technical matters

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# Technical Diving Equipment

**The equipment used by technical divers differs considerably from that used by recreational scuba divers. Even when it appears similar, the technical diver will usually either carry more equipment or configure it slightly differently. In this article, we will look at the different equipment configurations used by technical divers, the reason for those differences and also whether there are any lessons recreational divers can learn from these configurations.**

Text by Mark Powell

Over the years, recreational diving has developed a standard set of equipment configuration. Despite different makes and models there is a consistent set of gear shared by the majority of recreational divers. Buoyancy control is usually provided by a jacket style buoyancy compensator (BCD). The diver's main cylinder contains the majority of their breathing supply, which is delivered via a primary regulator. A spare regulator or octopus is usually carried to provide a source of air to the buddy, or in the case of a problem with the main regulator. Additional equipment is often carried in the pockets of the BCD or clipped onto it.

Technical divers have quite a different set up designed to deal with a different set of conditions to those experienced by the recreational diver. There are a wider range of styles of equipment configuration, although all of these styles have been developed to address the same key requirements.

Tech gurus John Chatterton and Richie Kohler trying to disentagle themselves after a technical dive

ROSEMARY E. LUNN

## Redundancy

The key requirement for any technical diving configuration is that it provides an adequate level of redundancy. Technical diving usually involves mandatory decompression stops, and it may be anything from a few minutes to a few hours before the diver is able to ascend to the surface without risking decompression illness. In this case, the loss or failure of any piece of vital equipment would be a major problem. As a result, the technical diver looks to provide redundancy of equipment so that he can resolve equipment problems whilst still completing the required decompression. Equipment that is required for the safe completion of the dive should always have a backup.

Even if you never plan to explore the far end of a cave or dive to 100m, there are still some aspects of technical diving kit configuration that would benefit a recreational diver:

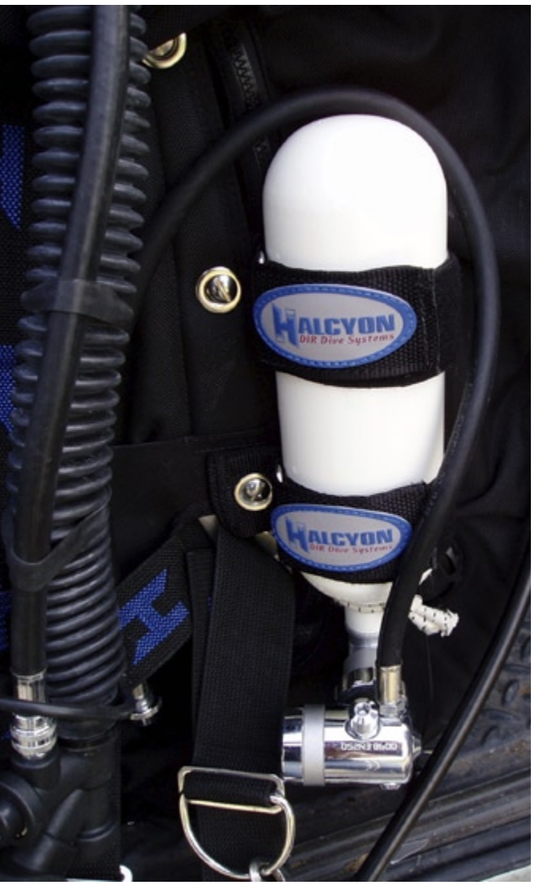
- Streamline your kit and eliminate any danglies.
- Ensure you have redundancy for any critical kit.
- Make sure you carry enough gas to deal with the worst case.
- Consider a long hose on either your octopus or your primary.
- Ensure your backup regulator is always accessible.
- If you have a single delayed surface marker bouy, then make sure it is orange or red.

## Don't be a Christmas tree

By adding backups, the technical diver ends up carrying significantly more equipment than the recreational diver. If this is added in a haphazard way, or without consideration of how the configuration will work as a whole, it is very easy for the technical diver to become overwhelmed with equipment.

Many divers carry equipment "just in case" it is needed without ever thinking about what is really required. When combined with a poor choice of equipment placement or a lack of storage space, the diver can end up looking like a Christmas tree with pieces of equipment randomly clipped on and dangling from every conceivable spot.

This dangling equipment can introduce a number of additional risks. Firstly the diver may have so much clutter that when they need to get a specific item of emergency equipment, they cannot find it amongst all the other equipment. Secondly, dangling kit may become lost, caught in a piece of wreckage or entangled in a line.




