INTERNATIONAL DIVING SCHOOLS ASSOCIATION

# idsa

NEWS EDITION NUMBER16: JULY 2010

## SCHOOLS IN NORTH AMERICA

Full details of next annual meeting in Rotterdam

**DMT Training**

**Salvage and Construction**

New Full Member: The YAK Academy Mumbai

idsa NEWS

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***Front cover photograph***
***A diver from Svensk Sjöentreprenad AB working on a Current Measuring Device near Oregrund East Sweden***

# A MESSAGE FROM THE CHAIRMAN

I would first like to welcome new members, and I look forward to their involvement with the future work of the Association. They are: The **YAK Academy, Mumbai,** to Full Membership (Diver Training) - page 3. and to Associate Membership: **'Forespro' – Spain 'Centre Méditerrannéen Plongée Professionnelle'** (CMPP), Morocco. **'Regional Centre for Underwater Demolition', Montenegro. Podvodrechstroy Divng School, Moscow.University of Southern Denmark.** and to Affiliate Membership **DERA Diving, Indonesia.**

Since the last IDSA News we have had two Board meetings which are reported on page 3. They have generated a number of items for the Rotterdam Agenda, with the purpose of accelerating the progress of the Association towards International certification. One of the items as you will read on page 3 is a GAP Analysis comparing as many National Standards as possible with those of IDSA, in order to ensure that the IDSA Standards are fully comprehensive.

I am looking forward to the Annual meeting in my home country, the programme follows, and the involvement of members is essential. Please send in items and proposals for discussion by 15 August – after which new items will not be accepted until the end of the meeting if time is available.

Finally, don't forget that the Editor of IDSA News is always looking for articles and photographs of diving activities, please send in news of any events which would be of interest to divers.

LEO LAGARDE

## ABOUT IDSA

The Association is concerned with all divers - Offshore, Inshore and Inland, and has established International Diver Training Standards based on the consensus view of its many members.

The Standards provide both a yardstick for those responsible for either administering existing National Standards or creating new ones, and a guide for Clients, Diving Contractors and Divers themselves.

It is considered that the introduction of these Internationally agreed diver training standards will have the effect of Improving Safety Providing Contractors with a direct input to the Diver Training Syllabus Enabling Contractors to bid across National Borders on a more even playing field Improving diver quality Providing Divers with greater Job Opportunities.

Some governments have and will, set their own National diver training requirements.The IDSA programme provides a means of equating National Standards by maintaining a Table of Equivalence.

One of the main thrusts is towards International Diver Certification in order to bring together the various National Schemes which are currently in existence. However, the Association is not just concerned with standards, it also serves as a valuable forum for the interchange of News & Views between members, many of whom are the only Commercial School in their Country. Current routes for this interchange are the Newsletter - published in January and July, the IDSA Website,the Annual meeting in September/October, and various and many forms of contact between members and the Executive Board.

## BOARD MEETINGS

### DELFT – January 2010

The Meeting took place at the Netherlands Diving Centre and was attended by Leo Lagarde (Chairman), Mark van der Esch (Treasurer), John Rabone a co-opted member and Ashild Eftevåg deputising for the Secretary Dag Wroldsen.

Following the brief discussion of the Membership Structure during the Annual Meeting the subject was further discussed to consider the possibility of simplifying the categories.

As a first step towards the Standardisation of Programmes, it was decided that a GAP analysis of the main National Diver Training Programmes should be initiated in order to identify the differences and similarities between them.

The conduct of the forthcoming Full Membership Audit of the YAK Diving Academy was outlined and agreed.

### OSLO – May 2010

The meeting took place at the Norwegian Commercial School in Oslo and all members were present.

The programme, agenda and other arrangements for the Annual Meeting in Rotterdam were discussed in detail.

The re-structuring of the Membership was further discussed and the outline of a proposal for the Annual Meeting drafted. The acceptance of recreational and other training (Military etc) or the 'accreditation of prior learning' and so the reduction of the length of course time was considered and will also be an Agenda item for the Annual Meeting.

The possibility of increasing the status of IDSA by obtaining 3rd Party approval for the Audit Procedure from DNV or a similar organisation was introduced.

## THE YAK DIVING ACADEMY, MUMBAI AUDIT May 2010

The YAK Group was formed in 1999 by Mr. D.S Yadav with the purpose of providing quality education and training for the Maritime Industry to all, keeping in mind the globally changing education requirements and the needs of society.

The Group initially started with Maritime Courses approved by D.G Shipping (Govt of India). Since then It has grown from strength to strength and diverted into various other associated disciplines e.g. Shipping and Logistics courses, Warehousing, Custom Clearance, Freight Forwarding, construction activities, and now Commercial Diving with associated Specialist courses such as wet welding.

The YAK Group has its head office at CBD Belapur, Navi Mumbai. The site covers approximately 20,000 Sq ft, and in addition to the administration a number of DG Shipping approved STCW courses are held at this location.

