

The Great Barrier Reef, Australia

-- Two Trips And Tips For Tight Budgets

Dear Reader,

Send three Aussies to the ABC islands and have one dive Aruba, another Bonaire and the third Curacao. The first won't think much of the diving, the second will toast it with a Swan Lager and the third will consider it pleasant enough, but no toast, mate. And these islands span but fifty Caribbean miles.

Australia's Great Barrier Reef spans more than 1200 miles. Most of the reef earns a toast by anybody's standards, but the diving is not uniformly spectacular. For this issue, two correspondents traveled in November north and northeast from Cairns, into the Coral Sea, for super diving.

Now, don't stop reading because you can't afford the money or the time to travel to the GBR. For West Coast divers, it's damn near as easy to go to Australia as it is to Bonaire. Do you Easterners realize we West Coasters can't fly to most Caribbean islands without overnighting in Miami or New York? Furthermore, the daily cost of Australian liveboards is comparable to Caribbean prices, so 10 days of GBR diving -- with air from LA -- can be had for as little as \$2000 (see p. 3 for some price tips).

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In mid-November, friends and I chartered the Cairns-based Bali Hai II, 50 feet long with 16'8" beam, a 1200-mile range, and cruising speed of 10 knots. We departed Cairns to motor at night (we always ran at night to maximize daytime diving) to our first site on the Great Barrier: Yonge Reef. Gadzooks. The visibility was not much better than a northern California dive, and at No Name Reef dead coral destroyed the view. Thankfully, we were headed to the distant Coral Sea where the diving would be better. Thumbs down for Day One.

But thumbs up for the crew. Owner/captain Gordon Oke has dived these waters for more than 25 years. A fine and cautious captain, he offered little small

INSIDE UNDERCURRENT

The End To Life As We Know It	pg.3
Getting The Best Deal On The Great Barrier Reef	pg.5
Is The CO ₂ Cartridge Essential To Safety? --And Why Are The Manufacturers Eliminating Them?	pg.7
You Can Run, But You Cannot Hide	pg.9
The Challenges Of Cave Diving: Part I --As Well As The Hazards	pg.10
DEMA '88	pg.10
Free Flow	pg.12

talk, but he had a quiet sense of humor and a well-honed intuitive wisdom of people and the sea. His son Marcus, a marine biologist, was along for the ride. Chef Gerry Quinn produced abundant and intelligent meals, served each day in accordance with our diving wishes. For lunch it was usually several super salads, hearty soups and freshly baked bread. For dinner fresh grilled fish, roasted chicken or juicy lamb chops, always with several perfectly cooked vegetables, potatoes, and ambrosial desserts. On Thanksgiving at sea, surely no Aussie holiday, came a fully-trimmed turkey repast. Breakfasts? Fresh scones, hot Irish oatmeal bread, and anything else, including that reprehensible Aussie staple, Vegemite.

Hoping that the diving would be as satisfying as the meals, we next tried Cod Hole. I followed Gordon to a bommie (coral head) at 40 feet. Suddenly, I was surrounded by a score of cod, as much as 200 pounds each! Fed by hand, they behaved like pets, gently bumping me, or stopping in front of my mask, as though to say Welcome! It was a blast. Gordon took me to a huge moray, halfway out of its hole. He fed and petted the eel as it slithered through his hands. The rest of the dive I spent exploring the dramatic canyons, covered with multicolored corals and the bommies swarming with brilliant tropicals.

Visibility at Cod hole had been 70 feet or so, but visibility at #10 Ribbon Reef, the northernmost of 10 narrow reefs at the edge of the Coral Sea, was awful. Under 30 feet! Chagrined, Gordon concluded it was an early plankton bloom due to an unusually warm spring. Usually, it clouds up a month later.

But we still hadn't reached our final destination, Osprey Reef, when the starter motor on the main diesel malfunctioned. A hundred miles at sea is no place for a mechanical problem, so we motored two hours back to the lagoon at Lizard Island, and an exclusive resort -- with its own landing strip. Thanks to the magic of overnight air delivery, the next day he had a new starter motor to install. To pass the time, I frustrated myself on Bali Hai's windsurfer, and took three pleasant dives in the Lagoon, murky indeed but loaded with color from huge, tradachna clams with brilliant mantles, profuse soft corals, indigo starfish, and anemones loaded with unique species of clown fish.

The Bali Hai is a comfortable craft on which to pass time. She is fully air-conditioned with a large upper deck and covered flybridge with cushioned seats for relaxing and sunbathing. She carries eight passengers in four small two-bunk cabins; the limited cabin storage space could be better organized. Although there are two showers and heads, one, functioning erratically, was to be used as little as possible. With five passengers, it was no problem, but with a full load of eight, it would be an inconvenience. We were permitted one shower a day, and always had a large tub of fresh water for rinsing cameras. The Bali Hai sports 20 aluminum-88 tanks and a new Bauer compressor that can fill two tanks in less than seven minutes. A stepdown transformer and converter are needed to charge American strobes. An aluminum outboard powered dinghy is used for drift dives (we did only one). The wheelhouse is well equipped with radar, radio telephone, echo sounders, automatic pilot, stereo and TV.

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With the repairs complete, we motored eastward to the 20-mile-long Osprey Reef. Moments after stepping off the dive platform for my first dive into 150-foot visibility water, an 8-foot hammerhead swept in and swam away. By the time my heartbeat was back to normal, a 7-foot whaler shark visited. It would be a while before I saw the astonishing color of the tropical fish and corals covering the walls.

