SELECCION DE MENSAJES DE GEORGE IRVINE

Abstrayéndonos de la personalidad siempre controvertida de GI, son indudables dos cosas: en primer lugar, su categoría como buzo técnico y en segundo lugar su papel innegable como creador del DIR.

En este último sentido, no existe un compendio de conocimientos sobre el DIR, ni en los manuales, ni en los temarios de los cursos de la GUE y quien pretenda comprender y practicar un buceo DIR, estará huérfano de razones si desconoce la ingente cantidad de explicaciones y conocimientos diseminados por la red. Sin el intercambio de información y sin el trabajo en equipo dentro y fuera del agua, compendiar y comprender esos conocimientos es imposible.

A fin de preservar el tono original, hemos reunido sin traducir algunos de sus mensajes más polémicos y conocidos junto con otros de distintos buzos, que aportan a quien haya pasado o se disponga a pasar un curso de la GUE una información valiosísima sobre la conformación del DIR mucho antes de la creación de la GUE.

BUEX
Seguridad en Tecnologías Subacuáticas
Buceo técnico y de exploración

**Subject: Fallacy of Twist-On Light Heads**

Date: Fri., 8 Nov 96 02:51:46 +0000

From: <George.Irvine@m2.interserv.com>

Recently one of the usual suspects decided to recommend another piece of useless gear - the twist on light head. The problems are:

0) The obvious - one more failure point

1) The handle is the anode -great idea for salt water

2) When it gets a little dirty - it might still work, or it might not

3) When it floods, it shorts out in salt water.

4) It is not focusable

5) You can not signal with it - extremely dangerous

6) It puts out a blob of light rather than a beam

7) It is very heavy

8) It requires a separate convolution to make it a Goodman handle

9) Changing the bulb is a nightmare - four screws, a gasket, etc.

10) The lens and o-ring are one more failure point

11) It uses the useless type of light bulb

12) Only a blithering idiot would own something like this, and having one is like wearing a T-shirt that says, "I have no clue".

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**Subject: WHY WE DON'T BUTT MOUNT LIGHTS**

Date: Thu, 24 Oct 96 23:16:42 +0000

From: <gmiiii@interserv.com>

I spoke to Jarrod Jablonski, and he reminded me of a few more reasons why we do not butt mount lights. We are really sick of going over the same stupidity, and sick of hearing hardheaded strokes insist this dangerous bullshit is a good idea. We can not always be expected to remember all of the stupid mistakes of the past that we have long ago forgotten.

I hear Tom Mount now teaches butt lighting and proper lighting. Tom, is this like sticking your dog's nose in his own shit when he schmoos the rug? Maybe I should teach the rookies in my office how to calculate a bond yield with their fingers or dial the phone with their feet. Maybe I could have them practice reading yesterday's paper or talk into the wrong end of the phone.

Get serious - you are dead wrong on this bullshit, and your insistence on perpetuating something you learned from a bunch of half-wit red necks is appalling. Get over it.

Here is Why we do not butt-mount lights:

1) We use this position to tow scooters and to tow buddy in an emergency -his head is tucked in behind the tanks. We also keep the exploration reel there sometimes, and or the liftbag in wreck diving.

2) We do not plaster our tanks with d-rings and convoluted crap like what is required to butt mount.

3) We do not use metal to metal connections of any kind, and we do not clip things behind us that can not be unclipped from the front with one hand by reaching through, in the case of the scooter, it is clipped to the front and pushed back through.

*** By the way, whoever is the moron of the century that is teaching people to put brass rings with brass clips around tanks necks needs to be shot on sight -how stupid are these guys? ***

4) We do not have loose things or entangling devices behind us that can not be freed from the front with one hand and one motion.

5) We do not sit on our lights, bang them on tanks, or have any sloppy gear.

6) We do not expose our lights to damage of the cord, switch, or lid.

7) We do not put heavy objects on our legs (or on our knees in the case of 121's), and we are not stupid enough to use the Neutralite (which is neutral, but square). We need the extra weight of the Gavin light, but in the right place

8) We do not use extra long cords that catch on everything just so we can put the light in the wrong place.

9) We do not reach behind us to turn on our lights, and we do not want them knocked off at an inopportune moment because the switch, cord, and interface are not protected. We are not stupid enough to use a twist-on light head, an MR16 light head, or any other silliness like it.

10) The concept of "less drag' is total bullshit - the light on the hip is in the lee of the shoulder where it is protected. The less drag bullshittters do no real diving and do not know what they are talking about - it just looks good to them because, like monkeys, they saw some other brain-dead moron doing it

11) We park our long hose under the canister in its routing. The long hose does not need the canister to sit properly, but it is much neater, and the hose will be tight to that point and not catch anything. The hose is where it is because the whole system is built together. We have worked all of this out for every kind of diving, and do not change one thing as it causes something else and then something else to be changed, and pretty soon you are back to nothing functional.

12) The cord routing is a real mess and interferes with the stages and all of the other gear, or requires some hideous convolution of routing to keep it out of the scooter wash, out of the wreck or rocks, and generally out of trouble, and then you have some completely unsafe mess on your hands.

13) Only a complete and utter stroke would butt mount, and you will find that those who do either are a) complete idiots, b) have copied or been taught by an idiot, or c) sell dive gear and can make the most money off of this ridiculous horseshit, which they will tell you usually

requires a list of horrendous crap so expensive as to equal the price of real gear plus a scooter. Your instructor is then riding YOUR scooter, and don't forget it.

14) If you can name one guy who does any serious diving like this, I will kiss your ass in Macy's window.

15) Just ask whoever taught you this stupidity about their biggest dive, how much gas it took, how long it took, and put it on here so we can all get a huge laugh.

16) Look at my video, "Doing It Right", and tell me what you think.

17) If you flood a butt light, or in the case of the Dive Rite, WHEN you flood it, the thing becomes extremely negative and causes the associated problems being in that position.

18) Butt mounters demonstrate a total lack of foresight and dive planning comprehension -tantamount to an admission of strokery, and according to rule

number one, we do not dive with strokes.

19) If you have been stupid enough to do this or teach it, it is time to admit you are wrong, and "do it right".

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**Subject: Why We Don't Stuff Hose**

Date: Fri, 8 Nov 96 02:50:54 +0000

From: <George.Irvine@m2.interserv.com>

I have noticed that there are those who would stuff their long hose rather than breath it, as is recommended by many instructors, and as somebody pointed out, is mentioned as an alternative in one of Tom Mount's books. There is a contingent out there who feel that if a technique is "safe", it is OK. I don't think stuffing is either safe or optimal, and I will point out why.

First of all, we breathe the long hose. This hose generally, but not necessarily, has a high-performance second stage. I use a Beuchat VX10 for this, as it a high-performance and is not the least bit finicky. I also use the ScubaPro G250, but prefer it on the deco bottles (breathes

easiest, but is more likely to lose gas while scootering that the VX10) The intermediate pressure of the first stage, or the ability of the first stage to deliver must be in keeping with the length of the hose -don't use a weak first stage. This is the hose we share gas from: it is always either in our mouth or clipped to our right chest d-ring, where it can be passed off quickly - QUICKLY and efficiently is the difference between success and failure. If you think that you can unstow you hose fast enough, well, you better hope you are right, because YOU are the one who will be needing it to breath off of, as the stressed diver rips yours from your mouth. Now pinned to you because of the shortness of the hose, you have an even bigger problem - TWO stressed-out divers with the clock running.

We won't go into the merits of different stuffery - they all are found lacking and not in the least due to the forced compromise of some other part of your gear to accommodate the stuffery and the mess. Stuffed hoses get caught on things, they are hard to free up, they are confused and messy, and clutter your dive gear. There is no convenient way to stow the hose where the second stage is protected. It generally takes two to restuff, as when the hose falls out, or gets caught on something. With the long hose being the primary, there is no problem repositioning it. Trying to unravel a hose from behind your head or under your arm or along the sides of your tanks is not good planning - putting it back is worse.

The backup reg needs to be around the neck on a short leash. This reg should be a lower performance model, so as not to lose gas. I use a detuned Beuchat VX10 for this, again because of the reliability. Both regs should be of the type that you can remove the boxtop to unfoul, and should be finger tight on the hose so that you can swap them out with your stage regs if a problem develops.

The issue of safety is obvious in the rare case of air sharing. But the real safety comes in an uncluttered, unencumbered, smooth, clean, non-convoluted rig that will not grab and catch and cause excess drag. So to those who say, "any gear config is OK as long as it is safe", I agree, it is just that not breathing the long hose is not the safest or the most optimal.

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**Subject: More Hose Stuffing**

Date: Fri, 8 Nov 96 02:50:39 +0000

From: <George.Irvine@m2.interserv.com>

Great post, let me add a little to it:

1) - If you can make one piece of gear do two things, then that is the best way. Breathing the "octopus" saves stuffing, stowing, holding, hiding, or dealing with it. Stuffing a hose is messy, cumbersome, an entangling point, a failure point, and adds extra steps, motion, and equipment - it is neither optimal, nor safe. It is a dangerous and stupid practice - a dead giveaway that the person doing it is an inconsiderate, disorganized, shortsighted stroke.

2) - The logic of he hose choice can be backed up one step - where should your "Backup" reg be? It should be around you neck where you can reach it with no hands -(see "Doing It Right"). This should be a smooth feed, so it must come from the left post. Proper regs (not upstream-valve pieces of shit like the Poseidon) feed from the right. This means the long hose needs to be on the other post - the right. The wing inflation needs a smooth feed, so comes from the right, and the pressure gauge needs to go straight down where it gets no bends, so it goes on the left, where your only waist d-ring should be. There should be no metal knobs on your tanks - this is again the trademark of the stroke, as only a stroke would worry about turning them off rather than being able to turn them on, and a dented metal knob don't turn. If you can not reach your valves, see "Doing It Right" for how to rig your harness properly. If you are a fat slob, horribly crippled, or just an uncoordinated stroke , or Jaba the Crea (inventor of the "slobwinder" - for huge fat slobs who insist on wearing the wrong drysuit and so can not reach their valves), see Option Number One (Don't Dive).

3) - Since only stroke would stuff a hose, you are implicitly violating Rule Number One by diving with this person. Anyone who teaches a diver this stupidity should be shot. Notice it is the same people who viciously pushed the square light, and whose total gear configuration is a monument to sloppy thinking.

4) Hose stuffing is not "personal preference", it is personal Ignorance.

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**Subject: Metal to Metal**

Date: Fri, 25 Oct 96 11:22:34 +0000

From: <gmiiii@interserv.com>

The short version of why we do not use metal to metal stage connections:

Dave, if you got hung up on wreck, for example, you need to be able to cut yourself free. Same with stuck, etc. There should be some line

between the metal components in case the snap jams, which it will do if it gets hit or if it gets sand in it. Ask Bill Deans how his friend died on the Doria (wrong kind of snap plus metal to metal - could not free himself). All snaps, clips, connectors, etc. need to be tied on with cave line, tie wrapped, or tied on with cord, not shackled, buckled, welded, wedged, captured.

The tricks to great diving is thinking everything all the way out in advance. This kind of attention to detail will be your key to longevity and a lot of fun. I always see strokes with that metal ring around the tank neck with the clip on it and then a metal to metal connection at the lower connection point of the bottle. This is a case of "stroke see, stroke do", and is part of the machismo "I am a big tech diver" baggage that goes with the other bullshit that I hate to see, like butt mounted lights, stuffed hoses, bondage wings, unnecessary trinkets, etc. Notice it is always the same guys - the strokes.

See the video, or the web page, and it shows how to properly rig a stage bottle. Since I do more multi-stage diving than anyone, in deep water where I can not afford to get tangled, encumbered, or slowed down in any way, I have worked this out completely with Jarrod and Brent. We will be going over this very carefully at the workshop along with other fine points.

Now I am sure we will hear from all of the one-dimensional thinkers that this is "just as safe" as ... Bullshit - metal to metal is prime face evidence of a total lack of foresight, and a stroke somewhere in the woodpile, usually a "tech" diving instructor.

Subject: metal to metal (was Cave Lights)

Date: Sat, 26 Oct 96 19:52:17 +0000

From: <gmiiii@interserv.com>

Reasoning is that I want nothing that can get hung up to be permanently attached to me. I can cut off something that has no metal to metal connection.

Some people thought I was discussing electrolysis - a good point for other applications -dissimilar metals will set up a little welding shop of their own, as they are technically a battery in action, and make a mess. I just grease these things with silicone, like the tank to tank band interface, stainless screws to aluminum interface, etc. Some tank bands used to come with liners for that reason. You can also run a piece of electrical tape where the hose clamp or band is going to go, and it will work, or paint the area first.

The main thing is that if you get hung up, and this is more likely to happen in a wreck than a cave, where the current can come up unexpectedly, but it happens in cave - it happened to me in Wakulla of all places, and repeatedly in Big Dismal and Sally Ward - you need to be able to remove you stages no matter what, and you light no matter what (by the way this is another reason for not using a butt light, now we are up to Reason Number 19), and your reels, and anything else that could hang up. This is a good reason to have you knife on your belt where you can reach it and to have a hilt on it so you don't drop it, and to have a serrated blade so it cuts the first time, and to carry a backup knife someplace, in your pocket, on you light handle, etc.

This is also the reason that I use Velcro straps on my argon bottle - so I can free it myself or it will pull loose in an emergency. This is how I got hung up in Wakulla and Sally, and how you can get "keyed" into a restriction (fit going one way but not the other). It was only a momentary problem for me.

This is the reason I use stainless hardware - it usually never jams, but there is a kind of sand that will freeze it that you can not see in the Florida Panhandle, and if you are stuck by that piece of gear, it should be possible to cut it free.

Like I said, wreck is where this really is very important, as in a four knot current, even a buddy like Jablonski may not be able to get to you.