IDSA approval has been given for a Level 2 training course (Surface Supplied Inshore Air Diver) which has a duration of 18 weeks

The auditors found the diver training and maintenance facilities very well kept, several of them being newly built.

The classrooms are well equipped and all fitted with 'Beamers', many lessons being given using the 'Powerpoint' programme.

Their 15m diving vessel is permanently fitted with all the necessary equipment for Surface Supplied Air Diving, and in addition to their on-site chamber there is a modern Hyperbaric facility at a nearby hospital.

Courses are residential and the Academy provides excellent accommodation for all students

## IDSA GAP ANALYSIS ON DIVING STANDARDS

In line with IDSAs endeavours to provide guidance to diver training schools on the best possible courses, including programmes to truly International Standards, IDSA is currently carrying out a GAP analysis of all the known diver training standards worldwide, including, but not limited to UK, USA, Canada, Australia, France, Netherlands, Norway, Sweden, Denmark to name but a few.

This analysis takes into account not only the varying depths and bottom times used by different countries as part of their National standards, but also more importantly diving methods, safety procedures and the theoretical and practical skills covered during training, including the use of specialised surface and underwater tools.

Requests are in progress to diving contractors & oil companies who ultimately employ the divers, to feedback to IDSA what competencies they expect from a commercial diver.

Although the analysis is still in its early stages, it is already apparent that there are vast differences between various countries in both the competencies required and methods of training used.

It is hoped, when completed, that IDSA will be able to produce the highest levels of training & competencies including recommended programmes & skills training guides for our courses and member schools alike.

Any feed back from interested parties will be gratefully received if sent to the Administrator (Alan Bax) at: info@idsaworldwide.org or (John Rabone) at: interdive@telefonica

# ANNUAL MEETING 2010 ROTTERDAM

## 13th to the 15th of October

### Hosted by 'SMIT' the World Renowned Salvage Company

*Smit's floating conference facili-tyto be used for the meeting*

### ABOUT OUR HOSTS

SMIT' (founded in 1842) is one of the oldest, most respected, and Internationally recognised names in the Marine Sector.

The company has earned an excellent reputation by combining expertise and experience with high-quality materials and equipment, based in nearly 50 locations around the world. The company aims to provide its worldwide services to shipping companies, producers in the oil and LNG industries, (offshore) construction companies, insurers, governments and shipyards. The highest standards of safety, health, quality and environmental protection are maintained.

The Salvage Division is the area of work most relevant to diving operations and thus to the work and interests of IDSA and its members. SMIT Salvage's name is synonymous with total commitment to the challenging field of marine emergency response, where optimal care for the environment is a priority.

As the world's most experienced marine salvor, a round-the-clock readiness for operations anywhere in the world is maintained. Salvage is the first line of defence against marine pollution when major casualties occur.

Although IDSA General Meetings are normally hosted by a Full Member School, the Board welcomes this opportunity for closer links with the Industry and wishes to express the thanks of the Association to our hosts.

## ATTENDANCE

**In addition to delegates from member schools and organisations, the meeting will also be open to non members In the capacity of Observers. Wives or Partners wishing to attend meals and other social occasions, for example the Association Dinner, are welcome on payment of an appropriate fee.**
**Those wishing to attend are asked to complete and return the Registration Form on the last page as soon as possible.**

## TRAVEL

**By Air** Rotterdam Airport is about 15 km from the Conference Hotel – Taxi fare about €35
Amsterdam Airport is about 65 km north of Rotterdam – there is a frequent local train service between the Airport and Rotterdam Central Station.
**By Rail** The Central Station is about 5 km from the Hotel – Taxi Fare about €20
**By Road** Directions are on the Website www.novotel.com

# ACCOMMODATION

The Conference Hotel is the Novotel Rotterdam Brainpark
Address: K.P. van der Mandelelaan 150, 3062 MB Rotterdam, The Netherlands
The following special rates have been arranged, and will be available until 15 September.
**Booking** – without restrictions - can be cancelled or changed up to 24 hours before arrival
**Single room:** € 147.50 per room per night, breakfast included
**Double room:** € 166,00 per room per night, breakfast included
Booking – with restrictions – Credit card only, costs will be charge at the time of booking cannot be cancelled or changed
**Single room:** €133,00 per room, per night, breakfast included
**Double room:** € 152,00 per room, per night, breakfast included
Bookings should be made direct with the Hotel
**Telephone:** +31 (0)10 25 32 532
**email:** h1134@accor.com
They should be addressed to :
'Reservation Number 90409870 - IDSA Annual Conference'

# OUTLINE PROGRAMME

**TUESDAY 12 October**
1830 to 2000 Registration and welcome drinks in the Conference Hotel – Novotel Brainpark

**WEDNESDAY 13 October**
0930 Welcome by Smit
1300 to 1400 Lunch onboard the Smit Conference Facility
1000 Meeting session 1
1400 to 1730 Meeting Session 2
1245 Group Photograph
1900 Aperitifs, followed by the Association Dinner

**THURSDAY 14 October**
0900 to 1215 Meeting Session 3
1430 to 1530 - Tour the Dutch Diving Training Vessel RV50
1230 to 1330 Lunch at the Conference Facility
1330 to 1430 Visit the Smit Maintenance Depot
1600 to 2000 Tour of Rotterdam followed by an Indonesian style Buffet 'Rijstafel'.

