

Peak Buoyancy Skills

Good buoyancy control is a key skill for all divers, both novices and experienced divers alike. In fact it is probably the most important diving skill to master. With good buoyancy control a diver uses less air, will feel more comfortable in the water and is less likely to suffer an uncontrolled buoyant ascent. Despite being such a key skill, most of the UK diver training agencies have noticed a reduction in general buoyancy skills. This reduction in skills is not restricted to novices; many experienced divers have poor buoyancy control.

The first step to good buoyancy control is correct weighting. It is a fact that the majority of divers carry too much weight. This ranges from a couple of kilos to tens of kilos overweight. Again this is not just restricted to novices. Experienced divers are often over weighted, some to a remarkable extent. They set up their weight belt and then never change it. In the mean time, with experience, they need less weight; their equipment may change, they may add pony cylinders, deco cylinders, torches, etc. As a result they may be significantly overweight without realizing it, they have come to think that it is normal and change their diving technique to compensate for being over weighted.

If you dive over weighted then you must put more air into your BCD or dry suit in order to achieve neutral buoyancy. This additional air significantly increases the risk of an uncontrolled buoyant ascent because as you ascend there is more air in the suit or BCD to expand. This leads to the surprising situation where, by adding weight, you can make yourself more buoyant on your ascent rather than less. By reducing the amount of over weighting you reduce the chances of an uncontrolled buoyant ascent.

It is good practice for all divers, no matter how experienced, to do a buoyancy check at the start of each diving season, mid way through the diving season and whenever they dive with a new or different kit configuration.

To perform a buoyancy check, go through the following steps. At the start of your dive with your full dive kit in place, take a normal breath from your demand valve and empty your BCD. Once all the air has been dumped from your BCD you should be floating with the water at eye level. Breathe out and you should start to sink. Perform the same test at the end of the dive when you have less air in your cylinder, ideally with about 50 bar left. You will be more buoyant, so will float higher with a full breath of air, but you should still start to sink when you breathe out fully. If you can do all this, you are correctly weighted. If you start to empty your BCD and immediately start to sink or start to sink before the BCD is fully empty then you are over weighted. If you do not sink even with no air in the BCD then you are under weighted.

There are a number of exercises that can be used to teach you buoyancy skills at various levels of experience. These same exercises can also be used to test your own personal level of buoyancy control.

Once you are correctly weighted try the following exercises in the pool.

1. Fin pivots – On the bottom of the pool achieve neutral buoyancy while in a horizontal position, then raise and lower the upper body from the bottom of the pool using the depth of respiration. Breathe in and you start to rise, breath out and you will start to sink. This is only possible if you are neutrally buoyant
2. Hover just off the bottom of the pool without touching the bottom for 1 minute.
3. Hover in mid water for 1 minute

4. Hover 1m off the bottom of the pool for 1 minute, ascend another 1m and hover for a further minute, ascend another 1m and hover for a further minute, ascend to the surface.

In open water you should try to keep your buoyancy under control at all times. This starts with the descent. Do not just dump all your air and sink to the bottom like a stone; instead you should be doing a controlled descent where you can stop the descent at any point. I once dived with a buddy who used to descend so fast that even with no air in my BCD and suffering with suit squeeze in my dry suit I couldn't keep up with him on the descent. After struggling to keep up with him for a few dives I convinced him to do a weight check - we managed to remove 6 kilos from his weight belt while still allowing him to descend easily.

A controlled descent will help in a number of areas; it will help in avoiding narcosis, as rapid descents are a predisposing factor to nitrogen narcosis; it will help if you have trouble clearing your ears as you have time to clear them or stop and ascend slightly. A controlled descent is especially important if the dive site is deeper than you expected. There are numerous examples of experienced divers jumping into the water after being told that the site is 30m, doing an express descent to the bottom without checking their gauges and getting to the bottom only to find that they are at 40m rather than 30m. This will ruin even the best-planned dive plan and if diving on Nitrox could be fatal!

Once on the bottom it is important to maintain neutral buoyancy rather than just bump along the bottom. In many countries British divers have a bad reputation for buoyancy control due to their habit of crawling over the bottom rather than swimming over it. This is due to their tendency to be negatively buoyant as a result of not putting enough air into their BCD or dry suit. Once you reach the bottom take a few seconds to adjust your buoyancy so that you are neutrally buoyant. This will make the rest of the dive much more comfortable and is likely to reduce your overall air consumption as struggling with incorrect buoyancy during the dive will cause you to breathe harder or more irregularly than if you are neutrally buoyant. Being neutrally buoyant also gives a much more enjoyable feel to the dive as you really do feel weightless and can move effortlessly in three dimensions. If, on the other hand you are negatively buoyant on the bottom then you do not get the feeling of weightlessness and can only move in the same two dimensions as on land. If the bottom is silty then by being neutrally buoyant and floating above the bottom you will greatly reduce the amount of silt you kick up which can have a marked effect on visibility.