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**Subject: Serious Trimix Mix Choice**

Date: Thu, 14 Nov 96 12:48:07 +0000

From: George Irvine <gmiiii@interserv.com>

Gas Choices

First, while we can get used to the effects of narcotic mixes, we can not operate any better on them. We are still impaired.

To set the depth, it is amazing how well the old PADI 130' mark seems to be the demarcation line for the onset of hidden impairment. Keep in mind that ten feet is more narcotic that the surface, and that oxygen is also narcotic.

A 130 AED with reduced oxygen is likely to be less narcotic than air at 130.

Also keep in mind that the mere presence of helium in a mix alters the way nitrogen effects the rigidity of red blood cells, and reduces or eliminates the microcirculatory damaged associated therewith.

Moving on, we set the oxygen to a maximum of 1.4 PPO2 simply because that it the level at or below which commercial diving operations have found that seizure is no longer to be expected in normal individuals.

From the 1.4 (MAXIMUM/1.6 deco MAX) we reduce the PPO2 for the longer exposures for both whole body, CNS, and pulmonary toxicity reasons. The longer the exposure, the lower the PPO2. For a saturation, a mix may have to be ridiculously low in oxygen just to accomplish this.

Once establishing the bottom mix, the length of deco will dictate the use of the decompression gasses. Keeping them standardized is a good idea, and marking them for depth is the way to go, but two primary points must be considered: do not spike the oxygen after a long bottom exposure, so maybe move your gas switches up a step or two, and figure where to begin taking air or bottom gas breaks.

Taking breaks at a regular interval, including 20 minute "cleanup" breaks will greatly reduce the risk of seizure on the one hand, and greatly reduce the pulmonary damage on the other. We break every twenty for five, but do not alter the deco schedule for it.

This is a good starting point for discussion, but let's leave out the "good deep on air" bullshit, since we are talking technical diving here.

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**Subject: Re: Doing It Right questions**

Date: Fri, 3 Jan 97

From: George Irvine <gmiiii@interserv.com>

Anthony - you are exactly right about the "keyhole" issues with argon bottles - great point - we do have places that I regularly get stuck in, that is why it can be released by those two Velcro straps. Usually, the dive buddy can just guide it through, but if stuck, I can pull the straps, let it fall, and put it back on, or get my buddy to do it. If you put it on the left hip, which I do with a smaller bottle when doing short dives, you do that by using a piece of webbing like the light, but looser so that you can slide it on over top of the d-rings, and you loop a small piece of bungee into the backplate which holds the bottle back against the plate (it is just looped over the end of the bottle so can be removed easily.

We use the 14 cu ft at 2015 bottle to be sure to have enough Argon for both a long dive and to transfuse buddy if he looses his argon. We never mix anything into the argon, and we just buy a new 300 cu ft bottle if the pressure gets below 1800. We only put 2000 in the bottle so that the reg failures are nonexistent, and we use a pressure relief valve on the fist stage so we do not lose the hose or the valve if the reg fails (just turn it off and on when we need it).

As you know, in cave diving, you could go through a deep section and back up, so losing suit inflation at 200 and then having to go to 310 is impossible without a transfusion or an injury.

The position of the argon on the tanks is just back into the slipstream already created by the tank - Lamar English and I verified this by testing all of these configs in haloclines with video, like having a tracer in a windtunnel - we are positive of the positioning of all of this gear, even though it may appear to be weird to the naked eye - we just look stupid, we are far from it.

The stages must be exactly as we have them to get the speed, and that is all I will say about that, as nobody believes me anyway, yet no one can outrun me with stages on. Our gas management depends on speed; our speed depends on gear positioning. Exley tired running with Gavin and me with a stage on each side ONCE. He was riding one of my scooters, and could not keep up. I was carrying an extra safety bottle for him since he was not originally supposed to be on the dive, so I had three to his two -after that he was a firm believer. I showed this to another guy who will remain nameless in the water where I switch scooters with him, out ran him again, and then kept taking one more of his bottles each time until he could keep up with me (after I had both of our stages and he was riding my scooter and I his). After that dive he reconfigured his gear.

Some of the biggest mouths on here have been with me in a cave and been severely outrun and still do not get it.

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**Subject: Re: Argon Bottle Mounting**

Date: Tue, 7 Jan 97

From: George Irvine <gmiiii@interserv.com>

Eddie, you are looking at high current - we are riding fast scooters. The bottle should be mounted where you can reach the valve - not rightside up. The guys who started doing this quit before we got way into it - you were looking at Bill Gavin or Bill Main - they tied it on with a piece of cave line and a clip - it came off easily, but had the valve the wrong way. They bailed out on an equipment failure, I do not bail out unless it is hopeless to continue - the dives are much longer now.

I like the bottle to be removable by me, as is all my gear. Others like the bottle tight, and need their buddy to get it off in a pinch.

Here is the answer - the guys who do it like me were there the day that Parker died or guys who also wreck dive, the rest have not had the shit scared out of them yet in a cave, or have not gotten stuck in a wreck. I will wear nothing that I can not cut loose myself.

The side is easy - you can not reach around the argon bottle and the light, so they must be on opposite sides. The bottle can not be up close to you or it binds against you when you inflate the wings and you can not carry multi stages on the left hip with it against your plate.

The feed of the hose is cleaner from the left side, as otherwise it must go under the light, which is uncomfortable, or over it, which interferes with the backup light position.

You need to be able to reach down and have you hand just touch the argon valve, so that if you have to operate it from the valve, it is easy to do. We have a pressure relief valve on the first stage so that we can avoid losing the gas on a first stage failure, and you can not rally reach it if the light is in the way.

There are a bunch of reasons, but I have forgotten most of them - my straps are mounted to all of my tanks - I do not dive without argon anymore, and I have one set for tighter places where the Velcro straps are mounted to the tanks with hoseclamps to slide through restrictions more easily

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**Subject: The long hose (was: Which hose to breathe??????)**

Date: Sat, 11 Jan 97 01:57:41 +0000

From: Tennantm@aol.com

By Steve Irving, from awhile ago:

I sent this in 2 years ago, but sense the subject has come up again, I figured it would be easier to just send it out once more rather than write a new one. Tom, please show me the error of my ways.

Is it safer, and or a superior method, to breathe the regulator attached to the long hose, as your primary? It is my opinion that the only reasonable conclusion after weighing all the evidence, is that a cave divers primary regulator should be the one attached to the long hose.

First, we all agree that the reason for the long hose is to facilitate the safe exit from a cave in an emergency situation. The extra length being to allow for restrictions and limited viz. etc. We purchase the long hose in hopes we never put it to use in an emergency, but its there when needed. We all agree that gear intended for emergency use must be working, and immediately accessible. This is why the military trains continuously. When we look to the rules of accident analysis, we find the rule of thirds, three light minimums, and the continuous guideline. All adopted for safety, assuming a worst case scenario. We agree that this is reasonable. Should we not also assume a worst case scenario when deciding which hose to breathe off of? If we never have to share gas, other than in our cave class or when doing an "S" drill. Then it really doesn't matter which regulator we pass off. If we never get in an automobile accident, then it won't matter if we ware our seat belts. We must assume the out of gas diver became aware of his/her present condition, after exhaling and then trying to pull a vacuum on their hundreds. Panic, even for the trained diver is only seconds away. They need gas, and they need it now. They need pure gas, no water. They need a regulator that's working.... now! They don't have time to remove a small twig, or piece of debris from the exhaust diaphragm.

We agree that the regulator that you're breathing is working right now. If it's not, you called the dive, or fixed it. We also agree that there is no way of knowing if the regulator you are not breathing is working right now. You checked it at the beginning of the dive, and you checked it after trenching through that last restriction, but right now we really don't know. If that regulator is fouled and needs clearing, who's in better shape to deal with it? The out of gas diver is probably not right next to you. He/she has signaled you with the light. Got your attention, and has indicated that they are out of gas. You both are beginning swimming towards each other. Now is the time to go to the back up. You have time, they don't. What if they are right next to you? They don't signal, they just grab and you don't have time to give. You are still in better shape. You have gas. And which regulator do you think they will reach for? We agree that not all divers keep their alternative second stage in the same place.

We can agree however, that all divers do keep their mouths in the same place. Which regulator do you think they will grab? Some argue that by passing off the regulator you are currently breathing from causes two divers to be temporarily out of gas, and this is a problem. If you can not remove a second stage from your mouth, and replace it with another, should you be cave diving? Think about it. This is basic stuff. They will also contend that the long hose increases breathing resistance, and thus choose to breathe from the short hose. A quality regulator that is properly adjusted will deliver more than adequate gas supply, even through a long hose. If it doesn't, then how is your buddy going to react when he tries to take a few hits from it in a stressed state?

What it comes down to is this; are you willing to save your buddy by passing the best breathing, and guaranteed working regulator when he/she needs it? It's just not a good idea to plan a dive, that when someone runs out of gas, you pass them a regulator that worked.... last time you checked it.

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**Subject: Re: stage bottle rigging**

Date: Sun, 3 Mar 1996

From: "G.Irvine" <gmiii@interserv.com>

STAGE BOTTLE RIGGING:

Using the Luxfer aluminum 80, loop a doubles 3/16" nylon line over the neck of the bottle, tie a 3" stainless steel bolt snap high on the neck, run the double line through a piece of hose for an UNDERWATER ONLY handle, underneath the bridge of a stainless steel hose clamp cut exactly to the diameter of the bottle, and then tie on the other stainless bolt snap leaving about four inches of play in the line. To tighten this up (reduce the slack), loop the clip back under the handle, to loosen, pull it back out. Cut a piece of innertube and slide it over the tank so as to cover the hose clamp and to use as storage for the reg hose. The reg should have a small bolt snap on near the second stage to clip off to the line from the handle on the bottle so the reg does not fall out and catch something. Stage bottle regs should always be stowed and the bottle turned off unless breathing it. Anything else is sloppy behavior. The reg need have a hose only long enough to make it around you head and into your mouth, so that will be different for a MK15 than for a Poseidon by about four inches. The high-pressure hose should be a shortie, and can be folded back with a rubber band to point the pressure gauge towards you as it is banded to the first stage. They will not break -I have never broken one, ever.

The bottle must be a Luxfer 80 or the Catalina that has the same buoyancy characteristics: neg. 3 lbs. full, pos 3 lbs. empty. Anything else is abject strokery - too heavy, and only a stroke would use buoyancy tubes. This applies to American tanks only - I have no idea what the equivalent British tanks are. For ocean deco bottles, the Luxfer al 40 is the best for all gases. For a tough guy like me, the al 30 is the choice for oxygen. Bottles should have the MOD painted on the side so everyone can see what your are breathing.

For the WKPP guys - stop picking my bottles up by the handles. Rig the stages so anyone can use them. You all know you can all use mine easily, but I need double enders to use some of yours. Lose the hardware snaps, and the non-stainless stuff. Brass bolt snaps will cut your thumb, and the suicide clips are too iffy, and a no-no for wreck diving. They take prisoners, and they get easily clipped inside each other.

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**Subject: Re: equipment list**

From: <George.Irvine@m2.interserv.com>

Date: Fri, 1 Mar 1996

On Fri, 1 Mar 1996, Peter M Larimer wrote:

>Hi George,

>able to get a list of the equipment you dive. I'm new to this list and

>Is there an archive that I should look at for an equip. list?

Here it is:

104's or OMS 121 tanks

Dive Rite bands

Sea Elite, Dive Rite or ScubaPro manifold

Dive Rite or AUL metal backplate

rig your own harness from one piece of webbing

line cutter - homemade

safety spool - homemade

AUL or Gavin light

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Oceanic backup lights

Dive Rite or Seatec wings (single bladder)

Poseidon, ScubaPro or Beuchat first stage

ScubaPro or Beuchat second stage (G250, VX10)

24" LP hose

24" inflator hose

26" hp hose

7 foot long hose

Uwatec pressure gauges

Uwatec bottom timers - no computers

Suunto reverse bezel compasses

DUI TLS 350 drysuit with commercial grade neoprene hoods and overboard

discharge, all custom fit, with C-4 Thinsulate and gaiters

2015 Luxfer Argon bottle

Poseidon reg with OPR valve 24" hose

Pony Tamer to hang this on

Wet Notes

pockets in dry suits

Scuba Pro Extra Large Jet Fins with Oceanic fin straps (spring)

Tusa Liberator Mask

slap strap

Luxfer aluminum 80 stage bottles

OMS 95 oxygen bottles

custom built scooters

also Oceanic Mako scooters

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also AUL scooters for filming

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**Subject: Gear- Rigging**

From: <gmiiii@interserv.com>_

Date: Fri, 16 Feb 1996 05:45:20 -0800

I talked to JJ yesterday about gear rigging. He ask me to supply him with a set of copies of "Doing It Right" so that he can send it to students to rig their gear properly prior to coming for his courses, leaving more time to get right to the meat of the matter. He said the ones who have done this on their own have shown up squared away and ready to start the courses.

Here's my question. He said that those who have the same regs as I do rig with no problem, but that those with other brands have difficulty with hose routing. Do you who have seen it think I can make it more clear somehow? If so, I can add a section to the film and add anything that anyone thinks is appropriate, and put out a second version. Give me a list of what is needed.

On the hose thing, the idea is to have no adapters on the first stages, but to run the hoses straight from the ports, straight down, and then off to their routing. If they all have strain reliefs, this will be OK. The most number of hoses possible should cross behind the neck, so that you can hear a leak -you head transmits the sound perfectly, and the flow in the hose from even a pinhole leak will be heard as regulator action and air moving. This is not needed with the hp hose, as the leaks are so loud. Hoses should be exact lengths, like 26" for the pressure hose so it will be possible to run it from the left reg without bowing. Any shorter and you can't read the gauge. A quick fix until you get the 26" hose is to put the clip a few inches up the hose, rather than right at the gauge: the hose will lay smoothly, but will stick down further - good until you can get a custom fit. The two LP hoses should be 24".

