

The counterweight solution – lock, stock and two smoking ballasts

By Claude Chapuis

Which competition organiser has never questioned their own management of the safety aspects involved in Constant Weight or other depth-based disciplines? Although the concept of safety is made up of many factors, the fundamental question remains: how do you get an athlete back to the surface when he cannot manage on his own? Numerous people have addressed this question, sometimes with unexpected answers. Here is the approach of the Nice group of freedivers, home to Loic Leferme, Guillaume Nery and sometimes, Pierre Frolla.

The evolution of freediving safety

From the beginning, there have often been safety divers around to keep an eye on the athletes. In 1989, we had an iron sled just like Mayol's. It did not go below 20 metres. At the bottom, two divers equipped with twin bottles spent about an hour waiting for the “brats from above” to finish playing Jacques and Enzo. Their job was to pump air from their bottles into the sled's lift bag in case the freediver was unable to inflate it himself.

In 1994 we stopped putting down safety divers for sled dives because we could not find anyone to wait long enough on SCUBA at 50 or 60 metres. We therefore doubled the amount of inflation devices and put in place draconian rules, but in the end, everything relied on the athlete himself. In 1996, at the first AIDA world championships: 36 athletes and 120 safety divers for Constant Weight. Why? Because we couldn't be confident in freedivers we didn't know personally, so the safety divers, positioned in pairs every 20 metres, would have to pass an athlete from one team to another, up to the surface. At the same time in No Limits, thanks to Olivier Heuleu and Loic, we put into practice a safety system allowing two divers situated at depth to send a freediver, line and weight back to the surface by means of a rope-locking climbing handle and a lift bag. Later on, we were even putting down three divers for this system which we called “assisted line”, as this seemed to work more efficiently.

As lanyards became increasingly widely-used, we organised the AIDA world cup in Villefranche in 2000: 120 athletes and 40 safety divers. It was enough for the safety diver to be positioned 10 metres from the plate, awaiting the athlete, so that if any problems occurred, a lift bag could be attached to the wrist of the athlete, resulting in the freediver speeding up to the surface and the safety diver remaining at depth. Around 2002, with the increasing depths being achieved in Constant weight, this system became difficult. During Guillaume Nery's training sessions, we began pulling up the line and weight once we had felt his bottom turn from the surface. So throughout the entire ascent, the weighted rope would follow about 5 metres below Guillaume. Of course, at the end of the line we had 5, instead of 50 kgs. In 2003, we put into practice the counterweight system for Loic and Guillaume. From now on, it is used on every dive outing.

Counterweight... what's that?

It is a safety device permitting the rapid resurfacing from depth of a freediver tethered to a line, by means of a counterweight. Instead of pulling the line up by hand, which is always just that little bit too heavy, there is a weight situated on the surface just like the counterweight of a lift in a building, which is dropped, its descent pulling up the other end of the line to which the freediver is connected.

A counterweight without a boat?

Why not! Just take two large solid buoys or a pair of 20 litre containers joined by an aluminium bar as a flotation device with a pulley positioned in the middle of the bar. A replica of this

~~apparatus should be held at a distance of 3 or 4 metres by two bars. What you therefore end up with is roughly a square, with four floats. Such a light and portable system can be used at shallow depths (20 to 40 metres). Beyond these depths, it is not safe to train without a boat, the whole thing being too complicated.~~

One line, two pulleys and two ballasts

We work on the principle that it would be surprising to see freedivers use a counterweight system for depths of 20 metres. Once past these shallow depths, we might suppose that a club would have to get hold of a small inflatable boat, but as we have seen, a portable version of the counterweight system is also available to less fortunate freedivers who make their dives from shore.

First of all you need a rope at least 8mm thick, a lifeline for all self-preserving freedivers.

The ballast on the athlete's side of the line should be as light as possible in order to minimise loading of the line and various components. 5kg is fine. In lakes, some athletes have told me of using a mere 1kg, but this is only suitable for depths of 20 metres in still waters, not for dives to 100 metres in the sea. Our well-known spot is the bay of Villefranche, where there is little current in the mornings. We would use up to 10kg of ballast if there was a little "rip" through the bay, but overweighting the line to get it vertical is plain stupid. Strong currents mean extra effort up and down for a freediver and represent bad conditions for deep diving. Equally, slightly lazy athletes who like to warm up with a spot of Free Immersion often ask for the line to be weighted more heavily, say 15 to 20kg. It would be better to have this load on a separate shallow line rather than weigh down the official diving line. So, in the end: two pulleys, or sailing winches, a wedge to fix the line and a counterweight about three times the weight of the opposing side.

For a more upmarket version, you can opt for a self-locking pulley device that allows the counterweight release mechanism to be set in motion at the push of a button.

A word of warning on self-locking devices in the case of very heavy loading of the line: in the case of No Limits a bottom weight plus a 30 to 40kg sled require a counterweight ballast of around 100kg. Under such loads a self-locking device can become aggressive on the rope, literally "biting" in. What you can do in this scenario is simply to put two twists in the lines around some solid peg or bar aboard the boat.

Stick to the rules rigorously!

Having an apparatus which lifts an athlete to the surface is all well and good but it must work perfectly and without exception. Rigorous standards are the order of the day, everyday.

The pulley

The line must not leave the pulley. Therefore the pulley must have a deep groove which, most importantly, must be closed so that the line cannot be dislodged by the motion of waves.

The line

The line must be rinsed after every outing and left to dry in such a way that nobody walks on it.