A pony cylinder is not sufficient redundancy for technical diving

## Streamline

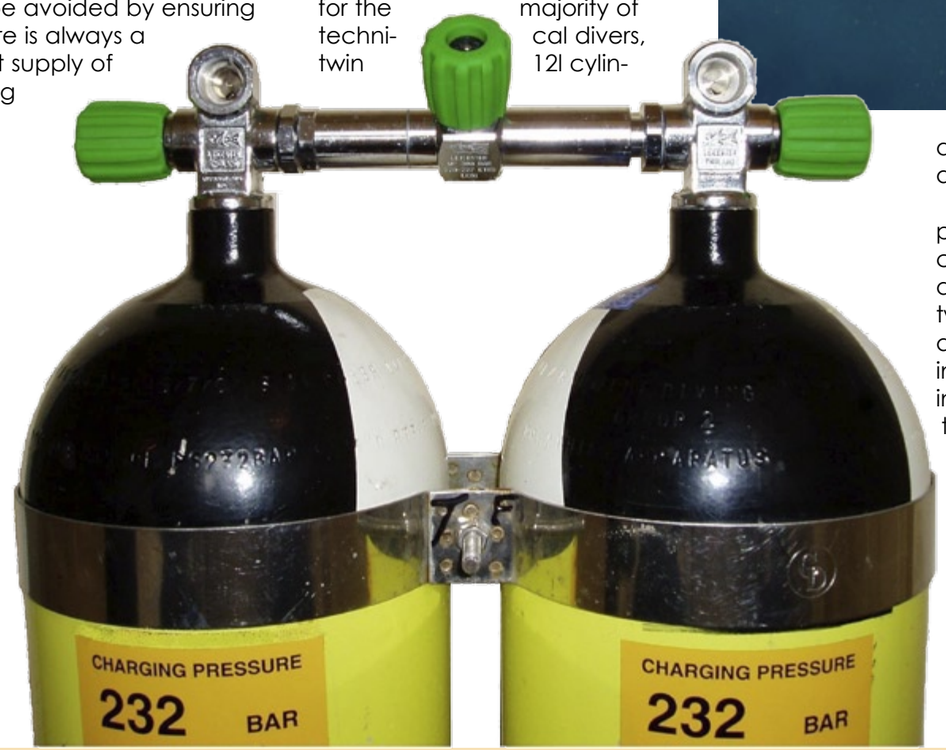
In order to avoid this Christmas tree effect, technical divers try to streamline their equipment and the placement of it. Contents gauges are clipped on rather than allowed to hang down. Reels, Delayed Surface Marker Bouys (DSMBs) and emergency equipment are stored in pockets rather than dangling on a lanyard. The same principles can be applied by the recreational diver to ensure their kit is streamlines and the Christmas tree effect is reduced.

We all know that human beings are not designed to breathe underwater. For this reason, divers need to take their own breathing gas with them when they dive. It is essential that enough gas is taken to complete the dive. For a recreational diver to run out of air is bad enough, but for a technical diver, it is not an option. If a recreational diver runs out of air on a no stop dive to 20m, they simply have to get to the surface. However, on a decompression dive where the diver may still have 20 minutes of decompression to complete, they are faced with the decision of staying down, completing the decompression and drowning, or going to the surface and risking decompression sickness. This is a choice that should be avoided by ensuring that there is always a sufficient supply of breathing gas.

## Twins

The use of a 'pony' cylinder may provide enough gas to allow an ascent from recreational depths, but the volume of these cylinders is simply not enough to allow an ascent plus decompression stops from greater depth. This means that a pony cylinder is not sufficient redundancy for technical diving. The use of twin cylinders or twinset is a way of providing this redundancy.

A twinset is usually made up of two identically sized cylinders with a regulator connected to each cylinder. These can vary in size. Twinsets comprising two 7l cylinders are popular with recreational divers who want to have additional redundancy, but for technical diving, cylinders smaller than 10l do not provide a sufficient volume of gas. Twinsets made up of 12l, 15l, 18l or even 20l cylinders are available but, for the majority of technical divers, 12l twin cylinders provide a good balance of weight and gas volumes.