The backup must come from the left and feed around to the mouth. There can be an elbow there to make is lay evenly, but no swivel. It is not really necessary, but I do it because I do not want the reg to snatch when I turn my head to the left, and I do not want any excess hose flapping in the breeze. The inflator is on the right reg, with the long hose, so you can hear the air, and to get a good feed. Almost any regulator can be made to run the hoses properly. DO NOT pay any attention to those silly "R" ports or other bozonity. Any post on a good reg will deliver more than you need, unless you are running power tools with it, or a paint sprayer, or a Haskel pump. NEVER use adapters at

the first stage, and just think it out, you will see a way. NEVER accept any gear situation that is not 100% to your liking and perfect- get in the habit of correcting everything immediately to perfection and you will get fewer bites in the ass. - G

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**Subject: Dive Rite wings**

From: <gmiiii@interserv.com>_

Date: Sun, 21 Jul 1996 05:44:28 -0700

I just changed the bladder in my Dive Rite Wings. I had finally broken it after six years (the tube came unglued from the bladder). I replaced it with a six-year old bladder that I held as a spare, and it blew on the first dive. I took me until the end of the line in Wakulla to figure out why I had to keep adding gas. I kept hitting the inflator and instinctively trying to clear my ears, figuring that I must be getting deeper, but when I would glance at my bottom timer, it was always the usual 285. I finally looked at my pressure gauge, saw I had lost 400 psi, and just used the drysuit from then on for buoyancy - not a problem. I really did not need the wings at all, but have a thing about being neutral at all times.

I had bought two more bladders recently (a month ago), and installed one of them. It is put together differently than the ones from six years ago, and will likely not come apart. I would suggest to Dive Rite and other manufacturers that when they spot a problem, they tell us. I can figure these things out by myself, and they will not kill me, and I do not ever expect a manufacturer of dive gear to give me my money back or anything like that, just let me know what to look out for, but look what happened with the bondage wings on the guy in the quarry. For the Dive Rite version, they have instructions, according to Mark Leonard, a good idea.

While I redid them, I decided to test the buoyancy of them in the pool. As it turns out, the Dive Rite original wings will suspend 48 pounds perfectly. This is amazing given the small size of the wings, and the fact that they do this without stretching the inner bladder - a real good idea. There is no way you could ever need 48 pounds of lift, unless you are using the wrong gear.

These wings will wrap around my tanks when not fully inflated, and have very little drag. In fact, I will out-run severely anyone wearing any kind of bondage wings with my Dive Rite "originals". Sea Tec would be awesome if the dumb bastards put the inflator in the right place. On

mine I had to move it, and they looked mutilated, and I have to look good, so I only use them in the ocean where only the fish will see.

Here is what I did to these Dive Rite wings to make them work for six years. I took a truck inner tube, and cut it out to the shape of the wings, and laid it over both sides of the sheath that covers the bladder, so that no part of the bladder is exposed to anything but the rubber from the inner tube. I took the valves apart and removed any excess material and smoothed them to seat perfectly. I cut the little plastic thing off of the rear dump, as stage bottles will dump your wings if you do not. I three-clamped the upper hose connection and the lower one, but not until I had removed the inflator, turned it so that the intake button is facing to the right (so you can operate your inflator and your drysuit with one hand), and added little bike tire inner tube sections over the corrugated hose to hold the inflator hose tight to it. You can use these little sections to compress or bunch the hose near the top of the BC so that the inflator does not get accidentally pressed when you are clipping a stage to your upper d ring. If you get the non-compressible kind, which is too bad, cut it shorter (that is what JJ did to his).

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**Subject: Re: Proper Regs**

Date: Fri, 14 Feb 97 13:16:50 +0000

From "Ken Sallot" <KEN@condor.circa.ufl.edu

Drew,

I have no experience with the Mares regulators, so I can't talk about them, however I sure can tell you what I look for in a diving regulator.

1) 1st Stage, streamlined, clean. For my back I like balanced 1st stages (I dive one balanced diaphragm, 1 balanced piston). Stage bottles I've been using unbalanced pistons for economical reasons, but am switching to balanced pistons (MK-20's).

2) Second stage, You must be able to take it apart and clean it out underwater.

You must be able to swap it out with any other 2nd stage you have underwater, so it can't have funky hose sizes. I like my primaries to be adjustable so I can turn them down in the event of a free flow. I like a regulator that's not like breathing through a straw.

You can take it from there. The regulators I'm currently using are Oceanic Alpha's (great stage regulators), Beauchat VX-10 (really nice regulator), MK-20 G-250 (great all around regulators).

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**Subject: Re: Hogarthian Pressure Gauge**

Date: Sat, 15 Feb 97 17:21:40 +0000

From: "'George Irvine'" <gmiiii@interserv.com>

on Sat, 15 Feb 1997, Mark Melendez <SUBMRGE@worldnet.att.net wrote:

>I'm in the process of putting together my first doubles rig and have a question >about the use of only 1 pressure gauge.

Mark, at this point the dive is over (reg failure), and you will be able to tell when you are out of gas. In practice, you are diving with buddies of equal breathing rate and identical tank capacity. I had a gauge fail 6500 feet back in Wakulla, and when I wanted to know where I was on gas, I just looked over at Brent's. You could turn it back on, but only to satisfy your curiosity.

Depth and time are the same as a pressure gauge for most people. I almost never check my gas, since I can more easily see my bottom timer/ depth gauge, and my hoses are rigged in such a fashion (see "Doing It Right") that if there were any movement of gas in the system, I here it as they all touch my neck, and the HP hose shrieks when leaking, and is a pinhole anyway.

I also plan my gas in advance for the depth and time, and only need to check for a cutoff point when we are delayed or are doing something repetitive in one area, but then the rebreather is what we would use for that anyway, and then gas management is a non-issue, since I have full 121's on as well, and can go 12,000 feet at 300 on that much open circuit.

We also run into the turn issue if we have to pass through restrictions.

I am amazed that instructors don't teach this kind of logic - probably because 99% of them do no real diving, and have no real clue.

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**Subject: Joel Silverstein's Equipment Configs**

When I dive I always carry the following items for emergencies

Line Reel

Lift Bag

Scuba Tuba (orange thing)

4 Cyalume sticks

spare flashlight (4 AA cell)

Sky Blazer Smoke

Sky Blazer Locating Flares

Mirror (red/white)

Space Blanket (can be used to keep head warm)

Small Snorkel

2 Power Bars

All this fits into a dive rite pouch at the bottom of my back plate under my butt.

_____

After having used every set of tanks available I have settled on two main types for my wreck diving. Mostly because of length and diameter -I like them skinny.

I use them doubled up and have a minimum of two sets of each

Pressed Steel (Sherwood Genesis - USD HP - Dive Rite Hot Dip) 120's they are rated at 3500 psi 7.25" diameter I uses them with OMS isolation manifold. A little heavy on land but very comfortable.

OMS 85's (damn I love these tanks), 85 cu ft at 2640 psi 7 inch diameter. At 2640 I have a fill from any compressor. I usually fill to 3500 (not recommended by manufacturer) and have approximately 120 cu ft of gas per tank. Neutral when empty. Best tanks I ever used.

OMS 45's doubled for shallow dives where I want balance. Double 45's you say? I like the feel of my harness and I like my tanks not to roll. I don't care what anyone says, a wing with a single rolls. I have twin 45's with non-iso manifold (external dives only), 90 cuft at 2640, 120 at 3500.

_____

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The tools

Wet Suit or Dry Suit

Hood

Gloves

Mask -2 suggested

Fins

Harness/Backplate BC -single bladder only

Dive Rite shoulder pads -2 sets

Regulators -2, one with 5-7 foot long hose

Double tanks with Isolator dual outlet manifold

1 SPG

Dive Computers -2, capable of stops as deep at 90 feet on air. Nitrox preferred

Wreck Reel -1 primary Wreck Reel (dive Rite, OMS or Aqua Explorers) 250' line

Secondary Reel 1 (DR blue reel)

Lift Bags -2 Carter Lift Bags (50 lbs. each) or (1 100 lb and 1 50 lb) or OMS surface marker floats

Scuba Tuba or Safety Sausage

Whistle or Dive Alert

Sky Blazers Divers Flare/ Smoke pack

Compass

Signal Mirror

EPIRB -Personal Class B

Knife -UK Remora or Ocean Edge (the small sharp ones) mounted on inflator hose

Primary Wreck light -8 D-cell lantern or 30 watt rechargeable UK or Princeton Tec. Canister light is preferred (Dive Rite or AUL) no more than 50 watts of light

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Secondary -2 backup lights, minimum 3 c cells in each

Slates -2 small slates

This is the standard equipment config of the US Deep Wreck Diving Team

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**Subject: How to make a $75 Miniox**

Date: Tue, 6 Aug 1996 17:08:27 EST

From: "Ken Sallot" <KEN@condor.circa.ufl.edu>

I've been getting a lot of email lately about how a person can make a Miniox for cheap (actually how to use a voltmeter with an O2 sensor).

I don't have the original email sent to me on this subject anymore, however here's the gist of it.

Go and buy a Mini-Ox sensor (or any other sensor you like that will work with a Miniox). Should cost you about $75-$85.

Go to Radio Shack. Buy a couple of stereophonic miniature plugs. The type that will fit into the O2 sensor bottom.

Hook the sensor up to a voltmeter. Set the meter to DC, millivolts. You may need to do some soldering to connect wires to the stereo plug.

Take out a calculator. Use a solar powered one to save batteries (and money).

Meter air. You should get a number like "11.7mv". Negative or positive doesn't matter.

Take the O2 content of air (20.9) and divide it by 11.7. For those of you who are truly technical types take out the calculator, type "20.9" then the divide button then the MV on the sensor reading.

Now throw the sensor onto a tank of mix. You'll probably want some sort of flow regulator (you'll need one with a Miniox anyway). Alex Varouxis makes this great little flow regulator that fits on top of a sensor and plugs into a power inflator hose, I think he sells them for $15. Of course you could buy the dive rite flow meter for $49 which doesn't do half as much.

Let the sensor sit on the flow for a minute or so. Meter the sensor with the sensor still in the flow. Take the previous number (remember

20.9/11.7) and multiply it by whatever the readout on your meter is now. That's your O2 content.

A few words of warning. Chemical sensors (such as Miniox sensors) are not 100% accurate. They're considered valid within 1-2%, so it may say "32%" when really it's 34% or 30%. This would be the case if you use a Miniox as well. Also, these sensors will change calibration over time, and different temperatures as well, so you're an idiot if you don't calibrate your sensor before analyzing any tanks. The primary reason to analyze your tanks is for that "sanity check" to make sure you're within the ballpark. Obviously if you're expecting EAN 34% and your analysis says 50% you screwed up somewhere.

Credit for teaching me this goes to Bill Gavin. George Irvine hinted at it before hand, and Gavin went ahead and wrote it all up. It works great; I've been using it since Gavin explained the detail, and am quite happy that I haven't had to buy the Miniox. Of course, buying a Miniox would eliminate the math work, and for some the lack of the calculations will probably give them a warm fuzzy feeling.

Ken Sallot

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**Subject: Re: argon bottles**

Date: Thu, 23 Jan 1997 03:46:50 -0800

From: <gmiiii@interserv.com>

On Wed, 22 Jan 1997, Kevin Connell wrote:

>Would anyone like to comment on a good choice for an argon bottle?

>What capacity & material is it?

>Where & how do you mount it?

Luxfer 14 cu ft 2015 psi aluminum. Argon comes at 2600, and the idea is to keep the pressure low so as not to stress the reg and the volume high - never mix it with anything else as it will ruin the effectiveness of the argon. Use a pressure relief valve in the reg so as to not lose the hose or drysuit valve on a creep. Mount it upside down with a pony tamer to the left tank so you can get out of it if stuck, and you can reach the valve. For short dives you can use the 1/2 liter bottles and slide them on the left side of the waist strap by making an oversized belt loop (so it will go over the D rings) and use a small piece of bungee to loop over the top of the bottle to hold it back against the backplate. For large bottles this style binds the wings and gets in the

way of proper stage bottle flow, but then if you are doing a dive where you need less argon you will not be using a stage bottle anyway. Do not put it on the same side as the light or you can not reach around the tanks to untangle yourself. Use a 24-inch hose and run it under the belt.

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**Subject: Re: Buying O2..**

Date: Fri, 15 Nov 1996 10:07:50 -0500

In a message dated 96-11-15 00:26:01 EST, you write:

<< When buying this O2 from the welding shops as aviator O2 how can you ensure the quality of the O2?>>

You don't buy oxygen from welding shops. You buy oxygen of any grade from a Gas Supply House, many of which are supplied by the gas purveyors (Liquid Carbonic, Air Liquide, Linde, etc.) True many gashouses supply welders and welding shops but most do a significantly more business with hospitals and hospital supply companies.

Oxygen is available in 3 grades.

Industrial (i.e.: for welding)

Aviators (low moisture content)

Medical (requires prescription in some areas and by quantity)

The main significant difference in these cylinders is not the gas it the handling of the cylinder. A welding O2 cylinder since it is ASSUMED that it will not be for breathing can be refilled ON TOP of what is in it. There is a chance, albeit small that some acetylene MAY have back flowed into that cylinder due to a bad check valve on the welding rig. It has no affect on welding but could if you breathed it at depth.

Medical and Aviators Grade Oxygen are handled more meticulously. When a cylinder is returned for recharging the cylinder is emptied REGARDLESS of how much is in it and is further emptied to a vacuum. There by eliminating the possibility of ANY gas being in the cylinder at time of refilling. These cylinders are then labeled and tagged, serial marked and if you like a purity report will be provided to you as to the exact percentage of oxygen (usually 99.??).

These procedures are not arbitrary they are set by the CGA compressed gas association.

I buy oxygen all the time from a gashouse here in NY. Usually 10 large cylinders at a time, medical grade, no prescription. They deliver and pick up and its about $20 per cylinder. We then will use it for filling our training bottles (CPR/first aid stuff) trans filling our O2 scuba deco bottles, and hauling the full cylinders on the boat for Oxygen deco with whips over the side.