Each dive was sensational -- so good that we stayed a full week here. At "The Entrance," a 7-foot thresher shark circled while I watched a bommie full of crinoids creeping across the coral. At "The Opening," a Volkswagen-sized Queensland grouper (not grouper) startled me. On a shallow sunset dive, inside Osprey Lagoon, gold-green lettuce corals as big as boulders served as homes for hundreds of posing fish, and I really got off on a garden of fluorescing BLUE staghorn coral! At the North Bay, I came upon a piece of living jewelry: dozens of tiny domino fish and several skunk clown fish darted in and out of a gold and florescent blue anemone! A short ways away, in a strange cave with warm and greenish water, huge soft corals swayed in the surge, fed to obesity by the nutrient-filled water. In a second chamber, filled with long sea whips, their delicate peach-colored polyps out feeding, fish were everywhere.

I have no room to describe the delights of every dive, but one more is a must. After we anchored at the North Horn, I hit the water and swam 30 yards to the wall. There was Marcus, swimming back and forth at 60 feet, in the midst of a dozen sharks. The visibility was superb, the current strong. As I descended, more sharks appeared. I hugged the wall as a couple dozen of the mothers cruised beside me, above me, below me. Though they moved gracefully and never threatened, two of my group had seen enough. They split. I stayed. Most were 4-7 foot white tips, with a few grey whalers. I kept watching Marcus swim among them. Finally, after silently saying goodbye to my family and friends, I screwed up the courage to leave the protection of the wall and join in. I have no words to describe the depth of the thrill. You had to be there.

On the way home, we stopped at the north end of #6 Ribbon Reef. I dropped into a medium current to the flat top of an enormous reef 30 feet deep. It was covered with iridescent hard corals in blue, pink, lavender, and lime green, with thousands of fish. I peered over the edge of the reef, only to find in the upsurge of the current below, as many species of fish as the good Lord, bless Her heart, had ever created: sharks, giant Maori wrasse, unicorn fish, clown triggers, bump-head parrot fish, emperor angles, Moorish idols, blue jacks, and

The End To Life As We Know It

No doubt it's a triumph of technology for tourism, but from our perspective it signals the end of serenity for the more remote reefs of the world.

By the time you read this, the Four Season Barrier Reef hotel, 45 miles from Townsville, Australia, will have welcomed its first guests. It's not built on an island. The hotel is itself a floating island, constructed in Singapore mainly of prefabricated steel modules, and towed to its mooring place in the central lagoon of the John Brewer Reef. All wastes will be controlled through treatment or incineration, and no wastes, even treated, will be released into the lake. They will be barged to the mainland or dumped at approved locations at sea.

The 200 guests, who will pay from \$85 to \$550 per day, will have no beach, but otherwise will have many amenities on floating piers: a helicopter landing pad, a tennis court and swimming pool, a gymnasium and sauna, a restaurant and bar, and an underwater observatory for viewing marine life. Scuba diving will be offered as well. In fact, the S.S. *Yongala*, considered by some to be the most beautiful wreck dive in the world, is not far away.

Eight heavy anchors will keep the hotel in position against tide and wind in 26 feet of water. The hotel is designed to withstand winds of up to 100 miles per hours. No one has said whether it will be able to withstand a team of monkeywrench divers from Earth First or Sea Shepard, armed with plastics explosives.

butterflies in such numbers that they seemed to be schooling. A well-attended school of large barracuda circumnavigated me, hovering while the sun's rays hit them like spotlights. I hovered on that edge for perhaps 30 minutes, absolutely spellbound by this constantly changing procession not six feet away.

Although Gordon occasionally led our dives, most of the time he sent us off on our own after a good pre-dive briefing. We were asked to dive with a buddy, to enter our in and out times, as well as our dive group letter for each dive. The only limit to the diving was the amount of nitrogen anyone had absorbed. So long and full were my day dives, that I only made two dives at night. Unless one has a specific photographic mission, I'm not sure night dives are worth all the hoopla anyhow. The thrills of days on the Great Barrier Reef are themselves almost too much to handle.

* * * * *

Step lightly I told myself, as I shone the beam wherever my foot was to light. Below the surface might be a dozen turtle eggs, still warm from the mother's body. It was egg-laying season here on Raine Island, on the northern tip of Australia's Great Barrier Reef, and enormous turtles were everywhere. As hundreds clamored ashore at surf's edge, hundreds more, having finished their God-given task, headed back to the sea's safe refuge.

I watched one lumbering animal laboriously scoop sand to fashion a cavity for eggs. Spittle dripped from her chin as she struggled to deposit her unborn young, then flailed her flippers to push sand over her nest. So thick were the turtles that often one digging her nest would uncover the eggs of another. In fact, once, on a single night on Raine Island, scientists recorded more than 10,000 turtles nesting. Not all complete their journey. Some become wedged between rocks and others fail to find their way back to the water. So heavy were the turtles, it would take half-a-dozen of us to wrestle them back to the water.

