diving and the desire to increase reliability." Also, "I don't trust the dive shops here—so I don't get it serviced unless it malfunctions in some way." One person told me her dealer told her "it doesn't need to be serviced yet."

Statements like this indicate a problem somewhere. After hearing these complaints, I called several dive shops and asked them about their servicing procedures. As a factory-authorized serviceman for several brands of equipment, I am aware of the general servicing policies that major companies advertise. One dealer I asked said they simply "cleaned and adjusted the regulator and that parts didn't need to be replaced for two or three years." Another dealer said that unless something "catastrophic" happened to the regulator, it "might not need service for seven or eight years." I was shocked!

Most manufacturers indicate that certain parts be replaced annually, regardless of usage or wear. Normally, they require the regulator to be serviced around the time of its purchase anniversary or the warranty becomes invalid. Some manufacturers include lifetime parts warranties, which cover the replacement costs of some or all parts if they fail to perform properly. For a dive shop servicing an in-warranty regulator, it doesn't cost them or you anything for replacing warranted parts. If certain parts are excluded from warranty protection (such as rubber, teflon, and silicon parts) they are usually inexpensive: \$0.40 to \$2.50. Why are some dive shops seemingly avoiding regulator servicing?

It may be that only one person at the shop does the servicing and he is overloaded with work. It may be they don't invest in a repair

parts inventory (which can be surprisingly expensive). This means that replacing a worn part in your regulator is not a smooth-running aspect of the operation. Imagine the dealer calling the manufacturer to order \$2.00 worth of parts when there is a \$50 minimum order. Or they may simply not like to service any more than they have to, because the profit made is so low. It may take several hours to service a high-performance regulator (first stage, second stage, and octopus), and they may only charge \$20-\$30. A small businessman usually isn't too motivated to do unprofitable work.

Regardless of the reasons, it seems that some action needs to be taken to insure that your equipment receives the level of servicing you desire. When you take it in to the dealer, I'd recommend the following things:

1. Complete overhaul of all first and second stages. Explain your need for high reliability in cave diving.
2. Request all dynamic (moving) O-rings be replaced.
3. Request that hose O-rings and other static (non-moving) O-rings be checked for flaws or extrusion (change of shape).
4. Have the swivel O-ring changed in all submersible pressure gauges.
5. Have all high-pressure and low-pressure seats (or poppets) replaced. Ask for new seats. Some seats can be flipped over and re-used, but this is discouraged.
6. Ask what your regulator reads on a magnahelic gauge. The gauge measures inhalation and exhalation resistance in inches of water. An inhalation reading 1.0 to 1.5 is common for most late model regulators while very high-performance regulators may breathe at 0.5 to 1.0.

These six points should apply to almost every brand of regulator. By bringing up these points, the dealer gets a signal from you that you understand something about regulators, and know what to expect from a qualified service center. If you still feel uncomfortable with your dealer, most manufacturers offer in-house regulator service.

Are you currently servicing your regulators yourself, even though you are not authorized by the manufacturer? Being certified as an Equipment Specialist by an open-water agency does not qualify you to service a regulator, even if you did that in the course. This can be very unsafe, because there are so many things you may not know about. There are many "tricks" and special tools that a manufacturer teaches its servicemen about. These tricks are procedures that cannot be shown on a diagram or readily explained on paper. Often, manufacturers change parts, provide updates, or discover technical problems years after a regulator is on the market. Unless you are working closely with a dealer, you may never find out about these important changes. Servicing your regulator is "deceptively easy"—don't do it without proper training.

**OTHER EQUIPMENT.** As a rule, any gear you own with moving parts may need occasional servicing. When was the last time you had a power inflator serviced? A worn O-ring or seat can cause leakage or make the inflator button hard to push. Did you know that most valve manufacturers suggest annual replacement of the burst disk and crimp washer? (Wonder what they would think about double disks). For those of you not yet using D.I.N. valves, one well-known cave divers says that valve O-rings should be replaced every three dives or more often.

Hopefully, there are very few dealers who have poor servicing practices. Because regulators are not inherently failure prone, it is possible for one to function well beyond the recommended service period. But why take a chance?

#### MORE ON TWINS AND DOUBLES - by Buford Pruitt, Jr.

Roger Werner and Mark Leonard (UWS 14:3 and 14:4), among others, have discussed some pros and cons of twin singles versus manifolded double tanks. One system may fail more often one way than another; some failures are worse than others. It depends on whether you are diving solo or with a buddy; it depends on how small the passage is; and so on.... There are too many variables being discussed to keep it all straight sometimes, so I constructed a comparison table (Table 1) similar to Leonard's (in UWS 14:4).

