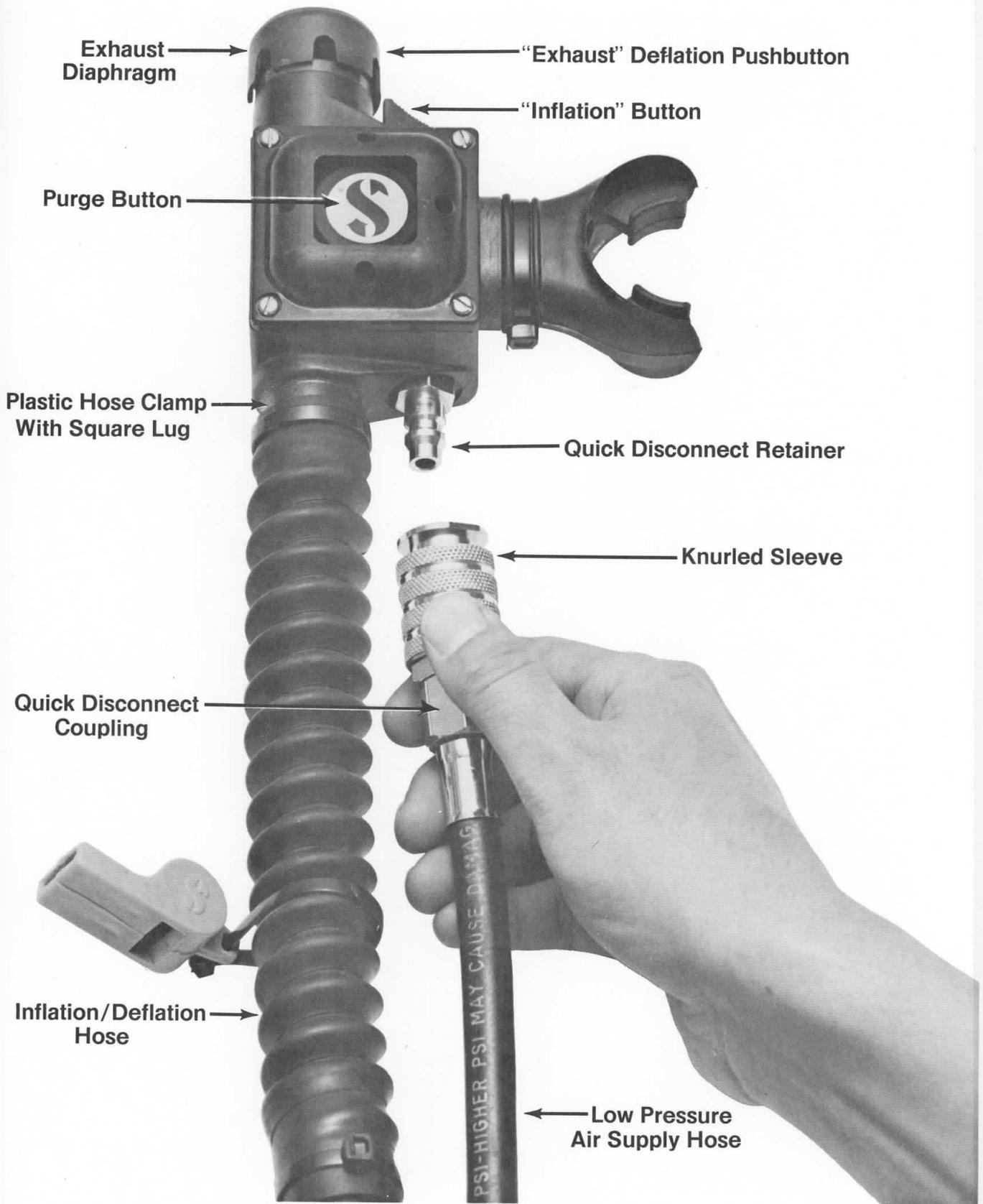


SEA™ INSTRUCTION SUPPLEMENT SCUBAPRO® A.I.R. II





INSTRUCTION SUPPLEMENT

SCUBAPRO A.I.R. II

INTRODUCTION:

