



Ask Gib..... as no question is a stupid question

"Dolly Parton Lungs"

I really like my BMCL on the Meg, but do they have to be soooo... big?

Great question, and while I personally like them on the tiny side, if they are going to be big, they should be proudly displayed out front! But before you hang me too with the same rope used on Weinstien, lets move on to the subject of counter lungs. There is a lot to be said about the subject of "minimum loop volume" verse other catchy phrases like "optimum" , etc. etc. loop volumes. These terms are often sprinkled generously about the curriculum of ccr training and even given a skill set. As if an instructor can actually see that a student has a too small, or too large of loop volume in rebreathers where the counter lungs are contained inside? If in these cases the student cannot inhale, then "hey its too low", or if they have gopher cheeks with eyes bulging out then "perhaps you should vent out your nose"... But in the case of rebreathers with OTS counter lungs its fairly obvious when the student rockets towards the surface with what appears to be a zodiac boat fully inflated on their chest. Hey its time to pull the dump valve, and any other dive gear containing compressed gasses like wing, drysuit... So the point is that loop volume should be a fairly obvious in rebreathers such as a KISS Classic or rEvo Micro, but less intuitive in rebreathers like the Inspiration Classic. What happens with the larger lung volume is that you lose track of the sweet spot of "optimum" loop volume and it tends to slowly creep up more, more, more... If you take your standard KISS Classic ccr with a 2 liter and 4 liter MSR bag you have a combined theoretical volume of 6 liters to expand and contract, and with an Inspiration Classic with OTS CL you have approximately 5-7 liters in each counterlung for about 11-14 (med to lrg) liters of volume. Ironically the AP BMCL is only 7 liters total volume. And while I have seen divers enjoy both ccr's with equal passion, I have found it was much greater difficulty to get a new diver to hit the sweet spot in the large loop volume lungs.

I discovered very early on that there is a disconnect in the brain of introductory or "discover ccr" divers as they would be in the pool, stand up only to claim that they "cannot breath, there is no volume" when I damn sure know that the gas is turned on and the loop is not empty, rather it is too full. So they vent all gas out of the loop and inhale to find nothing and they hit the wall of empty... So to avoid this I decided to start the demo in classroom where each diver was giving a "counter lung" of a simple garden variety soft plastic produce bag. They start with the bag empty, put to their lips and exhale into the bag, now pinch the bag closed and look at the volume. Not once did I ever have Lou Farigno in my demo where he would explode the counter lung bag. Most often the average adult was surprised that the lung volume was actually quite small when viewed right in front of them. Ok now the diver feels challenged, so they try again, and this time take a very big breath...blow into the bag and pinch tight. You now have a larger volume, but still within the confines of a small plastic bag. It is valid for the reference of what you actually breath in volume as its right there in front of you. But the real value is when you have them try to breath on an empty bag, or a bag that is completely full. They might squawk at first but make them try it. They obviously cant inhale on an empty bag, and they cant exhale on a full counter lung. Well guess what, it is not so simple when you strap the ccr on as you don't see the bag in front of you to tell you the status. So plant the visual image in their mind that No you can't inhale on an empty bag, and you can't exhale on a full bag. You need to be in the middle where it is comfortable to inhale / exhale . Of course this gets complicated with a non static environ, so you have to talk about compression on descent and expansion on ascent but its all part of the story....

Now this last bit is a side story to the main story about Dollys (IQ Sub) BMCL being so big. Well I don't think they are as they fit snugly behind my wing and don't get in my way? But the points above are skills that all certified ccr divers should have mastered such as the "Optimum" loop volume or the sweet spot in breathing. Yes you have to keep reading to get to the good bits...

To start this ramble I did a bit of surfing, and while I claim to never visit whore houses of ill repute such as rebreather forums; a guy gets an urge that can't be itched elsewhere, and alas you end up with a rash that itches afterwards.... But I did some homework (not a lot as most of it is made up) and I started with a Google search of " Counter Lung Volume on KISS / rEvo / Inspiration Classic" . Of course the priority of topic is some CCR Forum where you have this guy asking a valid question about "size" of counter-lungs on an Inspiration. Sounds promising. Nope, the responses have nothing to do with the actual question, but you get some blow hard tooting his horn about his Vital Capacity that he obviously gets by pulling his weiner all day rather than actually diving? Damn! Waste my time clicking on these links.... so I dig deeper and rEvo has a great info site on unit specs, KISS has info in the user manual, and if you go to the UK site for AP diving you can link the user manual and buried deep in is the specs. I guess I wanted this article to have some authenticity, so I don't end up Like "weiner guy" talking only b.s.

At this point I have to interject some techy facts and terms.

AP Inspo OTS Counter Lugs: Medium to Large 5 - 6 liters each with combined 11 -14 total liter capicity. AP BMCL 7 liters

rEvo - models vary by size, but: 5.5 - 7 liters total capacity.

