opinion

Text by Mike Ange

In my previous two articles, I discussed the importance of building a comfort zone and improving the diver's ability to anticipate problems. As divers' skills continue to develop, they will venture into deeper water and perhaps more hazardous conditions. The more variables introduced into any given dive, the more likely it is that divers will encounter an unanticipated problem. Extended bottom time and deeper depths also increase these probabilities. This article will discuss methods of building a safer and more comfortable diver at the more advanced levels by preventing the diver from anticipating issues before they occur. While this may sound contradictory to the earlier articles in this series, in reality, it is taking those skills to the next level.

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Transferring Anticipation Skills to

Problem Resolution

Scripts

Perhaps the largest safety issue in training diver responses is the use of a script, which is shared with the diver for training, especially when no off-script reinforcement is completed. By the time a diver reaches advanced or rescue training, he or she should have spent significant time learning to deal with out-of-air emergencies, buddy out-of-air emergencies, flooded mask, free-flowing regulators and other commonly encountered issues. However, for the vast majority of students, these are panned scenarios.

"Hover just off the bottom and I will swim up to signal that I am out of air." Every experienced instructor has done these drills a million times. In fact, many instructors have done the drills so many times that even they are ill-equipped to deal with the real-world scenarios that occur. At the risk of stating the obvious, real-world issues rarely arrive with warning or use a ready-made script. The student diver sucks in, gets nothing to breathe and is on you for air in a split second, or worse, off to the surface in a death-defying sprint, which may not defy death.

Adding realism

So, adding some realism to your training protocol also requires adding spontane-

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ity, distraction and surprise. This is not as hard as it seems, but it can be dangerous for instructor and student if not well-controlled. For recreational divers, I recommend building these skills in 1 to 1.5m of water, never deeper. With this hard bottom control factor, the worst case is that the diver simply stands up and the lungs will generally be pressurized to no more than 0.8 to 1m of water depth or 1.2 to 1.45 psi gauge (pressure above surface).

Historically, I began adding the "respect for the unexpected" at the open water level. Most agencies require that divers experience an out-of-air situation. Frequently, this is completed by having the diver kneel in 1m of water; the instructor then turns off the air; and the diver watches his pressure gauge fall before either standing up or reaching back and turning his or her own air back on.

As a follow-up, to introduce the idea of the unexpected, brief your divers that in the next out-of-air drill, they will swim to their dive buddies, keeping their regulators firmly in place and exhaling continuously. When they reach their dive buddies, they are to signal out-of-air, secure the alternative air source, clear it by taking four to five breaths, and then stand up slowly. After standing, have the divers orally inflate their BCDs to create and improve muscle memory.

Position the divers in a sort of spoke-and-wheel configuration, so that the divers who will be out of air are kneeling very close together and facing toward their dive buddies. The buddies should be 5m or so away and spread out a bit so the configuration forms a semi-circle, and all of the divers should be kneeling in no more than 1 to 1.5m of water.

The instructor will randomly select a diver and gently turn off the air. The idea is to prevent the divers from knowing which diver will be out of air next. This works best if you have three to four buddy teams participating in the skill at the same time. When the diver detects he or she is out of air and begins the mad dash to the dive buddy, the instructor should move with the diver and remain in a position to prevent a breath hold and be ready to turn on the air if necessary. After the diver successfully commences sharing air, move back for the next diver.

At the advanced level, complete this same skill, but to further enhance the effect, have the divers assemble an underwater puzzle, or do something similar, to provide a distraction while completing the drill. It is critical that you limit the depth for this skill and maintain close contact with your diver during this drill.