In the past several years, diving industry manufacturers and instructional organizations have adopted and generally endorsed the use of a back up second stage as the primary means of sharing air with an "out of air" diving buddy. It is apparent that the "alternate second stage" will totally preclude "buddy breathing" as a technique by the end of the decade. While this movement toward an alternate breathing system is certainly a step forward in the interest of safety, it's by no means fail safe in itself. Properly designed back up regulators and detailed attention to training techniques are still vital if the diver is to successfully handle an emergency air situation.

In 1979 Scubapro® introduced an exciting innovation in back up regulator design called A.I.R. II (Alternative Inflation Regulator). It combines the function of a power inflator and alternate second stage in one compact unit. It is the purpose of this instruction supplement to explain the philosophy behind the development of A.I.R. II and suggest a teaching approach that will be effective in training new students as well as experienced divers. This information is described in the following outline:

- Design Philosophy
- Suggested Training Procedures
- Supplementary Technical Information
- Design Features and Benefits

DESIGN PHILOSOPHY

Until the introduction of the A.I.R. II, both primary and back up regulators were designed basically alike. Some color variations have been adopted to identify the back up second stage, but the unit itself is the same. While it is certainly true that both regulators must be dependable air delivery units, that's where the similarity ends. The primary difference between the two is how they are used, and what function they supply to the diver. The primary second stage is used continuously and must deliver air with maximum ease and volume to allow total comfort in a variety of diving conditions. The back up regulator, on the other hand, is seldom used and air flow and breathing resistance take a back seat to many other design features vital to successfully controlling an out of air situation.

1. LOCATION REACTION

Of all the problems surrounding two divers breathing from the same air supply, **locating the back up regulator quickly is the most crucial consideration in Design Philosophy.**

Both physical and psychological stress can be held to a minimum if air supply is restored to both divers quickly. A.I.R. II is totally unique as a back up regulator because it was designed around a principle called "Location Reaction." Positive, reliable location is assured because of A.I.R. II's multiple use as a power inflator. It is estimated that a diver will use his power inflator 10-12 times on an average dive. Every time the A.I.R. II is used as a power inflator, the location capability of the diver is improved and will eventually form a conditioned reflex or reaction. This "Location Reaction" is related to the back up regulator as well as the power inflator and its location in the event of an out of air situation will occur instantly. In short, the least used piece of equipment is now the most used because of the integrated multiple function design of the A.I.R. II. (Note: The foregoing description of "Location Reaction" philosophy is concerned primarily with long term maintenance of conditioned response related to the back up regulator. The initial response conditioning for the new student including stimulus response relationships will be covered under "Suggested Training Procedures.")

2. SIMPLIFIED HOSE CONFIGURATION

The multiple use A.I.R. II design helps to eliminate hose clutter by using one hose to supply both the power inflator and the back up regulator. The high flow connector allows simultaneous use of both units with little or no effect to the breathing response of the regulator unit. The A.I.R. II is designed to be worn over the left shoulder completely free and away from the primary second stage. The mouthpiece is positioned so that the unit can be used from the left side without twisting hoses. The result is maximum simplicity in handling and complete comfort.

3. APPLICATION DEPENDABILITY

As previously mentioned, back up regulator design varies somewhat from primary regulator design. Dependability in the back up regulator, for example, not only entails fail safe delivery of air, but also includes some means of keeping the air chamber of the regulator free from foreign material. Because it is not used frequently, it is not uncommon for the back up regulator to accumulate sand and gravel in the air chamber. The A.I.R. II partially eliminates this problem by channeling the air, dumped from the buoyancy system, through the exhaust valve and mouthpiece intermittently flushing the air chamber. Of course, it is always recommended that a back up regulator be forcefully purged prior to use. Purging the A.I.R. II is accomplished through a large opening in the front of the case that allows the diver to push directly on the diaphragm, which in turn depresses the air flow lever fully for maximum purging force. This purging system is also below the surface of the case eliminating accidental purging and subsequent loss of air.

