

## Doing It Right Gear Configuration

by George Irvine

A good SCUBA equipment configuration needs to carry through all of your diving, from open water to cave in such a fashion that the addition of items necessary for each dive does not in any way interfere with or change the existing configuration. Diving with the same configuration allows the same response to emergency at all times while reducing effective task loading due to familiarity. In other words, it not only helps solve problems, it prevents them.

Let's start with the backup regulator ( not the "safe second" or "octopus", the BACKUP). The backup must be instantly accessible. We hang it around the neck on surgical tubing or bungee which is held on by the tie wrap that holds the mouthpiece to the regulator. It must be up close to the neck in order to minimize the venturi effect on the reg, and to provide a strap to hold that reg tightly in the mouth when necessary. That reg must be a non air balanced, low performance reg. The intermediate pressure of all regs should be held to a minimum to prevent free flow and stress on the second stage and hoses. Since most regs feed right to left, we initiate this regulator from the left post of the manifold, with its hose short enough so as not to "flap in the breeze" and wear out the swedge fitting. As with all hoses, we use a strain relief. We do not use "upstream" valve regulators, regulators that get water in them when scooting or in a current, or regs that require custom hose fittings. We use regs that can be taken apart and cleared underwater. We use regs that operate at low IP's. We leave them loose so that they can be changed underwater. For open water configuration assume that all hoses are off of the one reg, rather than the manifold doubles.

For manifolds we use the dual port style with a center shutoff for redundancy and to be able to solve the most common failure mode: loss of knob followed by a free flow, or roll-off followed by loss of the knob. Manifolds should have barrel style o-rings, no face seals, and should be adjustable. The ports would be 300 bar for more thread depth, and should be straight facing ports, no angles which end up breaking off DIN connections. Knobs should be spring loaded and soft with a metal insert so they do not strip out - no metal knobs. Metal dents and will lock off or on, and are hard to turn in a pinch. Burst ports would contain higher working pressure plugs, and be changed often.

The primary second stage reg is then on the right post for redundancy and ease of gas sharing. This is the long hose in any configuration. It runs straight down behind the wing, under the light ( if a light is worn - around the knife or tucked into the belt if not ) and back up the left side , behind the neck and into the mouth. When not in use, as in staging or deco, this reg is clipped of on the right chest d-ring using a breakaway clip. While you always must be willing to donate the reg that is in your mouth, switching to the long hose donation for traveling is a must. You NEVER put the primary reg on the left post due to the roll-off , break-off failure mode, the effective shortening of the hose for sharing and comfort of routing, and the oblique angles created in a traveling share that will restrict gas flow by being on that post. Hoses float, and since the diver should always be in a supine

position for purposes of gas exchange and general good form, the hose will be held against the body and stay in place. This treatment of the hose solves several problems at once while not creating any and not interfering with the rest of the rig. To make the long hose breathe the way you like it, adjust the intermediate pressure of the first stage, but keep it as low as you can. Today, we all use helium for deep diving, so the ease of breathing is greatly increased, allowing for lower intermediate pressures.

The pressure gauge is from the left run straight down the left side to the left side d-ring where it is clipped off. This has no boot, no console, and no other clap trap on it. The hose should be short enough to stay out of the slipstream and long enough to view when unclipped. It is read on the fly with the left hand. The inflator from the wings runs over the shoulder and through a small bungee attached with the left chest d-ring. This keeps the inflator where it can be located instantly. The inflator must be long enough that it can reach the mouth, the dry suit inflation valve, and the nose for ease of operation with one hand controlling all three maneuvers. It must be long enough that it can be breathed by holding both buttons down at once (never "rebreathed", only breathed). The low pressure hose to it must come from the right post. This then acts as a second backup or third regulator which can be used if the left post knob either gets rolled off or rolled and broken off. (The right knob can get broken off, but will roll "on", so would be broken off in the "on" position.) Also, you never want to discover you have a roll-off by not being able to inflate - an invitation to further problems. The inflator mechanism itself must not be air balanced or high speed - it must be a slow inflator so that runaways are easier to deal with. The diver must anticipate his inflation needs, part of good form which is the hallmark of the safe diver.