Counterweight

The counterweight must be able to resurface an athlete at a rate of at least 1 metre/second. To test this, one must perform numerous experiments and take the average speed of ascent. It is vital to perform this test with an athlete attached to the line who is simulating the limp posture of a

blackout, as the hydrodynamic resistance can be substantial. In general, three times the weight of the athlete's official line should be used as a counterweight.

The view of Guillaume Nery...

"The idea of a counterweight system emerged in Reunion Island in 2004, during my world record attempt in Constant Weight. I was looking for a light and efficient safety apparatus which would replace safety divers. The system is, in my opinion, the key to safety at depth. It has been an invaluable element in my progress. In addition to its practical aspects (operable aboard any boat since it is installed on the side; takes 5 minutes to set up; is simple to use, and doesn't require much manpower,) it is the extreme reliability of the counterweight which allows me to dive in total serenity. After my turn at the bottom plate, the first few metres of ascent are the most difficult physically and psychologically, so knowing that my surface team have set off the counterweight is very reassuring during this time. I can close my eyes and fin serenely."

The lanyard

The lanyard must be attached to the wrist of a freediver. Some athletes prefer to keep the lanyard clipped to their weightbelt. This is totally useless in the event of a problem because if a freediver drops his weightbelt, he also drops the lanyard. If he wears two different belts, experience has shown that sometimes when letting the weightbelt drop, it remains attached to the lanyard belt! It is equally important to imagine the day when your lanyard gets caught. If it is attached to your wrist, you will be able to see the source of the trouble. More importantly however, try asking a friend to simulate a blackout at 15 metres and not to move, then try to pull up the line, bringing him to the surface with the lanyard attached to their weightbelt: the hydrodynamic resistance is enormous. By contrast, if the lanyard is attached to the wrist, then the athlete is pulled towards the surface in a narrower profile and veritably glides!

The lanyard must not be able to detach itself by accident, otherwise the counterweight will be useless. We have discussed at length with Loic whether the lanyard should be irremovably affixed. If a freediver is very deep and most probably under the influence of severe narcosis, in the midst of problems he might be tempted to release the lanyard, again rendering the counterweight useless. To avoid this, it is vital the athlete has total confidence in his surface team to, above all, engage the counterweight around 5 seconds after the turn in Constant Weight or around 15 seconds after the arrival of the sled in No Limits.

Ballast

For the same reasons, it is a good idea to use weights with a small diameter (such as weight-lifting discs) for ballast, as a large diameter means more resistance during resurfacing, which in turn requires the counterweight ballast to be even heavier.

The view of Loic Leferme...

"It is a system which has allowed us to continue the adventure of No Limits, without needing Claude, Francois or Delphine to dive on Trimix to 80 or 90 metres. It became contradictory to ensure the safety of an athlete by putting safety divers concerned with their own wellbeing at risk! This simple and reliable system is used on every training dive of mine, and on every occasion the brake is released after I begin my ascent. For No Limits, I would insist on a solid structure at the surface due to the sheer load of equipment required, compared to Constant Weight. In my opinion, safety divers have no part in the future of deep freediving. Everything must centre around the lightest possible apparatus in order to avoid overloading the line. For this very reason, AIDA have recently modified their rules."

Precautions

- When a freediver is down, no-one must put their feet or leave possessions in the boat near the line being used, because if the counterweight is activated, there is always the risk of seeing that fin or wetsuit top you left hanging around fouling up the system.
- There must be no safety divers or freedivers in the water around the counterweight zone.
- Avoid any “dog-legs” in the rope which might otherwise cause friction. Two big pulleys which spin freely and a rope whose width is suited to the pulleys. Nothing else.

The vital role of teamwork

Like everything we have done since 1989, group effort is vital in the running of such a system. There must be someone in charge who makes the decisions. He times the descent of the diver with a stopwatch, feeling the line with his hand. When the athlete turns and begins his ascent, he pulls on the line to get some initial momentum. This is absolutely fundamental as it acts like a signal to the surface team, letting them know the athlete's whereabouts. Any freediver who does not give this pull on the rope during a bottom turn must not be allowed to dive close to their maximum depths. We drill this automatic procedure into beginners from the very start: I turn, I pull on the rope. Once the jolt is felt by the person in charge on the surface, he counts 5 to 10 seconds and then orders the brake to be released. Thus, the weight beneath the athlete follows him to the surface. If a blackout should occur, the bottom weight would catch up with the lanyard of the athlete and drag him to the surface at the same speed of a normal ascent. This means an end to deaths where the safety divers have not been able to get a collapsed athlete to the surface in time or after the failure of a balloon to inflate.

There should be someone responsible for the release of the brake. He carries out the instructions of the leader and does only two things: he makes sure that no-one entangles their feet in the rope or gets too close to the counterweight in the water, and secondly, he opens the the brake which holds the counterweight when the team leader shouts “Open!”

The two safety divers warn the team leader about the imminent arrival of the athlete at the surface by holding up their hands and the team leader shouts “Close the brake!” In this way, the whole apparatus need not come to the surface and goes unnoticed by the athlete.

The ideal system?

The counterweight is useful because it allows one to avoid having safety divers waiting at the bottom, sometimes at great depth, themselves unsure of whether their actions will be enough in case of an emergency. It simplifies the logistics of a deep dive and can be put in place anywhere and at any time, which is rarely the case with safety divers. It is a system that gets an athlete to the surface at the same time he would have arrived under normal conditions. These days, athletes have to announce their expected dive time in a competition. Should the athlete not appear within view of the surface in his announced time, then the counterweight is released. In any record attempt or maximum training dive, the counterweight must systematically be released upon ascent. To be complete, the system needs only a live video feed of the bottom plate.

Claude Chapuis