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Technical and Saturation Diving

In the world of recreational scuba-diving, you can earn your Deep Diver Specialty Course by paying US$175 and completing two open-water dives down to depths of between 18 and 40 m. For some divers, however, the 40-m limit prescribed by PADI (Professional Association of Diving Instructors) is not deep enough. Fortunately, for those wishing to venture deeper, there is the world of technical diving.

Technical diving is usually defined as diving that includes dives deeper than 40 m, required stage decompression, diving in an overhead environment beyond 40 linear meters from the surface, accelerated stage decompression and/or the use of multiple gas mixtures in a single dive.

Although commercial divers venture deeper, technical divers fall into a special category, since, by utilizing open-circuit equipment, they face infinitely greater risks. In fact, as we shall see in this chapter, it is no exaggeration to say that this elite group of divers work on the ragged edge of technological and physiological knowledge.

The deepest dive achieved by a technical diver using open-circuit scuba is 330 m—a mark set by French diver, Pascal Bernabé, on July 5th, 2005. However, deep as this may be, there is another group of divers who regularly dive even deeper. Saturation (SAT) divers operate at extreme depths as deep as 500 m, breathing exotic cocktails of helium, oxygen, and hydrogen. “Saturation” refers to the fact that the diver’s tissues have absorbed the maximum partial pressure of gas possible for that depth due to the diver being exposed to breathing gas at that pressure for prolonged periods.

Here, in Chapter 2, we consider the world of extreme mixed-gas diving. We discuss how revolutionary technologies such as rebreathers will allow technical divers to continue to dive ever deeper and how divers may one day overcome physiological problems such as decompression sickness (DCS) by simply popping a pill.

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1 The term “technical diving” was first coined in 1991 by Michael Menduno, editor of *AquaCorps*. 
TECHNICAL DIVING

Extreme technical diving requires extraordinarily high levels of training, experience, fitness, and logistical support. As of 2009, only eight technical divers are known to have ever dived below 240 m using open-circuit scuba equipment. More people have walked on the Moon and those who understand the perils of this high-risk underwater activity would argue that traveling to the Moon is less dangerous! The deep-diving daredevils of the technical diving community push far into the dark labyrinths of extreme ocean depths. During these extreme excursions, they encounter myriad dangers ranging from disorientation and oxygen toxicity to high pressure nervous syndrome (HPNS) and nitrogen narcosis. Some succumb to the dangers of breathing helium, a gas that can reduce even the most prepared diver to a nervous, quivering wreck. If they survive the gauntlet of these hazards, there are the problems of ascent. If they ascend too quickly, all the nitrogen and helium that has been forced into their tissues under pressure can fizz into tiny bubbles, causing a condition known as the “bends”, which may result in paralysis and death.

If you ask recreational scuba-divers about technical diving, you will get different answers. While newly minted scuba-divers may talk about their 20-m dive for months, experienced technical divers frequently plan dives in the 60–100-m depth range. However, there is an elite cadre of technical divers that plan even deeper dives. In the same way as the military seductively draws in new recruits through the imagery of high technology and personal challenge, sport divers are enticed to experience the “new frontiers” afforded by technical diving, but apart from the depth that technical divers reach, there is some disagreement about what the term “technical diving” means. Some divers argue that technical diving is any type of scuba that is considered a higher risk than conventional recreational diving, while others seek to define technical diving by reference to the use of decompression. A minority in the diving community contend that certain non-specific higher-risk factors require diving to be classed as technical diving. PADI, the largest recreational diver training agency in North America, has adopted this as their definition of technical diving:

“Diving other than conventional commercial or recreational diving that takes divers beyond recreational diving limits. It is further defined as an activity that includes one or more of the following: diving beyond 40 meters, requiring stage decompression, diving in an overhead environment beyond 40 linear meters from the surface, accelerated stage decompression and/or the use of multiple gas mixtures in a single dive.”

PADI’s depth-based definition is derived from the fact that breathing regular air at pressure causes a progressively increasing amount of impairment due to nitrogen narcosis that may become serious at depths of 30 m or greater. Increasing pressure at depth also increases the risk of oxygen toxicity based on the partial pressure of oxygen in the breathing mixture. For this reason, technical diving often includes the use of breathing mixtures other than air. PADI’s mention of decompression alludes