4. LOW MAINTENANCE

The body of the A.I.R. II is injection-molded high strength foamed glass-reinforced plastic, virtually unaffected by the corrosive effects of the diving environment. The addition of glass fibers to the basic material composition adds tremendous strength to the over-all case and provides maximum shock resistance. All internal regulator and inflator parts are chrome plated brass and require only minimum maintenance. The diaphragm and exhaust valve are made of the highest quality silicone rubber for maximum breathing ease and long life.

In addition to unprecedented material components, the A.I.R. II's uncomplicated design is easy to service and requires no special tools. Repair and general maintenance, however, should be done only by Scubapro or one of its network of authorized service centers.

SUMMARY:

A.I.R. II is a combination back up regulator and power inflator designed with a specific purpose in mind. Through constant use in controlling buoyancy a "Location Reaction" is ingrained to insure instant results in finding the back up regulator when needed. The simplified hose arrangement reduces hose clutter and keeps all alternate systems clear of the primary breathing regulator. This design breakthrough is accented by Scubapro dependability and minimal maintenance. An overall product value unequalled in the industry.



Attaching The Low Pressure Air Supply To The A.I.R. II

SUGGESTED TRAINING PROCEDURES A.I.R. II

Prerequisites:

Before attempting the described pool exercise, the student diver should be able to:

- Relax with scuba in shallow water (3'-4')
- Clear water from his mask
- Remove the regulator while breathing and then return and clear it comfortably
- Understand the physics and physiology associated with breathing compressed air underwater.

Pool Exercise

- (A) **Introduce the A.I.R. II** — With students assembled so that everyone can see and hear the instructor clearly, explain the A.I.R. II and its function to the class. Points that should be covered are:

Location and handling

Purging the regulator

Power inflating the B.C.

Dumping air from the B.C.

Pre dive operational safety checks

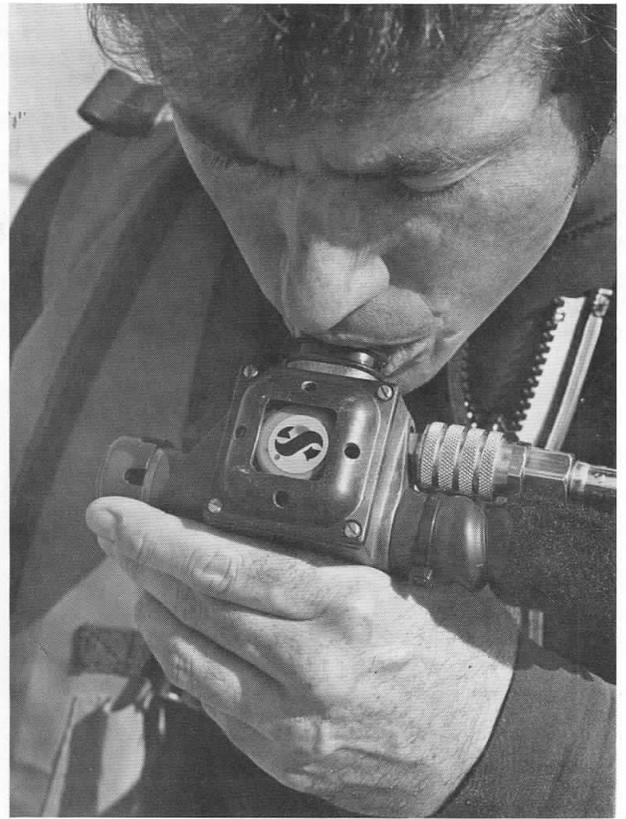
(For details see the Design Philosophy and Design Features section of this instruction supplement.)

note a.) It is important that the student be actually wearing the buoyancy system with the A.I.R. II attached during this introduction session. The most ideal condition is in high waist deep water. If the water is too cold, the introduction can be done at pool side wearing the buoyancy system without the tank. Wearing the A.I.R. II in its normal position begins to orientate the "Location Response" and each student can identify the parts and their function in their normal positions.

b.) The remaining exercises are involved *only* with the A.I.R. II when used as a back up regulator. The power inflator function of the A.I.R. II is similar in operation to existing power inflators, and instructional procedures involving buoyancy control need not be altered to accommodate the A.I.R. II.



