



opinion

Text by Simon Pridmore

Failure points is a very important concept in the technical diving world, which is highly relevant to every form and level of scuba diving, but it is rarely addressed and often neglected.

Let me begin, as I often do, with a short story.

Andrew was a relatively experienced technical diver. One warm spring day, he back-rolled off a tender boat into the exciting, fish-filled, current-strewn waters of northeast Bali, deflated his wing and descended. As he was rolling around onto his front to get his bearings, his world exploded. Suddenly he had no regulator in his mouth and he was surrounded by a thousand Jacuzzis-worth of bubbles. As he was only at a depth of 6m (20ft) or so, he decided to ascend to the surface first and then see what had happened, rather than try and sort everything out under the water. So, exhaling continuously, he rose up and emerged to the sunlight, surrounded by the chaos of a frothing ocean.



Scuba Confidential:

The Concept of Failure Points

He made himself buoyant, then inspected the damage. Reaching for his regulator hose, which was whipping around him like an angry snake, he found that his second stage was completely gone and air was pouring out of the

open hose-end. That was the source of all the bubbles then! He reached behind his head and turned his valve off. As he flipped onto his back and started to kick back towards the dive boat, he realised that he had also somehow managed to

lose a fin. He climbed on board, a little shocked but otherwise fine. His diving day was done, however.

An hour or so later, the rest of the group returned bringing with them Andrew's missing second stage and his lost fin,

which they had found on the bottom under the boat. The second stage still had the hose swivel attached, while the fin was missing part of the plastic buckle on one side and the strap was hanging loose.

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Failure Points

it also introduces another o-ring into your air supply path. It adds a further thing that can go wrong to a survival system that already has plenty of things (mainly o-rings) that can go wrong. So, the number of points where the system can fail is increased.

The primary rule behind the concept is that you aim to reduce, rather than increase, the number of failure points in your gear. You only add a failure point when there is a fundamental need that is more important and justifies adding risk. And I am afraid, in the game of chance we call scuba diving, a gas supply failure trumps an aching jaw every time.

As for Andrew's fins, yes, they had stainless steel straps, and these are indeed preferred for cave diving, but the straps he had bought were attached to the fins with normal plastic fittings. The idea behind using coiled springs instead of rubber thongs is not just so that you do not have loose bits of rubber flapping around your ankles, where they can get caught up in your guide line, it is so that you remove the failure points that flimsy plastic buckles represent and, by so doing, you make it less likely that you will lose a fin on a cave dive. So, to be fit for purpose, stainless steel straps need to be permanently bolted into the body of the fin.

What had gone wrong?

Afterwards, Andrew tried to analyse what had happened. Everything had been fine on the boat but, once he started descending, the second stage had sheared off at the point where the hose swivel had been screwed into the low-pressure hose. He concluded that, when he had fitted the swivel to his regulator the previous week, he must either have failed to tighten it, or cross-threaded it without noticing, and either increased pressure in the hose or the shock as he entered the water, or a combination of both, had caused it to break off. When the hose started whipping around freely, the jet of compressed air spurting out of it must have hit his ankle right where the fin buckle was, snapped the connection and knocked the buckle off.

He had bought the hose swivel because his jaw would ache after long dives, and he had read that a swivel might be the solution. His fins were quite new too. He had bought them because they had stainless steel heel straps and he was planning on doing some cave diver training. He had heard that normal floppy rubber fin straps represented an extra hazard in a cave environment and that stainless steel straps were safer.

Not just bad luck

Andrew initially put the accident down to bad luck, but, of course, bad luck is never the only cause of accidents. Andrew had made a couple of mistakes and one of these was to neglect to consider the concept of failure points.

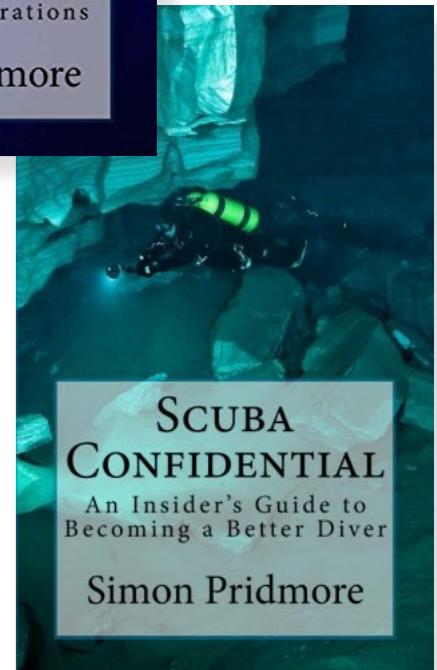
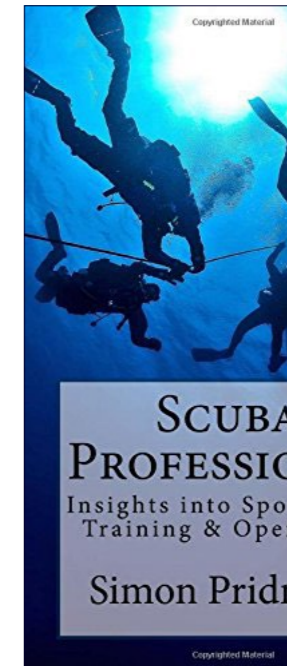
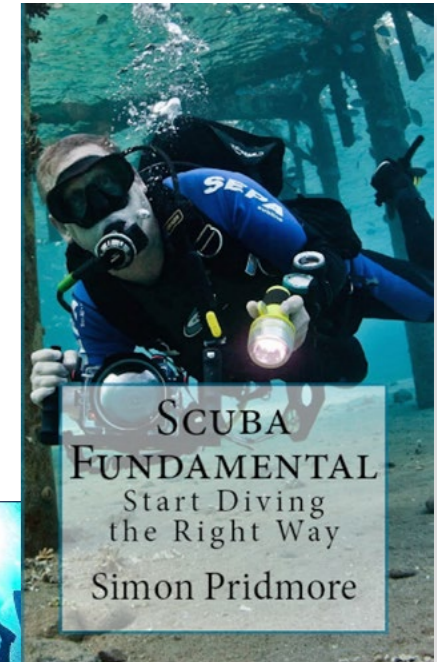
A second stage swivel can indeed relieve jaw fatigue but