If its gonna go into your body don't chintz out buy the stuff you need. If you have NO OTHER choice than to get industrial grade O2 do it with caution.

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**Subject: Three Bad Instructional Practices, One Flawed Concept**

Date: Fri, 23 May 97 21:24:28 +0000

From: "G. Irvine" <gmirvine@safari.net>

The flawed concept? Wait a minute for that. The three bad instructional practices:

1) Deep Air

2) Putting bottles with different mixes on different sides as an aid to identification, instead of marking the bottles correctly in the first place and doing it right.

This is in the same category with putting different colored regs on to identify gases, or any other convoluted scheme.

The correct way? Mark the operating depth on the bottle the way WKPP does and leave it turned off with the reg parked on the bottle until ready to use. Unpark the reg, from the marked bottle you want, put it in your mouth turn that bottle on. IF YOU CAN BREATH, YOU ARE BREATHING THE RIGHT GAS.

Any other scheme is dangerously flawed, and I invite anyone to argue this with me.

3) A new one: using quick releases on harnesses, or using convoluted harnesses. The dive harness should be made of one continuous piece of webbing, with a separate crotch strap. See the "Doing It Right" video or web page, which you can locate from the WKPP web page at wkpp.org.

NOTE: if the harness is not weaved properly, the shoulders will slip tight when you stand up, causing the gear to be hard to don or doff. Any instructor should know this, especially the ones who claim so many years of experience.

A harness failure underwater from using separate pieces of webbing, plastic pieces, or quick disconnects is a death sentence.

THE FLAWED CONCEPT:

The concept that there is a solution for every self-inflicted problem, which is itself a problem, is flawed. For example, putting in a quick disconnect because you rigged the harness wrong is not the answer - it creates a bigger problem. Putting bottles on either side to try to compensate for not marking them properly, or adding the insanity of special regs is a complication and convolution that adds risk to the situation, WHERE THERE PREVIOUSLY WAS NONE.

WHY THE FLAWS?

Several things contribute to flawed logic. The first one that comes to mind is that we have people teaching diving and running agencies who do no real diving themselves, and are only involved as instructors. Another reason is they all want to be big heroes and reinvent the wheel when they clearly are not thinking things all the way through. They are at the same time constantly preoccupied with covering their asses from previous mistakes, and to cover the fact that they are or were lacking the knowledge at the time. They hold hands to try to fight guys like WKPP who have long since learned better methods, and are willing to bring them to divers while pointing out where we were wrong and why and why the changes.

I CHALLENGE THE DIVE INDUSTRY TO MEET THAT STANDARD

They are trying to teach people to do things they should not be doing, rushing people into more an more courses. Tech diving means doing it right in any situation, including instruction.

AN EXAMPLE:

An incident comes to mind in Ft Lauderdale where an instructor tried to take an overweight novice on a deep wreck dive, only to have the person panic, loose a fin, drop the reg from its mouth, and go epileptic and refuse donated air. The student had to be cut from its gear and taken to the hospital. The solution: put quick disconnects on the student's gear - this is what we have out there. Here is the best part - the "student" is an INSTRUCTOR!!!

The ultimate flaw comes with the instruction of DEEP AIR. The new line of reasoning from instructors is that deep air gives the student an appreciation of gas. My son is getting his drivers license. Do you dive instructors, and deep air advocates, think I should have him drink some vodka and go for a drive so that he will appreciate driving sober?

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**Subject: O2 clean - very long post !**

Date: Tue, 12 Aug 97 18:46:37 +0000

From: <CHKBOONE@aol.com>

All,

Jim Cobb writes of his reasons for believing that O2 cleaning of scuba tanks for oxygen service is an unreasonable requirement (BS) . . . . .

>The main dangers with O2 are in high temp/pressure situations, so

>compressors do require special treatment if you are running high pps of O2 >through them. You should never use a ball valve with 02.

High temp / pressure situations can exist whenever there is turbulence in the flow of a gas. Turbulence is caused whenever there is a change in direction, objects projecting into the path of flow, or a sudden change in the shape of the passageway and it increases with the velocity of the gas. Turbulence is characterized by areas of higher and lower velocity than that of the main flow as well as areas of compression and expansion.

As a gas passes by these obstructions and nonconformity's tiny areas of much higher pressure are created for reasons similar to those that cause a wing to provide lift, turbulence behind a car, and others. Because the gas is moving through these areas rather than eventually becoming static, as when filling a tank, new gas is constantly being compressed into the area and bringing more heat into the area to be absorbed by the walls of the container.

We are talking about an area the size of a pinhead or a pinpoint inside the tubing of a compressor system, a tank, or tank valve and the phenomenon is referred to as "adiabatic" in nature because temperatures rise or fall without adding or removing heat from outside the system. Temperatures can rise hundreds of degrees in an instant if flow and/or turbulence is high enough regardless of pressure. Air conditioning and refrigeration are controlled adiabatic processes.

A tank valve has sharp bends, protrusions, and noncomformitys and the tank threads have many more. Gas must squeeze into the space between these threads if they are not filled with a non compressible lubricant and no one "fills" these threads with lubricant. Currents inside the tank during filling result in gases moving along the walls at very high velocities. Any pits, scale, or particles of rust or aluminum oxide in or on the side of the tank contribute to the opportunity for these adiabatic processes as well as to moving particles that create points of heat or sparks from friction. As the tank is filled the walls stretch and these tiny pits, imperfections, or points of corrosion (even invisible ones) snap, crackle, & pop as microscopic pieces of corrosion fly off under the influence of vibration and friction from stretching. Much of this mechanical energy is converted to heat and if the walls of the tank are impregnated with traces of hydrocarbons in a high O2 environment the stage is well set for fireworks.

Every pyrotechnic explosion starts with a detonation at the microscopic level.

Filling slowly greatly reduces the risks of ignition and virtually eliminates any problem from the threads because they represent a dead end space that does not receive a constant supply of new gas (they fill up) but the valve and the sides of the tank remain vulnerable.

Note that matter contains heat and any time matter is removed from or added to a system heat is also removed or added. When a tank is filled it gets warm for two primary reasons.

1. Because you are squeezing the heat of many air molecules into a compact space (more atoms banging on the side of the tank and each other). The opposite happens when you empty it.

2. You are stretching the metal of the tank walls as it expands like a balloon.

When you compress a gas into a tank or any closed container the rate of compression and flow slows to an eventual stop so that a finite amount of heat (carried by matter) is added to the elements of the system. When a gas is compressed by turbulence as a result of flow, however, the rate of compression is sustained and it is always new gas being compressed into an open area. The difference in the amount of heat transferred to and concentrated in adjacent material is astronomical. Spacecraft heat up upon reentry not because of friction with air but because of compression of the air under them. There is some heat from friction but nothing to compare with that of compression.

The static electrical charges that result in lightning is caused by friction between air, water vapor, dust, . . . . The same thing happens between the material ejected by volcanoes and between propeller blades and air. Though it is much less likely to occur in a "normally" clean scuba tank where everything is usually well connected electrically it is not impossible for high velocity gas movement to build charges on particles that are electrically isolated from the tank walls. Even the tiniest invisible spark may be all it takes to start the show.

Pumping pure O2 on top of air does not mean that the O2 will mix with the present contents of the tank without setting up currents of isolated gas that allow parts of the tank to be exposed to pure O2 moving at high velocities.

It is considered safe to pump mixes of up to 40% O2 into tanks that have not been oxygen cleaned and some shops have large banks of this "pre-mix" (usually 32% or 36%) that can be used in any tank. The problem arises when pure oxygen and air are mixed in a tank because at some point you must run pure O2 through the valve and because whether the O2 comes before or after the air the tank walls are still exposed to 100% O2.

So the point here is that you admit that "The main dangers with O2 are "In high temp/pressure situations" and the virtual guarantee that there will be some degree of adiabatic processes at work in the valve and around the threads of the tank, that heat and possibly high velocity particles will be generated as the metal is stretched during filling, and that friction between particles and gas will create static charges, makes pumping high O2 percentage gases into a scuba tank a potentially very high temp/pressure situation on the microscopic scale where everything gets started anyway.

>Pressure vessels carrying your primary air supply should be clean period.

>Any tank which is clean enough for your breathing air is clean enough for

>nitrox. If it is not clean enough for air then you need to get it cleaned.

Yes they should be clean but clean enough for breathing is not necessarily clean for over 40% oxygen. Hydrocarbon is not a dirty word biologically - we breath them all the time in quantities that the body handles with no sweat.

We lust after them at the dinner table and we smear them all over ourselves in the interest of attracting other similarly slimy humans. There are many compounds that we use regularly or are harmless that

simply ignite easily and violently in high O2 atmospheres. Silicone grease is normally used on o-rings in normal scuba but is a no-no with O2.

With few exceptions, only vapors and gases will burn in air but solids and liquids will burn in high O2 environments.

>But for the most part the 02 is added downstream, so any quality

>compressed air source can be used for PP fills.

What you are talking about here is atmospheric entrainment mixing or continuous blending.

These are mixing systems, developed by Dr. J Morgan for NOAA, that mix gas as the tanks are being filled; one gas coming from an "oil free" compressor and the other from a bank or tank of compressed gas such as Oxygen and in these cases the O2 is indeed injected down stream of the compressor and everything is mixed by the time the tank valve is reached. This method, however, is not partial pressure filling and is still limited to about 40% oxygen or less unless the scuba tank is cleaned for O2 service. Very few, if any shops use this method; it is primarily seen in commercial diving systems. It is considered the best and safest method for transferring high pressure oxygen.

In partial pressure filling pure O2 is added to a tank to a calculated pressure and then air is added on top of that to the final pressure and gas percentages. Adding O2 after the air still exposes the tank interior and the tank valve to pure O2.

No matter how high the quality of the compressor and filter system there is no such thing as 100% filtration. Some minute amount of vapors get through and build up on the walls of the piping with time. Compressors designed for O2 use either no lubrication, water, or special lubricants in the gas compression elements because of this accumulation problem and because undetected blow-by or filter problems could easily contaminate the system without the operators knowledge.

When you pump air into an O2 clean tank from a hydrocarbon lubricated compressor you are introducing at least minute quantities of oil vapor into the tank interior and valve. These materials; water, oil, carbon monoxide, etc, are not always mixtures or particles but often vapors and gases in solution with the air and they can not be reliably filtered out as you filter dirt or dust from air and water.

These must be removed by "absorption" onto substrates such as activated carbon, or by combining with other compounds, or altered by catalytic actions.

These types of filtration do not normally restrict the flow of gas as impurities are pulled out so that when loaded to capacity they often allow everything to pass unchanged and unimpeded with no visible indication that the filter is overloaded. Also as some filters load up they become a source of contaminants themselves. With many types of filtration, the only practical way to insure a working filter is changing it on a schedule based on hours of use or quantity of gas / contaminants passed through it.

Sintered filters are great for keeping particles out of your tank but if not periodically replaced as they wear and corrode they can actually become a source of particles. Check out the filling stations as you dive around the country and see how many have these filters in their filling adapters and the condition of those that do.

I have found water in my tanks many times. Some came through compressor systems as vapor and then condensed in the tank. This is not serious in itself because as a vapor it can not carry anything in solution with it so it is clean water. But if that vapor condenses in a filter or in fill station lines it will pick up accumulated hydrocarbons and can arrive at the tank as atomized droplets with the oil in tow. Any water, of course, causes rust in a steel tank - often resulting in those tiny pits mentioned earlier.

Jim, in another post you say :

"Well now, here's a news flash. Now sand reacts with oxygen."

It's not the sand, it's what might be adhering to the surface of the sand and the turbulence, friction, or static electricity the grain will cause. Also, if the grain of sand made it into the tank there is no telling what else might have gotten in.

Normally, in an air environment, only vapors and gases will burn but in a 100% oxygen environment there is enough sustained contact with oxidant to support the combustion of solids and liquids.

In the case of hydrocarbons in a scuba tank full of oxygen this fuel can have worked into a pseudo-solution with the metal to some depth or at least packed into porous spaces. Any heat build up in the tank walls can easily create tiny local areas of explosive atmospheres against the walls of the tank as vapors rise out of these microscopic reservoirs.

When these hydrocarbons ignite there can be enough heat and explosive force generated in the local shallow depths of the metal to pulverize and ignite some of the metal itself. If enough heat is generated by this initial ignition to sustain combustion everything in the tank that can will eventually vaporize and combine with oxygen so that the final explosion releases far more than the potential energy of just the instigating fuel itself.

This may be why some agencies will not fill aluminum tanks with oxygen perhaps aluminum is more easily pulverized and ignited than steel alloys.

>If you could see how oxygen is handled in a shipyard, you would

>understand why I think all this nitrox hoo-haa is a joke. While we treated

>02 with respect, we sure as hell didn't tippy-toe around it like it was a

>bomb ready to go off, as scuba rules seem to decree. We would regularly

>drag oxy-acetylene hoses into bunker C tanks which were not exactly what

>you would call "oxygen clean". And these hoses carried 100% 02. We were

>more scared of methane from leaking sewage systems.

>Even with the shipyard experience, it seems that the rules for handling

>oxygen were derived primarily from industrial usage, for lack of a better

>source. 02 is used in different fashion in scuba.

The danger is not in moving or handling the tanks but in filling them. These nitrox and oxygen tanks can be safely dragged around just like any other once they're full. The "scuba rules" as you call them only pertain to procedures for "filling" tanks during which they are, indeed, bombs waiting to go off.

Did you think nitrox tanks were supposed to be kept on padded cradles and the outside wiped down and scrubbed ? Someone else wrote of his experience dragging oxy-acetylene tanks through mud and grime, wiping the valves off and using them. None of his welding or your shipyard examples have anything to do with the reasons for O2

cleaning nitrox tanks. When they speak of "handling oxygen" in OSHA and other regulations they are talking about filling tanks or moving gas from one container to another under pressure - not about rolling or dragging the tank to the job site through mud puddles.

