

## **SIMA, NORFOLK DIVE CHAMBER'S PERFECT HYPERBARIC TREATMENT RECORD**

The Navy's dive team in Norfolk, Virginia is stationed at Norfolk's Shore Intermediate Maintenance Activity (SIMA). The dive team is made up of Navy



**Navy deep-sea diver makes underwater repair**

and civilian professional deep-sea divers who play a vital role in the SIMA Norfolk Hyperbaric Division/Repair Department. Each of SIMA's six diving units is made up of a diving officer and seven master divers. The six units rotate through duty calls of 24 hours a day for seven days. The dive team makes underwater repairs for the U. S. Atlantic Fleet and controls SIMA's *hyperbaric dive chamber*. The chamber is a pressure vessel that is designed for human occupancy and is specially equipped to treat diving-related and other health conditions.

The term *hyperbaric* refers to gases at pressures that are greater than

atmospheric pressure at the water's surface. Medical doctors trained in Undersea and Hyperbaric Medicine administer hyperbaric oxygen therapy (HBOT). The treatments provide therapeutic advantages, shorten treatment times, and otherwise improve the outcome of many diving and non-diving health conditions. During treatment, the hyperbaric chamber is submerged in ocean water, and the patients breathe pressurized oxygen and other atmospheric gases, such as nitrogen, at greater than atmospheric pressure. The chamber depth and number of hyperbaric treatments depends on each patient's situation and rate of improvement. Some patients require only one treatment, while others may need multiple treatments during several weeks.



**Eight patients at one time can be treated with high-pressure oxygen inside the dive chamber.**

The SIMA Norfolk hyperbaric chamber dive team is made up of professional divers who assist medical personnel with the monitoring and care of the patients during descent to designated ocean depths for treatment, ascent to shallower depths, and back to the surface. The team consists of a *chamber supervisor*, *chamber operator*, *saturation technicians*, and *inside tenders*.



**Inside SIMA's dive chamber, Inside Tender, Mr. Leo Henderson, monitors patient**

The *chamber supervisor* has ultimate responsibility for the dive chamber and is the focal point for all dive chamber operations. He works with the diving medical officer to determine when to leave the surface and to schedule the intermediate and maximum depths for each treatment session. The *chamber operator* continuously monitors and controls the oxygen and other gases used in patient treatments as well as gases exhaled by people in the chamber. The *chamber operator* also controls the ascents, descents, and holding depths of the chamber. An *inside tender* is a diver who closely monitors the medical condition of one or more patients during hyperbaric chamber treatments. The *saturation technician* is specially trained to maintain the chamber's saturation life support systems.

SIMA Norfolk's dive chamber has had a 100% success rate in treating hundreds of military and civilian patients as well as professional and recreational divers for decompression sickness (DCS), also known as *Caisson disease* or *the bends*, and for arterial gas embolisms (AGEs).



**Navy diver participates in salvage operation**

DCS is often characterized by severe pain in the limbs and joints, a choking sensation, or difficulty breathing. Nitrogen gas, which makes up almost 80% of the air that we breathe every day, is also a major component of most compressed breathing air used in diving. This usually harmless gas can become a health hazard to a diver who ascends too fast. The nitrogen, which has dissolved in the blood and fluids in body tissues, may come out of solution

too soon, forming painful nitrogen gas bubbles, too big to move through the



**Navy diver during descent**

circulatory system to the lungs and be exhaled. When the diver is unable to return to depth and wait until the symptoms of DCS are gone, or if symptoms of DCS are delayed, a hyperbaric dive chamber is used to return the diver to a depth where the increased pressure forces the nitrogen bubbles back into solution. Then the diver returns to the surface, slowly, under the close supervision of an inside tender who determines when

the diver is ready to ascend to a shallower depth or return to the surface.

Another type of DCS, known as altitude decompression sickness, can also be treated in hyperbaric chambers. Altitude DCS results from a sudden change in air pressure at high altitudes. It can occur during flight in depressurized or unpressurized aircraft and in high altitude parachute operations.

An Arterial Gas Embolism (AGE) is a serious health emergency that is a major cause of death following a dive.

Holding one's breath during ascent from a dive is a common cause of AGE. The inhaled air leaks directly into an artery too suddenly to be dissolved in the blood. When the diver surfaces, the inhaled air forms bubbles in the bloodstream that block the blood supply to the heart, brain, or other parts of the body, cutting that part of the body off from oxygen and energy. Symptoms of AGE may include bloody foam from the mouth or nose,



**Navy diver begins ascent**

disorientation, chest pain, weakness, dizziness, or convulsions.

The Navy's undersea and hyperbaric medicine specialists are experts in treating both DCS and AGE. Recompression with hyperbaric oxygen therapy (HBOT) is beneficial for both conditions. HBOT provides additional oxygen, under pressure, to redissolve the nitrogen and air bubbles and to repair some of the damage caused by the bubbles. In addition to treating DCS and AGE,

HBOT is an effective therapy for numerous other health conditions. It is used to promote healing of burns and slow healing wounds, certain complications of diabetes, some types of infections, carbon monoxide poisoning, and tissue damage caused by oxygen deprivation.

The hyperbaric chamber operated by the Navy Dive Team at SIMA, Norfolk is the Navy's largest dive chamber.

It came on line in April 1999, successfully treating six patients during its first week of operation.

In June of that year, the SIMA Norfolk Dive Team also treated seven U.S. Air Force aviators in the dive chamber over a six-day period. Each crewman received between three and six hours of HBOT for altitude decompression sickness. All of the aviators recovered completely and were returned to full duty.

The SIMA Norfolk Dive Team received a *Meritorious Team Commendation* from

the U. S. Coast Guard for their outstanding service to the Air Force during this emergency.



**Left to right: Chamber Supervisor Engineman First Class Porth; Diving Medical Officer, LT Gutierrez, M.D; and Chamber Operator, Damage Controlman Third Class Edmonds confer about hyperbaric chamber treatment**

In addition to SIMA's dive chamber, there are two other hyperbaric dive chambers in the Norfolk - Hampton Roads, Virginia area. A fourth chamber is planned for the Naval Medical Center in Portsmouth, Virginia. The Navy teams associated with the dive chambers currently in operation are proud to offer their highly successful hyperbaric treatment services to Navy enlisted and civilian personnel and to the general public.

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