Risk level in drills

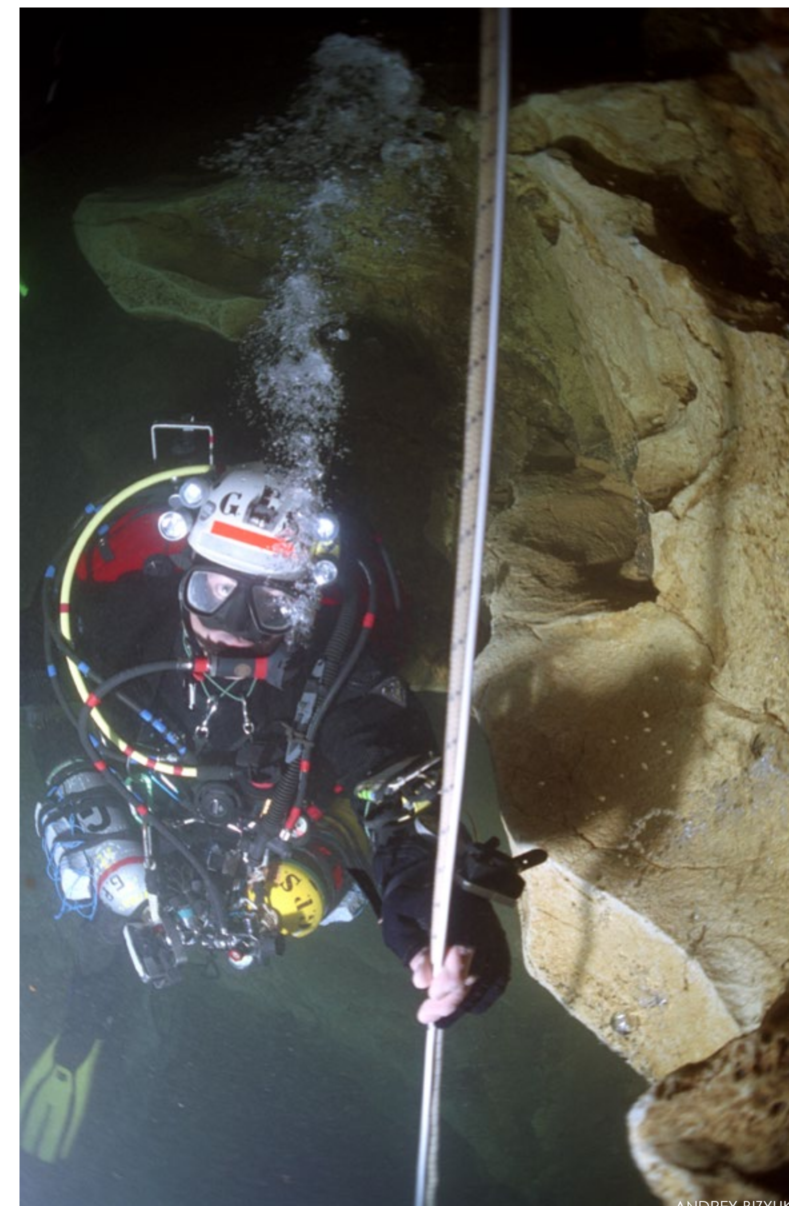
It is difficult to complete true out-of-air drills without introducing an unacceptable level of risk. Over the years, many different methods have been tried, such as using submersible pressure gauges (SPGs) that do not read accurately or using minimum fills in cylinders to create an out-of-air situation. NONE of these are recommended, because the out-of-air situation in these scenarios cannot be anticipated by the instructor, allowing him or her to be in a position to prevent diver injury.

However, beginning at the advanced diver level, I do make it a habit of surprising my student divers with urgent requests to share air, and I continue that process all the way through the most advanced instructor classes that I teach. In the words of one technical instructor candidate, "Once a set of twins barrels at you at light speed, trying to drag the regulator from your lips that first time, your whole perspective and outlook on life changes. It makes you suddenly mortal—I don't care how many dives you have."

Unexpected entanglement

In public safety and cavern training courses, another drill used frequently by instructors is unexpected entanglement. This skill can also be introduced at the rescue diver level. In the typical scenario, the divers are asked to follow a navigation line while wearing a mask that either limits or completely restricts vision. Lenses coated with petroleum jelly will distort the view and simple cloth covers, or duct tape, can be used to completely restrict vision. (Safety note: If these skills are completed in open water, then covers that can be quickly and easily removed are required for safety).

As the diver swims along the navigation route, the instructor will



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use either the primary guideline, or another line on a reel, to create entanglements. In the cave- and wreck-training world, it is typical to use this drill to drive home the importance of equipment rigging and streamlining. Dangling gear easily becomes entangled gear (with just a little help from the instructor)—hence, the frequently heard term in cave and cavern classes: "Every dangle is a tangle."

In overhead environment courses, cutting the line is a true risk to safety due to the potential "spring back" of stretched line, the resulting loss of the line and therefore the loss of the pathway to exit. So, divers are encouraged to reduce entanglements without cutting. The process of working out of an entanglement reinforces problem-resolution skills and improves panic resistance in divers.

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As with all of these skills, safety concerns are paramount. Restricting a diver's movement and navigation ability underwater is a risk that must be managed. The instructor should only use lines that are the size equivalency of a cave or wreck reel line (#24 or #36 braided). A sharp and well-maintained line cutter, or a pair of shears—not a knife—must be readily available to the instructor. You should also use a sacrificial reel, so there is no hesitation in cutting if necessary.

Blind trust

Perhaps the second most deadly trend we see in diving today is the reliance on technology, especially blind trust. The truth is that modern diving equipment rarely ever fails, statistically. However, it is truly a bad day for your friends and family when the tiny statistic becomes a major tragedy, because you are not equipped to respond.

We see this failure most commonly in forms of diving that use advanced technology like closed-circuit rebreathers (CCRs). This is not surprising as the newer technology is more complicated, has more failure points, requires more training for sufficient responses, and finally, due to the fact that reactions are not merely reflexive, they require a higher level of situational awareness.