A.I.R. II properly assembled and situated on stabilizer jacket — on diver — out of water.



Pre-dive check — Diver out of water — checking unit for inlet, exhaust, breathing.



In chest deep water have student bend at waist putting his face in the water and breathing from the A.I.R. II.

(B) Breathing From the A.I.R. II — With the students in chest deep water, have them bend at the waist while still standing on the bottom, put their faces in the water, and breathe from the A.I.R. II.

note a.) This exercise simply instills confidence in the unit and aids in relaxation. Have them take 8-10 breaths and then return to the standing position.

(D) Regulator Switch—This exercise is again done in the kneeling position in approximately 4'-5' of water. When the student submerges this time, he should be breathing from his primary regulator. Once comfortable and stable on the bottom, he should remove the primary regulator with his right hand, locate the A.I.R. II with his left hand, purge it in the water, put it into his mouth, clear it, and begin to breathe. This completes one cycle of regulator switch. The exercise should contain a minimum of 8-10 cycles before surfacing.

note a.) This exercise adds left and right hand co-ordination to the over-all multiple response. Take special note that these exercises are a building block process. Each new exercise adds one vital element to final behavior pattern. The instructor in charge should not allow any of these elements to be forgotten in this progressive learning experience and mistakes in procedure should be corrected immediately.

(E) The "Out of Air" Stimulus—This exercise produces the sensation of running out of air (stimulus) without inducing the fear normally associated with such routines. Complete explanation and demonstration, however, are vital to controlling unnecessary anxiety. The first phase is done while standing on the bottom in waist deep water. If the students are wearing fins, it is wise to remove them to facilitate changing positions without stumbling. While still on the surface, the instructor approaches the student from the front, then turns the student's air off, and back "on" a half turn. The half turn open is sufficient to supply the regulator and eliminates excessive turning to shut the valve off. When ready, the instructor faces the student, and has him put the primary second stage in his mouth and begin breathing, allowing him to take two or three breaths before turning the valve off. When the breathing diver senses the drop in air and final shut off, he should respond by removing the regulator from his mouth with his right hand and giving the out of air signal with his left hand. As soon as he completes the correct response, the instructor immediately turns the air back on one half turn. Since everyone is above the surface on this routine, instruction can be supplied as needed. Let the same diver repeat the exercise, and then switch positions with another student. After everyone has completed two above water air shut downs, the exercise can be done underwater. Again the kneeling position is best in water 4'-5' deep. Allow practice to continue until each diver has experienced a minimum of 10 shut downs in the underwater position.

note a.) In an out of air situation, there are actually two roles that the diver must be prepared to control. He can be either the "diver in distress" who has run out of air or the "rescue diver" that will give assistance. Parts A-D of this motor skill training session were directed at teaching the individual skills associated with the responsibilities of the "rescue diver." This exercise (E) is obviously directed at the "diver in distress" and combines the stimulus (the sensation of running out of air) with the appropriate response (removing the regulator with the right hand and giving the out of air signal with the left hand). Again, 10 repetitions are certainly not sufficient to insure the behavior pattern described. The final exercise of this group combines all the elements of the total response for both roles and should be repeated in practice sessions in subsequent classes.

b.) Actually this exercise sets the pattern for two stimulus response relationships. In addition to the out of air sensation actually experienced by the student, his response (regulator out/hand signal) will become the visual stimulus used to communicate the situation to the "rescue diver." It is important, therefore, that the hand signal be quite obvious in its execution to leave no doubt as to its meaning.

Student removes regulator from his mouth with his right hand and gives the out of air signal with his left hand.