In twinsets, the two cylinders are often connected at the valves by means of a manifold

Twinsets can be configured as independent or manifolded. Independent cylinders provide complete redundancy, as there is no link between the two cylinders. Thus, if one cylinder has a problem, the other is completely independent. However, as the two cylinders are independent, the diver has to switch from one to the other in order to balance the gas usage in the two cylinders. Whilst switching regulators should be easily within the skill set of a technical diver and should be a routine action, it can sometimes be forgotten when the diver is in the middle of a problem.

The other option is to manifold the two cylinders together. This involves connecting the two cylinders at the valves by means of a manifold. This has the benefit that the gas from both cylinders can be accessed from the primary regulator. The disadvantage is that, in the case of a problem, the diver must shut down the problem regulator, or isolate the two cylinders by means of a valve in the middle of the manifold, otherwise the gas from both cylinders will be lost. For this reason, it is essential that a diver with a manifolded twinset can carry out a 'shutdown' to prevent the complete loss of their gas.

VIKKI BATTEN

## Long hose

One of the most distinctive aspects of a technical diving setup is the use of a long hose. A typical recreational diver will have their main regulator and then an 'octopus' regulator, which can be donated to their buddy in case of emergency. This octopus reg is often, but not always, on a slightly longer hose than the main regulator.

Technical divers tend to use a much longer hose, from 1.5m to 2m in length. There are a number of reasons for this. When diving in an overhead environment, such as a cave or inside a wreck, then if one diver were to go *out of air* (OOA), it may be difficult to swim out whilst in the side by side position that a normal length octopus would require. With a long hose, the divers can be one in front of the other and so can easily swim through restrictions.

Of course, most recreational divers will never go anywhere near a cave or any level of wreck penetration but a long hose is still useful, even in an open water environment.

If you try to ascend while breathing off your buddy's short hose, you will need to be very close together. Sending up a DSMB, controlling the ascent and holding a safety stop are much more difficult when you are very close together and 'in each other's faces. Combined with the stress of the initial OOA, this can be enough to turn a difficult situation into a full blown incident.

The long hose gives you the space to perform all of these tasks with enough room to remain comfortable and composed.

*The first reason for donating the regulator in your mouth is that you know this regulator is working.*

It is possible to use a long hose configuration even on a recreational single cylinder set up.

## Which regulator?

The long hose could go on the octopus, but most technical divers put the long hose on their primary regulator. This is because, in the case of an OOA, they would plan to donate the regulator in their mouth. This is not what the majority of divers were taught in their entry level courses, so why should this method be adopted?

The first reason for donating the regulator in your mouth is that you know this regulator is working. The OOA diver will be under stress and putting a working regulator in their mouth is the quickest way to calm them down. Another reason is that many people believe that an OOA diver is more likely to take the regulator from your mouth rather than hunting around for an octopus.

The last reason is that technical divers frequently carry multiple cylinders. These cylinders carry gasses that are only breathable at certain points of the dive. If you breathe the gas at the wrong depth, then oxygen toxicity could be a very real risk. We know that the regulator in our mouth always contains breathable gas, and so by donating this regulator, we are ensuring that the OOA diver is getting a safe source of gas.

## Bungee

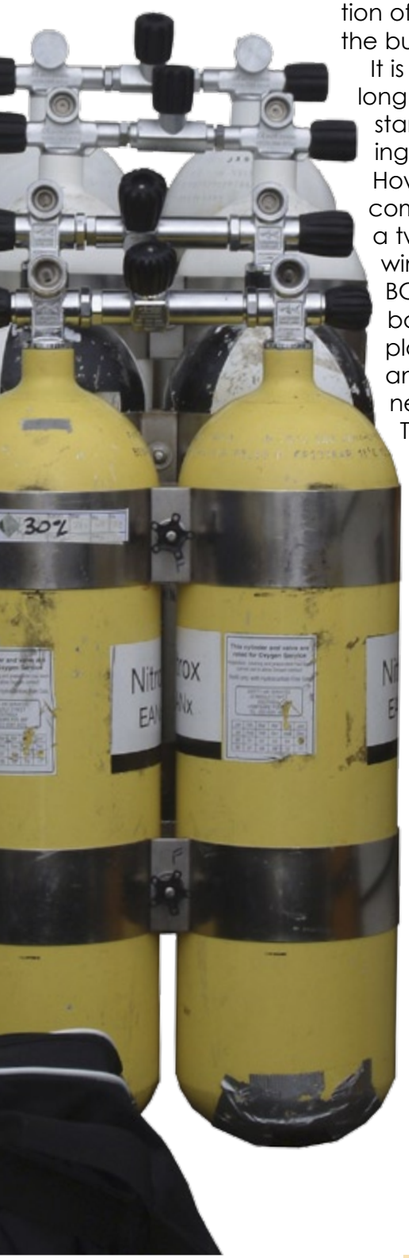
Of course, if we donate our regulator, then that leaves us with no regulator. This is not a situation that we want to be in for very long. If we now need to start hunting around for our backup, ensuring that we don't take a deco gas regulator by mistake, then we are just moving the problem along from