**FRIDAY 15 October**
0900 to 1030 Meeting Session 4
1100 to 1230 Presentations

**Notes**
1. A Ladies' programme has been arranged for Thursday afternoon, before joining the Harbour tour andBuffet at 1600
2. The outline programme above is subject to such changes as are necessary for the smooth running of the programme. Session items may also be changed if necessary.
3. Smit's Floating Conference Facility to be used for the meeting

# AGENDA

**The Agenda for the meeting sessions shown in the outline programme on page 2 will be circulated in July. Further information may be obtained from the Administrator at info@idsaworldwide.org**

# THE CONFERENCE FEE

**The Conference fee for delegates from member Schools is €200 & for Observers €250.**
**The fee will include:**

**Throughout:** *Attendance, Refreshments, All transport from the Novotel to the Conference Centre*

**Tuesday:** *Welcome drinks at the Novotel 1830 to 2000*

**Wednesday:** *Lunch & the Association Dinner – including pre dinner drinks*

**Thursday:** *Lunch & the afternoon tour of the Smit facilities, Boat tour of Rotterdam Harbour and evening Buffet Supper – all courtesy of Smit*

**Friday:** *Bus from Conference Centre to the Central Station then Rotterdam Airport on completion of the meeting.*

# INTERNATIONAL DIVING INSTITUTE

## Charleston, South Carolina


It is early morning as the sun rises above the Cooper River in Charleston, SC. A contingent of wetsuit clad students wearing red hard hats begins the ritual morning swim as they leave the dock at International Diving Institute. When they return they will spend 30 minutes in topside physical training before beginning their academic day. Students are then briefed for the day's activities which will include classroom theory as well as diving operations. Due to the Institute's proximity to local ports, marine terminals and other water front activities, students here are literally surrounded by an environment with cranes, barges, and tugs, very similar to the environment they will work in upon graduation. Instructors not only teach diving but they also stress safety, efficiency, discipline, and a high work ethic. An outsider watching a student diving operation would find that students perform like they are working for an actual diving company. One important feature of the school is the realistic training environment that students train in. Located adjacent to a commercial shipyard, the waterfront environment changes daily.

International Diving Institute is strategically located on the Old Navy Base in Charleston, SC a place with a rich diving and marine heritage. The Institute was founded by CEO, Sergio Smith, a former US Navy Diver and Seabee. From its modest beginnings in 2003 the Institute has flourished to its state of the art facilities on the Old Navy Base. The Institute's physical facilities include a 2 story building, housing multiple classrooms, administrative offices, and work areas. The lower level includes a metal fabrication shop, a welding shop, a clean room for gas systems fabrication, a dive gear locker, and a diesel and compressor training area.

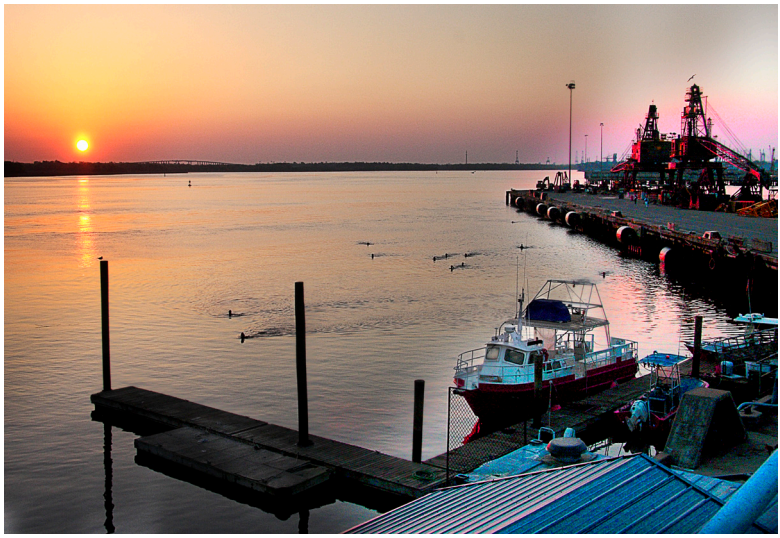
One of the most impressive features to visitors at the Institute is the Triplex Wet Tank facility. Where many schools have a single Wet tank for training, IDI has 3 tanks. The Main Wet Tank where students begin their diver training is 20 feet deep and contains 48,800 gallons of filtered water. At the base is a large aquarium style observation window where instructors keep a watchful eye on fledgling students. In December of 2009 a horizontal tube (3 feet in diameter X 15 feet in length) was attached to the side of this tank to create a penetration and confined space training environment. Advanced students enter this tube through a 20 inch diameter trunk and then complete a 4 bolt flange-up project within the confined space.