>02 is used in different fashion in scuba.<

Yep! It is more often handled by untrained, undisciplined, unbelieving, people - the general public! All the more reason for the shops to carefully enforce the standards for "handling oxygen"! What better source for these standards than industry where it has been safely handled for decades and why spend money and time to come to the same inevitable conclusions all over again ?

It seems to me that the chances of hydrocarbons or other "fuel" entering most industrial application tanks is not as great as that for scuba tanks because they are rarely opened and are only filled by facilities that do so under more uniform and reliably safe conditions than can be expected in a typical dive shop operation involving the general public.

I doubt that welding or medical tanks are ever filled directly from a compressor, rather from a very large holding tanks. If this is true then the regulations specific to scuba probably take into account the fact that a source of ignitable fuel is much closer to the final vessel handled by the consumer and, therefore, considerably more likely to make it's way into the tank either by accumulation, by undetected compressor and filter problems, by standard "Joe Blow on the street" carelessness and ignorance, or by people who just don't believe it or misunderstand the intent of the regs.

>There is a long track record of oxygen being used with standard scuba

>equipment with no failures due to oxygen induced o-ring degradation.

>o-rings used in Scuba gear are changed regularly as a matter of course,

>never giving them the chance to degrade. It seems that the degradation is

>something which takes place over a period of time which makes it

>irrelevant to scuba.

This is probably true where equipment receives regular maintenance but where it does not, if a seal failure occurs you have the same situation as a ball valve opening in a compressor system - sudden turbulent flow. The only place this is likely to happen is inside a

regulator; can a detonation occur inside your regulator during a dive and if so would it be life threatening? Yes and possibly !

The environment inside the regulator is no different from the filling station system as far as bends and obstructions go. If flow suddenly becomes constant and/or high due to a seal failure you want it to be O2 clean if the tank contains a high percentage of O2 (over 40%).

>In my own experience I have seen partial pressure fills done in shops, on

>boats, and in cars, on tanks which have had no special preparation and

>never once has the world come to an end.

Well! I'll have to take your word for this. If these were real partial pressure fills I am impressed with your luck and I hope it holds out.

Keep in mind that the space shuttle held out well for many flights before the design flaw in the solid booster o-ring blasted several people and one damn expensive ship into oblivion. The same situation exists on airliners that eventually drop engines off or are incinerated when oxygen canisters that have surely been smuggled on board for years finally light off under "just the right conditions". How much do you think the unlikelyhood of this happening means to the surviving wives, husbands, and kids?

You and every other diver out there using oxygen owes it to every other diver and filling station attendant to follow these procedures whether you understand the underlying principles or not. It is only because of the cooperation of thousands of people, none with a complete understanding of all the details, that you are able to dive at all.

How can you be willing to take the word of the people who have studied the physiological consequences of breathing gases under pressure and follow their decompression recommendations but publicly debunk the word of those telling you of the touchy nature of high oxygen environments with nothing to back it up but the fact that you've never seen it happen ?

Let me say that I am not a maintenance nut with unreasonable oxyphobia and that I am not taking the "side" of dive shops or anyone else here. I hate having to O2 clean anything, I hate government regulations, I hate industry manipulation of markets, but more than this, I hate having body parts blown off.

**Subject: Tank Marking**

Date: Sun, 17 Aug 97 12:28:27 +0000

From: "G. Irvine" <gmirvine@safari.net>

We (WKPP) feel that the only true gas related risk in the kind of diving we do lies in breathing the wrong gas. I will leave it to you guys to argue the filling, explosions, cleaning, etc. Suffice it to say that I do not count these questions among the real risks, since they are both redundant subjects and subject to obvious influences). We know how to care for and fill tanks.

Death comes with breathing the wrong gas. To avoid this, we mark our tanks with the max operating depth of the gas according to our standards. Most of this involves deco gas, and we have found the optimal set of deco gases to be 190 (air) 120 (35%) 70 (50%) and 20 (100%). Bottom gas in stages get the depth marking (most of our stuff is 300, so we only occasionally have to tape over the three hundred for a shallower depth). Back gas gets tagged if it is in doubles.

There is a lot to be said for uniformity and simplicity, including easy handling of on the fly deco situations.

The markings we use are three inch high letters (for the oxygen) and three inch high numbers for the depth painted on (or taped over the paint for odd depth bottoms) horizontally in the orientation of the tank on both sides. The divers name is also painted on the tank and on the doubles. The diver can see his own tank marking, and his buddies can see it regardless of which side the tank is on.

For filling, we use two tapes: one for the non-air contents and date. This information is filled out before the tank is removed from the whip. The second is for the post fill analysis, done before the first piece is removed and put over the tank opening to signify it is full.

The analysis can be left on the tank, but is merely confirmation, and with its date prevents any question. We dive nothing without an analysis, unless it is taped over and still has the original analysis. If the pressure reading is full, the gas is the same as it was.

The real key to tech diving is to identify and handle the real risks - this is the biggest real risk in tech diving, and as an accident cause, has the body count to prove it. - G

* we do not dive air at 190, but we will use it or a normoxic trimix in the 190 bottle with gas on our backs. Any other choice of bottles or gas follow the usual logic: 130 ead, 1.4 ppo2 max, with a 1.6 deco max for the first stop of a bottle, like 35% at the 120 stop with appropriate

back gas breaks to prevent spike reactions, all dependent on the cumulative exposure. In some cases the bottles are brought up a stop or two first. This is not a likely problem in ocean diving, but is in long cave bottom times where delays are possible.

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**Subject: WHY WE DO NOT USE 80/20**

Date: Thu, 18 Sep 97 16:33:08 +0000

From: George Irvine <gmirvine@safari.net>

WHY WE DO NOT USE 80/20

1. This gas was introduced in an effort to overcome the inability of unqualified student "tech" divers to control their buoyancy in open water, and is as such is yet one more concession to doing things in a convoluted fashion to offset a self- inflicted set of problems brought on by the "doing it wrong" thinking that pervades diving today.

2. A heavy sea is not a problem for a deco stop if it is not posing a lung-loading problem. Look at your depth gauge in a heavy sea and "see" for yourself what the changes are - insignificant, and if they are not, you should either not have been diving or incurring a decompression liability of this magnitude in the first place. In the event of a change in conditions during the dive, see below where the 80/20 becomes a liability rather than an asset.

3. In the interest of using a standardized set of gases for which you can permanently mark your bottles, it is a poor concession to inability to sacrifice the benefits of pure O2 to accommodate a real or perceived lack of skill - learn to dive before taking up techdiving.

4. In this same interest you will find that when you graduate to real diving, as in caves, you will not want to accelerate your ppo2 at lower depths while still being faced with a long decompression at shallower depths, and making bizarre mixes to do this is a dangerous mistake (just like the fantasy of holding an accelerated ppo2 on a rebreather throughout a deco). I am anticipating the thinking that the

80/20 crowd would then go to an additional oxygen in cave without accounting for total exposure, and subject themselves to the risk of tox in the final deco steps. Tox you do not get out of - bends you do.

5. The 80/20 mix is in fact totally useless and contraindicated as a deco gas. At thirty feet it is only a 1.52 ppo2 ( the real 1.6 ppo2 gas would

be 84/16) and as such does not either provide the right oxygen window, nor does it does it work as well as pure oxygen without an inert gas at any depth. The gas mixing in your lungs has already lowered the effective ppo2 enough to prevent spiking at 20 feet anyway with the use of pure oxygen - in other words, we are dealing with a simplistic misunderstanding here, or "old wives tale" that is typical in diving.

6. If 100% oxygen is a perceived buoyancy control risk at 20 feet, then why is the same ppo2 (intended) not a risk at 30 feet? This shows the total lack of reasonable logic involved in the decision to use this gas, as well as a lack of understanding of the whole picture (see the rest of this discussion).

7. Along those lines, all we hear is howling about "oxygen cleaning" above 40% mixtures, and dive shop proprietors on here complaining about scuba tanks with oxygen in them being filled in their shops. With a pure oxygen system, the tank only ever gets filled with oxygen from oxygen tanks, not from every dive shop compressor it sees. Again, this shows the total inconsistency of agency thinking, and reveals that the true reason for this gas is to pretend to lower liability for teaching incompetents to dive, which is bull, and to attempt to accrue some inventive accomplishments to the dive agency pundits who themselves prove that they do no real diving by making this recommendation in the first place. This is like the colored regs, the stages on either side, the quick-release buckle, and the poodle jacket: nonsense of the most obvious nature developed through one-dimensional thinking by those whose universe of understanding is not only severely limited, but blinded by the hubris of not being the "inventor" of the techniques that work.

8. Any perceived decompression benefit of using a higher ppo2 at 30 feet with 80/20 is then given back by the lowered ppo2 at 20 feet, not to mention the fact that the presence of the inert gas in the breathing mixture defeats the purpose of using oxygen in the first place (see the Physiology and Medicine of Diving) . The ppo2 of 80/20 at 20 feet is 1.28, not much of an oxygen window, and at 10 feet it is 1.04 -useless for deco. To make matters worse, you can not get out from your 30 foot stop in an emergency (not doing the other stops) on the 80/20 mix without really risking a type 2 hit.

9. This is a dangerous method to achieve a greater total volume of gas for the bad breathers (another obvious reason the gas is in vogue), who should not be incurring these decos, and even that benefit of having more gas is lost since it is breathed at 30 feet, and then has to last for the other stops. The fact is that gas is effectively saved by using the lower deco gas up to this point, relying on the pressure

gradient to both achieve the deco and provide a break from high the previous gas's higher PPO2 prior to going to pure oxygen where the spike could be a problem on an extreme exposure without an adequate low ppo2 break (again this shows that the 80% user is a neophyte diver with no real experience or understanding of the true risks of these dives) .

10. The 20-30% longer 30 foot time on the lower ppo2 is not only overcome on the pure oxygen at the next stops, the breaks do not come into play until the initial good dose of pure oxygen has been absorbed, since you are not spiking from a high pervious dose without a break that is effectively achieved on the previous gas. These things need to be understood and taught by the agencies, not some superficial convolution that is designed to obfuscate the problem rather than openly acknowledge and deal with it in a responsible fashion.

11. In an emergency situation, getting onto the pure O2 for 20 minutes or so (for long dives something approximating the bottom time or a any decent interval) would give you a real good shot at getting out of the water having missed the rest of your deco and living through it with pain hits only. You have to think these things all the way though, not go for the transparent superficial thinking of those who merely are trying to "make their mark" with some "great" idea they can call their own. The acid test is, as always, is the caliber of the divers who adopt these practices.

12. If there is some problem with your deco or you otherwise develop symptoms and need oxygen either on the surface or back in the water, it is silly to have not had it there all along. 80/20 is a joke for that purpose, unless you have asthma, in which case any accelerated oxygen mix would be a nightmare. This is again part of the "thinking it all the way through" philosophy which is obviously missing from the 80/20 argument.

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**Subject: ean80**

Date: Fri, 19 Sep 97 18:28:30 +0000

From: Tom Mount <TOM.MOUNT@worldnet.att.net>

Dear Bill and George

This post is not a debate; it is not intended as an argument: it is strictly shows why some of us opt to use EAN 80 in training situations. You as a diver do what you feel comfortable with as long as you do not exceed

physiological limits. Take responsibility for your own actions and decisions.

I had no intention of responding to this series until I opened my email today and had a dozen post from instructors requesting I do so.

One it should be noted IANTD does not require the use of EAN 80 or any other specific gas on decompression stops. Thus instructors who prefer oxygen are welcome to use it.

However some of us use EAN 80 in training programs for the following reasons.

1. It evolved because several students in various instructors' classes did develop oxygen tox symptoms. Fortunately these were not convulsions

2. Usually divers at the 20-foot stop tend to hang out around 22 or 23 feet (1.69 PO2). So the instructor has to keep reminding them to ascend to exactly 20 feet.

3. When we originally started offering these programs most of the students had already used oxygen and thus we could assume they were capable of handling it as time went on we begin to have students we did not know.

4. This being the case some of us felt that perhaps it is a little risky to be giving students in water oxygen tolerance test. So why not be a little conservative and spend an additional 2 to 3 minutes of time in the water.

5. In fact on long air dives, and some mix dives, it is frequently possible to shorten the total decompression time by switching to EAN 80 at thirty feet Vs oxygen at 20 feet. With only 20% nitrogen in the mix there is still a large pressure gradient enhancing off gassing of nitrogen. The primary reason for EAN 80 is to reduce the oxygen exposure to a student or ourselves.

4. Some sample dives using EAN 80 Vs oxygen are shown below:

Using a Buhlmann model reflects the following:

1. 100 minutes at 100 feet on air with oxygen deco at 20 and 10 feet. Total runtime 174 minutes

2. the same dive with EAN 80 as a deco gas gives a total runtime of 167 minutes, faster deco with less oxygen exposure.

3. 200 feet for 30 minutes trimix 19 30 this is a typical dive in a mix course

-With EAN 40 at 80 feet and oxygen at 20 &10 RT is 91 minutes.

-The same dive with EAN 80 at 30-20 and 10 instead of oxygen 91 minutes

exact same runtime just less oxygen exposure.

-On a dive where the EAN 40 is not used RT with oxygen at 20 and 10 is

126 minutes

-Same dive except using EAN 80 at 30-20-10 RT is 109 minutes

-Same dive except deco on EAN 40 from 80 to surface RT is 143 minutes

-Same dive with deco on bottom mix 19-30 RT is 244 minutes

*By the way a constant PO2 on a CC Rebreather of 1.3 ATA, with the same diluent on the bottom, 19 30, and one switch at 80 feet to a diluent of EAN 40 will give the following RT. 85 minutes*

Again these are just from the model, If you run other models you will see similar results.

Most dive shops would probably prefer to sell pure oxygen as it would make them more money than an EAN 80 fill with out all the hassle of doing the fill.