Table 1 compares the number of components that can fail in either system, and their likelihood of failure. We can disagree over estimates of the likelihood of failure of any given component, but the num-

ber of components that can fail should be objective. Another point to consider is that the amount of air loss in the "moderate-to-minor" category can be minimized by an alert team.

Table 1 shows only two real differences in hardware failure potential: twins are slightly more likely to have failures causing major-to-minor air losses (due to the addition of one air-pressure-gauge assembly), and doubles are significantly more likely to have catastrophic losses (due to inherent weaknesses in the manifold). All other hardware failure issues appear equal.

So much for tables and probabilities. I have used twins and doubles, and have experienced an air-supply failure event in each case. The two events have taught me the importance of air-system redundancy; in fact, I believe it is the crux of the matter. Unfortunately, the value of redundant air systems has been only briefly mentioned in print lately. Buddy pairs using double have two air systems; if one blows they have only one remaining. If they use twins they have four air systems, and three remain if one blows. Four air systems can be considered "fail-safe." The two referenced events illustrate this.

Failure One occurred with both divers using doubles in a low, silty cave having a few sand dunes requiring a little digging. Buddy's manifold appeared to be broken, denying him all use of his air supply, and we buddy-breathed out on my air system. We were a little anxious during the first half of the exit, being in zero vis. in those sand dunes and having only one air supply between us. Having no air system redundancy, the relief was immeasurable when we surfaced.

Failure Two occurred with both divers using twin singles in a moderately large passage with deep, flocculent silt. The hose to one of my air-pressure gauges popped and I lost a tiny amount of air before the valve was shut off. At that point we had three air systems between us, and if pressed could have accessed the tank with the disabled regulator assembly via one of the three other assemblies. There was no anxiety during the even with three air systems between two cavers; we were merely annoyed that the dive had to be called.

The trade-off discussed in paragraph three pales in comparison to having three air systems remaining versus only one, or to being anxious or not on the exit. I've experienced both kinds of failure; for now, I'm staying with twins, and carrying an additional stage on solo.

Don't worry about having one more gauge to read (more task loading). Simply mark your left air-pressure gauge and left regulator

with a small band of tape. Attach the left regulator to your left chest D-ring with small-diameter surgical tubing, and ditto the right side. If you forget which is which you can simply look for the tape bands or watch the gauges.

Table 1: Comparison of Potential Failures of Twin and Double Tanks

CATEGORY 1: FAILURE CAN CAUSE CATASTROPHIC LOSS OF AN AIR SYSTEM			
Components	Twins	Doubles	Failure Likelihood
Tanks	2	2	remote
Tank-to-manifold/ K-valve O-rings	2	2	rare
Burst disks	2	2	remote
Connections between housing pieces	-	4	uncommon
First stage regulators	2	2	rare
<b>SUBTOTAL</b>	<b>8</b>	<b>12</b>	
CATEGORY 2: FAILURE CAN CAUSE MAJOR-TO-MINOR AIR LOSSES:			
Components	Twins	Doubles	Failure Likelihood
First-stage regulators	2	2	rare
Second-stage regulators	2	2	common
BC hose	1	1	uncommon
Second-stage hoses	2	2	uncommon
Manifold/K-valve to first-stage regulator O-rings	2	2	common
First stages-to-hoses O-rings (except air pressure)	4	3	common
Air-pressure gauges	2	1	rare
Air-pressure-gauge hoses	2	1	uncommon
Air-pressure-gauge-hose O-rings	4	2	common
<b>SUBTOTAL</b>	<b>21</b>	<b>16</b>	
<b>TOTAL</b>	<b>29</b>	<b>28</b>	

### LETTER TO THE EDITOR - by R. G. Churchill

Concerning Mark Leonard's analysis of the comparative safety of two independent cylinders versus the dual-outlet manifold (UWS 14:4). I believe Mark's reasoning is faulty in that he fails to give appropriate "weight" to the consequences of the various failures he discusses. For example, a "best choice" chart for sky diving might be:

	2 Parachutes	1 Parachute
Parachute Failure	X	
Cost		X
Equipment Weight		X
Task Loading, etc.		X

Clearly, one parachute is a superior system to two parachutes—right?



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