Experienced	★ ★ ★ ★ ★
Beginners	don't start here
Money's Worth	★ ★ ★ ★ ★
Accommodations	★ ★ ★ ★
Boat otherwise	★ ★ ★ ★
Food	★ ★ ★ ★ ★
Crew	★ ★ ★ ★ ★

* poor, ★★ fair, ★★★ average, ★★★★ good, ★★★★★ excellent

Earlier in the day, my dive boat, the Challenger I, had arrived, gently making its way through the turtle-deep waters. As soon as we anchored, I donned my tank to join the migration. Few ships have permission to bring tourists ashore at this marine park and I was fortunate to be on one. And not only to view the turtles. The inhabitants -- brown boobies, red-footed boobies, red frigate-tailed tropic birds -- were splendid sights as well. And after night fell, I grabbed my dive light to meet the turtles.

The 112-foot Challenger, handling 21 divers, is indeed a comfortable craft, with two staterooms upstairs and two berth cabins below. I initially paid for a trip on the Auriga Bay, but shortly before departure I was informed there were not enough passengers, and I was given the opportunity to join the Challenger, half-filled by an International Diving Expeditions group headed by wizard photographer, Chris Newbert ("Within a Rainbow'd Sea").

I was pleased to join a trip with Newbert, but when I arrived those people initially in his group saw my people as nothing but interlopers. I was in no mood for hassles. It had been a bloody three-hour struggle to get more than one

Getting The Best Deal On The Great Barrier Reef

When is the best time to dive the Great Barrier Reef? We called Neville Coleman, publisher of the Australian quarterly *Underwater*, who told us that the GBR is easily dived year-round, but the best months are September through December, when one can expect calm weather, the best clarity, and 82° water (in July it can drop to 75°). January through March can mean plankton blooms in the inner reefs (which wouldn't affect Bougainville or Osprey Reef) and in September and October visibility may drop due to spawning coral.

Americans like to believe the best diving is north of Cairns, including Bougainville and Osprey Reefs in the Coral Sea. Coleman likes GBR diving out of Townsville or Gladstone just as well: "If you want mantas and sea snakes you have to go south to Lady Ellen, Lady Margrave, and North Reefs." And most everyone considers the *Yongala*, enveloped with life, the finest wreck dive anywhere. Our caution: many *Undercurrent* readers write that the pricey Heron Island resort falls short of their expectations.

Airfare to Cairns is higher during most of the best diving season: round trip from Los Angeles via Qantas runs \$1445 from October 1 to March 31; other times of the year it's \$1095; in most cases American tour groups don't offer any better fare than you get by booking on your own.

Your options for booking a GBR trip.

You can use an American agent which has chartered a boat for a specific week or you can put yourself into a group. Advantages: Most trips are ten or more days, they are easy to get information about and join, you often travel to and from with a group. Disadvantages: the prices may be higher than other options. Typical prices: IDE's 14 days with Chris Newbert, \$2295 (\$164/day); See & Sea books the Coralita from September through December, at \$2650 for ten days (\$265/day).

You can use an Australian travel agent to sign up with the same boats. Advantages: you pick a period in which you want to dive and they can offer you a range of options and trips; the cost per day is frequently less than the cost per day for the same boats organized through American agents. Disadvantages: it's a little more of a hassle to be calling overseas. Typical prices: Aquarius Travel, 11 days on Auriga Bay (where our writer joined the Newbert trip), \$1600 (\$145/day).

You can go standby. Townsville's Reef Travel Center, a source for all GBR boats, discounts spaces from 30-45% if a boat hasn't filled 14-30 days in advance. Advantages: good prices if your time is flexible. Disadvantages: on short

notice you may lose airfare discounts; many trips are 4-7 days. In early February, seven days on the *Supersport* could be booked for \$810 (\$115/day).

You can go directly to the boat and charter it for your own group. Advantages: privacy and control. Disadvantages: You better know what you're doing. Typical prices: Our writer chartered the *Bali Hai* for \$1500/day (\$188/day).

To further develop your options for Australian travel, let us suggest two Australian magazines.

Underwater: this colorful quarterly, which has articles about the GBR and charter boats, reviews boats, (and advertisements), is \$14/year. Send your check to Helix, 310 South Racine Ave., Chicago, Ill.

Sport Diving is a bimonthly publication, available from *Sport Diving*, PO Box 167, Narre Warren, Victoria, 3805, Australia. \$27.36, surface or \$39.50, airmail.

And then there is *Dive Australia*, an excellent 415-page volume on diving throughout Australia, complete with site descriptions, boat and resort information, and maps. It's available for \$15 from Oceans Enterprises, 38 Taylor Street, Ashburton, Vic 3147 Australia.

To accurately reflect the exchange rates, send a bank check in Aussie funds or send your VISA or MC number, expiration date, and signature, authorizing your subscription or purchase.

Int. Diving Expeditions
6380 Wilshire Blvd. #1715
Los Angeles, CA 90048
213/655-5225
800/544-dive

Poseidon Ventures
359 San Miguel Drive
Newport Beach, CA 92660
714/644-5344
800/854-9334

See and Sea Travel
50 Francisco St. #205
San Francisco, CA 94133
415/434-3400
800/div-xprt

Reef Travel Center
181 Flinders St.
Townsville, Qnsland 4810
Australia
(77) 724-688

Going Places
26 Abbott Street
Cairns 4870, Queensland
Australia
6170 514053

Tropical Adventures
170 Denny Way
Seattle, WA 98109
206/441-3483
800/247-3433

Aquarius Dive Travel
38 Taylor St.
Ashburton, Vic 3147
Australia
(03) 258-863

Sea Safaris
3770 Highland Ave. #102
Manhattan Beach, CA 90266
800/262-6670 (Calif)
800/221-6670

Adventure Express Travel
185 Berry Street #5503
San Francisco, CA 94107
800/443-0799
915/442-0799

Aqua-TREK
1980 Mountain Blvd.
Oakland, CA 99611
415/339-2550

suitcase each on board the DC-3 out of Cairns for the flight northward to Lockart River. After being met by well-worn four-wheel-drive Land Rovers, we bounced slowly along a 50-mile dusty road in the Iron Range National Park, viewing three-foot tall termite mounds, wild turkey and wombat along the roadside. The caravan ended at a lovely, palm-tree lined, sandy beach, where small boats ferried us to the Challenger.

