

ing, as a contribution to the Emergency Ascent Training Workshop. It had been originally written in response to a query from the Queensland Diving Industry Workplace Health and Safety Committee.

**Emergency Swimming Ascent Training (ESAT)
vertical ascent training and multiple dives
by instructors**

1 The risk of Emergency Swimming Ascent Training (ESAT) is essentially two-fold;

- a Decompression illness
- b Pulmonary barotrauma

The risk of "reverse squeeze" is present, but the incidence appears to be low.

Multiple ascents on a single dive modify, in an unpredictable manner, the kinetics of inert gas clearance from body tissues, in favour of the development of decompression illness.

2 In my opinion (and based partially on my own experience between 1978 and 1983 as a practising PADI open water instructor), it is better to have practised any skill (including ESAT) at least once before having to do it in anger. There is analogous data from resuscitation training that supports this contention, but I know of no firm data either way, relating directly to ESAT.

It should be appreciated that no student does it once only. It is done, as is "buddy breathing ascent" and "octopus ascent", once only in open water. It is practised several times in swimming pools beforehand. This prior pool practice is essential.

3 These practices have been applied, in Australia alone, to hundreds of thousands of student divers. Where are all the injured patients? I find it difficult to advocate curtailing the activity in the face of such admittedly circumstantial evidence. However my understanding of diving medicine causes me to urge strict practice codes for such training. I should be happy to discuss them if you wish, but these are my opinions only.

I believe "horizontal ascent training" is a poor (and not necessarily safe) alternative to ESAT. The concept that ESAT implies a rushed ascent is false.

4 It is the dive instructor who is a maximum risk. However 32 ascents a day is totally unacceptable, medically speaking and is unnecessary. In my view (and after some consultation) there should not be a necessity for an instructor (or his assistant) to do more than 10 ascents from a depth greater than 5 m during any single day with a student class (maximum 10 students). Even that number of ascents is medically undesirable, but difficult to reduce.

The maximum depth of the entire dive should be 5 m or less. The dive must not be a repetitive dive. The practice of conducting multiple open water classes with more than one student group on the same day is to be deprecated. I know it happens.

The use of the divemaster or the assistant instructor to do an equal share of the buddy breathing and octopus ascents is essential. I know at present PADI says only the Instructor can conduct the ESATs.

This approach would mean that each of the Divemaster/Assistant Instructor and the Instructor would conduct 10 ascents in 24 hours (excluding the snorkel dive), in a week-end open water dive course. Conducting the open water component of the course over 2 weekends would be safer, but will be opposed.

5 There is no hard data, except to say the fewer ascents above a total of 1 per dive, the better. However, slowly, painfully, and with the efforts of my colleagues in this Unit, the DAN Australia and DIMS (Diving Incident Monitoring Study) data is accumulating. Some meaningful data should emerge in the next 5 years.

A LETTER FROM THE U.S.A.

Larry Williamson

One of the first issues I would like to address is that I think it is a mistake to take an either or approach. Even when there have been rare occurrences of wide spread agreement on what could be best for people, no single solution or technique works every time. So the question should be, not what to throw away but what system is the most likely to be successful and then give that system the most support and give the other options their appropriate levels of support based on their own merit.

During discussions such as this people sometimes point to past results to determine what should be done next. During a recent (May/June 1993) NAUI Sources Forum, the debate focused on "Should Buddy Breathing be discontinued?" The majority said "No" citing such things as many lives were saved in the past because the skill was taught. However, the person saying this did not include how many died while unsuccessfully attempting buddy breathing. But even if they did include all of the past facts, the problem is that they all come from the past and are thereby incomplete or slanted by all of the other events that influence people's actions that were also at work in our culture. We should remember that no one who knew anything about history or current events regarding the relationships between countries predicted that the Berlin Wall would suddenly disappear without a shot being fired. The

Berlin Wall fell because there were people who were working on the future who were able to gain some freedom from their own past and stand in the question of "what could happen?" I invite us to imagine that right now we are in the year 2010 and we are looking back to the year 1993 and then ask ourselves if that was the time we began to address issues such as Diving Safety, Free Ascent Training, and Redundant Breathing Systems accurately and free from the past's distortions? Did we realign our training resources, based on what would give each person the best chance for survival, or did we keep on saying things like all "alternate air sources" are alike, pick anyone you want?

You may have wondered when my own personal bias would show up, here it is. There can be little room for advancement until the diving community can distinguish between true redundant systems such as SPARE AIR and Pony Bottles vs. octopus or so-called safe seconds. I think that this omission keeps diving in the dark ages as compared to other sports. Can you imagine how Sky Diving would be viewed if their instructors went around saying spare chutes are a good idea but you don't need one for yourself as long as your buddy has one and that you both jump from the same plane. Of course, it sounds ludicrous but after 13 years of SPARE AIR, Pony Bottles and octopus's all being available today's new diver is being told that their value to him are all the same.

Every training agency that I am aware of has a statement that goes something like this "without making specific recommendations we do support the use of all alternate air systems i.e. safe second, pony bottles and/or redundant systems". I believe such statements are gross errors of omission from a past directed viewpoint and all of its limits. Such omissions help perpetrate misconceptions of future divers. After all, they would expect really important safety information to be clearly stated. They would believe that the experts and the Great Leaders of Diving would have given them all of the important facts. When they read that **all** alternate air supplies are the same they would tend to believe it and later pass on the same myth.

