

# **Build Your Own Hookah And Save**

**Plus**

**Shallow Water Diving Apparatus**

**Helmets**

**2004 Edition**

**By Carlos Silva**

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**Imagine the freedom of floating underwater, weightless. Not worrying about running out of air. Unencumbered by heavy equipment. Restricted only by the radius of your hose.**



## **Disclaimer**

This book is written as a source of information. by purchasing this book you agree to assume responsibility for your

own safety. You must be a certified PADI or equivalent open water diver or higher, in order to dive using any type of compressed air. Please read this manual in it's entirety before attempting to build one of these rigs.

The author is not a Diving instructor, and this book is not an intended diving manual . Safety and training is beyond the scope of this book, and can only be obtained by professional instruction, and personal experience.

The same rules learned in your PADI certification course apply to hookah diving, as well as shallow water diving. There are other concern involved with this type of sport. PADI offers some courses involving hookah. Refresher courses are quite affordable, and fun. Don't gamble with your life! Get the training!

Shallow water diving is an unregulated sport. Let's keep it that way. Bad publicity will result in restrictive regulations.

### **REMEMBER**

Never Dive alone. Always keep a monitor on the surface. Have a backup emergency air supply in case the compressor fails.

Although there are cheap substitutes for surface supplied air equipment, there is no cheap substitute for training.

Note on the pictures: These pictures came from different sources and the quality varies. I recently had a computer crash and was unable to recover all my original work. Luckily I had some of these on a gif and jpeg, but they lacked the resolution of the originals pdd format. I apologize for my lack of thoroughness, future editions will have better quality graphics. I will maintain a database of my customers and will send you any updates as a courtesy.

Notes on generalization: Unfortunately I'm not familiar with metric system. I'll try and give both Imperial and metric where applicable, some instances I've not been able to give the metric measure. I'll try and correct that in future editions. I stayed away from mentioning specific part numbers, and brands, reason, buyers in foreign lands have no use for American SKU numbers, and providing them with details about any product might raise questions about compatibility. Anyone brave smart to build their own diving gear should be sufficiently resourceful to procure the parts. By the way getting the parts is the hardest part of building your own gear. And last reason liability.

## **Introduction**

Anyone starting out as a scuba diver can easily spend \$1250 in equipment. By the time you end up buying a BCD, weight belt, first second stage plus alternate regulator, and tanks. A hookah rig can replace all the above stated equipment, you'll still need a weight belt but not as many weights. By doing away with the mentioned gear, you'll also be eliminating the yearly fees associated with mandatory, tank visual inspections, sport licenses, the periodic hydrostatic tests, and the maintenance associated with the equipment.

By switching to a hookah rig you'll do away with all the above mentioned expenses. Your maintenance costs will be the same as running a lawnmower. A simple oil and filter change costing less than \$10 a year will keep your engine running smoothly for many years. As an added benefit your rig will weigh less than all that cumbersome scuba equipment. The back breaking work of carrying the gear to your dive site, sometimes having to make two trips, and then having to assemble and check the cumbersome scuba apparatus, and then trying to dawn the gear in waist deep surf, as this is usually too heavy to put on while on land... All this goes away with a hookah rig. Hookah rigs are lightweight compared with the scuba gear needed, and it's less awkward to carry, all the equipment is attached to the float including diver down flag. Boat mounted rigs also have the same advantages, the only drawback is you are limited in range by the length of your hose.

Once you arrive at your dive site the only thing you have to do is start the gasoline motor, and put on your harness. you'll still need fins, mask, and snorkel, pressure gauge. Your harness should have weights built in. Other equipment is optional, compass, flashlight etc. You'll be in the water diving, while scuba divers are still retrieving their gear from their vehicles.

Scuba diving is fast becoming a sport for the elite, and hookah diving is not far behind. This book will show you how you can beat the high prices.

The goal of this manual is to help the reader:

1. Avoid spending thousands in scuba diving equipment
2. Avoid the high costs of tank refills
3. Avoid the yearly tank inspection fees
4. Avoid expensive hydro testing
5. Extend bottom time
6. Lessen the size and weight of your diving gear
7. And save hundreds of Dollars by building your own hookah rig
8. Explore other means of diving using surface supplied air
9. Eliminate un-needed or redundant components
10. Build you own gear

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### **Section 1 Commercial Hookah Systems**

COST COMPARISON BETWEEN TANKS AND

A HOOKAH SYSTEM FOR TWO DIVERS

Aluminum 80 tank \$150

Aluminum 80 tank \$150  
BC Back Pack \$200  
BC Back Pack \$200  
Regulator \$200  
Regulator \$200  
Pressure Gauge \$75  
Pressure Gauge \$75  
Tank Boot \$15  
Tank Boot \$15  
Total per diver \$640 for two divers \$1280

A commercially available system costs \$799 ( Model KET80GH Engine Driven Air Compressor, supplies only one diver ) It comes without the expensive costs associated with scuba gear.