Wings must not be too big or too small. A diver must start with a balanced rig which gives him every chance to deal with emergencies. In ocean or lake diving, steel tanks should never be used without a drysuit. Double wings are an invitation to a disaster - do not use them. Elastic wings are a disaster waiting to happen. They can not be operated safely by mouth, they lose their gas if ruptured, they can not be breathed like normal wings, and they cause more drag than normal wings. For ocean, aluminum 80's are the tank of choice. If more gas is needed, take an aluminum stage, but don't risk your life being over weighted at the beginning of the dive. The buoyancy characteristics of aluminum, especially when using helium, are such that a weight belt and or canister light will provide the necessary ballast which can be dropped in an emergency, making the rig only reasonably negative when full, neutral when empty, but swimmable by dropping the weight. In cave, steel must be used with a drysuit and they must be negative enough to allow the diver to stay down in a low on gas emergency. There is nothing worse than being too light to stay off the ceiling while low on gas and then struggling. For this reason, the rig must be balanced to a no gas situation prior to cave use, and weighted accordingly.

The diver's harness is rigged from one piece of webbing - no buckles or disconnects or other failure points. One d-ring is on each chest, one on the left side. The crotch strap is also one piece, and has a loop in

the front the the belt passes through. The belt buckle must be to the

right side so as not to get opened by the crotch strap. This strap is necessary to hold the rig in place whether scootering or not. Any upward pressure on the diaphragm crated by unstrapped rigs increases the breathing rate and discomfort of the diver markedly. The crotch strap has a scooter d-ring just below this loop. We never use a quick disconnect here. The knife is in an open sheath on the waist belt left of the crotch strap, where it can be pulled like a gun. The backup lights are attached to the two chest d-rings and held to the strap by a bungee. This puts them under the shoulder and out of the way.

The light is worn to the right side on the waist belt, and is held on either by the same buckle that fastens the waist belt, or by a second buckle slipped on. The light head is held in the left hand , or clipped of to the right chest d-ring when not in use or when changing stages . There are no d-rings on the right side, but if a bottle is carried there for some reason, a piece of bungee cord on the belt will suffice if the bottle has the correct stage bottle buoyancy characteristics. The light is part of your weight and balance, should never be on the butt, and is under the shoulder where it is protected and out of the flow, and can be conveniently operated or removed if necessary.

Stages should be aluminum 80's. These swing equally from negative to positive with air, less negative with gas, by the amount of the air or gas carried. They are rigged with stainless steel bolt snaps, the size of which is determined by whether or not your diving requires gloves, and those are attached by a piece of 1/4" line run under a hose clamp halfway down the tank and tied to the neck. The upper clip should be tight to the break of the neck, the lower clip should have plenty of tail to work with. The bottle needs to be held close in the front and lose in the back to prevent drag. There should NEVER be any metal to metal connections of any part of your rig.

Stages need to be permanently marked as to their maximum operating depth in three inch high letters placed horizontally in the orientation of the tank on either side so that the diver can see what he is breathing, and so can his buddy, no mater where the tank is. The stage reg is rigged with a short pressure gauge which is bent back on itself to face the diver and held in place by bungee cord at the first stage, The reg hose must be the octopus length. The stage regs are always parked on the bottle and the bottle turned off unless in use. Stages are generally worn on the left side for streamlining, and because of the position and balance of the rest of the gear and the other hoses so as not to interfere with the operation of any other gear, as well as the scooter , which is driven with the right hand, favoring the right side.

To deploy a stage, we look for the correct depth marking, we put the reg around our neck, we then turn on the bottle , put the reg in our mouth, and if we can breath, we are breathing the correct gas. It is just that simple. No other convolutions are necessary, and would only add to the chance for error.

Gauges and compasses are worn on the wrists. These must be situated according to need. In the ocean, the compass is paramount, and needs to

be viewable and held in its correct orientation without interfering with other activities - that means the left hand, away from the scooter.

The depth gauge and timer needs to be viewable all the time , so is on the right hand. Fins straps and mask straps should be replaced with springs and stretch material that will not rot and break on a dive.

To quote Bill Gavin regarding gear, a diver must "settle for nothing less than perfection. Those who do will discover on their own the value of such effort. Those who do not will never understand what the others are talking about". What we have presented here is called the "Doing It Right" system, and is a platform that is integrated completely and accommodates all contingencies and additions, but no phobias. Use it accordingly with one caveat - "never break Rule Number One", which is "Don't dive with strokes". A "stroke" is somebody with an unsafe attitude.