This horizontal tube also has a large observation port in the side for instructors to monitor student divers.

As students progress they move to the 2nd wet tank which rises to 30 feet above the landscape. With a small diameter of approximately 8 feet across students work in zero visibility to complete a multiple flange-up project in this confined space. At this point students are also learning rigging skills as they assist fellow students in hoisting the project components in and out of the tank.

The 3rd tank has become a favorite among students. Once they have completed underwater welding courses and have proven their proficiency at topside welding, they beginning underwater welding training in the state of the art Wet Welding Tank. With a depth of 20 feet and a diameter of 10 feet across, this underwater welding training site offers a supersized filtration system to keep the water clear. As with the other tanks this one has an observation window so that instructors can keep a watchful eye.

Only a portion of the student's training dives are spent underwater in the Wet Tank Facility. Many dives are made in the Cooper River



*Students taking their morning swim*

along the school's waterfront where permanent dive stations have been created. These include to dockside platforms complete with a diver's stage and a floating dock. Students train on many projects in the water front area learning salvage techniques, airlifting, jetting, underwater welding and burning. Once advanced classes have reached a level of safety and proficiency they are given the chance to set up a mock diving company where they will plan and coordinate diving operations in the deep water at the end of Pier Juliet. Here they will use a mobile diving station and perform multiple dives in deep water with strong currents and low visibility while being surrounded by ongoing commercial shipping operations. It is here that they encounter all of the conditions that are present

in a real commercial diving situation.

Along with these incredible facilities the Institute maintains and operates two hyperbaric chambers. These are used for student training involving surface decompression as well as recompression treatments.

The well-stocked dive shop is not only the source for student materials and equipment, but it also services many professional and sport divers throughout the Southeast.

After 16 weeks of intense physical training, academics, and practical underwater exercises, students have completed 640 hours and they graduate from International Diving Institute with a surface supplied air/mixed gas, entry level tender/diver from Association of Diving Contractors, International.

International Diving Institute
*Phone 843-740-1124*
*1400 Pierside St.*
*Bldg. 190, Suite C*
*Website - www.internationaldivinginstitute.com*
*N. Charleston, SC 29405-2206*

# SANTA BARBARA CITY COLLEGE

*Super Aviator Launch*

Since 1968 the Marine Diving Technologies (MDT) department at Santa Barbara City College has been training Marine Technicians in the support of commercial and research operations on, in, and around the maritime environment. As we proceed with 2010 the department continues with its core mission, as well as supporting our industry partners and local commercial diving community.

The department recently conducted sonar training for marine contractors, federal, state and local law enforcement agencies, and members of United States Homeland Security. The week long course, conducted in cooperation with Kongsberg Mesotech, focused on acoustic theory of sound underwater, as well as equipment and field operation of high resolution scanning SONAR.

December's clear skies and calm waters saw the California Department of Transportation Dive Team in Santa Barbara to upgrade operating and emergency procedure training both in the classroom and offshore in the Santa Barbara Channel. Also in December, Sub Aviator Systems brought their Super Aviator to Santa Barbara for flight testing which provided a perfect opportunity for several past and recent graduates to support and learn from their operations.

The MDT facility is undergoing an upgrading of its own this year, with work being completed on the saturation system and deck decompression chambers, including new windows, chamber lights, habitat conditioning, bell plumbing and surveillance video systems. These upgrades will allow students to operate chambers configured for the offshore environment, as well as configurations found in many medical facilities. New inverter welding machines have been purchased and installed in our wet welding lab and we have acquired a new Lincoln 400 diesel machine for offshore. For those of us who have spent time on the back of a dive support vessel standing next to a full throttle welding generator, this stainless body, low decibel machine is a joy to be around.

Although very pleased with recent events and accom plishments, I reflect on the importance of relevant instruction delivered in a manner congruent with good pedagogical ractice. The finest equipment cannot make up for a lack of knowledge and experience, which places in stark reveal the importance of what we as commercial diving educators do for our students and our industry. I recently reread Requiem for a Diver by Jack Warner and Fred Park, and encourage others to do so as a reminder that the knowledge tha we share was often purchased at great expense.

***Geoff Thielst***
***Director, Marine Technologies***
***Santa Barbara City College***


*Cal Trans Safety Training*

*Geoff Thielst in a Sub Sea bell 1994*

# Diver Medic Training and Certification

## Part Two

The author, Dick Clarke

This second in a two part review of the diver medic program takes readers of IDSA's newsletter from its formative years through to the present.
The program has recently entered its 35th year and has much to celebrate. Countless divers have benefited from the immediate diagnosis and comprehensive treatment that an on-scene diver medic affords. This has been particularly the case in the industrial setting of offshore oil and gas exploration and production. Traditionally, the injured commercial diver relied on his diving supervisor. At best, supervisors had real time contact with shore-based diving medical control physicians. Further, one would like to think that the supervisor was able to provide essential diving history and medical findings that allowed the physician to make a reasonably sound diagnosis and order appropriate care. Unfortunately, such coordinated medical care was certainly the exception rather than the norm. Less than impressive clinical outcomes became far too common, more so with the increasing degree of medical and geographic isolation.