To ensure you are neutrally buoyant, once you reach the bottom you can do a few fin pivots as described above or try to hover just off the bottom. This only takes a few seconds and you can then start your dive knowing you are at least starting with the correct buoyancy. During the dive it is important to keep adjusting your buoyancy as required. If the bottom is uneven, if you are on a wreck or on a wall, then it is likely that you will need to make numerous small adjustments to your buoyancy. By making these small adjustments as and when necessary you can ensure you are neutrally buoyant at all times. This is made easier with practice as you get a feel for when you will need to make these adjustments. In general, anytime you ascend more than, say 10cm, the buoyancy increase in your BCD or suit as a result of Boyle's Law will be enough to make you positively buoyant and so you will need to dump air to remain neutrally buoyant. In the same way, dropping more than a few cm will reduce your buoyancy and you will need to add more air. The change will, of course, depend on your depth, as the relative change in the buoyancy will be greater at shallower depths. For example in ascending the 5m from 20m to 15m an air space will expand by 20% whereas in ascending the 5m from 10m to 5m an airspace will expand by 33%.

This means that adding or dumping air in order to compensate for changes in depth will need to be done more often at shallower depths.

You can also use your breathing to fine tune your buoyancy. Breathing in will naturally increase the amount of air in your lungs and make you more buoyant; breathing out will have the opposite effect.

This can be used to adjust your buoyancy during a dive. Breathe in to rise above that rock or piece of wreckage and then breath out to descend again once past the obstruction. With practice your breathing can be a very effect method of buoyancy control, however, it should only be used for small alterations in buoyancy. Never hold your breath in order to ascend more than half a metre as you will risk over expansion of the lungs and the possibility of an arterial gas embolism.

The ascent is the most important part of any dive. It is only once you start to ascend that the nitrogen dissolved in the body's tissues will start to be released. Good buoyancy control helps to ensure that the ascent is always at the correct rate - reducing the risk of decompression illness. If you are correctly weighted and neutrally buoyant at the start of the ascent then it only takes a slight squirt of air into your BCD or dry suit to begin the ascent. However if you are over weighted or negatively buoyant then you will need a lot more air to begin the ascent. Again Boyle's law tells us that this air will expand as we ascend and with more air needed to start the ascent we will have correspondingly more air to dump as we ascend if we want to avoid an uncontrolled ascent.

Good buoyancy control is especially important if you are doing decompression diving. Unless your buoyancy control is good enough to hold a safety stop without moving up or down more than half a metre then you should not even think about doing decompression diving. If you are unable to hold a safety stop then it is likely that you will be unable to hold a decompression stop and missing a decompression stop is likely to result in a decompression incident. For this reason it is good practice to do at least a 1-minute safety stop on every dive in order to perfect this skill. Once you can reliably hold the safety stop for at least a minute without exceeding half a metre variation from the target depth then you can start to think about decompression dives. Ideally you should be aiming for a variation of +/- 0.3m or less from the stop depth.

Once you are correctly weighted that isn't the end of the story. Anytime you change your equipment you will need to re-check your weight. If you switch between a 12L and 15L cylinder then you will need to adjust your weight and even two cylinders with the same capacity can vary in weight by 2 or 3 kg. If you add or remove a pony cylinder this will affect your weight and also your buoyancy. A new dry suit can vary considerably in buoyancy characteristics and even wearing an extra layer under your dry suit can make a significant difference to your buoyancy – remember layers keep you warm by trapping air and that air is going to change your buoyancy. There is a definite link between divers suffering uncontrolled ascents and the use of new or different equipment. If you are using any new equipment – even a new set of fleecy underwear – then do a buoyancy check at the start of the dive.

Hopefully it is clear that buoyancy control is a key skill that should be reviewed regularly by all divers. Reducing over weighting, regular weight checks, practicing buoyancy control exercises and being aware of the impact of new equipment can all help to perfect your buoyancy control skills. With increased buoyancy control you will be more comfortable in the water, use less air, reduce your risk of an uncontrolled ascent and generally enjoy your diving much more.