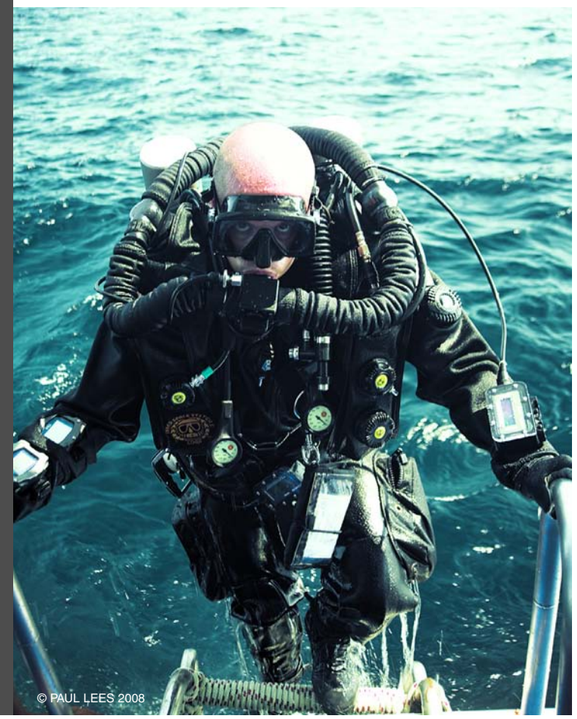
CCR: DESIGNED WITH DEEP DIVING IN MIND

+ LANCE ROBB'S MODULE ONE REBREATHER TRAINING ON THE ISC MEGALODON CCR AND OUR REPORT ON THE RECENT DEEP CAVE EXPEDITION IN SOUTHERN THAILAND USING MIXED GAS TECHNOLOGIES HAVE INTRODUCED YOU ALL TO CLOSED CIRCUIT TECHNOLOGY. LET'S NOW DELVE INTO THE ADVANTAGES AND DISADVANTAGES REBREATHERS BRING TO THE EXTREMES OF DIVING DEEP WRECKS, CAVES, AND SCIENTIFIC EXPLORATION. AND WHAT SHOULD BE CONSIDERED WHEN CHOOSING A REBREATHER FOR MIXED GAS DEEP DIVING APPLICATIONS?



: MATHEW PARTRIDGE

CCR divers Lance, Matt and Charles pre-dive checking prior to deep dive; Opposite: Mathew exiting after his lengthy deco

I was introduced to rebreathers over a decade ago and I've worked hard to master the techniques required to dive deep using this state-of-the-art technology. I'm now dedicated to passing on my experiences to those with an interest in technical diving using CCR. Be mindful that if you choose to move over to a rebreather with the intention of executing deep mixed gas dives, you too will need to work hard to understand the art of unit. Mastery of these machines takes dedication and practice, but for those willing to put in the time, the opportunities for exploration using CCR are endless.

SOME OF THE BENEFITS A REBREATHER BRINGS TO TECHNICAL EXPLORERS:

One major benefit is cost – deep technical dives using open circuit gear require insane amounts of gas. Rebreathers help reduce the need for large volume tanks for both deep divers and their support team. An example: a dive to 100msw using double tanks, would cost around US$200 in helium alone; multiply that by several days of diving and a team of divers and quickly you're up in the thousands of dollars. The same gas fill required using a rebreather to carry out a similar dive profile would cost around US$18*. It isn't rocket science, but if you make these types of dives regularly, you can see how much money you'd be saving and just how quickly you'd recuperate your initial investment of purchasing the unit.

More efficient decompression

In short, due to the onboard mixing capabilities of a rebreather, a diver is able to utilize the best mix for every depth of the dive. The effect – a

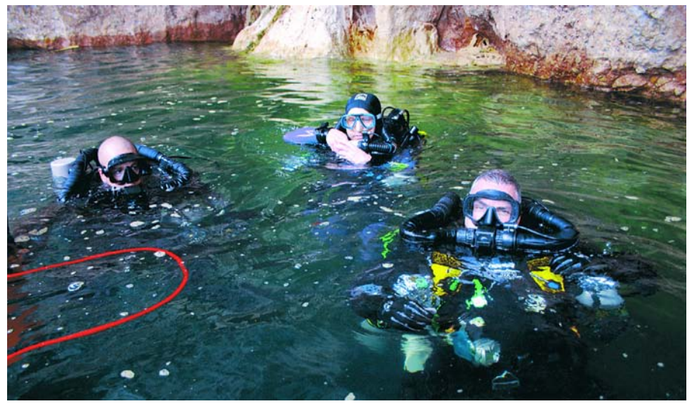
diver is able to wash out inert gas faster than using pre-mixed decompression tanks that only have a short optimum off-gassing period, resulting in a shorter decompression. There are other phenomena that need consideration when diving deep on mixed gases:
The increased risk of inner ear DCI that usually results in extreme vertigo and nausea putting the diver under high risk when still needing to complete a lengthy decompression or, even worse, getting hit in deeper water with little support.