Some other commercially available compressors:

TG-280 Oil free Direct drive from 5.5 Honda, Very compact unit, 18 Liter stainless steel air receiver, 18 cubic foot free air delivery  
Light weight Small: \$4150.00 Large: \$4250.00

**BROWNIES THIRD LUNG**  
Explorer 280 Series \$2,394.95

Where to Find Commercial Hookah Gear  
<http://www.keeneengineering.com>  
<http://www.akmining.com>

Don't let these figures scare you I'll show you how to build Several systems under \$700, using brand new parts. If you are really handy you'll be able to build rigs under \$200, using off the shelf parts, but requiring some work and ingenuity.

### **The Basics Of Hookah Diving Using Designated Hookah Equipment**

There are two air supply systems that are used for underwater diving activities. One system, known as Self Contained Underwater Breathing Apparatus (SCUBA), involves the use of high pressure metal tanks which are worn on the diver's back while diving. The equipment used in SCUBA diving is quite technical in nature, and SCUBA gear should not be used by persons who have not become a certified diver involving expensive, specialized instruction. Without a certification card indicating completion of such a course, you cannot purchase compressed air.

Of course, the SCUBA air system has its advantages as well. A diver using SCUBA gear is literally "an entity unto himself," since he carries his life giving air supply on his back at all times. He can go anywhere he chooses, completely free of any ties with the world topside.

There are many times when an underwater diver does not need the total freedom that is afforded by the SCUBA air system, particularly in cases in which the diver is submerged in a limited area for long periods of time.

For these applications, the "Hookah" (Surface Air Supply) was invented. The Hookah air system uses no high pressure air tanks of the type worn on a diver's back. Instead, it uses a small air compressor which is located at the surface. It is commonly powered by a portable gasoline engine or electric motor, and the air is delivered to the diver via a floating air hose. With the Hookah system, the diver has an unlimited and nearly "cost free" air supply which will only stop flowing when the engine or motor that powers the compressor ceases to operate. This makes for a truly economical air system, which will quickly pay for itself when compared to the cost of refilling a SCUBA tanks every hour or so.



**A Typical Hookah Air Assembly**

The only operating cost for a Hookah system is fuel, since the vast majority of Hookah compressor units are gasoline powered. It is not uncommon to get two hours diving time on a single gallon of gas, which shows just how economical the Hookah air system can be.

Most Hookah divers will have a partner working "topside" as a safety man, and he can refill the engine's gas tank as it starts getting low. This will enable the diver to stay submerged so long as he desires.

### **The Air Compressor:**

The Hookah air system begins at the diver's air compressor. Hookah compressors are small, lightweight, and of simple design. They are commonly constructed of an aluminum alloy, and utilize a rubber diaphragm as the means of air displacement. There are also compressors that use a "piston" arrangement to displace air and these types generally deliver more air at higher pressures than the diaphragm models. The moving parts inside a Hookah compressor are lubricated with Teflon for the life of the unit, and need no additional lubrication; to do so may actually damage the compressor.



**Air Compressor belt driven**

The air that is delivered by this type of Hookah compressor is pure, oil free air. It is however recommended that at least a 40 micron filter be included to remove any solid particles that may occur. This type of Hookah compressors contains sealed bearings rather than oil for lubrication which can contaminate the air supply. Most compressors utilize an "oil bath lubrication system which will contaminate the air supply.

Hookah compressors operate at a relatively low pressure. The maximum pressure available from the higher capacity models is about 125 pounds per square inch. The higher the operating pressure, the lower the air output. Consistently high operating pressures (unless the unit specifically designed for high pressure use) will shorten the life of the compressor by a noticeable degree. Conversely, the LOWER the operating pressure, the greater the air output, and the longer the compressor life. A compressor should not be operated at high pressures unless a diver intends to be submerged at greater depths. If a diver is working at depths of 33 feet or less, he will need only 30 to 40 pounds per square inch for optimum operation of his regulator.