Also again instructors may use the deco gases of their choice, in the class. Outside of a training program training agencies do not have control of a divers activity. So make your own decisions.

On a personal note regarding double 80's and why I will not allow men or big women to use them in classes I teach in the USA, in some countries I do not have a choice.

1. While many of us can easily pull the bottom time requirements in a course on double 80's. My experience has shown that many divers (primarily men) cannot get more than a 20 to 25 minute bottom time using the rule of thirds at 160 feet, and 18 to 25 at 200 feet and less than 20 at 250 feet, on double 80's. Therefore I require at least 200 cubic feet of gas in my classes (except for women who generally do better on gas than men) In the case of women with low gas consumption double 66/10L cylinders in training. Patti uses double 7 L

/45 cubic foot cylinders and it is more than adequate down to 170 feet below that she

goes to double 66/10L. I personally use double 13 L /85 cubic foot steel tanks and pressure them to an equivalent of 200 cubic feet. In the ocean. When I'm teaching cave I use either double 104 or double 112 cylinders. I could get by on less gas but carry more than needed in case a student gets into a problem. Again better safe than sorry.

2. The buoyancy of the 80's to me is annoying I hate having to wear a weight belt. And if you used angle weights behind the backplate then you have lost all buoyancy characteristics of the cylinders that would enable you to swim to the surface with them easily, and may as well have more gas for the same weight and not be as uncomfortable as a weight belt is.

3. I and IANTD recommend (do not require) two wings if diving wet (although I do not always do this) because I and other members of IANTD have seen to many BC failures and have even experienced a couple. With a dry suit I use and recommend one wing

4. Do I think using 80's is unsafe NO I just prefer not to. If I have to carry more weight on my body I prefer it be something I can breathe.

Next standards in IANTD are not produced by me they are a product of BOA recommendations and in field request from instructors then approval by the international IANTD licenses and finally by the BOD.

Again first seek out safe training , become informed and knowledgeable, and skillful then be responsible for your own decisions, use your god given intelligence. It is not important that you agree with or disagree with many facets of opinions expressed by a lot of us. It is important that you understand why this or that is better for you or your purposes and where you are diving.

Tom Mount

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**Subject: WE DON'T USE IT ANYMORE**

Date: Fri, 17 Oct 97 14:22:29 +0000

From: "George M. Irvine III" <gmirvine@safari.net>

The WKPP no longer uses air in any application. We used to use it for deco from 190 (where there was immediate relief to 150 above us), but now we use the right mix for that. We used to dive to 150 on air ( with gas on our backs), but now we use the right mix. JJ and I changed the

150 rule when we suspected a problem three years ago, and we recently, starting with the Wakulla dives last April, changed the deco 190 rule. For support divers who have a variable depth and may go beyond 120, we use mix. Gavin originally selected the 190 deco and 150 air because we had a long run at 150 with TRIMIX ON OUR BACK in Indian Springs, but JJ and I changed that. He also used the 190 WITH GAS ON OUR BACK for ONE application, Wakulla Springs. None of our other sites even had air in the combination, as they were either too deep or they were shallow

enough for nitrox . In Cheryl, Turner, Big D , Sullivan, etc, we dropped nitrox and other than Turner, the bottom gas had a high enough oxygen content to make a 21 nitrox unnecessary. The original standard predated the type of exposures we do now, so did not have enough use to warrant any attention, and GAS WAS ALWAYS ON THE BACK IN EITHER THE 150 OR 190 situations, there are no 150 caves that we dive : they all only stay at 150 for a while before dropping, or in the case of Sullivan upstream, they dip and go back shallow.

Now we do neither. It has come to our attention that air at these depths is a severe mental impairment, and causes severe physiological damage - only a blithering idiot would continue a practice that has been shown to be unsafe, and I am not afraid to admit that I was a compete moron for not doing something sooner when JJ and I had REPEATEDLY discussed it and suspected it for the last several years. Sometimes it takes a wakeup call, and unfortunately with the level of ignorant stupidity in diving we are on our won as to arriving at these decisions, and I will do nothing or impose nothing on others that I have not tested on myself, so JJ and I tested these things out before we instituted them, hence my excuse for the delay. I was an idiot, but I admit it, and I also NO LONGER DO IT.

It was never the intention of Bill Gavin, who was dead set against air diving, to push the narcosis limits, it was only to make the deco, and he was always very concerned about the deco. Bill Gavin was the guy who ended air diving by the WKPP after he saw McFadden get killed. That was eight years ago. Gavin only did dives with gas on his back, so was only thinking in those terms - he in no way was ever making an air diving level judgement.

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**Subject: TRIMIX was Re: trimix**

Date: Sat, 18 Oct 97 11:15:51 +0000

From: "G. Irvine" <gmirvine@safari.net>

Hans, we believe as you do. We have a "starting" point of 130 aed and 1.4 ppo2 maximum. This is calculated to the deepest depth we are expected to encounter, even though the "profile" is probably less. We then reduce the ppo2 for the longer exposures, and raise the helium for more precise work. Effectively, we end up diving more like 1.0 ppo2 and less than a 100 aed. Jarrod, Brent and I are actually diving as low as a .6 ppo2 and a 60 foot aed in some cases. I do the survey and the mapping, so I dive the highest helium, in many cases approaching heliox. I feather this in, diving a lower helium and higher oxygen early in the dive and then a higher helium and lower oxygen later in the dive ,bringing the ppo2 up at deco, but still no spikes. I have no haskel, so get the higher mixes by lowering the pressure, or running the helium through my compressor. I generally dive lower pressure on my back gas (to prevent reg failure), and have more in the stage bottles, where a reg failure is insignificant since I can manually operate the tank valve.

What all of you will find, as I did per force, is that the higher helium, lower oxygen mixtures are much more pleasant to dive on, and really only incrementally more expensive than helium at all. Oxygen is dirt cheap here.

We found a lot of this out by accident, since we dive helium so often, and do so much decompression diving, we are not afraid to experiment with gas. We end up blowing air on odd gasses and diving them shallow, rather than dumping the gas, and have even done some trimix dives at Ginnie Springs. I did that one on 18/40 ( air blown back onto a 12/55)one day and really liked it.

Our oxygen maximums come from commercial diving ( and I do not mean cleaning the bottoms of boats, I mean oil company diving). We use a maximum level for ppo2 at or below which seizures are not expected to occur using previous datalines. The helium we have gradually changed our thinking on as we discover impairment in different ways, and as we realize that it is in fact a more friendly gas to decompress from than nitrogen. The Germans found impairment is effective at all depths, and this not only makes intuitive sense, it explains an awful lot of unexplainable accidents .

If you want to experiment, breath some heliox in your living room and read the newspaper - see how fast you can read and still comprehend everything. Personally, I would like to see my kids take their SAT tests on heliox.

Let's remember that we are talking technical diving, and that the WKPP represents the logistical sophistication and logical perfection of that discipline, and we do it in ways that every last one of you can immediately implement by adopting our way of thinking and attitude

about diving, and rejecting the ego threat and peer pressure of the air or deep air equivalent depth crowd who falsely believe there is some "ability" to operate impaired. Did you ever hear the term, " he can really hold is liquor"? That is a euphemism for an alcoholic - only a drug addict would need to "hold" a drug. Call me a weenie, but cakewalk

160 long range deep mixed gas cave exploration dives first - we must know something. The deep air guys have ZERO of these dives, the high AED guys have ZERO of these dives. Helium is the best thing that ever happened to diving.\

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**Subject: Gas Diving Made Easier**

Date: Fri, 31 Oct 97 00:09:42 +0000

From: "G. Irvine" <gmirvine@safari.net>

Common Gas Diving Topics

We need to look at some topics in gas diving that are being misapplied due to misunderstanding, and then used to justify deep air diving.

#1 - "air tables" are wrong. We all learned some simple things first, like PADI tables, and then Navy tables. PADI tables are Navy no-decompression tables. Navy tables are nonsense - they bend you by not doing the deep stops and then treat you by extending the shallow stops.

#2 - Gas tables are more correct: unlike the more arcane Haldanean models in the air tables, gas tables were mostly developed using Bulhmann's theories which started deco deeper, but not deep enough.

#3 - In real life, stops start deep, helium is your friend, it makes you feel better after the dive and keeps you from narcosis, it is EASIER to decompress from.

The result is that people were first taught to believe that gas needs deeper deco than air, when in fact air needs deeper deco than is in the "air" tables.

The term "decompress from gas on an air table" is an oxymoron - there is no "correct" "air" table as we know it, the gas tables are what is needed for air.

Having said that, let's look at a diving situation:

I want to do the "Doria", but my captain, Janet Beiser, has to limit my gear baggage since there are others on the boat. I can be a dope and dive air (if Janet would let me), or a convolute and put air in my back tanks and take gas stages, losing redundancy in an emergency, and being forced to air at the worst possible time (like what happened in the death of Rob Parker), or sharing air with an out of gas diver, who is now hammered, scared, and on my long hose, or I can make the exact mix for one dive and then blow it into oblivion with air or,

I can "Do It Right":

I can lose the abject fear of helium and low oxygen mixtures, and make up two sets of doubles with high helium, like 50%, and low oxygen, like 14 percent, and take stages of the exact mix for the depth, probably something like 18/33, and some stages of 50/50 and my oxygen bottle.

I dive the stages and try to save the backgas, but let's say I want to use the backgas. I can blow it back three times and still be ok on the oxygen, and probably pretty good on the helium, but what happens to the deco?

My first dive for 25 minutes is probably a good hour of deco, my second with the diluted mix is more like 52, and the third more like 45 (relatively 60,50,40 or padded ratios like that). In other words, for a few extra minutes in the water, I get to do it safely. I then do the same with my other set, and/or my stages were dived first, and then I do a couple of back gas dives . I keep the dives to reasonable bottom times, and end up making the deco gas last longer, and as the deco gas gets diluted or lower, the deco using the higher oxygen "reblows" is getting shorter and shorter anyway, assuming I am giving myself a decent interval between dives. Most of the deco time is on oxygen anyway.

POINT HERE: mixes that are too low in oxygen and too high in helium are not a bad thing - this is ok. The opposite is not. The former means a tad more deco, the later means a lot more risk.

For a shallower dive, lets say 130-160, I can take my doubles with something like a 16/40 and blow that up a couple of times for back gas diving in that range with the boat's compressor. The deco pickup over a higher oxygen mix is not enough to warrant the air, especially at the more insidious depths, like 150, that have enough impairment to cause an accident, but not enough to "ring your bell" and make you aware of the impairment.

Keep in mind I am talking about trips where you have limited gear space and want to maximize your gas .

Technical diving is fun, but it is getting a bad name due to the accidents. The accidents are due to impairment from narcosis. The accidents need to stop. I repeatedly do dives that were not even thought possible by my original dive partner, Bill Gavin, and I do them safely, and I do them all the time, and they are fun to do. If I can do 300 for three hours and then go out to dinner with my pals, then you can dive the Doria or anything else without the self-imposed risk. I know what I am talking about - learn this stuff right and stop the nonsense.

If you need information to keep yourselves alive, ask me or any of the WKPP guys, and examine your own misconceptions - there is no such thing as an "air table", and the real risk is death. - G

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**Subject: Argon Bottle Placement**

Date: Sun, 9 Nov 97 13:17:04 +0000

From: "G. Irvine" <gmirvine@safari.net>

The argon bottle does not interfere with the stages on the left side. If it is on the right, where the light is, you can not reach behind you to untangle yourself. You can reach around the argon bottle, or the light, but not both together. It appears that the bottle would get in the way of stages, but it does not in fact do so. Try putting on your tanks and have somebody hold the argon bottle on the right, and see how much range of motion you have lost.

The bottle needs to be upside down -so you can reach the valve easily- it needs to be closer to the bottom of the tanks (so that it is in the slipstream of the tank and not making its own pushwave, and so that the hose feeds freely below the edge of the wings when they blow up), and it needs to be stable so it does not set up its own drag by moving around.

It is preferable to be able to release it yourself so that if you get keyed in a restriction or stuck on something, it is removable, just like your light should be. Carmichael makes a great argon bottle holder, but I do not have one. I have two types -one for tight cave, and one for powercave. The tight cave uses hose clamps on the tank to slide smoothly through a restriction, as in Sally Ward, and the rest have webbing.

I use black 1/8" bungee loops to keep the Velcro secure, but they easily pull away if I try to remove the straps.

The bottle needs to be a low pressure 2015 bottle with a 3000 burst disk. It needs to be permanently marked "argon", and it should never be filled on a compressor with air. These bottles will let go. The regulator needs a pressure relief valve so that you do not lose your hose or damage your driest valve in the event of a first stage failure. The intermediate pressure of the reg needs to be set way low , like 60 to 80 psi to keep the action of the inflator very slow (you anticipate and take the pinch off ) and to buy you some time in the event that the

drysuit valve sticks. The inflator hose heed to have a positive release, as in the kind supplied by DUI. For high rollers, commercial quick-disconnects are the ticket.

I hook everything in front of me and send it back between my legs, so can get my stuff from front or back, but if something gets between my second scooter and my legs, I need to be able to reach it. This is hard with 121's, easy with 104's. For 121's, you pull your legs into tuck and get whatever the problem is.

Obviously, the way we work, the buddy would solve problems for you, but thinking of all situations in advance makes this placement correct. We also like to have everyone place gear in an identical fashion so that in the event of a problem, the other divers can deal with it routinely, rather than trying to figure out some new convolution in the middle of an emergency. We do not want to have somebody disconnecting the wrong hose or turning of the wrong valve.

On the rebreathers, Vinny and JJ are using the argon bottle to hold up their switch blocks (which are on the right), and you can not reach behind the 121's with the reabreather anyway. I keep mine on the left with the rebreather because I always do everything the same way so that in a pinch, I can react automatically - mine stays on the left. I tried other placements but they all resulted in loss of range of motion or an inability to reach the valve. I lay my switchblock hoses over my light and that holds them up. Vin and JJ have a bigger light so that will not work for them. I have a small NiCad light which is sitting a couple of inches below the tanks so that the rebreather hoses can get behind it. However, with the rebreather diving we all watch each other so closely that by the time one discovers a problem, the other guy is already fixing it.