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opinion



ANDREY BIZYUKIN

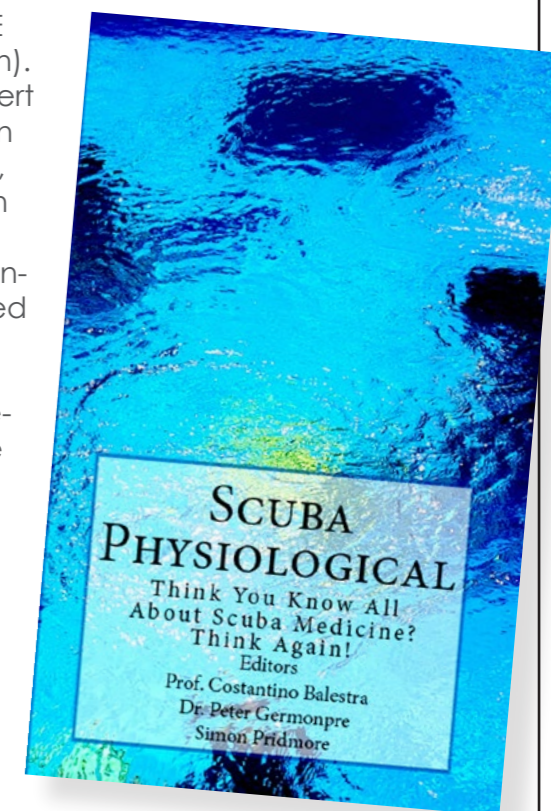
A New Book for Scuba Divers!

If you are a diver, much of what you learnt about topics such as decompression sickness and narcosis in your scuba diving class is over-simplified and some of it is just plain wrong, as diver training agency texts have not kept pace with the science. Despite 170 years of research, the nature of decompression sickness and decompression stress remains unknown. Great advances have been made to make diving safer, but there are still glaring gaps in our knowledge. *Scuba Physiological* provides us with a good summary of what we know, a glimpse of where current science is taking us, and some good tips to make us all safer divers now.

The chapters in *Scuba Physiological* were originally written by scientists in the field of decompression research as part of a three-

year project called PHYPODE (Physiology of Decompression). Simon Pridmore is not an expert on diving medicine but, when he came across the material, he knew that many people in scuba diving beyond the scientific community would be interested in it. So, he contacted the original authors and proposed an abridged, edited, simplified and re-formatted e-book, which would make the information more accessible to the general population of divers. They thought it was a great idea and *Scuba Physiological* is the result.

Scuba Physiological: Think You Know all About Scuba Medicine? Think Again! by Simon Pridmore is available on: **Amazon.com**.



Misconceptions

Since mainstream diving equipment manufacturers first noticed that technical diving was attracting more divers and was not just going to be a passing fad, they have been trying to make equipment to sell to technical divers. But, there are aspects of technical diving that many of them just do not understand.

For example, producing wings and harnesses with fixed D-rings that cannot be moved around shows that they are completely ignorant of the idea of configuration and making fins with stainless steel straps, AND plastic buckles shows that they have no idea of the concept of failure points. They are like many local restaurants in my home island of Bali that sell pizza. What they serve to customers looks like a pizza, but it sure does not taste like

pizza. It is as if they once saw pictures of a pizza, but without a list of ingredients, and just guessed what should go in it.

What can you do?

There are potential failure points in every piece of gear you dive with. Recognize that they are there, eliminate them when you can and, where you cannot eliminate them, make sure you have a plan for what to do when the failure happens—a plan that works and that you have tested in a pool or shallow water.

When you are planning to buy

equipment, compare options with the concept of failure points in mind. For example, BCDs all have multiple potential failure points, some more than others. Have the manufacturers considered the

There are potential failure points in every piece of gear you dive with. Recognise that they are there, eliminate them when you can and, where you cannot eliminate them, make sure you have a plan for what to do when the failure happens...

concept when they built the product? Do they use double cable ties on the corrugated hose, so that if one breaks, the hose still holds? Is there an internal air cell to keep the wing functional if the external casing gets torn?

Finally, if, like Andrew, you are buying gear with technical diving in mind, buy products made by specialist technical

diving equipment manufacturers who know what they are doing. ■

Simon Pridmore is the author of the international bestsellers, *Scuba Confidential: An Insider's Guide to Becoming a Better Diver*, *Scuba Professional: Insights into Sport Diver Training and Operations* and *Scuba Fundamental: Start Diving the Right Way*. He is also the co-author of the *Diving and Snorkeling Guide to Bali and Raja Ampat* and the *Diving and Snorkeling Guide to Northeast Indonesia*, as well as a new adventure travelogue called *Under the Flight Path*. His new e-book, *Scuba Physiological: Think You Know all About Scuba Medicine? Think Again!* is now available on: **Amazon.com**. For more information, please visit the author's website at: **SimonPridmore.com**.



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