The advent of the diver medic dramatically altered the dynamic of medically and geographically remote diving accident management, just as it was designed to do. Now, diving supervisors had someone within the team who could carefully evaluate the physical and neurologic status of the injured diver. More detailed clinical findings would then relayed to shore-based medical control physicians, physicians who were keenly aware of both the capabilities of the on-site medic and the contents of their medical kit. Resulting orders were case-specific and comprehensive in scope. Not only was it recompression and oxygen breathing for decompression sickness. Now, the bladder could be catheterized, intravenous fluids could be administered and various pharmacologic options brought to bear. Each patient would be followed closely from a neurologic standpoint and prevailing treatment algorithms adjusted as indicated. The sum of all of this was a greatly improved clinical response. Where resolution was incomplete patients transferred ashore to higher levels of care were generally in much better condition than had previously been the case and with a more favorable prognosis.

By the early 1980's there was a waiting list for DMT training opportunities. Not surprisingly, an increasing number of facilities elected to offer diver medic training. During this same period the National Association of Emergency Medical Technicians (a U.S. first responder certification agency) was approached. It was considered important that DMT's become formally certified through a credible organization. It was also though desirable to standardize the course curriculum now that several different venues were available for training.

Discussions with the NAEMT got nowhere. In fact, their representatives were quite alarmed to learn that diver medics could be functioning many hundreds of miles from comprehensive medical facilities. They were even more concerned to hear that patients (injured divers) may not be able to have their medical transfer initiated for several days (diver in saturation, for example). Land-based EMT's and paramedics commonly practice on the assumption that a 30 minute maximum scene-to-hospital time frame will exist.

We think that NAEMT administrators quickly weighed the related medical-legal implications (this was the U.S.,

of course!) and equally quickly said no thank you. Perhaps this was to be expected given the diver medic's very unique operating circumstances.

It was considered unlikely that any other organization would take on the certifying responsibilities of the DMT program. Not to be deterred, however, it was decided that a new organization specific to our needs be formed. This was accomplished and in 1985 the National Association of Diver Medic Technicians came into being. It was first headquarted at the Ocean Corporation, in Houston, Texas, one of the three diving schools training medics at that time.

The next step in the formalization of the DMT program was to standardize its course curriculum The NADMT subsequently introduced 'Module 16' as the course outline specific to diving medical

Photograph Courtesy Interdive Services UK

training. The term Module 16 was derived from the EMT program, which consisted of 15 separate modules. So, the entire DMT curriculum involved 16 modules (EMT and DMT) and concluded with invasive skills laboratory and practicum sessions. In the U.S., EMT-Basic (the product of the 15 modules) does not involve invasive skills training. This comes later, at the EMT-Advanced and paramedic levels.

Invasive skills training included time in the animal lab at the supporting medical facility, and rotations within their emergency department. Manikins were also used, for bladder catherization and intravenous fluid and drug administration, while pressured up in a deck decompression chamber. The program's headquarters was relocated to New Orleans in the late 1980's. Dr. Keith Van Meter, a leading diving medicine specialist and NADMT board member, kindly agreed to house the Board within his administrative facility.

The on-site medical presence demands of the commercial diving industry were now being met to a much greater extent.

With an increase in the number of training courses available waiting lists had largely evaporated. Soon courses were no longer filled to capacity. This led to an opening up of the previously 'oilfield diver' only eligibility. Those involved in marine science and open water research diving operations, employees of the National Oceanic and Atmospheric Administration (NOAA) diving program and other professional diving groups were accepted for DMT training.In 1989 the NADMT underwent a name change and a re-orientation from an association of DMT 'members' to a medical certifying board. It was renamed the National Board of Diving & Hyperbaric Medical Technology. This rather lengthy title allowed the incorporation of a certification program in hyperbaric technology. The 'CHT' is a hospital-based hyperbaric oxygen therapy designation for technical and nursing personnel.

It was during the early 1990's that, in retrospect, an unsatisfactory and largely unresearched decision took place. Requests had been made to the Board to introduce a two-tier level of DMT certification. Until this point in time there was only the 'DMT'. Several training organizations wished to offer DMT training but did not have the necessary facilities and personnel to provide the invasive skills component. The Board subsequently introduced DMT-Basic (no invasive skills training) and DMT-Advanced (the traditional DMT) certifications. Further, with greatly expanded availability of training courses, student eligibility criteria were largely abandoned. A growing number of individuals, who just liked the idea of being trained as a DMT, registered for available training opportunities. They included recreational divers, land-based first responders, and others with very much of a background quite peripheral to diving medicine first responders. Many would not find employment as diver medics; many others did not seek such employment.

