National Offshore Safety Advisory Committee (NOSAC)

Sub-committee on:

Evacuation and Medical treatment of injured Divers From Remote Outer Continental Shelf Facilities

April 11, 2012

Background:

The NOSAC subcommittee tasked with reporting on Evacuation and Medical Treatment of Injured Workers from Remote Outer Continental Shelf (OCS) facilities issued a final report on November 5, 2009. One of the recommendations in that final report was to further study evacuation and medical treatment of injured divers on the Outer Continental Shelf. (OCS)

Problem:

Due to the increased distance from shore of remote Outer Continental Shelf (OCS), injured divers are many hours away from shore based medical facilities and timely medical evacuation. Compounding this problem is the injured diver may require treatment or transport in a hyperbaric chamber.

Task:

1. Re-establish the subcommittee on commercial diving operations on the OCS to review and assess the various issues and challenges associated with providing timely medical attention and treatment to divers who become ill or are injured while working subsea under pressure at remote OCS facilities or from the vessels servicing them.

2. Review and assess present capabilities, practices and procedures for medical treatments and evacuations for injured divers to shore treatment facilities from offshore facilities, including industry and government agency resources and capabilities.

3. Prepare a final report to submit to the NOSAC for review and approval that would make recommendations that could alleviate the issues and problems associated with medical treatment or evacuation of injured divers from these remote OCS facilities.

The committee is composed of subject matter expertise from representative facets of the offshore diving spectrum presently operating in the Gulf of Mexico. Representatives of major oil companies, diving safety, logistical safety, three medical trauma physicians who are involved with hyperbaric treatment of commercial divers, and the Chairman of the ADCI Sat Safety Committee. This committee represents many major diving contractors in the GOM and interested international companies, as well as four Classing Societies. Actual membership began at 15, not including the USCG attendees.

The first meeting was held in April 2010 in New Orleans. Most of the communication and coordination between the committee task groups has been through email and telephone as required.

Based on the size and quantity of the various identified issues and timeline, it was agreed to identify the obvious issues first and task these to the members of the committee (best suited to provide research) and report to the committee.

1. What is the state of the diving industry response and practice at present to:
   - Barotrauma?
   - Non-barotrauma injuries?

   Answer: Both require trauma response; the severity of the injury will dictate the procedure and response protocol.

2. What are the alternatives if a regular treatment table fails?

   Answer: Numerous options, "Table 7" is a conservative and successful treatment.

3. "Table 7" is a mini or short duration saturation decompression used when a surface diver requires a slow decompression, with controlled levels of oxygen percentage and time to assist the diver in his upward transition to surface pressure. It requires all the technical and physiological issues associated with a saturation operational life-support in a chamber, not designed for saturation or prolonged exposure.

   Are all the companies dealing with this in a similar manner?

   Answer: With few exceptions, Yes, the industry has a successful response that works.

4. What are the required protocols for evacuating an injured diver right after the conclusion of a deep dive and decompression?

   Answer: Each company has the same, if not similar, protocols for this follow through.

5. What if it is necessary to evacuate a diver while under pressure?

   Answer: Based on the current equipment limits, evacuation is avoided and the attending physicians would rather stabilize and treat the diver until it is safe for travel

6. What if a diver under pressure is unable to decompress quickly and requires emergency surgery?

   Answer: Stabilize and treat until the diver is able to travel.

7. What are the load and volume capabilities of the current helicopters in the GOM?

Ongoing research and recommend this information be part of a Job Safety Analysis (JSA) and Simultaneous Operations (SIMOPS)

8. Are the landing platforms for larger and heavier helicopters identified?

   Ongoing research and recommend this information be part of a Job Safety Analysis (JSA) and Simultaneous Operations (SIMOPS)

9. Are helicopter fueling areas clearly defined, identified and are the fuel levels reported to a single source for logistical planning? How often is this done?