Most Hookah compressors have a built in "pressure relief valve" which prevents excessive pressure from building up in the compressor head when the diver is only making a small "demand" on the compressor. This valve is usually preset at the factory at approximately 50 p.s.i., which will give the average diver at shallow depths enough air to operate his regulator while leaving enough pressure left over to allow for increased exertion.

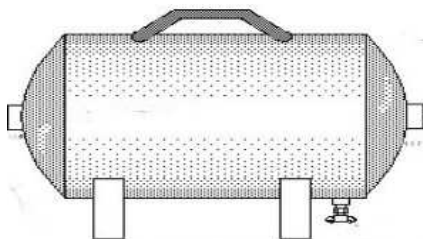
If a diver is breathing at a normal rate (light exertion), the pressure relief valve will occasionally "pop off" and shoot out a burst of air. This is normal, as it prevents excess buildup of pressure in the compressor head. If a diver is breathing heavily and is under physical exertion, he will be demanding all of the volume and pressure that the compressor can deliver. In this case, the pressure relief valve will rarely, if ever discharge excess pressure or "pop off."

The type of Hookah compressor that is required for a given diving operation is dependent upon the extent of underwater physical exertion, the depth, and the number of divers that are connected to the system. A single diver under light exertion at shallow depths will require a relatively small air output that is measured in "cubic feet per minute," or "CFM". The same diver under heavy exertion will require additional air at a slightly higher pressure and volume.

If more than one diver is connected to an air system, or if diving at greater than normal depths, more air volume at higher pressures may be required.

### **The Air Reserve Tank:**

The next major component in the Hookah air system is the reserve tank.



This very important piece of equipment performs four vital functions:

1. The reserve tank operates as an air "reservoir," that supplies a constant volume of air at all times. If you are diving under heavy exertion and demanding a greater amount of air, the large volume of air in the reserve tank will supply the reserve air required. If you were breathing directly from compressor itself, your rate of inhalation might actually surpass the air volume provided by the compressor, and you would not get a sufficient amount of air.
2. The reserve tank functions as a cooling and condensation vessel. Few divers realize it, but the air emerging from a Hookah compressor is quite hot, and can actually reach temperatures as high as 190 degrees. As the air enters the reserve tank, it will expand and cool. This expansion process will also condense most of the water contained in the compressed air. Hookah compressors, because of their small size, do not have the capability to remove the moisture from the air and hence, they deliver air with an appreciable moisture content. The expansion process in the reserve tank allows the water to condense, ensuring that the diver breaths less moisture in the air.
3. The reserve tank also suppresses surges from the compressor or any temporary decrease in running speed. Often a the compressor's engine will run uneven due to moisture in the gasoline. The reserve tank can compensate for this by delivering an even flow of air.
4. And finally, the most important function of all. The reserve tank will contain enough pressurized air to give the diver a couple of minutes breathing time, should his compressor, or engine failure run out of fuel. Equipment breakdown is not a pleasant thing to consider while working underwater, but is always a possibility. In the event of an engine failure without a reserve tank in the system, a diver could experience an immediate loss of air that could lead to desperation and panic. Any experienced diver will tell you, that panic is the leading cause of drowning incidents.

### **The Air Hose:**

The next component in the Hookah air system is the air hose. Hookah air hose is made of a special vinyl plastic construction, is resistant to the effects of oil, gasoline and sunlight that exists in the environment.

Conventional rubber hose should never be used for diving, because it will gradually deteriorate and become toxic. Hookah hose commonly has an inside diameter of 3/8ths. of an inch. It is constructed of an inner liner of food grade vinyl wrapped with a nylon webbing reinforcement and covered with a heavy duty PVC abrasion resistant wall. Hookah hose is designed to prevent kinking and collapsing that could prevent the flow of air being shut off

A quality Hookah hose will be colored a bright yellow or orange, for a high degree of visibility. It will also float, so that any excess hose not actually being used will float on the surface, completely away from the diver, reducing the possibility of entanglements on the bottom. For example, if you are diving in ten feet of water but are using a thirty foot length of air hose, the excess twenty feet will float on the surface, completely away from you. A quality Hookah air will not impart any "flavoring" to the air, and should meet "FDA and OSHA" requirements.

## **The Regulator:**

The regulator is an oral respiration device that is worn in the divers mouth. The regulator regulates the amount of air that is received by the diver each time he inhales. Because the divers nose is covered by his face mask, air must be inhaled through the divers mouth.