Be that as it may, diving companies continued to seek only those DMT's trained as commercial divers. Invariably, these DMT's were paid a medic bonus on top of their standard diving pay as long as they were formally certified and maintained their certification status. Some diving company clients actually began to mandate the presence of a DMT within the contracted dive team. In several instances a client required that a DMT be one of those pressured-up on deeper saturation dives. Organizations such as the Association of Diving Contractors, now the Association of Diving Contractors International, had made a concerted effort to educate the oil and gas exploration and production companies regarding diving safety. There were many reasons for doing so. not the least was to limit the likelihood that ADC member companies would be outbid by lesser capable companies who, at face value, were less expensive to hire. The consequences of awarding jobs to those who would short-cut industry standard safe diving practices could be catastrophic. This writer recalls two such instances in the Campos Basin, off the Coast of Brazil, in the mid-1970's.

Photograph Courtesy Interdive Services UK

One valuable by-product of these oil industry meetings was an appreciation for the DMT as an integral component of diving safety.

During the annual ADCI meeting in New Orleans, in February 2009, a meeting of particular importance to future DMT training and certification was convened. It brought together many of those physicians active in support of diving operations in the Gulf of Mexico, and elsewhere in the Americas. Also invited to attend were commercial diving company safety officers and other diving medicine stake-holders. This meeting's principle objective was to learn from those at proverbial 'tip of the spear', those actively engaged in the medical care of injured divers, how well they were being served by the NBDHMT, specifically regarding its DMT training and certification product. Following a lot of valuable dialogue it became apparent that there was no useful role served by a 'Basic DMT'. One experienced specialist likened the Basic DMT to a mechanic without a tool box. Several other helpful points were made, particularly in reference to ongoing skills and knowledge updating and more effective communication needs between the in-chamber DMT, the diving supervisor, and their shore-based physician control.

As a result of this meeting the NBDHMT discontinued Basic DMT certification. Training agencies were notified in March 2009 that all training course scheduled from January 1, 2010 required an invasive skills component for DMT certification purposes. A period of consultation with the medical specialists in attendance at the above referenced meeting resulted in the development of an invasive skills module (see Box). As of 2010 NBDHMT eliminated both the Basic and Advanced designations. Designation is now simply 'Diver Medic'.

***Dick Clarke***
***President, National Board of Diving & Hyperbaric Medical Technology www.nbdhmt.org***
***President, National Baromedical Services***
***www.baromedical.com***
***Director, The Baromedical Research Foundation***
***www.baromedicairesearch.org***

# THE TROUBLE WITH PFOs

**Up to 30% of divers are thought to have 'holes in the heart'. These rarely present problems, but why not take out some insurance, asks BOB COLE – by modifying the way we dive?**

**THE US SPACE AGENCY NASA** nearly lost a mission because of a PFO, and there have been five NASA cases of decompression illness in space!

That's right, not UFOs, PFOs. Many doctors have yet to make the connection between PFOs and people under pressure – and that means not only astronauts but divers.

PFO stands for Patent Foramen Ovale. Translated from Latin, *patent* = open; *foramen* = aperture and *ovale* = oval, so a PFO is an oval hole, with a flap, between the right and left top chambers of the heart, or atria.

Which is right and which is left? The human body is usually described from the patient's point of view.

A PFO is a remnant from our time in the womb. Before birth, before our lungs are used for breathing, oxygenated blood supplied by mum bypasses the lungs by flowing from the left to the right atrium.

At birth, the foramen ovale should close and seal, but in a number of people it doesn't seal fully. Some of these PFOs require surgery; most do not.

Some 25-30% of people are thought to have a PFO, which of course includes divers.

In normal life a minor PFO causes no serious problems, but for some divers under certain conditions, large PFOs can become problematic.

During any ascent from 10m and below on air, bubbles are formed. These are washed with the venous blood into the alveoli of the lungs.