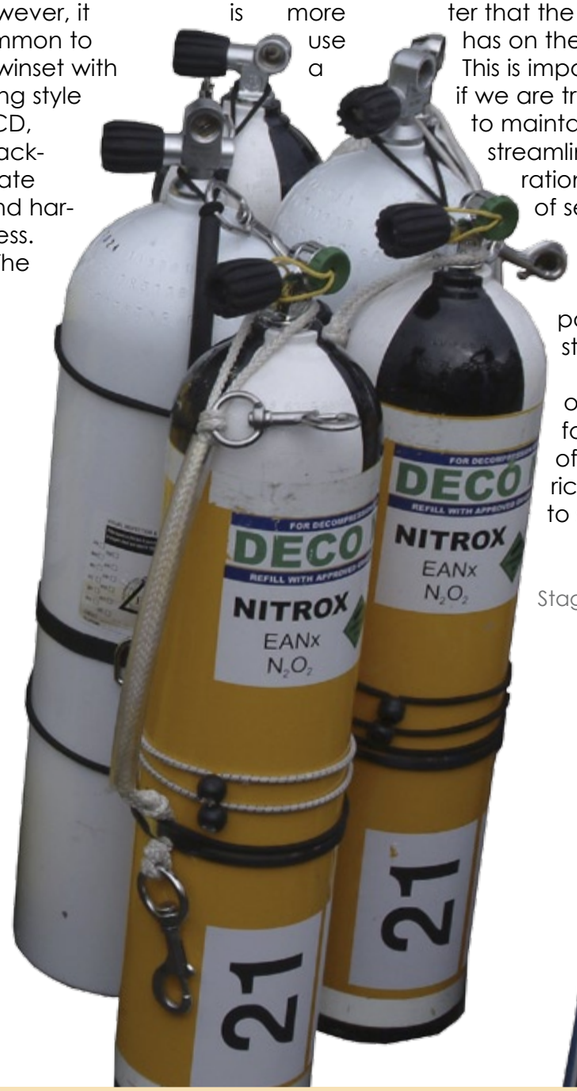
Rich Walker (left) demonstrating the reach of the long hose. In what is known as the *Hogarthian configuration*, it is the primary regular that is fitted with this long hose, which is routed around the head. The secondary regulator is fitted with a normal length hose and is suspended just below the chin on a bungy cord as seen on author Mark Powell below. See main text for full explanation

the OOA diver to ourselves. For this reason, the technical diver does not store his backup in his pocket, or clipped on somewhere on his chest, but instead, he stores it on a bungee around his neck. This means that once they have donated their primary, it is just a question of ducking the head and putting the bungied backup into their mouth.

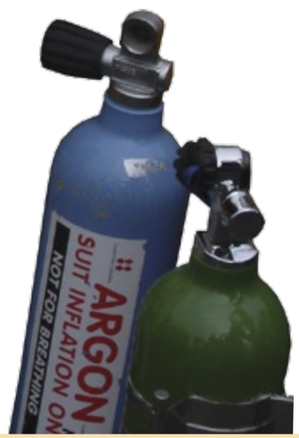
It is possible to use a twinset and long hose setup in conjunction with a standard BCD style jacket, providing that the jacket is sturdy enough. However, it is more common to use a twinset with a wing style BCD, backplate and harness. The wing provides the ability to have increased buoyancy to offset the twinset and also puts the buoyancy in the same place as the twinset. This usually makes the setup more comfortable then a BCD style configuration. The harness also reduces the amount of equipment and clutter that the diver has on their front. This is important if we are trying to maintain a streamlined configuration. When this type of setup is correctly configured it can be much more comfortable than a single cylinder and pony mounted on a BCD style jacket.

Technical divers will often carry multiple gases, for use on different parts of the dive. One or more rich nitrox mixes are used to speed up the decompression, and there may even be an additional gas that is breathed during the descent. These additional gases are carried in what are typically known as stage cylinders. These are usually clipped into the diver's chest and their waist and hang at their sides.