There are two types of diving regulators, those designed for SCUBA use and those designed for Hookah applications. A SCUBA regulator is designed for use with SCUBA an air tank, and delivers maximum efficiency when operated at a pressure exceeding 100 p.s.i. They require a "first stage" valve assembly, attached to the SCUBA tank. The function of the first stage is to reduce the extremely high pressure of the air in the SCUBA tank from approximately 2,250 p.s.i. to approximately 180 p.s.i. This pressure then goes to the "second stage," which is the part that is worn in the diver's mouth. The second stage of a SCUBA regulator has a spring loaded "downstream" valve which delivers the correct amount of air to the diver when driven by an air pressure ranging from 100 to 250 p.s.i.

A prospective Hookah diver must realize that SCUBA regulators CANNOT be used for Hookah applications without special modifications. A typical Hookah compressor operates in an average pressure range of 30 to 50 p.s.i., which is not enough pressure to drive the spring loaded downstream valve of a SCUBA regulator. A diver who already owns a SCUBA regulator, but who wishes to use it for Hookah applications, must take his regulator to a competent dive shop or repair station and get the regulator converted over for low pressure use; he should not attempt to do it himself. The conversion can be made by installing a set of low tension springs which will give maximum efficiency when operated at low Hookah pressures. A dive shop or repair station will also have the necessary test gauges, etc., to make certain the adaptation has been effective.

A Hookah regulator is entirely different from a SCUBA regulator. It consists of a "second stage" only, which is fed directly from the output of the reserve tank via the air hose. There are no valve assemblies of the type that are used with SCUBA tanks. Hookah regulators employ a "tilt," or "pin" valve, which delivers a full air flow to the diver at a pressure as low as 30 p.s.i. This type of regulator is specifically designed for use with low pressure Hookah compressors. Hookah regulators, as are all modern regulators, are of the single hose, "demand" type. A "demand" regulator works on a relatively low volume of air, since it only has to deliver air as the diver breathes, or "demands" it.

## **The Harness:**

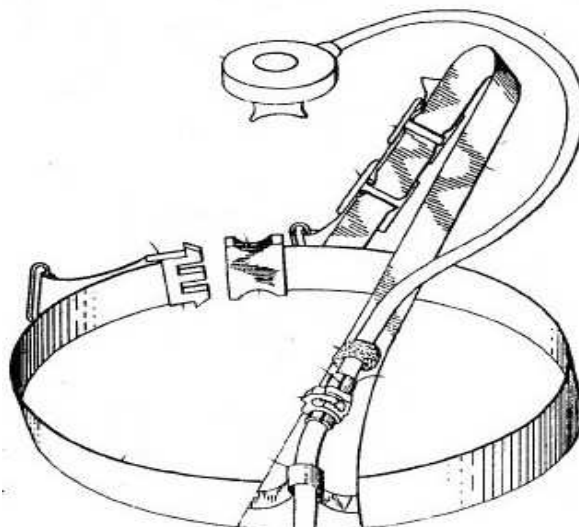
A regulator should not be used for Hookah diving unless it is in conjunction with a "chest harness." The harness serves three principle functions:

1. It keeps the air hose from getting in the diver's way when he is working underwater. The harness has a "back plate" which is automatically positioned over the center of the diver's back when the harness is worn. The back plate holds a "check valve," which acts as a "junction point"

for the air hose and the regulator. Since the air hose terminates at the diver's back, it prevents potential entanglements around the diver's body.

2. The regulator intake hose that attaches to the check valve prevents any pulling motion from the regulator while working underwater. For example; if a diver were moving around underwater and inadvertently came to the end of the air hose, the harness would absorb the shock and the regulator and would not be jerked from the diver's mouth.

3. The check valve that is found on the back plate performs the third very vital function. It acts as a "safety gate" by shutting down the air system, allowing the air to travel in only in one direction. Should a burst or leak occur in the air line somewhere between the output of the compressor and the input of the check valve, it could prevent a vacuum occurring in the mouthpiece of the regulator or cause a diver to breath in a large amount of water that could cause panic. "Never, ever, dive without a harness and check valve!"



### **Incidental Accessories, Hoses, Hints & Precautions:**

One accessory hose item you will need is a short length of hose for routing the air output from the compressor to the input of the reserve tank. The type of hose that is needed depends upon the compressor you are using. Diaphragm models that operate in the 30 to 50 p.s.i. range use a simple hose connector that is made of hookah air hose.

The high pressure, high volume piston compressors that are capable of delivering pressure of 100 p.s.i., require a connector made of special certified "heat resistant steam" hose, due to the fact that these models discharge air at higher temperatures.