KISS - depending on configuration, but common: 2 liter and 4 liter MSR bag with total 6 liters capacity

Average Adult Lung Volume in liters:

Average lung volumes in healthy adults^[10]

Volume	Value (litres)	
	In men	In women
Inspiratory reserve volume (IRV)	3.0	1.9
Tidal volume (TV)	0.5	0.5
Expiratory reserve volume (ERV)	1.1	0.7
Residual volume (RV)	0	1.1

Lung capacities in healthy adults^[10]

Volume	Average value (litres)		Derivation
	In men	In women	
Vital capacity	4.6	3.1	IRV + TV + ERV
Inspiratory capacity	3.5	2.4	IRV + TV
Functional residual capacity	2.3	1.8	ERV + RV
Total lung capacity	5.8	4.2	IRV + TV + ERV + RV

What's really a value here is Tidal Volume of only 0.5 liters that you inhale / exhale on average. That does NOT accommodate swimming or a bit of exertion. Now throw in a reserve for that diver who is on edge of a reef and getting sucked down by a down draft current, yes it happened, and you need that "Oh Shite" hyperventilation of big inhale - deep exhale. And you can get a Vital Capacity number around 4.6 liters.

The ccr that I was wearing during the most aggressive breathing that I've ever faced on this particular down draft in Bahamas, and yes more than swimming to Hinkle, made me think of the manufactures claim that their ccr could not be "over breathed". That means that the gas (specified by mix / depth) has minimum resistance based on design and that there is sufficient dwell time for the gas to interact with the chemical before being re-breathed. Well I don't know what volume the manufacture tested this at, but it had to be at a greater than just "minimum" loop volume and perhaps beyond "optimum". Now you need to consider the chart and think about 0.5 volume as tidal or normal inhalation / exhalation volume, as what could be considered "Minimum" and then add some extra on each side of inhalation / exhalation to get an "Optimum" value so you have a cushion. You certainly could never dive a rebreather such as an Inspiration Classic with say 11 out of 12 liters capacity full of gas as 1 liter of water = 1 kg = 2.2 lbs so you would have 23 lbs of buoyancy from gas volume! So an optimum value could be in the 1 - 1.5 liter range.

Now here is the hard part of research was to have to empty a 1 liter bottle of red wine, then fill it with water and pour it into the IQ Sub counter lungs to get an accurate measurement to compare with the above stated CL volumes. Now after finishing a nice bottle of Zinfandel, it was pointed out to me that this bottle is not a 1 liter but a 750 ml bottle. Well, damn this wont due as I'm only a scuba instructor and I can't do math that is not whole numbers, shoes on or off! But this brings up a point of how in hells name did wine bottles become 750 ml and not the standard 1 liter volume? Well it has a bit to do with history and those damn Britts again! The UK standardized on almost the same size bottle, 1/6 Imperial gallon. In the era of mouth-blown bottles, about 700-800 ml was simply a reasonable size for a man's lungs to blow. Additionally since ancient times, a fifth of watered-down wine (11%ABV) was considered a reasonable daily ration for a man. So field testing resumes with a nice Cabernet and i'll try to update in next CCR news.....

Ok get to the point of why have the large voluminous lungs? Well it is less likely that you will be able to "over breath" a rebreather with larger loop volume than one of minimum size. Basically the time measured as "dwell time" is the time the exhaled gas has to interact with the chemical bonding sites on the diving sorb in the scrubber. A very small loop with a "Pushmee-Pullyou" where every ml inhalation is pulling exhaled gas through the scrubber would rush the dwell time. But if you were to exhale into a slightly larger volume of gas, more than just the tidal volume, then upon inhalation , there is a slightly longer delay in the Co2 gas interaction on chemical bed. You are still pulling the same volume/speed but the exhale gas is diluted into a larger pool. Think of peeing in a hot tub and walah it turns yellow, but now pee in a Olympic swimming pool and it dilutes into the volume. And I did say "think" and not that you should pee in a pool.... but both a hot tub and a pool have a filter and are supposed to be chlorinated, but I'd take my chances with the larger volume of water containing more chlorine in the pool. So while we can choose to not pee in a hot tub or swimming pool, we can't avoid exhaling some Co2 into our breathing loop. We need a reasonable volume of gas to allow the Co2 enough dwell time, plus we need a reasonable space to accept a small quantity of water ingress / water condensate to pool before dumping or wetting our scrubber. The last bit is just as well design or location of exhale gas bag as we know OTS have a greater resistance to flooding our chemical than a popular rebreather based on Drager Dolphin that a gnat pissing in a loop would immediately flood the chem.

The conclusion is that What Works Works, and it really doesn't matter what some rebreather guru may state as you can't ignore history, and history has given us plenty of what works, works.



Boo-Boo-Kitty from "Jay & Silent Bob Strike Back"

And my experience with the IQ Sub BMCL has been nothing but BBKF awesome, so stop whining and start wine'ng as I need help me this research.

Just ask Gib.

Keep sending your questions to Ask Gib at gibanigav@hotmail.com

Gib Anigav

*Do as I say and Not as I do,
But Dive Safely!*