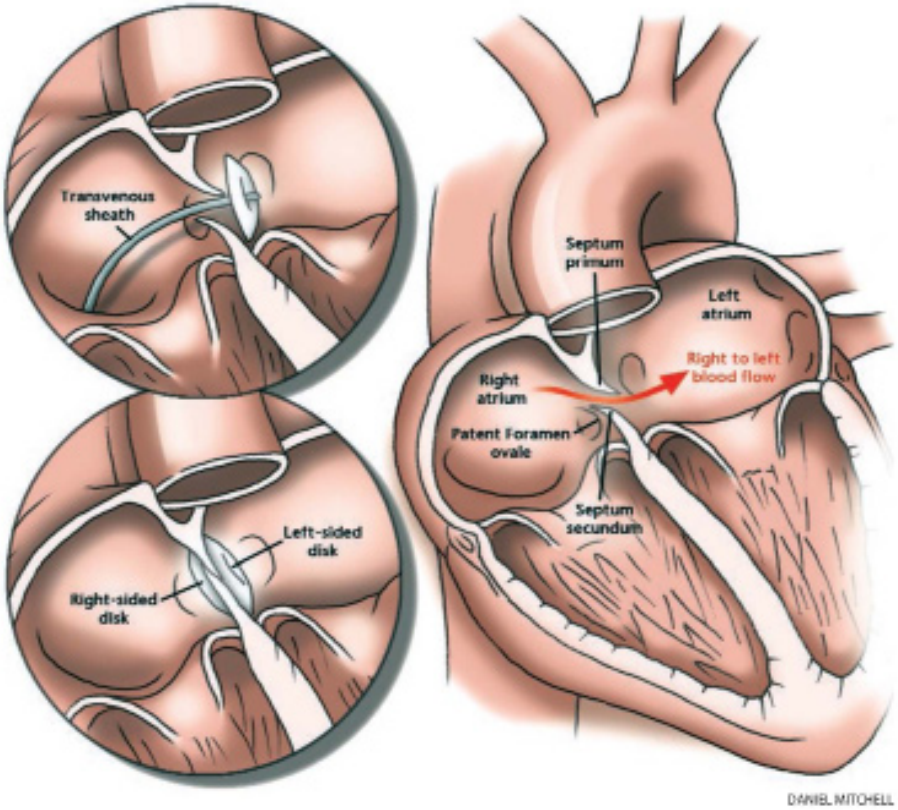
They become trapped here, then, almost instantly, dissolve out, releasing their excess nitrogen and other gases to be breathed out in the normal way.

It is the supply of micro-bubbles (MBs) that is important. MBs arriving at the lungs reach their peak in numbers within 15-20 minutes of surfacing, and then diminish in three broad reducing waves over the next 180-200 minutes (*see graph, above right*).

Poor ascent control can overwhelm the pulmonary system with micro-bubbles, leading to DCI. The lungs, which catch MBs, are sometimes referred to as the "pulmonary filter".

Bubbles are seen by the immune system as alien, and this may activate a response that can lead to tissue damage, wherever they are in the body. By controlling our ascents, stops and surface intervals properly, we reduce MB generation to a minimum.

A PFO is not just a hole in the heart between the right and left atrium. It is more like a short tube, up to 7mm long. The flap, in the left top atrium, acts as a one-way valve that, when open, allows blood to flow from right to left only (*see diagram, left*).




DANIEL MITCHELL

For about 95% of the time in the cardiac cycle, the pressure in the left side of the heart is higher than that on the right. This tends to keep the flap valve closed.

However, there are times during normal living, such as during a Valsalva manoeuvre, when the right-side heart pressure can exceed that of the left.

Blood and any debris (clots, bubbles etc) may then flow through this opening, by-passing the filter of the lungs and entering the arterial circulation. Crossing blood clots can lead to a stroke; crossing bubbles can cause DCI.

**ANTONIO-MARIA VALSALVA (1666-1723)** was an Italian physician and anatomist who studied the ears. He coined the term "Eustachian Tube", and described the aortic sinuses of Valsalva in his writings, published posthumously in 1740.

In a Valsalva Manoeuvre (VM), a person tries to exhale forcibly with a closed windpipe so that no air exits through the mouth or nose – as, for example, in strenuous coughing, straining during a bowel movement, or lifting a heavy weight.

Divers use VMs to equalise middle-ear pressures during descent, by pinching the nose and blowing to open the Eustachian tube. Valsalva actually described the technique as a method of expelling pus through a perforated eardrum.

For 18 years I've been trying to persuade divers to clear their ears without using VMs. I first published

## PFO Closure

All surgical procedures involve risks, and the cardiologist should explain these before any decision to operate is taken.

PFO closure is achieved without opening the chest or heart. A special wire with a button closure is fed into a vein in the groin up to the right top atrium and through the PFO. The device is released in the PFO to form what looks like a tight cuff-link (*see diagram below left*).

The patient usually goes home the next day. A month later, a repeat echocardiogram test verifies that the device is still in place, while a bubble test with Valsalva checks that the right-to-left shunt is sorted out.

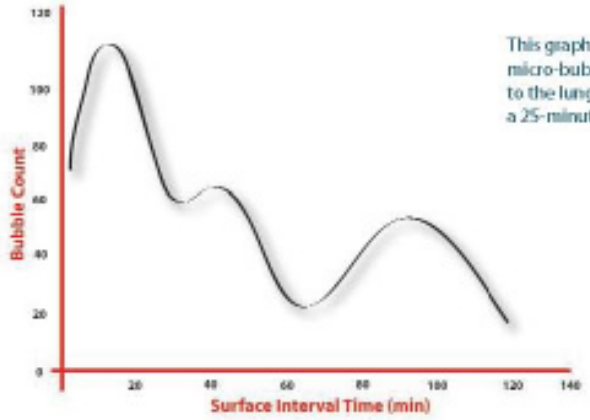
Two or three months later, the heart's skin cells will have grown over and covered the device.

After six to eight weeks the lining tissue will have filled the spaces in the device, making it invisible to ultrasound. Blood-thinning drugs are taken to reduce the risk of clotting and unwanted deposits building on the implant.