**We highly recommend that all hookah systems be equipped with a particle filter. The particle filter should allow nothing larger than 40 micron to pass. This filter is best located at the discharge of the air reserve tank.**

When setting up a Hookah air system, you will frequently need an array of metal fittings. For use around water, you should use stainless steel or brass fittings only. This is especially important when diving in salt water.

Fittings made of ferrous metal will rust or corrode when used in, or near a water environment.

If your Hookah compressor is powered by a gasoline engine, make every effort to ensure that the engine exhaust (which contains deadly carbon monoxide gas), is always placed DOWNWIND from the compressor. This will help prevent exhaust from being accidentally pulled into the compressor's air inlet. Always use a "snorkel" extension on any compressor that can elevate the intake of the air supply away from engine exhaust contaminates.

Never use a gasoline powered compressor in confined areas, such as underneath piers, in close, narrow grottos, etc. This will prevent the exhaust gases from dissipating into the atmosphere safely. Also, never dive in an area where there is little ventilation or air movement. Take special precautions when diving in areas where the air is extremely still, as dead air spaces, or poor ventilation can cause exhaust gases to linger in the immediate area of the engine and compressor unit.

Always install a long extension on the intake of your compressor to avoid the possibility of contamination of Carbon Monoxide Gas from the engine exhaust system. The air intake of a compressor must tower over the engine exhaust at a sufficient height or distance to avoid intake of engine exhaust gas. If this gas is inhaled even in small quantities for short periods, it can cause severe headaches and possibly result in sickness. In larger quantities it can kill you, so please be careful!

If you are using Hookah equipment around salt water, be sure to rinse off all your components with freshwater afterwards. This includes your

regulator, diving mask, harness, metal fittings, and air hose (flush it out on the inside as well as outside). A salt water environment will quickly corrode aluminum parts such as: Hookah compressors and gasoline engines. It is advisable to keep all metal components freshly painted and cleaned to avoid excess corrosion.

If you are using a gasoline powered compressor always shut of the engine before attempting to refuel. Do not attempt to refill the engine's gas tank while the engine is still running, as this will increase the possibility of spilling gasoline onto a hot engine, which could result in a potential fire or cause an explosion.

A diver should always surface and shut off the engine first prior to refueling and allow time for the engine to cool down. Always use a funnel for refilling the gas tank, or a special spill proof gas container to prevent spillage.

Every Hookah diver should understand the basic rudiments of engine and compressor maintenance, and should always keep his equipment in top condition. If you take proper care of your equipment, it will give you many years of trouble free service. Knowing how to work on your own equipment will also come in handy, should you experience any mechanical failure on a diving trip. It is a good idea to carry along some spare parts for your air compressor, and the necessary tools to make repairs.

All of the basic "rules of the deep" that apply to SCUBA diving also apply to Hookah diving as well.

**UNDER NO CIRCUMSTANCES SHOULD YOU DIVE ALONE!**  
**Always Hookah dive with a partner who owns his own regulator,  
harness and air hose.**

Make sure that his or her equipment as well as yours is attached to the air system at all times. If you were to experience underwater problems, your "diving partner" should be available to come to your immediate assistance.

Even though no formal instruction is required to use Hookah equipment, we strongly recommend that all divers should take a "CERTIFIED SCUBA" course at your local county or diving supply store.

You should also read books on the subject of underwater diving safety and study them thoroughly. This will further familiarize you with the "rules of the deep."

## **WARNING: CARBON MONOXIDE GAS**

**If you're considering diving with a "Hookah Compressor" , It is most important that you become aware of Potential Danger associated with exhaust emissions. We place a caution label on the engine, warning of dangerous engine fumes and also illustrate further warning in " Introduction to Hookah Diving" and Safety in Gold Dredging that is issued with the purchase of all diving equipment.**

### **WHAT IS CARBON MONOXIDE GAS?**

Carbon Monoxide is an invisible odorless gas which gives no warning of its presence. It is the product of the incomplete burning of any material such as Oil, Gasoline, Wood, Coal, etc. that contains carbon.

