

Redundant Gas Supplies

As one gets into more advanced diving, one of the first items that becomes desirable is a redundant gas supply. It allows a margin of safety above the free ascent to the surface that was taught as a last resort in basic open water class. More advanced dives can be too deep to easily allow a swimming ascent to the surface, can involve situations where it is undesirable to surface away from the established entry/exit point, can have overhead environments that prevent direct access to the surface, and/or may have decompression obligations that act as a "virtual" overhead. A redundant gas supply provides peace of mind when diving in any environment where a hurried, unplanned trip to the surface is undesirable.

There are essentially three kinds of redundant gas supplies: pony bottles, stage bottles, and isolatable main tanks. Each has advantages and disadvantages, and each can be appropriate for different forms of diving. The first, the pony bottle, is the most common commercially available type. This is any independent system (gas cylinder with attached regulator) that is mounted directly to the main tank. Examples include 6, 13, 19, 30, or even 40 cu. ft. tanks mounted directly to the main tank using special brackets of various designs. These are usually the first systems considered by new divers but are also the most limiting. Because the pony tank is usually mounted off-center of the main tank, it can lead to balance problems in the water and an uncomfortable bulkiness behind the diver that can become a collision or entanglement hazard. To minimize these problems, these systems tend to be small, but this leads to less available reserve gas. Pony bottles and their associated brackets can also be frustrating and difficult to change between tanks after the first dive, especially on a pitching, rocking boat. Finally, if they are not turned on before entering the water, they are fairly useless for redundancy and cannot be turned on underwater except with the help of another diver. However, these systems tend to be small and transportable, lending most of them to tropical dive vacations or other remote locations where some redundancy is desirable. Pony bottles best lend themselves to dives of less than 100' of water, although larger tanks can mean deeper depths.

The second type of redundant gas supply is the stage bottle, also sometimes called a swing bottle. This is an independent system (gas cylinder with attached regulator) that is clipped off to the diver's harness at the shoulder and hip and hangs down in front of the diver on one side. D-rings and snap bolts are used to accomplish this with the D-rings mounted on the buoyancy compensator (BC) harness. The primary disadvantage of this system is that it requires a BC with D-rings, which is why new divers do not initially use this system. However, it is by far a more versatile system and has innumerable advantages over the pony bottle. First, larger cylinders, typically 30, 40, or even 80 cu. ft., can easily and comfortably be carried. Second, the cylinder is easily detached and re-attached - thus the name "stage" - and turned on/off in the water, allowing greater

operational flexibility in case of entanglement, free flows, tight restrictions, or getting on/off the boat. If a high-oxygen decompression gas is put into the cylinder instead of low-oxygen bottom gas, it ceases to become a redundant gas supply and becomes a deco bottle, thus increasing the value and flexibility of the system. When used as a redundant gas supply, stage bottles lend themselves to depths up to 150', depending on the size of the tank. It should be noted that the popular Spare Air is technically a stage bottle, but it is so small that it is really only useful when traveling to tropical dive locations where minimal redundancy is required.

The final type of redundant gas supply is an isolatable main tank. This is a system where two regulators are connected to the main tank with an isolation valve for each regulator. This can be a single tank with an H-valve or manifolded double tanks (both tanks' air volumes connected together) with a single regulator mounted on each tank. In case of a free flow, the offending regulator can be turned off without affecting the total gas supply. While this may not be considered a truly independent gas supply, it is the system of choice for extreme environments. More gas volume is usually required for such dives, and it would be impractical to carry a completely redundant volume of gas. Instead, the rule of thirds (always keep a third of your gas in reserve) is used to increase the safety margin, and the equipment is designed to handle various equipment failures that would otherwise lead to an out of air emergency. This has proven itself to be a most useful system, but it is also the most complex, requires specialized equipment, is not very transportable, and requires specialized training and practice to be able to shut down the valves properly. It should be noted that originally double tanks were completely independent of each other, but this required complicated gas switching techniques to ensure there was always enough reserve gas in both tanks at any one time. These independent doubles have since fallen out of favor as a result. Modern manifolded double tanks typically have an isolation valve on the manifold to ensure that the two tanks can be isolated from each other as an absolute last resort. Isolatable main tanks are typically mandatory beyond 150' depths but can be useful for any dives where redundancy is necessary.