   Ongoing research Ongoing research and recommend this information be part of a Job Safety Analysis (JSA) and Simultaneous Operations (SIMOPS).

The meeting centered on the progress reports of these various task groups as well as related issues identified during the discussions.

We have discovered in the discussions that for the most part major diving companies who will be working on the Outer Continental Shelf (OCS) either engaged in saturation or surface diving operations will be prepared for emergencies. This is because of the necessary culture of safety required to work in the remote OCS for the major oil companies engaged in drilling and production operations.

Issues and projects require detailed Job Safety Analysis (JSA) and Simultaneous Operations (SIMOPS) as a basic tool for successful and safe operations. Many diving companies and the clients they work with have in-place solutions and plans for emergencies, this includes Diver Medical Technicians (DMT) and appropriate medical professionals located on shore.

Medical Response:

Presently the industry has the requirement of at least one Diver Medical Technician on all Saturation Diving projects. This is a requirement in the 6th edition of the Association of Diving Contractors, “International Standards for Commercial Diving and Underwater Operations”.

The DMT in this case is a Certified Diver Medical Technician; he or she has been primarily trained as a “Commercial Diver”, according to the American National Standards Institute & Association of Commercial Diving Educators. (ANSI /ACDE) This requires a specific minimum curriculum of 625 hours of training.

Prior to DMT training he or she must be trained as an Emergency Medical Technician according to the National Association of Emergency Medical Technicians, then he or she is qualified to be trained as a Certified Diver Medical Technician according to the National Board of Diving and Hyperbaric Medical Technology (NBDHMT). The Undersea Hyperbaric Medical

Society approves this training curriculum. With this level of training the DMT/Diver will have all the skills required to assist a physician who is trained, certified (in accordance the Undersea Hyperbaric Medical Society) and experienced in hyperbaric trauma and other maladies a commercial diver could possibly incur.

Diver Medical Technicians fill a necessary void of primary emergency medical care while engaged in commercial diving activities offshore, and covers trauma or hyperbaric induced trauma.

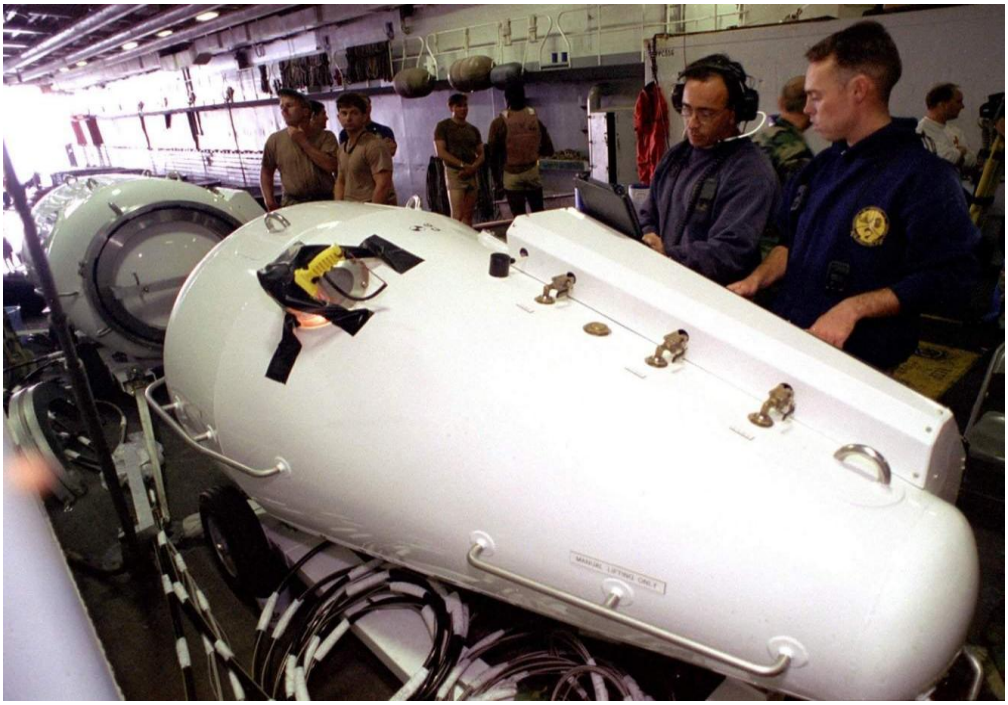
Recertification of the medical skill levels is a required necessity including annual documented hours of continued education and practice in order to stay current.