The hassles ended soon, as the kinship of divers prevailed. Each day began with a long dive before breakfast, then a trip to another reef. Morning and afternoon, we normally drifted along on the outer reef, followed by the dinghy. When I ran low on air, I would surface and the boat would tow me to the Challenger which had followed further out. (A wooden boat, the Challenger couldn't risk getting too close to the reef on the rough outer side). The drifts were leisurely, seldom hampering the serious photographer. At dawn, late afternoon and night, the Challenger anchored along the inner reef so we could dive at our own leisure.

In comparing notes with the author of the piece on the Bali Hai, the richness of my experience was indeed similar: virgin diving exquisite corals, the range and flurry of tropical fish, and sharks were commonplace on every dive. It was all there, but with my own twists (including a few dives with lower visibility because the coral was spawning). On Mantas reef we found two photogenic turtles on a ledge. At Black Rock I was followed the entire dive by a couple of white tip sharks; underwater I heard loud whistling and clicking sounds and later I was told that a school of pilot whales and dolphins had played alongside the boat. Just before I surfaced a school of lazy yellow Sweet Lips rose with me begging to be photographed, along with a large school of orange fairy basslets.

On stony flats outside one reef I drifted with a lazy manta and a serious hammerhead. On the reefs inside, divemaster Mary told me where I would find rare, and seldom photographed merlin (or, as some call it, a weedy scorpion fish). And indeed, I did. This was a lovely dive with great schools of purple basslets among beautiful soft and hard coral. On a dawn dive at this reef, I was partners with a Spanish dancer.

Silvertip reef was loaded with sharks -- seven grey whalers kept a close watch the entire dive. The visibility was 60 feet, due to plankton and coral spawn, but lovely hard corals and the sharks brought their own excitement. At Shark City ten tawny nurse sharks dined on a dead turtle. Though they ignored me as I scrambled to get better photographs, they often got too close for anything but a 15mm lens.

The crew, skippered by reserved yet friendly Trevor Buchell, was super (but a new crew will be aboard next year). The divemaster, Mary, always told us exactly where to dive and what we would see. Karen was a perfect hostess, extremely friendly and always careful to make sure you had enough to eat or drink. Meals, prepared by Carol, were good and plenty, with lots of vegetables and green salads, all artfully presented. I would have preferred more fresh fish. (A couple of Australian divers caught fish and cut it up for sashimi). After every dive, there were warm cookies and, in the afternoons, smoked oysters on crackers, cheese, tortillas and guacamole.

The Challenger herself was comfortable and spacious. And because she has a desalinization unit, hot water showers were unlimited. But because she was unable to anchor on the reef, there was a limit to the diving. It had to be more structured than I might have preferred. Although I was not an official member of

the photography group, I have an observation. It's not advertised as a seminar, but the travel agency plainly positions Newbert as the leader and many people who joined expected more than a chance to rub shoulders with a fine photographer. Newbert surely is a pleasant and friendly chap, answering questions and helping out with problems such as malfunctioning strobes. But he was on board to do his own thing, and indeed he did. If it's worth a few extra bucks to chum with a celebrity, then these are good opportunities. But don't expect a seminar -- or, on the Challenger, even E6 processing, which would be essential if one came to be taught.

Virtually everyone on the boat would go back in a flash, but one member won't be able to. She was seriously hit by the bends when she ended her third dive on the third day. She was immediately administered oxygen. The captain called the mainland and returned at full throttle, where a plane with a compressor on board was waiting. I saw her dive profile for the three days. On the day she got bent, she took a dive to 122' for 39 minutes, 116' for 49 minutes and apparently to 170 feet on the dive she got bent. She was using an Edge, but apparently didn't understand it. Several weeks later, as I understand, she still has serious symptoms.

It was hell for her and hell for her companions, marring our reveries throughout. Thankfully, the competent crew responded quickly and effectively. A lot of excellent boats ply the waters of the Coral Sea and the Great Barrier reef, and I'm awfully glad I was on one of the best when a true test came.

Is The CO₂ Cartridge Essential To Safety?

-- And Why Are The Manufacturers Eliminating Them?

The following article was written by Dan Orr, a NAUI instructor and Director of Underwater Education at Wright State University, Dayton Ohio. A version first appeared in the Proceedings of IQ87, NAUI's annual conference on underwater education.

★ ★ ★ ★ ★

Today's buoyancy compensating device is a rather distant descendent of the "Mae-West" used by pilots during World War II. In the early years of diving, it was exclusively considered a device to save a diver's life in an emergency via a quick-inflating mechanism to detonate a CO₂ cartridge.