The onset of this type of decompression illness has been noted when divers make gas switches that reduce the Helium content too fast by switching to Nitrox gases with too little or no Helium near, or at, the decompression ceiling. The adopted modern procedure is to implement Enriched Air Trimix (Nitrox with Helium in it) into the dive schedule to reduce the pressure gradient during gas switching, thus allowing the inner ear to off-gas safely. As the rebreather is continually mixing gas during the dive and providing optimum breathing gas, there is no need for gas switches during a normal ascent, so you create a much more efficient accent profile and in theory, reduce the risk of the inner ear DCI. It must be stated, however that inner ear DCI is a still a phenomenon that is not fully understood and the risk is still there on any dive.

Warmer moister breathing gas
During long exposures the body begins to chill. Breathing from the rebreather the inspired gas is warmer than that of open circuit supply due to an exothermic reaction-taking place in the unit's scrubber (CO2 cleaning device) thus enhancing the body core temperature for longer periods. This aids in reducing the risk of DCS, as becoming cold during a dive or dehydrated are known to pre-dispose the divers to DCS.

More bailout options
If you run out of gas using open circuit then that's just going to hurt, missing or not completing your required deco will most definitely result in the bends. The rebreather allows several ways of extending the gas supply allowing you to continue with your required decompression. Semi-closed circuit mode is one way of using your off board bail out gas via the rebreather to extend its breathable duration, typically 3-5 times that of open circuit. A good example would be a diver deep inside a wreck or cave becoming disorientated. Running out of gas on the rebreather would still leave a diver with say 20 to 60 minutes of remaining time before the loop breathing gas becomes Hypoxic allowing a diver more time to find the exit and survive the dive.

Streamlined equipment
Carrying large volume tanks teamed with several large decompression tanks creates weight and drag. Not a good thing if you have to swim for prolonged periods of time. The rebreather is significantly lighter than that of the open-circuit configuration creating a much more streamlined and efficient diver.



WITH OBVIOUS ADVANTAGES, THERE ARE ALWAYS DISADVANTAGES. THESE INCLUDE:
- Initial cost outlay for the unit and training.
- Higher equipment maintenance.
- Dedication to mastering skills required for mixed gas rebreather dives and a continuing need to further your education.
- More possible failure points.

But if you're serious about mixed gas diving, then I believe the advantages far outweigh the disadvantages for these deep technical dives.

The ever-evolving world of rebreather technologies ensures us that extensive research and development of new system design will in turn aid in improving safety for deep rebreather dives. But as we see a steady incline in the number of divers opting to use rebreathers for extended range and deep mixed gas dives, it's essential that the new rebreather divers ensure good training maintaining a high level of proficiency and earning their certification, not just being awarded it.

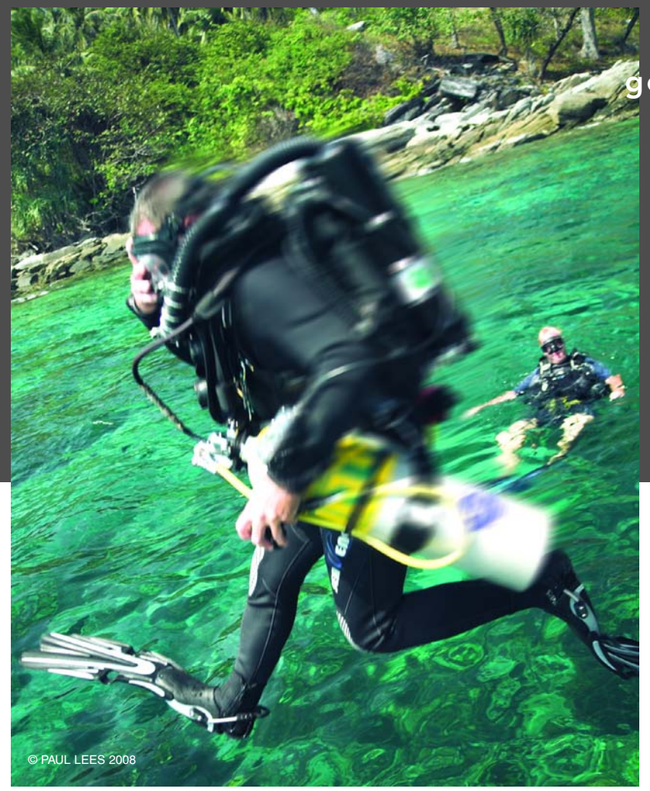
Make sure you're totally comfortable with your chosen Instructor and ensure you aren't pushed too far past your personal comfort levels. Don't run before you can walk, the training is ongoing. The idea of mixed gas CCR training is to provide divers with new tools and skills additional to those learnt on their entry level training. It's then up to a diver to practice with those new tools in a controlled manner and familiar environment.

There are several manufacturers producing rebreathers capable of using mixed gas all with advantages and disadvantages. Examples would be the Ambient Pressure range, the Inspiration and Evolution CCR, the Inner Space Systems Megalodon, the Ouroboros from Delta P (manufacturers of the VR3 diving computer), the O2ptima from Diverite, and soon more mainstream brands like OMS and Oceanic will be providing units to this developing market.

* Note: $ rates quoted by the author were accurate at time of publishing.

For more on mixed gas rebreathers or rebreather training, email Mathew Partridge info@tech-ccr.com

getting technical part III °



Opposite

Mathew performing his electronic checks.

Mathew demonstrating unit build up.

Deep divers ready to descend to the depths of the Koh Sok National Park in Thailand.

This page

A giant stride begins the adventure

Mathew entering the Sra Keow Cave in Thailand.