The original argon rig from the Gavin days was according to the original Hogarthian thinking, which was that all gear should be easily replaceable at any dive store. Hoses were standard lengths, etc. I changed that by asking the dive gear manufacturers to make what we need, and now you can buy everything we use right off the shelf in most places. Dive Rite has all of our hose lengths as standard, for

example. What started out as custom gear for me is now stock stuff anywhere.

All of our gear decisions have been thoroughly thought all the way through and we have tried all of the other combinations. Since we are diving a total system, the whole package must be considered dynamically, not each piece in isolation. That is what the strokes do, and that is why we have the classic "portrait of a stroke" taped to the door of the van, as a reminder of what happens when personal preference is placed in front of team safety where people with no clue make life and death decisions over a bowl of Gainesville Red- if you live through it, it is because the gear failed and stopped the dive - see the Bible of the Stroke, for 129 examples of this.

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**Subject: Right and Wrong posts**

Date: Sat, 12 Sep 1998 18:25:56 -0400

From: "Katherine V. Irvine" <kirvine@safari.net>

Steve, there are many other considerations which dictate the post in addition to what Sallot has pointed out. Start with the backup reg - it needs to be on the left post. Proper regs ( downstream, openable underwater, scooter without taking on water, pass without filling full of water, operate without pressure relief hoses, can be equipped with any hose length) feed right to left. To put that reg on the other post would be a mess of sticking out hoses, but there is more. Clearly you want one reg on each post ( redundancy, why you have a dual port manifold). As

Sallot said, you have a third reg if you run the inflator from the right post ( in case you discover your backup has shut down ).

We put that inflator on the right so as to give us two backups, and so as to not discover a turned off valve by loss of inflation at a critical juncture, as well as to have as many hoses as possible passing behind the head to hopefully hear any leaks that may occur - gas moving through a hose, especially helium, is quite audible at depth. Loss of pressure gauge is easily discovered on the second look - pressure has stayed the same. Splitting up the dependency on the regs is a good practice .

The right post allows the FULL length of the seven foot hose to be used and deployed. The length is necessary to comfortably run down behind the wing, under the light ( if you are wearing a light, or under the knife on the belt, or just around ) back up the left side out of the way of

everything , behind the head and into the mouth feeding again right to left, or clipped off on the right chest d-ring when staging. Shorten that and you have a bad feed. Nine feet is to long and is unmanageable.

The correct body position for diving and decompressing is always supine, not vertical. To be vertical is an invitation to DCS, and is just sloppy practice. The hose floats up against the body. When you do get vertical, it is held down by the wings, the light, and or the knife, or you can stick it in the belt if you have some need to be vertical and the hose is annoying you.

If you do have to share gas, and you have the hose on the wrong (left post), it is going to be crossing your head when the donor is in front, and then it is going to be kinked and possibly thereby shut off when trying to arrange it either in front or behind you, and then you get the real panic. Hose coming from that post is not long enough for a good air share under way, and unless placed on top of everything else can not be cleared to donate - this may cost you dearly.

Steve, a good system like DIR is designed to allow you to add anything to the dive without changing anything that is there to start with. I know, I do some crazy stuff, and what I go long with is exactly what I take on a wreck bounce dive, only more of it. The basic rig remains unchanged, and that is what makes it so good - everyone always knows what to expect and how to operate it.

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**Subject: DIVING TO 18 GRAND**

Date: Wed, 29 Jul 1998 19:09:08 -0400

From: "Katherine V. Irvine" <kirvine@safari.net>

DIVING T0 18 GRAND

Many times I go down to Ft Lauderdale beach intending to swim 10,000 meters -the length of the beach and back. I have only made it twice. 5,000 is my normal workout, and I have done plenty of 6, 7, 8, and 9,000 meter swims, but 10 just does not come off so easily.

There are problems. The Man 'O War's, box jellies, and other stingers, the weather, the current, the fear of the tigers, the spookiness of being alone, the dehydration, the depletion of potassium and glycogen, and the humiliation of trying to swim with Russians and kids who feel no pain, have no fear, and keep the hammer down.

It is the same in cave exploration. You show up ready to play, but there is so much that needs to go right in order to pull it off. Parker always

said , "you will never find any cave unless you have the True Heart". He mentioned some people to whom this applied ( applies) so I would understand. Bill Gavin had a red heart with the word "TRUE" on his scooter. Bill Gavin and I always found cave where there had previously been none. It always just "appeared" for us, not matter where we dove. We even added line at Ginnie.

The same thing happened Friday. To tell you the truth, I was scared that Wakulla Springs cave was going to wall out at 14+ in the big conduit (the other 14 did wall out). We had hit a giant room that contained an amazing optical illusion making it look like the tunnel stopped, and we had opted for a tiny offshoot to get around it, and the current had been so bad in there that it stopped us dead coming out. Pulling on the rocks at 295 while 14 thousand feet out is not too cool. I was afraid it was a sinkhole coming up that not only would be too

shallow, but that I knew from the surface was blocked completely. This would have told us nothing about the cave, and would explain nothing. That means it could not be right.

We discussed it. I threw out the optical illusion possibility to JJ and Brent. Brent said he swerved over there but saw nothing. I told him that behind him I could not see the ending wall. JJ said he did not see it either, but then the back guy always has the best view. The tunnel we had taken seemed to open a bit, but not knowing the tide, that tube represented a major risk. I had been in Spring Creek and knew exactly how bad it can really get when tide and rain go against you.

We had several options. We could go to the "G's Little Tunnel", an open lead way out there, but we all agreed that this should connect to our last tunnel. We could go to the other 14 grand end to the west of Cherokee and see if we missed something, but none of us had marked any sure thing leads in there. The main end still had uninspected rock slides, and had leads we had noted in the survey but not taken. These were giant leads, and they were in the conduit path of the cave. We needed a better look at that last 3500 feet of cave to be sure we had gone the right way. Indeed we had.

We had put more safeties in the cave on the previous two dives where we had worked tunnels closer to the entrance in the 7-8 thousand range. We had tested new routes for decompression and gas mileage ( they were deeper ) and for time. We had tried some new ideas with the scooters and with the drive gas. We rebuilt the rebreathers. We rearranged the plans and the logic. We threw some other options into the mix. We freed the rest of the team up to do their own explorations. We needed to see what really could be done, and we needed to be ready to do it anywhere.

Brent had Barry build him a new reel, one that holds 2700 feet of #24. He loaded that, I took a 1700 reel, JJ had an 1800. We met the night before and set up our gear, installing the deco bottles after the Park closed. In the morning at 6, we got rolling, with the first rebreather team of Trout, Rose and Mee taking off with our big scooters and drive bottles on their way to exploring M Tunnel where they added line in two leads. They dropped our gear at the furthest point where we were on the same route.

The B Tunnel team waited for us and went after us, going on to add line there. We would have three teams in the water doing gigantic dives - SOP for the WKPP. Just as we were ready to dive, JJ's drysuit valve blew. This kind of thing is made more annoying by the fact that we bust our chops to have perfect gear. JJ had tested that suit several times that week. When gear breaks, we wonder if we are really supposed to dive that day. Last time we tried this, we had so many things go funky at the surface , and then my light bulb , which I had just changed moments earlier in my room, blew in A Tunnel because there was no argon in it. We opted for an easy dive that day instead.

This day we were not swayed. I looked at JJ -he was cool as usual, and behind him in the water was Brent, visible only by his face above the water, holding Barry's reel in both hands towards me. He had written "Mack" on the yellow safety tape. He was laughing with that face of his that is so funny. The last time I saw that face was before the record dive at Chips when a certain detractor of ours told him that the only reason we could do anything is that we had all the gear, the team, and the best divers, and that otherwise we were "nothing" at the NACD workshop. We were going diving.

We took off with our escort team who check the rebreathers and gear as we go in. I can not tell you exactly how we did this dive logistically, since we have a group who claims they know better than us how to do this and is trying to disrupt our work, but I can tell you the rest of the story generically.

We picked up our extra gear as we went by it, and moved it further into the cave. We also picked up the safeties we had left at 6500 on our last dive, and moved them forward (covering ourselves all the way to 14,000 feet). We had already done every tunnel up to 11,000 (Cherokee Sink), so started working slowly and methodically from 11 grand.

I stayed on the line, Brent had the left, JJ had the right. When they went off, I held and spotted for them, adjusting as they moved in the 80 to 100 foot wide tunnel, and when they signaled me, I marked the leads and put them in the book, having kept track of exactly where we were, and I took a couple of survey shots to be sure, and made notes

as to the location and the look of the tunnels. I could see the cave clearly in the backlight of my two partners.

After 138 minutes of checking and taking notes and sketches, we hit "The Room" at 14 grand. This time Brent was on that wall, and he came back with THE signal. I gave him the "end of the line is right there" signal, and he pulled out "Mack". That answered my question. I dumped my last safety and adjusted my rebreather to breath from both regs and all bottles at once (so I would not be interrupted while surveying). I now was drawing at 10:1 from 340 cubic feet of gas, I was on a 30 amp hour NiCad light that looks like a Light Sabre, I was riding a Magnum Gavin scooter that is neutrally buoyant, and towing a full Gavin untouched, wearing new c-4 and a special hood that made the 68 degree flowing water feel like it was not there, and I was staring down a tunnel that looked like the most beautiful cave I had ever seen.

School bus sized boulders strewn around, white walls, giant width and height, and decent water. Huge white crayfish, old speleothems, natural black bacteria and the look of Tallahasse Power Cave with all kinds of spectacular features. The cave worked around some kind of sinkhole 300 feet above and took off for the ocean, making all kinds of unexpected twists and turns, but staying large with many side tunnels. It is as if the real volume of cave in this region does not even start until you get near Crawfordville.

The three of us moved slowly and carefully through the cave. You want to take as much in as possible when you are this far "Downtown". Information and data gathered from here might was well be from the surface of Pluto, and must be treated accordingly. If we don't come back with it, nobody else ever will. This is why we are there, and our job is to produce that data. We do.

The next thing I knew , Brent was holding a loop of line in his hand, and "Mack's" shiny new spool was empty in his hand. JJ was deploying his giant reel, and I heard them both laughing. When I got to them, they both pointed at me and gave me the "you're nuts" sign. We then had a hand signal discussion of who was more nuts, and we all kept pointing at each other.

Moving on, I started noting the time at each survey station. At 170 minutes, I still thought we could get out in 130 since 10 of that time had been checking out the stuff going into the last deco spot before we launched. I signaled JJ to wrap it up. He jokingly asked me, "turn around?", and I pointed to my bottom timer. He tied it off, and then the discussion started up again as to who was most nuts. This time each of us was saying it was the other two. We had a good laugh, packed it in, and cruised on out. I left my whole collection of line arrows and their holder ( which I keep in my pocket) on the line.

We had gone to our last scooter and left our big one, also we switched back to those when we got to them. It is always faster laying the last piece of line with minimal gear, but we have done it with everything on us. Also, we figure everything so that we have two (per man) of whatever it would take to get back to whatever we left. I keep that score running all of the time. We know what it really takes to do, execute and get out of these dives, and we not only do not listen to anyone who has never done it, we invoke Rule Number One as to even being on the same property with anyone who thinks otherwise. This may make a few of you understand my huge distaste for B.S. in any form, and why there is no longer any question as to what the WKPP will and will not do, and there is no longer any question or discussion as to who knows best in that regard - we do.

At 14000 feet we started collecting our safeties, and I converted mine to a rebreather bottle on the spot and hooked it into my system for the ride out. I disconnected my back gas, and we took off. JJ and Brent were laughing and examining my converter, as it had not previously been seen by them. I saw them switch regs to a full safety , but mine are din. JJ had broken the knob off of his bottle when went to turn it on, so he just unscrewed the reg, I took the bottle, and he switched to a safety. We put the other reg on his broken bottle, and added it to the outgoing batch.

Riding out towing all of the bottles took a lot longer that we thought. We picked up everything in the cave but one bottle that I did not pick up for fear that it could rip my drysuit -it was seriously crusted, and had been in there for a while. There is also another one that has been in there since 1993, which we keep forgetting to pull out. Seeing how delayed we were by the siphoning current and the wad of safeties, we left them all at 6500. This is where we need to leave from on our next dive, but we only need two of the bottles each to move forward. We may go do that open circuit with a rebreather team setup and then pull all of that stuff back to 3500 to go out of the cave completely and start all over again.

Following this dive we need to work the nasty water tunnels that nobody else will do, finish off the clear stuff that we have ignored for so long, and then we need to get on with Leon Sinks while we have the chance (the relatively "clear" water). Next year we can rework the outer reaches of Wakulla Springs, since that is not going anywhere and we know exactly how to do it in one day of diving each time. By then, all of our guys will be on rebreathers and we will have our newest tricks in place for everyone. Also, we need our gear at the other sites -we are spread too thin now to be effective in the 200 square mile W.K.P. with so much in Wakulla.

At six hours we hit the first deco stop on the sand hill next to B Tunnel. We knew that the team above would be seriously worried, since we usually call the time exactly in advance. That bothered me a lot . I did my 250 stop, my 240, and then broke to 200 to se if anyone was there -they were not. I grabbed a Gator Aide and went back to 230. I got one drink before I lost the Gator Aide to the void above me. I turned off my light, drank some water, restarted my rebreather and floated in the dark. There was no sense looking at my depth or time, since I had not yet figured out a deco schedule, and had no tables with me.

One time I did a dive with Gavin, and at 120 feet after a few stops he asked me for the schedule. I asked him to show me his. He did not have one. I told him I did not have one. He then frisked me and looked through everything in my pockets and my books. He wrote me back and asked if I had a "New York Times" he could read. I told him to get out and get it out of the van and bring it back, or I would get out and read the schedule and come back to tell him what it was. This went through my head, only I remembered taking the deco tables out of my van, and throwing them in the trash a long time ago.