As sport diving went through radical changes, so did the diver's "life vest." In the 1950s, divers used a small inflatable tube or belt for lifesaving, worn either around the waist or shaped like a bib and worn around the neck. Later, a pencil-thin oral inflation tube was added to allow the diver another mode of inflation for resting on the surface or buoyancy compensation at depth while still maintaining the mandatory CO₂ mechanism for emergencies.

In the 1970s, with the advent of large-diameter oral inflator hoses and air-injection inflator systems, the primary function of the BC was to compensate for changes in buoyancy rather than lifesaving. The CO₂ cartridge became an often-scorned and

misunderstood option, considered by many to be obsolete.

In July 1987, a potential problem with the CO₂ cartridge actuating device was discovered. It seems that the pierce pin in the mechanism known as the "Roberts Valve" had, through changes in design and the manufacturing processes, developed stress cracks which, when exposed to salt water and not maintained properly, could fail to detonate the CO₂ cartridge.

Once this potential problem was identified, both the manufacturer, Hulkey Roberts, and the U.S. Consumer Product Safety Commission (CPSC) initiated investigations. Both investigations determined that the problem was one of poor maintenance rather than a true defect in the device.

In fact, according to CPSC records, the manufacturer conducted a test of the pierce pin exhibiting a serious stress crack, yet the pin successfully detonated 474 CO₂ cartridges before it finally failed. Nonetheless, the manufacturer subsequently redesigned the pierce pin so that even in the "worst case scenario" (a pierce pin remaining lodged in the cartridge after detonation), the cartridge would still inflate the BC. A retrofit program was instituted by the valve manufacturer allowing the replacement of any "suspect" devices.

With the value of the CO₂ cartridge fueled anew, I

distributed a questionnaire to 300 divers of all levels of experience and qualification to determine their beliefs about the cartridge. The responses reflect the general concern and lack of objective information. The following concerns are shared by a large share of divers.

The CO₂ cartridge will not provide enough lift at depth to bring a diver to the surface.

This statement is essentially true, but the device was intended to be used by the sport diver as a quick-inflation mechanism to provide buoyancy at the surface, not as an escape mechanism at depth. The CO₂ cartridge will, however, inflate at depth, having an internal pressure in excess of 800 psi.

Oral and power inflation have shortcomings. The victim must be physically able to orally inflate the BC. If the victim is struggling in wave action, is having breathing difficulty, or is exhausted (which is commonly the case in accidents), oral inflation will not work. Power inflation will only work if there is sufficient air in the tank. Some power inflators will take more than 10 seconds to fill the BC when the tank is full and over 30 seconds when the air supply is between 100 and 0 psi.

<i>Tank Pressure (psi)</i>	<i>Inflation Time</i>
500	11.54
400	12.04
300	12.40
200	12.93
100	37.50

A struggling victim simply does not have the luxury of time. At the surface, the CO₂ cartridge will inflate a BC in approximately 2 seconds.

The accidental detonation of a CO₂ cartridge at depth will result in a rapid, uncontrolled ascent.

Accidental detonations have, indeed, occurred, but primarily on the surface. The result is most often embarrassment, not injury.

If an accidental detonation does occur at depth, the inflation time depends upon the ambient pressure. Inflation time at depth is generally long enough to give a *qualified* diver sufficient time to vent the air through the dump valve or the hose. In fact, some divers have experienced an accidental detonation underwater without realizing it, thinking that the buoyancy change was simply Boyle's Law affecting the air in their BC during normal diving activity, only to discover a detonated cartridge after the dive.

Loss of buoyancy control while diving is generally due to malfunctioning power inflators or dropped weight belts rather than the much-maligned CO₂ cartridge mechanism.

Accidental detonation of CO₂ cartridges at depth have resulted in numerous injuries and deaths.

After consulting the Divers Alert Network (at Duke University) and the National Accident Data Center (at the University of Rhode Island), as well as audiences throughout the U.S. and Canada, I've yet to be able to confirm any such injuries or deaths. In fact, as part of the investigation conducted into the Roberts Valve CO₂ mechanism, the parties involved were unable to verify any injuries or deaths where the CO₂ cartridge played a role. If an injury were to result from an accidental detonation of a BC at depth, it would most likely be due to a lack of proper training in dealing with emergencies or insufficient familiarity with the equipment.

The CO₂ cartridge and mechanism are unreliable.

This is a true statement which can be made about any piece of sport diving equipment if the user does not provide proper maintenance. The CO₂ mechanism does require regular maintenance, but no more than should be accorded to any piece of equipment.

Regular maintenance and checking of the device can be incorporated into the pre-dive equipment check. Students and staff of the Wright State Underwater Education Program, which I direct, regularly clean and lubricate the mechanism in 20-30 seconds; remove and visually check it and their buddy's prior to each diving experience in 10-15 seconds; and detonate it annually for replacement and practice in 5-10 seconds and an expenditure of a few dollars each year. The WSU Underwater Education Program has experienced hundreds of accidental, practice and demonstration CO₂ detonations over the past 15 years without a single misfire.

CO₂ is a deadly gas and should not be put into the BC because it might be inhaled by the diver.

CO₂ is deadly and should not be breathed. It would be a problem if the ascending diver were to breathe from the BC during an emergency ascent, while at the same time detonate the CO₂ cartridge to assure achieving the surface (as is taught in some quarters of the diving community). With the advent of such devices as the Emergency Breathing System (EBS) and Spare Air, as well as other traditional mechanisms and techniques such as the octopus and buddy breathing, CO₂ in the BC should present minimal risk to the diver.