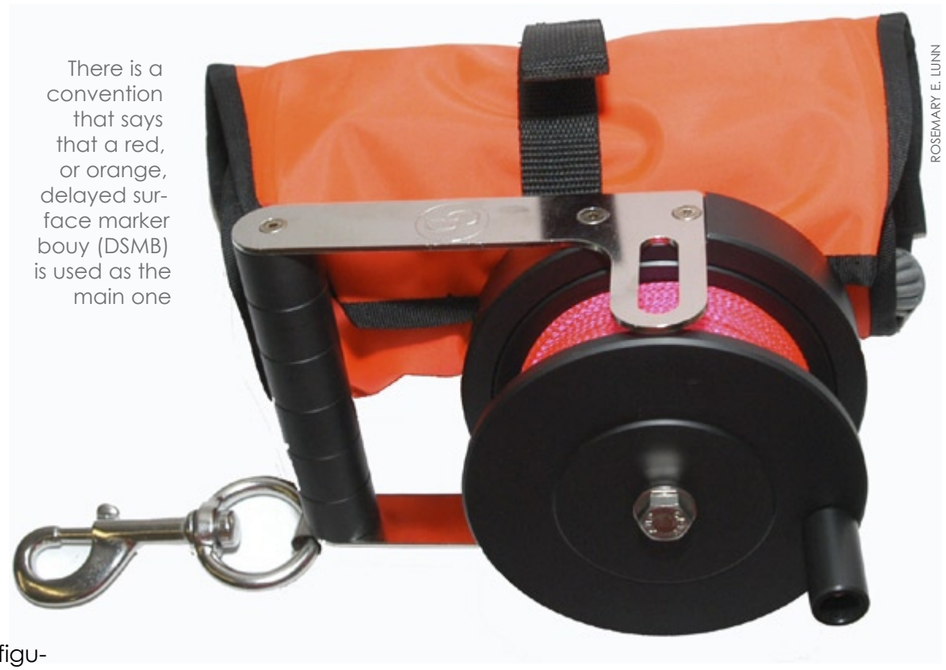



Stage cylinders




There is a convention that says that a red, or orange, delayed surface marker bouy (DSMB) is used as the main one



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## Marker buoy

Amongst technical divers, there is a convention that a red or orange DSMB is used as the main DSMB. They would also typically carry a spare DSMB complete with spare reel or spool. In addition, most technical divers also carry a yellow DSMB. This is used to signal that the diver has a problem and requires additional gas or other help. Typically, this is sent up the same line as the main DSMB and will often have a slate attached, which allows the diver to indicate what help they need. Of course, there is always the potential for confusion if a recreational diver has a yellow DSMB, and so all the recreational diving agencies through the British Diving Safety Group have agreed that if recreational divers carry a single DSMB then this should be red or orange rather than yellow.

The use of rebreathers has become very common in technical diving but that is a subject for another article...

*Mark Powell is one of the leading technical diving instructors. Mark has been diving since 1987 and instructing since 1994. He is a full time technical diving instructor for a number of the leading agencies and teaches all levels up to and including Advanced Trimix. Mark has led a number of expeditions to various parts of the world including the Middle East, Costa Rica, Malta and the Red Sea but is usually found diving the wrecks around the coast of the UK.* ■

GLOSSARY

Back Gas — The gas carried in your main (back mounted) cylinders.

Stage Cylinder — a) In the United Kingdom, a generic name for any cylinder carrying additional gas to that in the main cylinder.

Stage Cylinder — b) In cave diving, a cylinder that is dropped or 'staged' at a specific point in the dive. As such, it could contain deco gas, travel gas or bottom gas.

Side Slung — Another name for a stage cylinder, so called because it is usually connected or slung on the diver's side.

Deco Gas — The gas to be breathed during some of the decompression stops and used to speed up the rate of decompression. The stage cylinder used to carry this may also be refered to as a deco cylinder.

Travel Gas — Gas that is used during the descent if the back gas is not breathable on the surface. The stage cylinder used to carry this may also be referred to as a travel cylinder.

Bottom Gas — Sometimes the back gas in the twinset is not enough and an additional stage cylinder of the same gas is carried to breathe during the bottom time portion of the dive. The stage cylinder used to carry this may also be referred to as a bottom gas cylinder.

Bailout Gas — The gas carried by a rebreather diver in the event that they experience a problem with their rebreather. They would switch onto this bailout gas and then continue the ascent breathing from the bailout cylinder(s).