Whether you are diving standard tried-and-true open circuit gear at 20m or doing 100m helium diluent dives on a CCR, you must add practice for malfunctions to your training regimen if you want to be as safe as possible. Most divers have never practiced for malfunctions like blown hoses or blown O-rings, and few continue to practice those failures covered in initial training, like free-flowing regulators. Not only should responses to these issues be practiced, they should be practiced with as much spontaneity as possible—which can be accomplished by employing a good dive buddy at a shallow-water dive site, but more on this in a bit.

The more complex the dive type, the more difficult it is to train divers for responses. It is horribly dangerous to assume an open circuit technical diver, even with thousands of dives, can immediately move seamlessly to a CCR, and unfortunately, industry accident statistics clearly show a number of failures where this has been attempted.

In these more complex dives, responses will frequently require multiple steps. An out-of-air situation at 20m requires one to reach one's buddy, share gas and complete a controlled ascent. With a decompression obligation at 50m, this process becomes much more complicated.

Response time

We used to teach a technical diving rule which states that every atmosphere below five cuts the time to respond in half and adds 50 percent to the complications in responding. This rule is obviously stating the impossible, but the underlying concept is well established.

PIXABAY / PUBLIC DOMAIN

Underwater flashcards simulating CCR failures during a dive are used by instructors from the beginning of training to teach divers how to go through gear failure drills in a controlled way.

Problem Resolution

I teach my advanced technical divers to have two types of response—an immediate reaction (muscle memory) and a rationale checklist response. The immediate response is to get good gas to breathe. Every technical diver should have a bail-out source that is safe to breathe at every phase of the dive (in some limited cases, this could be a buddy's gas), and once the diver is on the gas, he or she has time to deal with other issues. Divers may only have 15 seconds or so before blacking out due to "bad" gas in a CCR or a cylinder, so this step is critical.

Checklists

The second phase—AFTER the diver has gas to breathe—may include a checklist. For CCRs, it may look something like: Signal my buddy, loop purge, O_2 pressure, diluent pressure, etc. For an entangled cave diver: Signal buddy, gas pressure check, slow controlled breathing, move each part of the body slowly to determine what's entangled, think about how to reach the entanglement without exacerbating the problem, etc.

These checklists should be written down—even though you cannot carry all of them on a dive—because the process of writing and refining the checklist builds memory retention and forces the diver to think about the efficacy and order of each step. I have long encouraged my technical, military and public safety dive students to do "dirt dives" with problem simulations.

Anyone who dives frequently at popular cave diving sites has probably seen cavern students with towels or blindfolds around their heads doing line drill "dirt dives." These drills are complete with added problem resolution, after action reports (i.e. what went wrong, what went well, how do we improve, etc.) and checklist test.

When a problem is "encountered," work the checklist. Does it let you live to dive another day? If not, modify the checklist.

I encourage my students to do visualization exercises as an extension of the dirt dives. These are essentially mind dives, and if you complete them over dinner with your dive buddy, you have the added benefit of being able to test each other on your checklist.

Flash cards

Take this process diving. Nearly two decades ago, when I was a training director with the ITI group, we developed underwater flash cards that simulated CCR failures during the course of a dive. The card would simply say something like high ppO_2 alarm or flooded loop. The instructor would use these from the beginning of training to teach divers how to run through gear failure drills in a controlled manner.

Better instructors would continue to use the cards throughout the course to throw surprises at the divers when they least expected it. Imagine swimming through the cave in your cave CCR class when over your shoulder appears a high ppO_2 alarm card—will you purge the loop? Bail out to open circuit? Or, as many divers do the first few times, freeze in indecision?

Primary takeaway

Here is the primary takeaway from this series of articles: As an instructor, I consider indecisiveness a threat to every diver's safety and what I must ferret out of my students at all cost. From the most basic level to the most advanced, I tell my divers: "Do something and make every step of that something a slight improvement of your situation." In this manner, and only in this manner, do you improve your probability of surviving a dive gone bad.

All of the drills and conceptual ideas in this series of articles have been oriented toward the goal of determining what makes my situation better through the building of a better conceptual understanding of what must be done to solve even an unknown and unanticipated problem. With that well-ingrained understanding, every diver is more likely to "do something" and therefor survive, even when a good dive goes horribly wrong. As an added benefit, this process improves the diver's risk benefit analysis process and may serve to prevent an accident before the diver ever enters the water.

Panic is the primary killer of divers and perhaps, depending on the source you reference, swimmers too. Unfortunately, panic is not always the screaming, thrashing fight that we all think of when we hear the word. It is frequently silent and frozen, doing nothing as life quietly slips away. Either way, if you can break the cycle of panic, you increase your odds of survival.

Anticipate the unexpected, improve your understanding of both why and how things work underwater, and practice responding to every conceivable failure—and you have a good start. ■