The CO₂ mechanism is unnecessarily redundant. The diver can power-inflate the BC even when the regulator can no longer deliver air to the diver.

This misconception is erroneously promoted throughout the diving community. During equipment performance tests conducted by the staff of the WSU Underwater Education Program, power in-

flator/BC combinations were evaluated with both balanced and nonbalanced regulators and all available BC designs from US Divers, Scubapro, Sherwood, Tabata and Seatec. The subjects were both experienced divers and students and none was told what was being tested. They were to breathe underwater in the shallow end of the pool until they were out of air. Upon surfacing, they were told to inflate the BC using the power inflator. The actions were individually timed and recorded. The results were as follows:

82% had insufficient air for positive buoyancy.

Of the 18% who could deliver sufficient air to the BC, the average inflation time to achieve position buoyancy was 33.57 seconds.

15% could deliver no air at all to the BC

Other comments: In addition to these repeated comments, some divers made absolutely ludicrous comments -- "divers should not be required to maintain their gear" -- while others' comments were only marginally insane -- "If they need a device like that and it doesn't work, they deserve the consequences."

Conclusion: As a diving educator deeply concerned about safety, I am disturbed that many buoyancy compensators are now being manufactured without the CO₂ inflation device -- apparently to reduce the product liability of the manufacturers.

As a rationale, some people continue to claim that the BC is not a lifesaving device -- it is only for buoyancy compensation. Some BCs even come with a tag or printed statement that the BC is not a life-jacket and will not maintain the diver in a face out of water position. A US Divers BC has painted on it "Do not depend on this BC to save your life under any circumstances."

A BC is not a lifesaving device if the CO₂ cartridge is not a part of the design. While the oral inflator can be used for buoyancy compensation, as can the power inflator, only the presence of the CO₂ cartridge makes the BC a lifesaving device because that's the mechanism's only function.

It is unfortunate that in an apparent effort to reduce product liability, an effective lifesaving feature may eventually be entirely eliminated from the buoyancy compensator and safety-conscious divers will be denied one more option for safe diving.

Undercurrent comments: It's true that the CO₂ cartridge is disappearing. A check of scores of BC's at the DEMA show turned up only two manufacturers with holders: Dacor and Seatech. A US Divers representative told us that they had dropped the cartridges two years ago and we were "the first people at a DEMA show to even ask about them."

No one acknowledged that liability questions contributed to the elimination of the CO₂ cartridge. The standard response was that demand was too low to

You Can Run, But You Cannot Hide

In the summer of 1986, 48 year-old Richard Smith Harley, an avid diver, moved to the Maldives islands to enjoy the world-class reefs. The Maldives comprise 1300 beautiful tropical islands, near Sri Lanka in the Indian Ocean. In this Islamic nation, there's little to do but sit in the sun and dive, dive, dive.

Harley, who arrived with his companion, Colette Golightly, soon found work as an instructor at the beautiful Bandos Island resort. Within a few months he had several instructors under his supervision and contracts to provide instruction at a couple nearby resorts as well. The friendly "Mr. Richard," as he became known, quickly became a very popular and well-liked man on the island.

Although the Maldives advertise themselves as "the last paradise on earth" and "the best kept secret in the world," not all secrets can be kept there. Especially Harley's.

On December 26 he was arrested by local police and released into the custody of US Marshalls. David Smith Harley, it seems, is David Friedland, an ex-New Jersey legislator who had been convicted of taking \$360,000 in kickbacks on loans of Teamster pension funds he administered. Authorities claim that in 1985 he arranged a bogus diving accident off Grand Bahama Island, fled to Europe with a phony passport, and eventually ended up in the Maldives, about as far away from New Jersey as one can get.

Friedland could run, but he could not hide. Not even as a scuba instructor in the nation proclaiming itself to be "the best kept secret in the world."

merit the increased cost. Bob Hollis, president of Oceanic, said that "we are at the top of the price market. If we put on a CO₂ unit it will boost our cost by \$3, but add almost \$10 to the retail price.

Many people we talked with do believe that the units are unreliable and that the power inflator is an adequate substitute. But the coup d'grace, it seems, may have been administered by the industry-wide recall of the Hulkey-Roberts detonating mechanism.

As one industry executive, who wishes to remain anonymous, told us: "The industry banded together to implement the recall of those units. Even those who did not use the Hulkey-Roberts units joined in the recall. But the truth is we never made the same effort to tell everyone that the units have been redesigned and they are now safe."

The Challenges Of Cave Diving: Part I

-- As Well As The Hazards

During the last 20 years more than 250 people have died cave diving because they believed that cave diving is easy and that it requires no special training or special equipment. Some had no scuba training at all.

No less than 20 of these fatalities were open-water instructors -- none of whom were cave certified.

Why, why, all the deaths?

It's a fatal attraction.

Humans are intrigued by the unknown. If primitive man 10,000 years ago was anything like his modern counterpart, then he undoubtedly stood at the edge of a crystal clear spring and wondered just

where all the water was coming from. He could see the rock tunnel or shaft disappearing down into the darkness and wondered just what he might find down there -- most likely the same thing that these dead divers wondered as they peered into the water.