### **WHAT IS THE EFFECT OF CARBON MONOXIDE EXPOSURE?**

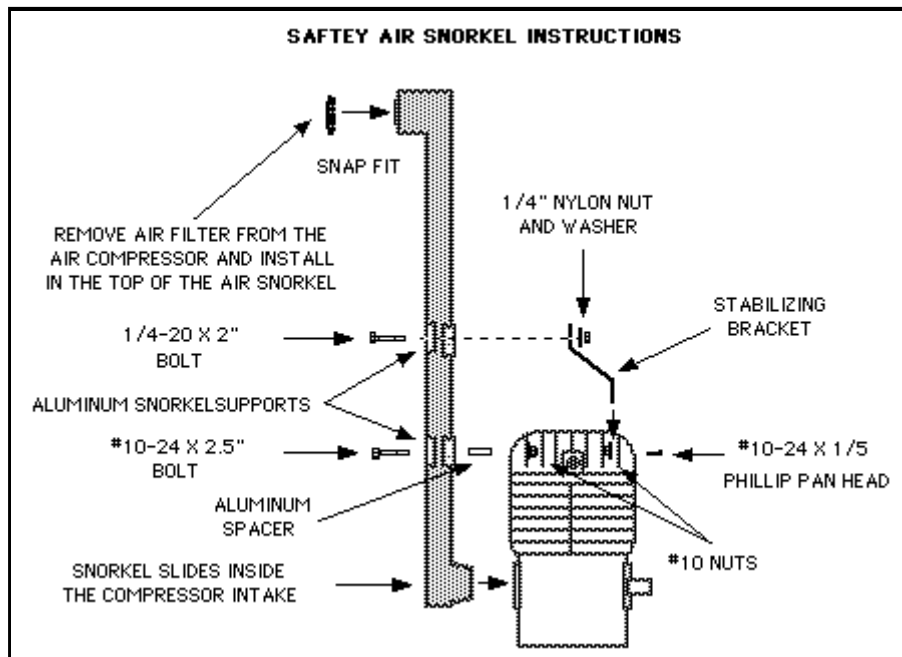
Carbon Monoxide deprives the blood of its ability to carry oxygen throughout; the body. When Carbon Monoxide is inhaled , it chemically combines with hemoglobin, the oxygen carrier in the blood. Even if there is plenty of oxygen in the air, hemoglobin combines much more readily with Carbon Monoxide than with oxygen. As the oxygen level of the blood is reduced, the heart must pump faster in an effort to supply sufficient amounts of oxygen to the brain and other parts of the body. When the brain does not receive enough oxygen, symptoms of headache, dizziness and mental

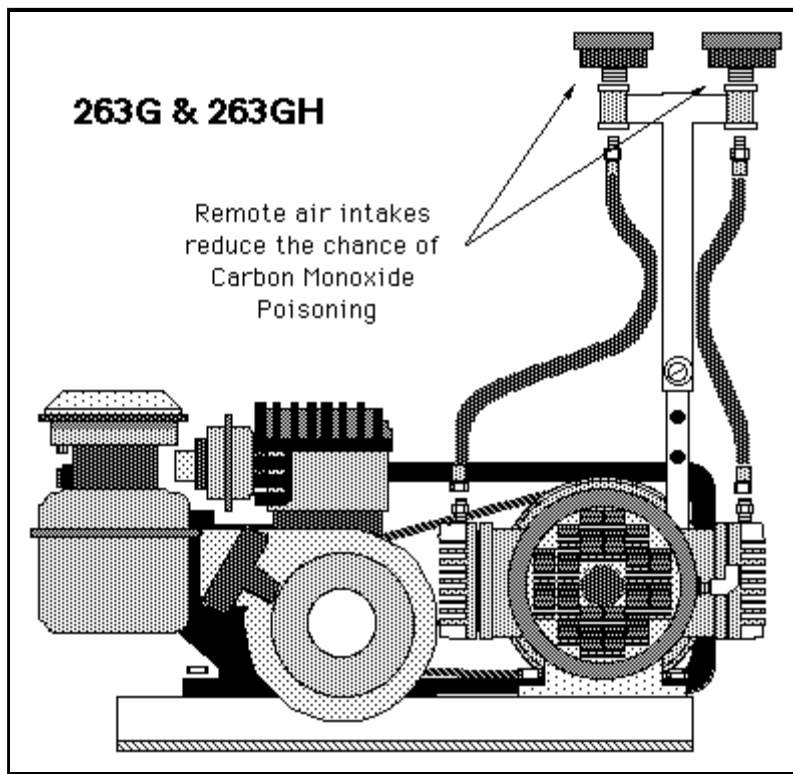
confusion occur. Further exposure to the gas causes lack of coordination, weakness and nausea. The final effect of excessive exposure are convulsions, coma and death.