There is a shortage of hyperbaric certified trauma physicians who are trained, fit, experienced and psychologically capable of locking into a deep saturation system. The Diver Medical Technician (DMT) can be the eyes and ears of the physician on the shore based medical facility by giving the “diver-patient” status in real time directly to the physician or his team through radio/cell phone or the ever increasingly utilized ‘Wi-Fi’ capability. ‘Wi-Fi’ allows real time video and telephone communications via satellite, an appropriate and useful technology for remote operations presently in use throughout certain remote areas of the world including the GOM. This is presently under investigation for hyperbaric use and could prove to be a very valuable tool in this remote site critical care evaluation.

Transport Under Pressure:

Photo courtesy of IUC

Titanium Transport System, North Sea during a demonstration in 1978



U.S. NAVY Photo

(TRCS) TRANSPORT RECOMPRESSION CHAMBER SYSTEM

Transport Under Pressure (TUP) is the ability to transport an injured diver quickly via helicopter or vessel while at depth in a chamber. The depth could be 60 fsw or in the depths closer to 1000 fsw. While not a new idea it requires:

- A fit for purpose designed build to meet ASME, PVHO minimum construction.
- Light weight.
- A dedicated system with Transport Under Pressure (TUP) mating/clamping standardization.
- Portable life support equipment and required power supply.
- Gas supplies.
- Trained dedicated personnel.

To add to the complexity of this task, a hyperbaric reception medical facility is required and must be manned by hyperbaric trained and certified physicians and support technicians ready to respond at a moment's notice to receive the injured diver while still under pressure.

Two random surface diving deck chambers showing different man-way designs

As an example of TUP clamp assembly difficulties

Transport Under Pressure (TUP) for commercial diving medical emergencies in the GOM is still being studied. Presently, one centrally located facility capable of receiving an injured sat diver is available in the GOM (Global Industries (Technip) in Port of Iberia, LA).

Other facilities are non -TUP equipped hospital based with relatively shallow capabilities or the US Navy Experimental Diving Facility in Panama City, Florida… if the facility is available and not being utilized.

A New Orleans medical group familiar with diving related hyperbaric trauma has expressed interest in building and operating a proper facility under the university medical school. This venture will require a budgetary plan based on capabilities and organization. This is in the conceptual mode at present.

Some major diving companies engaged in saturation diving activities in the GOM are investigating options, costs, delivery and implementation of these reception facilities. Industry is responding to meet this challenge for Diving Emergency Evacuation Systems but they also agree with the not transfer under pressure difficulty and added risk.

The medical task group discussed this option but remain hesitant to transport under pressure.

Emergency surgery and transport while under pressure is not the first choice of the medical teams on the committee, there are so many variables and reasons not to transport at this time they would put the option as a last resort. Strategic use of antibiotics as the medical consult on a shore based medical facility can guide and work with the DMT Divers to stabilize and delay the need of emergency surgery until either medical help arrives or the patient is decompressed and able to travel.

Things may change once a serious hyperbaric reception facility is available and practical TUP system is developed with a universal TUP clamp

The head of the medical project team of the Titanium Emergency Evacuation System in the North Sea presented a paper titled, “Transfer Under Pressure: A Re-Evaluation.” The document mentions various incidents where the outcome could have been similar regardless if evacuation or stabilization and on site treatment had continued. If one were to imagine the call to evacuate is given in the middle of the night, the weather is on the edge of bad and the call is given the go ahead…the scenario continues…. The helicopter is loaded with the patient and medical crew is headed back to the shore based facility then some mishap causes the helicopter to go down with the loss of all hands.