It was this same intrigue that, in the 1950s and '60s, as scuba gear became available, led people to try to explore underwater caves and springs wherever they appeared. But the underwater cave is not very friendly or forgiving. In addition to the obvious hazards of water, a ceiling, and the total absence of light beyond the cavern zone (or the "twilight" or

DEMA '88

I was sitting in a lounge area at the New Orleans DEMA show, late January, enjoying the company of Mike Busuttilli, Director of the British Sub Aqua club. As we traded comments about diving in our respective countries, I asked him why he came all the way from London to the Diving Equipment Manufacturers show.

He looked at me as if wondering where I had been hiding for many years. "Because it is the biggest show of its kind in the world." As I looked around, I realized that I had been coming to these shows for years -- looking for new equipment, contacting potential writers, button-holing folks who had avoided my phone calls, and taking some flack for articles that had gored someone's ox -- and had never really envisioned the full scope of what the show offered.

The DEMA show occupied some 200,000 square feet of display area. Nice wide aisles with no crowding, well-planned booths, video displays of dive computer operations, only a couple of exhibitors using models showing off sexy swimsuits. In short, I had a chance to see everything in each exhibit without being crowded even though 7,000 people attended.

The prime motivation for the show is to sell equipment and travel, and sign up shops for the certification agencies. This year there was an added emphasis -- educating the retailer. During the four days of the show, seminars were held all day long to discuss retail operations, how to teach underwater photography, dry suit repair, as well as introductions and discussions about the dive computers and PADI's new dive table wheel (more about that in a future issue). Virtually every

major manufacturer held repair workshops for retailers, teaching hands-on repair with engineers right there to explain various steps and clarify problems.

Each year the glitz and glitter have declined and more substance has been added. Some manufacturers like Oceanic have added instructors-only meetings to obtain information about the instructor's needs. Tekna management and reps dealt with their major customers prior to the show, permitting them to devote more time to smaller dealers and new customers, well appreciated by those who couldn't catch anyone's attention in other booths.

With the exception of the dive computers, there was little innovation. There were a few new products, but I would wager that 90% of the products introduced at a DEMA show either never make it to the market place or disappear after an initial hoopla. Dacor finally has a dive computer years after they introduced one in the early '80s at a DEMA show. Both Tekna and Oceanic pushed their dive computers at last year's show. Tekna has yet to get theirs to market and Oceanic began shipping theirs about a week before this year's show.

Colors are still in, but loud music and floor show-type promotions are out. Computer simulations and videotaped product information displays added to the professional air. In summary, it was a well laid-out, well thought-out presentation of goods and services. To judge from the 1988 DEMA show, the industry has come of age.

Ben Davison

ambient surface-light zone), the maze-like passageways, the silt, the water flow, and many potential entanglements serve as unforeseen hazards to the untrained diver.

Air Supply and the Novice

The hazards of cave diving ought to be obvious. On the face of it, after a straight penetration into a cave system with little or no water flow, it will take at least as much air to get out -- possibly more if there are any problems. If you have 3000 psi when you enter and you're not headed out when you get down to 1500 psi, it should be obvious that you can't possibly help but run out of air.

The ordinary open-water J-valve reserve of 500 or 300 psi simply doesn't work in the cave situation. It is hopelessly inadequate. (The joke is that "there's a new sonic regulator out for cave divers: when you get to 500 psi it plays 'Nearer My God to Thee'.")

But, the accident files are full of cases where untrained victims gave no thought whatsoever to air planning; they turned around only when their regulators started breathing hard -- or when they were just a few hundred pounds away from being out of air.

Air Supply and the Experienced Diver

Trained and experienced cave divers are pessimists; they expect everything to go wrong, and so are prepared if it does. I've even heard one very experienced cave-diving instructor and explorer say that if nothing at all went wrong on a dive she was disappointed, because she didn't learn anything from it or sharpen her emergency skills. The typical cave diver carries upwards of 150 pounds of gear on even a short, "routine" dive into a familiar system. And just try to talk her into leaving some of it behind!

The trained cave diver uses the Rule of Thirds: you turn the dive around and start heading out of the cave when you have used only one-third of your air supply. If you start with 3000 psi, you turn at 2000 psi. Ideally, if nothing goes wrong, you would surface with at least 1000 psi in your tanks. To the unthinking open-water diver this probably seems inordinately wasteful -- which is why there are so many accidents involving open-water divers who go into a cave with their single tanks only half full in order to burn off the remaining air. But this extra third is the cave diver's emergency reserve -- air to share with a buddy or simply the luxury of time to deal calmly with any problem that might arise.

Under certain circumstances, trained cave divers will even turn around on their dives when they've only used one-fourth, one-fifth, or even one-sixth of their air supply. For example, if the cave is a syphon (i.e., a system where the water flows into the cave rather than out) the return trip will require more ex-

ertion, and therefore, more time and air. In fact, serious cave divers typically use doubles for diving because of the large amount of reserve air required.

Sharing Air

An out-of-air emergency in a cave is more serious than in open water where you can make a direct, free ascent to the surface. In a cave, you must swim out before you can swim up; you cannot just drop your weight belt and "blow and go." The farther in you are, the slimmer your chances of doing this. 200 feet back in a cave -- forget it. If you can't solve your air-supply problem within the dive team, then it's all over.

You would think that this, too, would seem obvious to an untrained cave diver. However, scores of victims not only failed to plan their air supply with the possibility of air sharing in mind, but also didn't have octopus rigs. And when they attempted to buddy breathe sharing a single second stage, panic ensued and the result was a double drowning. And even an octopus rig doesn't do anything to protect you from a free flow, a high-pressure-hose leak, or a first-stage failure.