Needless to say, we cannot emphasize strongly enough that caution must be excersized. Never dive alone, never dive in an enclosed area, or in an area where good ventilation is not eminent such as under piers, narrow grottos, under heavily overgrown brush or trees or in any area where a good breeze does not occur. Always make an effort to position your air unit to allow the prevailing breeze to carry any exhaust emissions away from the air intake of the compressor.

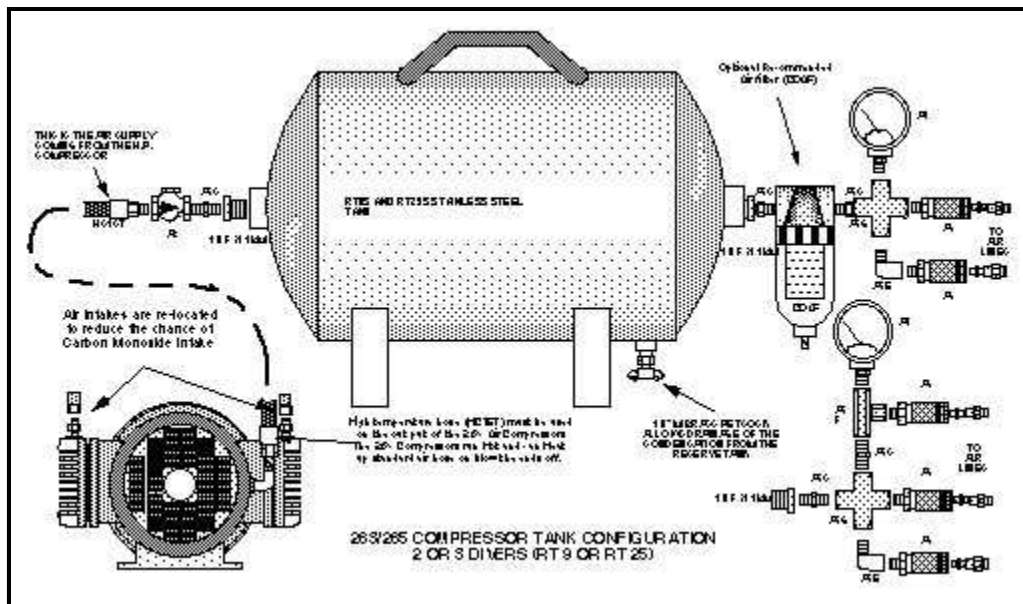
Remember, Carbon Monoxide is the product of incomplete burning of gasoline and oil, so it most important to keep your unit properly running and clean. Never allow gasoline to overfill or spill anywhere near engine and compressor.

**THE SAFETY AIR SNORKEL DOES NOT ELIMINATE CARBON MONOXIDE GAS!  
IT ONLY AIDS IN THE REDUCTION OF FUMES.  
ALL THE SAFETY CAUTIONS MUST BE OBSERVED!**





<http://www.keeneengineering.com/pamphlets/howhookah.html>



<http://www.keeneengineering.com/pamphlets/howhookah.html>

Product Keene engineering <a href="http://www.keeneengineering.com/">http://www.keeneengineering.com/</a> <a href="http://www.hookahdivegear.com/">http://www.hookahdivegear.com/</a>	Catalog Price
T80 compressor	\$245.00
T80G complete system less hose, regulator, and harness	\$640.00 w 3.5 hp gas engine 5hp models are \$799
LP120 Complete harness, regulator, tank and hose	\$242.00 include 20 foot hose a sixty foot kit will cost \$635
Gas engine 3.5 hp manual start including S&H online source not Keene	\$200 or less
Building it yourself: Gas engine, T80 compressor, and hose, harness, tank and regulator kit	\$700 you can do better by buying the same compressor and hoses on eBay and save \$100 or more.

Don't let these prices scare you, I'll show you other ways of building a reliable system saving you even more.

**Tip:** If you own a scuba regulator, you can convert it to hookah diving you'll have to take it to a competent dive shop and install a smaller spring. Don't try this unless you are familiar with regulators.

## Section 2 Building Your Own Gear



### BUILD YOUR OWN FLOAT AND SAVE!!!

If you want to attach your rig to a float, you'll need a pan (see the picture above ) buying one from a dealer can be costly. I purchased the float (I used an inner tube) from a discount auto parts store. The pan I built it myself of fiberglass. First I inflated the tube then I cut a cardboard circle and inserted inside the tube. then I cut a strip of card stock, I think it was 1/2- 3/4 inch and taped both ends. Next I placed it on top of the tube and taped it to the tube. I also taped the cardboard circle from the bottom, the bottom is the side with the valve. Next I brushed on PVA mold release agent, and let that cure. The next step was to lay the fiberglass. I used epoxy resin but you can substitute it with polyester resin, two layers were sufficient, but you might have to do three if using polyester resin.