What do I propose? I don't want any laws passed that make people buy SPARE AIR, nor do I want every training agency's specific endorsement. I do however believe that all who are the leaders in diving should do their very best to fully inform future divers of the distinctions and give all divers the right to do a free and informed choice.

I learned to dive in 1972 and was taught one free ascent from 15' (4.5 m) and the buddy system was supposed to be my final backup to any diving safety concern. I was told to practice free ascents on my own. This I did several times and reached a point of being able to come up from 50' (15 m) and even 60' (18 m) with some comfort and confidence. But then one night my buddy and I were chasing lobsters at 140' (42 m) and swimming at top speed,

when suddenly I was out of air. I looked for my buddy and saw his light way above me heading for the surface. He has run out of air just a few seconds before me and had no time to warn me. Needing air more badly than ever before in my life I started up. I estimate that I ascended to a depth of 70' (21 m) before I blacked out. Just before blacking out I realised that I was just one breath short of making it back alive. One small breath held the power of life or death over me and yet none were available to me. I also realised that if someone had tried to sell be one extra breath just before my dive that I would have looked him in the eye and said "I won't ever need it, I use the buddy system, and have practiced free ascents". Looking from my past my whole life showed me that I would probably never run out of air at a depth that I couldn't get back up from. Now too late I realised my error and that even though I would now pay any price for just one breath, it was just too late. My last action was to pop the CO₂ cartridge on my buoyancy compensator. I did reach the surface unconscious and was later revived. Of course, I never forgot that experience.

When I started Submersible Systems and began to make and sell SPARE AIR I knew it would be an uphill battle because I would be talking to people just like me who would say "I probably won't ever need it, after all I haven't drowned before etc. etc. " I have always known that even if all divers were given the opportunity to make a completely informed choice to carry a redundant system that some still would chose not to do so.

So I see my job is to help give them that choice, the choice to enhance their ability to rescue themselves. Progress continues to be made. Just this last month we received 3 letters from divers thanking us for saving their life with SPARE AIR. I am always thankful for such letters because I know that I didn't save their life, they did, I only helped give them the choice.

In closing, I again invite everyone in this conference to stand out ahead in the year 2010 and look back at 1993 and ask what did we give all those thousands of people who came after us. Did we begin to point out that an emergency ascent with a redundant air supply has the best chance of success, followed by a distant choice of trying to find someone else's octopus or did we say that the octopus was tied with practicing emergency swimming ascents and that a still distant 3rd recommendation was buddy breathing? Hopefully we will explain every option clearly and remind people that it is highly probable that you will not get a second chance about this decision, so make your decision clearly.

Finally, thank you for the opportunity to speak to you for I feel each and every person can made a small individual contribution to the outcome and that it is possible for this group to be the start of something for the future.

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CURRENT PHILOSOPHY AND PRACTICE OF EMERGENCY ASCENT TRAINING FOR RECREATIONAL DIVERS

Drew Richardson

The diving industry has worked hard over the past two decades to improve the safety of diving. The results have been more people diving safely. In comparison to other sports, diving has a low incidence of injury (Table 1). Relative to football, baseball, basketball, racquetball, tennis, swimming and bowling, recreational scuba diving has a lower injury rate.¹ Divers who dive within personal limitations, plan and follow proper diving practices, are generally able to avoid problem situations. Divers are encouraged to keep themselves fit, follow safe diving practices, and maintain diving skills.

The training organisations design course standards and materials to prepare trainees to dive safely with a

buddy after certification. Skills thought to be crucial to producing a competent diver are therefore included. Occasionally problems do arise while diving. Divers do need to be able to care for themselves and lend assistance to another diver. Because of this, diving courses include components on problem management.

The process of training and education of divers aims to instil a safety attitude in the diver. If the diver is properly trained and has a safety conscious attitude, few problems actually occur while underwater and those that do can usually be prevented by using good judgment and common sense in and around the dive site.

Diver training organisations' course standards emphasise attention to a pre-dive safety check (buddy check), good dive planning, relaxing while diving, careful monitoring of ones air supply and diving within ones limitations.

The problem of running out of air is probably the easiest problem to avoid, yet is one of the most life threatening. Years of diving medicine emergency treatments inspired Dr Tom Neumann of University of California San Diego (USCD), to write, "Neumann's First Law of Diving," which states "a diver should never try to dive without air in his tank." To keep from running excessively low on, or out of, air divers are trained to make a habit of checking their submersible pressure (contents) gauges frequently. The submersible pressure gauge, one of the most beneficial

TABLE 1

INJURIES IN VARIOUS SPORTS

Sport	Number of Participants	Reported Injuries	Incidence
Football (US style)	14,700,000	319,157	2.17%
Baseball	15,400,000	321,806	2.09%
Basketball	26,200,000	486,920	1.86%
Soccer	11,200,000	101,946	0.91%
Volleyball	25,100,000	92,961	0.37%
Water Skiing	10,800,000	21,499	0.20%
Racquetball	8,200,000	13,795	0.17%
Tennis	18,800,000	22,507	0.12%
Swimming	70,500,000	65,757	0.09%
Bowling	40,800,000	17,351	0.04%
Scuba	2,600,000	1,044	0.04%

Participants are individuals who participate in the sport more than once a year. Injuries represent someone who was treated in an emergency room for an accident relating to a sport or involving sporting equipment. Source: Accident Facts 1991 edition: National Safety Council (USA).