(F) Group Regulator Exchange—This exercise puts all the preceding elements together into one routine that can be used in the remaining classes of the basic course. The entire procedure must be fully explained and demonstrated before it is attempted by the class. A water depth of 4'-5' is again best suited and fins should be removed to facilitate moving.

To make this description of the exercise more understandable, we will call the people of the three member instructor-student teams by names that relate to their function in the routine.

#1—The Instructor: responsible for beginning each sequence by turning the air "off" and then back "on" after the response has begun.

#2—The "Distressed Diver": the diver whose air is turned off and will respond by pulling his regulator and giving the out of air signal.

#3—The Rescue Diver: responsible for supplying air to the Distressed Diver while maintaining control of his air supply by reacting to his back up regulator.

Because of details involved in combining all the elements of the procedure, it is best to make a dry run above water to correct any mistakes while the instructor has the advantage of talking to the students. It is very important in conducting motor skills training sessions that everything be done as precisely as possible. Sloppy practice will produce ingrained responses and defeat the over-all purpose.

The positions for the three divers are as follows: the "distressed diver" should be facing the "rescue diver" at slightly less than arm's length. The instructor positions himself behind the "distressed diver" so that he can conveniently reach his tank valve. The instructor begins the exercise by shutting the "distressed diver's" air off. When the "distressed diver" feels the air supply diminish (stimulus), he should respond by pulling the regulator with his right hand and giving the "out of air" signal to the rescue diver (visual stimulus). The rescue diver responds by making physical contact with the distressed diver in order to maintain their position underwater, then pulling his primary regulator with his right hand, passes it to the distressed diver with the mouthpiece turned down and toward the distressed diver. Note: if the regulator is passed with the mouthpiece turned up, a free flow of air will probably result, causing unnecessary confusion. The distressed diver helps guide the regulator into his mouth with his free left hand while still holding his primary regulator in his right hand.

The rescue diver then continues his response by locating his A.I.R. II with his left hand, purging it in the water to eliminate any possible foreign material, placing the A.I.R. II in his mouth, clearing it, and begin breathing. Any time after the regulator exchange has begun, the instructor should turn the distressed diver's air back "on" one half turn. This permits the distressed diver to replace his primary regulator any time during the exercise should the need arise.

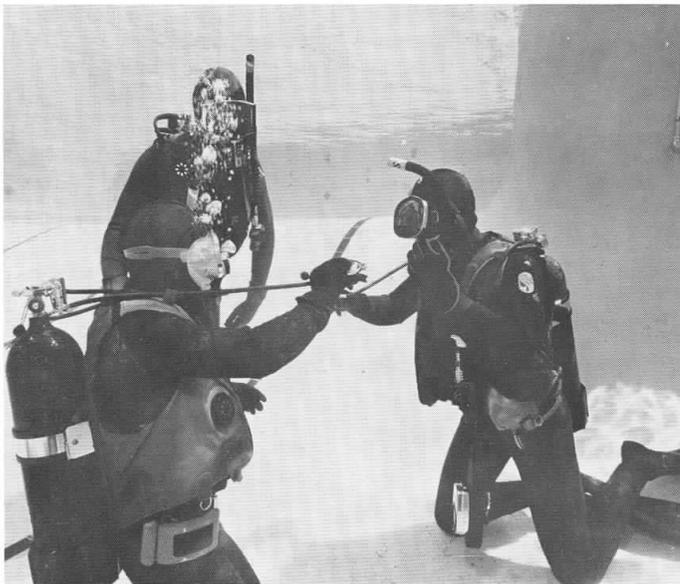
The rescue diver begins the reverse procedure back to the starting position by removing the A.I.R. II with his left hand and retrieving his primary regulator from the distressed diver. The distressed diver replaces his primary regulator and continues breathing. The instructor should allow a minimum of two breaths before beginning a new cycle. The best over-all results are derived by not establishing any rhythm between cycles. The instructor should mix it up by waiting two, three, or four breaths before turning the air off again. After the 10 cycles, positions are rotated and the exercise is complete when all three divers have occupied all three positions for 10 cycles.