The American standard for cave diving is currently the dual-valve manifold (designed for either a single tank or doubles), which allows you to use two completely separate regulators. But this still doesn't protect you from a ruptured burst disk, valve failure, or tank-to-valve O-ring failure. So the concept of buddy diving and air sharing is taken very seriously.

Cave divers use a minimum hose length of five feet for their air-sharing regulator, and with the increasing use of scooters for "cave driving," seven-foot and ten-foot hoses are coming into vogue. Cave-diving class drills in an open basin, with the students trying to share air while following a line under blackout conditions, very quickly demonstrates the advantages of the long hose. The students in my initial cavern-diving course were sobered by the realization that had the drill using a short-hosed octopus in the open basin occurred in a real cavern situation, they would have been dead.

For low- or no-visibility sumps where the buddy system is essentially useless, if not downright dangerous, the standard is to have two completely separate tanks, so that there is total air-system redundancy. These tanks are usually worn in a side-mount fashion rather than on the back, so that the diver's vertical profile is reduced and he can more easily slip through low-ceilinged horizontal bedding planes. The cave-diving community is currently debating the pros and cons of adapting the separate-air-supply philosophy for all forms of cave diving.

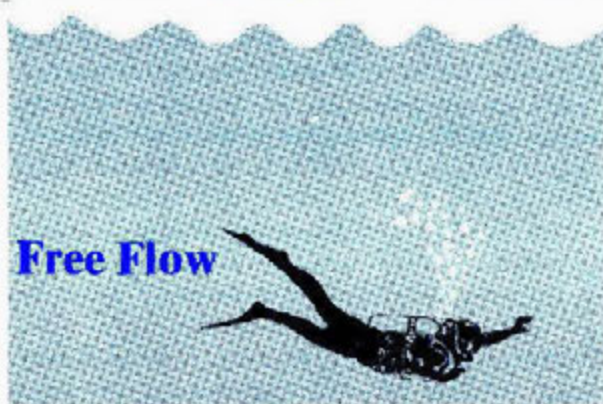
Light into Dark

It should also seem obvious that once you pass out

of the ambient-light zone, you will be totally dependent upon the artificial lights you bring. Yet time after time untrained divers enter with only a single light for two or even three people. When this light fails beyond the reach of daylight, the divers have no way of finding their way out of the darkness.

"The minimum recommended number of lights for cave diving is three per diver. Most cave divers carry four or even five."

The minimum recommended number of lights for cave diving is three per diver. Most cave divers carry four or even five, and I know of two reputable cave divers who each carry seven. The notion that you can't carry enough spares comes from an experienced cave diver who told me of one of his earliest trial-and-error experiences. He and his buddy had three lights apiece, or six lights for the team. When one light failed, they attempted to use a backup, but two of the lights wouldn't turn on. Then, two more floated away. They exited with only one working



If you want to try something new next New Year's Eve, visit Grand Bahama Island and look up the local dive club. Remar Sutton reported in his nationally syndicated "Fit Over 40" column that "members of the island diving club always do something that may seem a little rambunctious to non-scuba divers. We enter the water at 11:50 pm, sink about 50 feet to the sandy ocean floor near Treasure Reef and sip small quantities of a reasonable good champagne as the new year enters. Then we switch off our lights, break open some underwater liquid chemical fireworks, and explore the reef for a few minutes."

There's a fine little book called *Medical Examination of Scuba Divers*, edited by Jefferson Davis, M.D., and reviewed by Alfred Bove, M.D., which is just the ticket for physicians who want accurate diagnostic information about conditions which should prevent someone from scuba diving. The

light.

For "normal-visibility" conditions the "primary" light should be at least 35-watts, preferably brighter. (The difference between the typical small light used by ordinary open-water divers venturing into a cave and the powerful primaries used by trained cave divers can be compared to the difference between lighting a match in a completely dark room and turning on the overhead fluorescent lights.)

But while lights are very important, all the light in the world won't help you find your way out of a maze of dendritic passages that all look alike -- or if you run into silt, the number-one enemy of cave divers.

Next Issue: When even lights don't help.

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book covers otorhinolaryngology and ophthalmology, psychiatry and neurology, and common medical and surgical considerations, with a section which lists conditions for which disqualification from diving is recommended. Although the book is written for the medical community, a serious lay person may find it useful. Order it for \$13.50 from Medical Seminars Inc., One Elm Place, Suite 204, 111076 Wurzbach Road, San Antonio, Texas 78230.

The Japanese demand for sex organs from the California sea urchin is so great, that the state has imposed a moratorium on the granting of new diver licenses for urchin harvest. The gonads, called uni, are a delicacy widely served in sushi restaurants. Last year, more than 30 million urchins were taken from California waters, an increase in 50% from two years ago. Although a half pound of the finest Japanese uni sells for \$45 in Tokyo, the American variety only brings half that amount. Divers are paid from 15 to 70 cents per pound, with the average about 30 cents. Robert Young, an Oregon diver who works the area around Fort Bragg in Northern California says that "I can do about 6000 pounds on a good day, while an average diver can probably do 2,000 pounds. Young claims an experienced urchin diver can rake in as much as \$1,000 a day. The largest urchins weigh about a pound. Just before mating season in January, the gonads are about 20% of the body weight, and drop to 6% in April. There is little difference between the male and female sex organs ... at least to gourmets.