Once the resin cured I peeled the pan from the tube and ground off the edge along the cardboard strip. Next I installed four eye bolts on the bottom of the pan, and cut four slits on the lip of the pan. Next I got four bungee cords, the ones resembling tank bangers with the ball and loop. I looped the bungee around the eye hooks and inserted the tube in the pan, then stretched the cord pulling the ball over the slit.

After I installed the compressor assembly on top of the pan I noticed some of the bungee cord would pop out, and decided to install four more. Total cost for this project was under \$50, a comparable unit from a manufacturer ranges from 85 to 120 dollars.



**Homebuilt Hookah Compressor**

Select an OILLESS compressor with a suitable pressure tank and automatic pressure switch. They are readily available from places like WalMart, Home Depot etc., for \$100 to \$200 depending on size. For diving, the compressor should be at least 1 horsepower with a minimum output of 2.5 cubic feet per minute at 100 psi. Get a 2HP one if you want to dive with a buddy. The one pictured is 2.6 SCFM @ 90 PSI and should handle

two divers. Unless it is a big boat, you are only going to be able to run it on shore power or I run mine for short dives from a 2KW inverter. Make sure you get one with a pressure shut-off switch. Some cheaper ones just run all the time with a safety valve that vents the excess and you don't want to be wasting that energy if you are running from an inverter.

You will need a water separator /air filter fitted to the output from the compressor if it doesn't come with one. They are about \$20 to \$30. Due to humidity on a boat, a water separator with an automatic drain is a good feature but not essential. For a more versatile and permanent installation, you can purchase a belt driven compressor to run off your engine. I ran permanently installed PVC schedule 40 pipe to an outlet in the cockpit to make connecting quick and easy. You will need a bunch of quick connect air couplings to make assembly and disassembly easy when diving. Always use the all brass couplings, the galvanized ones will only last about 7 minutes. Even the "all brass" female couplers use steel balls so rinse with fresh water and spray a little WD40 on them to keep them working. The compressor should be bolted down so it doesn't move around while underway so remove the manual valve from under the air tank and plumb it to a ball valve to make draining water much easier. If you can plumb the outlet from the ball valve so it vents overboard it will be easier as it is hard to catch the water when it comes out under pressure. (How do I know that?)

You will need to purchase a "Hookah" type diving set (harness/ regulator) that lets you dive to about 40 feet (this is the limit allowed with a low pressure system such as this one, more on the physics of pressure later on) with a compressed air line tethered to the boat. You can convert a scuba regulator to handle these lower pressures, scuba and hookah regulators are built the same way, the difference is the air valves' springs. Check your local dive shop - the valve is not that expensive - it is made to work from the 80 to 100 lbs per square inch from the compressor, but otherwise it is just like a scuba valve, There are no tanks and it comes with a small harness that anchors the air line to your back. The dive shop may try to sell you a stainless pressure equalization tank that floats on the water surface to provide cooling and give you a small reserve if the compressor shuts down. You don't need this. Always use a long hose (40 ft minimum) for diving to provide cooling and you can hear the compressor from under the water so if it doesn't come on periodically you can head for the surface before the tank on the compressor runs out. I used regular neoprene style air hoses although some have reported problems using commercial air hoses so use with care or use the ones sold for diving. The biggest problems with hoses is hygiene, fungus will grow inside and can affect your lungs. I purchase clear hoses to see what's going on inside. If I can't clean them, I toss them out, and purchase new ones.

I made float with a "DIVER DOWN" flag on it and terminated a (multiple) 50 foot air line at the float that came from the outlet in the cockpit. This line has a Tee and two couplings so you can plug in one or two diver lines. That way you can work in a radius around the boat and only use the final length of line for the vertical part of the dive which keeps a control on depth. The float also makes a great storage area for tools, fishing gear, and weights, out of the water for safety from predators.

A set like this will still cost you \$425 or more depending if you buy a hose/harness/regulator from a commercial kit, and this is assuming you go with a 20' hose. As I explained before the hose can be bought at hardware stores at a reasonable prices, and you can adapt a scuba regulator to hookah use. The reservoir tank can also be dispensed with, as long as you use a long hose. The harness can be dispensed with as well. A simple attachment to your weight belt is all you need (more on this later).