8 Underwater exercise—Instructor turning student's air off. Rescue diver looking on, facing student.



Student gives "no air" signal to rescue diver.



Rescue diver passes his regulator to student. Holding mouthpiece down as student guides regulator to mouth. Instructor in background. (Option) Note: Out-of-air diver giving signal to share air.



Rescue diver placing A.I.R. II into his mouth. Note: Air coming out of mouthpiece to indicate it being purged. Student is using rescue diver's regulator. Instructor in background.

Exchange complete — Note: In the photo the distressed diver is facing the camera to better illustrate the exchanged regulator. In practice the two divers should face each other.



note a.) The responsibilities of the instructor in this final complete motor skill training exercise is twofold. First, no one should be allowed to participate unless he is completely relaxed, and second the instructor must correct any mistakes in the multiple response as soon as they occur. The two reactions are usually associated because if the student is upset he will not be able to concentrate and follow instructions. The best course of action is to relieve the student from the responsibilities of the team effort and have him practice on his own at a level that is comfortable to him. The outward indications of anxiety are:

- Rapid breathing**
- Quick or hurried movements**
- Preoccupation with simple tasks**

b.) Performing this exercise in deeper water will not add to its effectiveness in creating the proper stimulus response relationships. In most cases it will detract from the ingraining process by inducing anxiety detrimental to the student's concentration and, therefore, reduce his learning ability. Psychologists are uncertain as to the results of training under stress.

Many believe that there are undesirable emotional carry-overs that actually produce anxiety in direct relation to the stimulus. Very simply this means if the student was trained under stressful conditions the resulting anxiety could reoccur as the result of the stimulus even if the actual situation was completely under control. In the event of an actual "out of air" situation, it is vital that both the distressed diver and the rescue diver react in calm orderly fashion during the first few crucial moments and any possibility of creating an unnecessary anxiety response would not be in the best interest of safety. It's recommended, therefore, that this exercise sequence be conducted in water no deeper than 4'-5'.

c.) Due to the tremendous variety of possibilities surrounding an out of air situation, one additional stimulus may be worth consideration. That is the rescuer having the regulator pulled from his mouth without warning. This stimulus can be inserted in the exercise after the students are completely familiar and relaxed with the visual stimulus used in the original procedure. This new stimulus can be incorporated by simply repositioning the distressed diver and rescue diver into a side by side attitude instead of face to face. When the distressed diver feels the loss of air supply he should still respond by removing his regulator and giving the out of air hand signal. As a second response, he can reach for the rescue diver's regulator and remove it gently from his mouth.

SUMMARY

The foregoing procedure has described the methodology of training new diving students to properly and efficiently react in the event of an out of air situation using the Scubapro A.I.R. II. The exercises are designed in a progressive learning sequence and based on proven classical and instrumental conditioning methods. Properly implemented, this procedure will produce dependable behavior in the largest majority of circumstances involved in actual "out of air" encounters.

Further benefit from these exercises can be realized when they are conducted in an atmosphere conducive to the comfort zones of the participating students. This near zero anxiety attitude precludes the possibility of unwanted emotional carry-overs related to the stimulus and therefore enhances the probability of calm initial reaction.

"Precise knowledge is the only true knowledge, and he who does not teach exactly, does not teach at all."

— Henry Ward Beecher

Your comments and suggestions are welcome. Please address them to:

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Attn: Pete Wolfinger
3105 E. Harcourt St., Compton, California 90221

SUPPLEMENTARY TECHNICAL INFORMATION A.I.R. II

VEST QUALIFICATIONS:

The A.I.R. II is designed to work on all personal flotation devices that meet the following requirements:

- a. Equipped with a 1" corrugated supply/dump hose located over the diver's left shoulder.
- b. Contain a minimum bag working pressure of 2 psi above ambient.
- c. Be equipped with an automatic relief valve that will flow at a minimum rate of 6.5 standard cubic feet per minute with a 2 psi back pressure.