A question arises, at what point does one justify the added risk?

Cost can be very significant with the medical and technical staff required to maintain, operate, train and rotate an “on-call 24/7” team. This will require highly trained and qualified individuals who are also highly paid. The design, construction, maintenance, management and operation

of the system and the associated mechanical and life support components will be considerable. This is a serious life support endeavor.

Helicopter transport logistics for offshore landing platform locations, capabilities and fuel capacity is ongoing and this information varies and changes rapidly and should be part of a Job Safety Analysis (JSA) and Simultaneous Operations (SIMOPS).

Recommendations:

In conclusion at this time I wish to submit this final report with the following recommendations.

- Diver Medical Technicians (as defined on page 3) on each diving operation taking place on the Outer Continental Shelf in the GOM. This covers Saturation diving and surface supplied diving operations.

- The Certified Diver Medical Technician in a saturation diving operation shall have saturation diving certification and experience.

- The Certified Diver Medical Technician in a surface diving operation shall have surface diving certification and experience.

- There should be a detailed Emergency Action Plan in place for medical trauma or barotrauma related injuries for each diving operation. Environmental parameters, equipment, personnel, onboard medical supplies for remote operations and logistics should also be considered.

- The subcommittee meet once a year or as needed to review industry standards and changes. This will allow identification of technological advances on Emergency Transfer Under Pressure as well as the development of Hyperbaric Reception Facilities including the logistical data needed to react efficiently.

Conclusion:

This subcommittee has generated interest on an international scale. The industry has demonstrated its willingness to meet the requirements of working safely in the depths of the Outer Continental Shelf are actively moving in that direction

There currently exists an Emergency Mutual Aid listing available for the saturation diving companies in the GOM located on the ADCI website. This is where companies engaged in saturation in the GOM can contact others with saturation capability in case of emergency or locate who is working close by.

There is a common standard for fittings and connections in place for saturation diving emergency evacuation systems in the GOM. (ADCI 6th Edition) This will enhance and accelerate the ability for the company responding to the call for assistance.

The Transport Under Pressure (TUP) issue is actively being investigated. The capability exists in shallow depths relative to surface diving if the Transport Under Pressure unit is already on site.

The technical and life support requirements are similar to any closed environment hyperbaric chamber except the TUP adaptive spool piece is not an off-the-shelf item as each deck chamber is different and not designed for connecting other hyperbaric components (TUP fly-away chamber) which would be necessary as the average deck chamber is a twin lock pressure vessel weighing approximately 6000 lbs and over 12 feet long with limited life support capability.

- For deeper depths, a built-for-purpose lightweight hyperbaric chamber rated for pressures equivalent to 1000fsw (300 meters) or greater may be required. This "TUP System" requires a reception facility for the evacuation chamber.

- The TUP option is currently under investigation. More options and solutions are necessary to finalize the requirement.

Since this committee was formed, the subject of emergency evacuation has been active and is moving at a very fast rate.

* The Association of Diving Contractors International (ADCI) recently released the 6th Edition of the "ADCI International Consensus Standards for Diving and Underwater Operations". It requires an Emergency Evacuation System for saturation diving operations.

* BP (British Petroleum) issued a new safety memo requiring all of its diving contractors to have Self Propelled Hyperbaric Lifeboats and a Hyperbaric Reception Facility.

* A Diving Industry Working Group has been formed to study and create a standard on diving safety, which includes a working group to look at the current standard for the emergency evacuation of divers in saturation. Membership includes oil and gas producers, classing societies, IMCA, ADCI and major international diving companies.

Respectfully submitted,

William F. Crowley

Subcommittee Chair