I wondered if I could just get out right there. 360 minutes or SIX HOURS at 285-300 is so ridiculous that I did not want to think about it. I started figuring for a full saturation dive. I knew what that looked like from 250-180, so worked on the rest. I could not come up with any reason to do more deco than for 3 hours, but I did come up with a few very compelling reasons to do LESS between 170 and 100. I tried it. In my mind I broke the dive into three dives: 120 to 40, 240-130, and 300 only. The first dive cleared in my mind 20 minutes into the 40 foot stop. The second nearly cleared after the a 40 minute 40 foot stop, but oxygen did not help it any, and the third cleared to 120 after the 170 stop, producing the second dive as the deco, that in turn producing the third dive as the deco, and all telling me the whole thing could well be done without ANY oxygen. That I was not willing to try, since I had to be back home the next day for sure. I knew absolutely what WOULD work, so did it. I went ahead with an 8.5 hour deco plan, but knew I was not going to get out before 2:00 am, so sent up word to Dawn to get me a room at Wakulla so I could get a couple hours sleep before I left. Panos got the room, and I got up in time to catch Barry Miller coming out of the water from his SECOND 3500 foot plus dive of the day (he, Chris Werner and Ted Cole went back in and cleaned up the gear which we left at 3500 feet).

I could not sleep in the trough since everytime I fell asleep, I stopped breathing. Not wanting to die in my sleep after a record dive, I stayed awake. I realized that with the low level of CO2 in my blood, and with my conditioning, my body was seeing no reason to breath for extended periods of time. With so much stored oxygen, that feedback mechanism

was nonfunctional for me, and actually does not work in me unless the oxygen surrounding me is lower than in my body at one Ata equivalent of air. I have tried it with the rebreather and with pure helium to see. I got out after 150 minutes at 30 without any problems, and went to my room.

At 5:30 I went back down to the dock and got on the horn with the divers who were still in the water. The whole WKPP crew was still out there at it, and going smoothly. I loaded my stuff and took off.

I waited until a reasonable hour and phoned Mercedes Scarabin to let her know that Brent was ok and that he was just packing up his stuff. I could not get Becca until later. Now I was driving along and I wanted to tell somebody what we did. Tell somebody about this dive. I called Carmichael, left a message. He phoned me back, he and Bill Mee were at Gavin's house. He said, "what do you want me to tell Gavin?". Tell him 18 grand. He will understand.

Then I was driving some more, thinking about who I could tell. There was only one person who I wanted to tell, and I could not. Parker Turner. I would have loved to be able to tell Parker Turner. I remember his frog, it had a name, but I forget it. It was some kind of bizarre rain forest frog. He told me that this frog was the "best" cave diver. He still is, but we are not a bad second. I just wish Parker were here to tell about it.

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**Subject: More Diving To 18 Grand**

Date: Thu, 30 Jul 1998 07:26:55 -0400

From: "Katherine V. Irvine" <kirvine@safari.net>

.....starting back where we "left the bottles at 6500"...

And before that.....

As we neared Cherokee Sink on the way out, I started looking for the old end of the line , hoping to spot the loop. I did not, but I noticed on my timer that we were at four hours of bottom time already, and that my two dive partners' lights were fading. We were 11,000 feet from home. We bobbled back and forth trying to get our speeds more closely matched, huddling together to be better able to see each other and the line. I got hung up in JJ. On the way in, I had gotten hung up in Brent and had to flash him to stop. He immediately tried to turn around to face me, thinking he needed to help me, but I grabbed him by the leg

and pushed him forwards, giving him the "go forward" light signal while unhooking my rebreather gas block from his stage bottle -when we stay together, we stay together. We are a team.

I turned my light into my face to gauge its strength, and it blinded me. I ran into the roof. I reached back and checked my valves -everything was there. This was going to be a long ride. Six hours of scootering in 68 degree water in giant black tunnel may not seem like much when you read this, but it is about the time it takes to drive from Palm Beach to Tallahassee. Staying alert is critical. There are T's everywhere, and a wrong turn could really set you back, not to mention

put you out of the path of the safeties. All three of us are navigating, usually I am in the back. I illuminate my compass every few minutes so I can constantly watch it, along with the clock. Knowing exactly where you are is at all times is critical : if something were to go really wrong, you have to be able to make the best decision on how to proceed.

Right near the end of the old line I felt like my scooter was slowing down. I signaled JJ that I was going to make the switch, and he did the same. The temptation to turn the scooter all the way up is overwhelming sometimes, and we had been gradually easing ours on up , hoping for more speed -we got less. In our thinking, the scooters are the most critical gear, and in our imagination, they are always a little suspicious. Both of us have switched scooters only to discover that the one we were riding was at full power.

A few dives ago, JJ had Brent and I hold at the beginning of the dive and he went back to our escort divers. He came back with both of their scooters, plus all of his own. I recognized them -both were ocean scooters I had built for time , not speed. I tried to take the one away from him, he kept it. As we passed each safety scooter on the floor, he switched, picking up speed, but somehow ended up all the way out at the J Tunnel with FOUR scooters on him. We laughed about that for a while. This time we switched, we were not laughing, and started the calculation on that scooter. I did not like what I came up with at all, but let's keep moving, we are 10,000 out, the clock is running, we are at 300 feet.

At about 9,500 feet we came into our previous scooters and drive bottles. JJ and Brent had hung theirs from a ledge in the ceiling, clipped to the line. I had set mine on the floor eighty feet away, holding the line down . Here there is the illusion of mounds of silt, but it is only four inches deep to the hard rock below. The ceiling is at 270, the floor at 300 right here. I dropped down and hovered, putting away my other scooter. I went to switch my drive bottles, and lost my

double ender. No problem, being really anal, I had left a spare one on the line just in case. I dropped it. I could see the outline of both of them in the silt. Expecting to reach into endlessness, I was surprised to recover both of them only four inches down. Glad I dropped them. Glad I was breathing helium, able to hover inches above the floor with three scooters, two drive bottles, four safeties, and pick two clips up out of the silt without even puffing it while wearing a rebreather with twin 160's attached to it. I was remembering what Parker Turner told me, "It is the basics that keep you alive". I was thinking, "This is my basic

lobster-catching buoyancy control at work". I was also thinking, "how am I doing this with a rebreather?". It is a good thing I do not teach it, as I have no idea how I do it. I thought about the first question on my rebreather exam, "What kills the most rebreather divers". I had answered, "Rule Number One", Jack Kellon got pissed , he said "Task loading". He told me Tom Mount had answered that question correctly, and he failed me and Bill Mee. We laughed until we cried, "Task Loading". Bill Mee and I are the only guys who ever failed the rebreather test. However, Mount and Jack were correct - turn your back on the rebreather snake and it bites you.

My dad had a German Shepherd named "Lucky". If you turned and walked away from Lucky, he bit you in the ass. He bit everyone but me and my dad. My brother was his favorite bite. The secret was to pet Lucky before you turned your back, and to display no fear of him. Everyone who did not "pet the pony", or was "scared" inside, got bit. Some things never change.

We passed a lead we had started a few dives ago. I looked down it with my light momentarily, and then turned away. Normally we do everything we can in each dive, but this one was over. I automatically checked for my reel - it was there, loaded. I later dropped it at 6500 feet to reduce drag, and the temptation (to JJ).

At about 8,000 feet out we were slow, we were loaded down, Brent and JJ were on backup lights, we pulled up to a safety bottle depot to pick them up, did it too fast, hit the trigger, and lost the line. It was broken and gone in the silt way between tie offs in a section of tunnel on a corner that is 120 feet wide, fifty feet high, and does not have a good reference to check the compass course. JJ and Brent were in front and I was behind. I yelled in my rebreather, " I have no idea where the line is, and gave them the "lost the line light signal". They immediately froze still in place. Seeing that, I continued the signal and turned back , looking for my own smoke trail. Even in giant cave with a rebreather, there is the moving particle water trail that is your signature. I flipped on my powerful NiCad light and illuminated my compass, held it back in

front of me, spotted the "smoke", and dove to the floor. Even in Tallhassee Tanic Cave, if the line has been in the silt, it will stay white.

There would be no way to spot the suspended line, so I shrimp trawled for the line running a course perpendicular to what I knew the survey to be (you have to ignore the walls since they present the illusion of a four-way tunnel every time with no reference point). I did not need to plant and run a line, since I had the two best dive partners in diving - they held like a rock where they were. This is the kind of situation when Rule Number One means life or death. You could search for days in Wakulla for the line and never find it. This is why I dive with these two guys -they know what to do, when to do it, and they execute it perfectly every time no matter what else is going on -they are truly the best in the business.

I got lucky, "scoring" on the first pass. I turned into the survey and signaled them that I "had the line there, you go ahead and find it forward ". They did, we moved on. No reason to repair the line, we would be the only people who ever get that far anyway. That was a heart-stopper. We were already late, and Murphy says that when you get lost off the line, that is when your rebreather SHOULD fail, or your scooter should stick on, or your light go out. Murphy can't hang with us for 18 grand (in other words, we got lucky this time, Murphy missed his chance, but that is because he had a much better one waiting for us).

We unloaded our cargo at 6500, now ready to "fly" out of the cave. We hit a junction where you can go out two or three difference routes at 6,000 feet. The safeties are in the main tunnel, but we have another tunnel that we like to ride for the scenic beauty, and because it is usually clearer. We had ridden it on the way in , and it was in good shape. However, it is a backflowing siphon on the roof, ingoing spring on the floor. The line is on the roof, but we know the tunnel and can ride the floor, but that , we discovered, is IF we have one thing -lights.

We checked our gas supplies and looked at each other, deciding on the scenic route out. We took that turn, expecting to burst into clear water any minute, and it never came. The tunnel was hosed, and had gone down in the five hours we had been diving past it. I figured out what had happened as I passed a familiar tie off point, but we were committed now. I was thinking ,as I saw the line holding stiff in the current, "This thing has sucked the tannic out of A Tunnel all the way down here, it must have rained like hell out there".

Now Murphy got going. My light died, and so did the second lights of Brent and JJ - we were all on backup lights. I could see that Brent and JJ had the Rat Light, I had some other piece that was out of focus, but I did not want to go away from the working backup to pull a Rat light. I started thinking that the light must have water in it to be out of focus,

so it is getting ready to fail. I went to check my NiCad light to see how much power had built back up, turned it to my face and flipped the switch just as I passed through 306 feet - the test tube broke and it filled with water . I turned it off immediately - I would now REALLY need this if I had to signal, and it should work in the relatively non-conducting water. What next?

We came up on some really neat rock formations, poking our way long the ceiling with our little lights, and sure enough, there goes my scooter. I flipped on the crippled NiCad light, signaled JJ, and he and I both went for the rocks to switch scooters. I did a quick calculation -I had about twenty minutes in my other scooter (maybe), my big boy should have about five of rejuvenated life, and my NiCad scooter was 1000 feet ahead on the floor with an hour left on it. How bullet proof was that scooter now? There were four safeties each between there and the door, not enough to swim out.

We crossed through a nasty spot and blind jumped back to the A Tunnel line. I had done this twenty times before, but now it was absolutely critical to get it right and get to the scooters. As we pulled up to them, the other scooters began to fade. This was now a one shot deal. We sorted out the gear, got rid of everything that was not full or charged, checked our gas, and started out from 3500. My gauge read 2000 on my back gas -I had ditched my drive bottles and was plugged into it. I started thinking, " That gauge has said 2,000 psi for the last two hours" -I dove down and grabbed a safety bottle.

Now the line is deep, and on the floor, and the vis has dropped. We usually just follow the cave in and out, but that was not in the cards now. We stayed on the line. This took us deeper and longer, but Murphy had given up on us, and everything went smoothly. What we did not know is that our support team had become so concerned that Dawn had sent Scott Landon and Steve Straatsma 3500 feet into the cave to look for us, and they had waited for us for twenty minutes at the 3500 T, and had had to turn back , not knowing which route we were on. Rat, Cole, and Werner were gearing back up ( they had just done 80 minutes smoking B Tunnel, but still had FULL HUNDREDS left over from their dive. Werner left his leaning up against the tree and came back later to do the cleanup dive to 3500 with Cole and Rat. The Tough Guys of WKPP.

Later, when I got out and drove home, I was curious as to whether it was my head or my gear that was getting tired. I immediately took the scooters out of the van, ran through the checks and burn tested them - they all had tons of time left. It had been my imagination that told me the scooters were weak. I checked my gauges - my back gas gauge was perfect. I had only started with 3000. I had switched to back gas

from a drive bottle that I thought was out - it was full , the stage bottle gauge had stuck on zero due to the depth, so I did not use the bottle, thinking it was empty without questioning how it could be, but with the

way that arrangement works, the rebreather does not like funky intermediate pressures, and I would take no chances of blowing an OPV to get the last of the gas out. I went to rebuild my NiCad light only to find that the tube had a flaw all along, and that there was nothing else wrong. I checked the backup light, and it was perfect. I took my rebreather to Jerry to check. I had thought it was different. He said he had left my original ratio alone on the last rebuild. It was me, worrying too much. I had done my homework, my gear was perfect, and we pulled it off, despite the head and the best of Murphy.

What is it like diving to 18 grand? Well, it is like diving to 18 grand, and I think now we have shown that we are the correct team to explore cave in the WKP, and until you can say, "been there, done that", this story says it all -not as easy as we make it look, but a lot easier for us than for anyone else, and it has always been that way. And the good news is that we have just now discovered where all of the really good cave is, we now have access to every last little bit of it for the long term, and are gearing up to go explore it.

Somebody out there think they have "better technology", better skill, maybe "do longer bottom times", maybe "triple our distance". Step on up and pet Lucky, and see if he bites you . When Lucky spots a battleship mouth, he goes straight for that rowboat ass.

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