FIRST STAGE REGULATOR REQUIREMENTS:

The A.I.R. II is designed to work with all high flow first stages that do not exceed 162 psi intermediate (low) delivery pressure. (Higher intermediate pressures may be used if A.I.R. II is modified as described in repair, maintenance & adjustment procedures. A.I.R. II Alternate Inflator Regulator 21-009-000 [P/N 41-921-009]) The A.I.R. II should be connected *only* to the intermediate (low) pressure ports of the first stage.

MANUAL OR ORAL INFLATION:

To manually (orally) inflate the buoyancy system using the A.I.R. II, simply depress the dump button fully and exhale into the mouthpiece. Exhaled air will be routed into the personal flotation device via the 1" corrugated hose. To eliminate blowing water into the buoyancy system, exhale through the mouthpiece before depressing the dump button. This purges the water inside the mouthpiece and breathing chamber out through the regulator exhaust valve leaving the chamber dry.

USING A.I.R. II IN CONJUNCTION WITH CO₂

In the unlikely event that CO₂ has been discharged into the buoyancy system before or during the ascent, the diver using the A.I.R. II should always remove the unit from his mouth when venting off expanding gas to control ascent speed. If the diver has been trained using the suggested procedure described in the instruction supplement, and has also been trained to exhale on ascent, removing the A.I.R. II to dump excess gas will present absolutely no problem. With the A.I.R. II held at the highest point, in the normal venting position, unwanted gas can be dumped more efficiently, and the result of purging the regulator before breathing will remove any bag gas present in the breathing chamber.

DESIGN FEATURES AND BENEFITS

A.I.R. II

I. QUICK DISCONNECT COUPLING

Features:

- a. High air volume capabilities
- b. Large knurled disconnect ring
- c. Internal check valve
- d. Single hose
- e. Chrome plated brass components

Benefits:

- a. High flow potential, capable of supplying both units simultaneously
- b. Easy handling even with gloved hands
- c. Prevents air from escaping when disconnected with the air supply on
- d. Eliminates hose clutter
- e. Reduced over-all maintenance and extended life

II. FOAMED GLASS FILLED THERMAL PLASTIC POLYESTER CASE

Features:

- a. Foamed composition
- b. Thermal resistance
- c. Plastic base material
- d. Glass fibers

Benefits:

- a. Reduces over-all case weight to eliminate jaw fatigue
- b. Unaffected by normally encountered temperature fluctuations
- c. Total resistance to water related corrosion
- d. Adds to the over-all case strength and provides maximum shock resistance

III. REGULATOR PURGE

Features:

- a. Recessed design
- b. Large access hole
- c. Direct diaphragm to lever control

Benefits:

- a. Helps eliminate accidental purging and subsequent loss of air
- b. Easy location and activation, even with gloved hands
- c. Insures positive forceful purging to clear the breathing chamber of possible foreign material

IV. POWER INFLATION CONTROL

Features:

- a. Unique button shape
- b. Simple in line spool valve

Benefits:

- a. Positive identification without visual reference
- b. Time proven reliability

V. HIGH VOLUME DUMP/REGULATOR EXHAUST

Features:

- a. Unique button shape
- b. Multiple function B.C. dump and regulator exhaust
- c. Simple in line valve

Benefits:

- a. Positive identification without visual reference
- b. Helps keep the exhaust area free of foreign material
- c. Reliable fail safe operation

VI. REGULATOR COMPONENTS

Features:

- a. Chrome plated brass components and stainless steel springs
- b. Silicone diaphragm and exhaust valve
- c. Three moving part design
- d. Adequate air flow

Benefits:

- a. Minimum maintenance and maximum dependability
- b. Reduce inhalation and exhalation resistance
- c. Over-all dependability
- d. Capable of delivering sufficient air to a relaxed diver at approximately 200' and a stressed diver at 130'



SEA*

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SCUBAPRO®

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