The patient can dive again after three months or so, if the cardiologist agrees.

The rare, but possible, risks include:

- Incomplete sealing of the hole
- Dislodgement of the closure device
- Fracture of the implanted device
- Headache/migraine
- Perforation of vessels or the muscle tissue of the heart (myocardium)
- Stroke
- Abnormal heart rhythms
- Palpitations




This graph shows the micro-bubbles delivered to the lungs following a 25-minute, 30m dive

this advice in a book called *Decompression And Computer Assisted Diving*.

A number of divers, including trainees, say that they can clear their ears only by using VMs, to which I say, keep practising. If used, VM ear-clearing must be "gentle", but how many times have you seen someone hanging on a line, pinching their nose with the other hand and blowing like hell?

Usually, this approach simply causes the Eustachian tube to lock up but, more seriously, it could well open any lurking PFO. This is not an issue on the day's first dive, but may be important on dive two and three, if residual micro-bubbles are present!

**AS WELL AS THE 25-30%** of people with a PFO (*Fawcett EF; 1907*), Divers Alert Network (DAN) estimates that about 10% of folk have a right-to-left arteriovenous pulmonary malformation.

Normally, the lungs filter out micro-bubbles, which get stuck in the very small capillaries of the alveolus, but in these people a section or sections of these alveolus blood vessels are big enough to allow normal MBs to pass through.

In a recent study by DAN Europe, a group of divers was retested after a 6-8-year period and a number of changes were observed. Twelve per cent had a bigger PFO than before, a further 12% had acquired one where none had existed, and one had closed. No reason was found for the changes, but it is thought that the very small PFOs seen originally in some of the divers had enlarged over time.

If you find all this alarming, remember that of the PFOs found in 25% of autopsies, only 3% are of the 10mm-plus size thought necessary to have a significant right-to-left shunt.

We are not seeing high numbers of divers getting DCI from these causes. It is thought to occur only to those with the largest shunts, though this would still put around 5% of us at risk.

Mother Nature, as always, is working to protect you. Three mechanisms limit the incidence of DCI cases from this cause: the fact that the PFO is a one-way valve restricting right-left blood flow; that the one-way valve is kept closed 95% of the time; and that returning blood mixes turbulently within the right atrium and is swept, with any micro-bubbles, away from the entry of any PFO.

Fairly recently doctors have linked some "migraines with aura" with the presence of a PFO, though this has yet to be confirmed.

If you suffer from these, check with your GP and then, if necessary, with your local UK Sports Diving Medical Council Referee.

Unfortunately, there is no non-invasive PFO testing method, and doctors won't routinely test for PFOs during normal diver medicals, because of the risks and cost involved. Most people with a PFO find out only after suffering an unearned DCI, particularly where a skin bend is involved. If a PFO is found it can be surgically closed, and the benefits are more than just diving-related, because patients with a PFO are also at greater risk of a stroke.

However, some hyperbaric doctors feel that the risks of PFO DCI are too small to warrant concern or repair, particularly as repair has its own share of risks.

Dr Richard Vann of DAN USA told me of a diver who got bent again after having a PFO repaired.

Dr Phil Bryson, of Plymouth's Diving Diseases Research Centre, says he also has such a patient, and two others who want their PFO closures removed. So having a PFO fixed doesn't make you immune to DCI. No dive is risk-free, and closing a PFO reduces the risk only to that of a diver with a normal heart.

As there is no medical consensus on DCI and PFOs, they are not considered an absolute bar (contra-indication) to diving.

Better control of micro-bubbles by means of superior dive profiles, better ascent control, decompress/safety stops at the correct depth and diver behaviour as outlined in the panel below reduce the risk. No MBs = no DCI.

**I'M SURE MANY EXPERIENCED** divers reading this article will shrug and think: I've been diving all these years, and I'm still all right.

It was what happened to two of my friends that led me to write this. They had been diving for 30+ years (5000+ dives) and 12+ years (2000+ dives) respectively with no DCI problems – until recently.

The first got a vestibular bend (ear/CNS – very serious) from a 24m dive that was much shorter than the allowable no-stop bottom time, with no ascent violations. The other had a very serious neurological hit from a normal, non-provocative dive profile, with extra time spent at the last stop.

Later, both were diagnosed with PFOs. Even after all their years of diving experience, they had no idea of what was in store for them.

One has elected for surgery, the other has not. Both have moderately changed their behaviour before, during and after diving.

The recommendations below will cost you very little but may save you a lot. Think of them as an insurance policy.

# Modify your behaviour

PFOs become less important for divers if there are fewer or, preferably, no free-gas (bubbles). Modest changes in diver behaviour can help reduce the amount of free gas and limit PFO opening and micro-bubble wash-through.

Divers can best protect themselves by learning to work with, rather than against, Nature. For example, some technical divers dekit in the water and let others do the lifting – sounds good to me!

They also use many of the other techniques mentioned here.

## AS A MINIMUM:

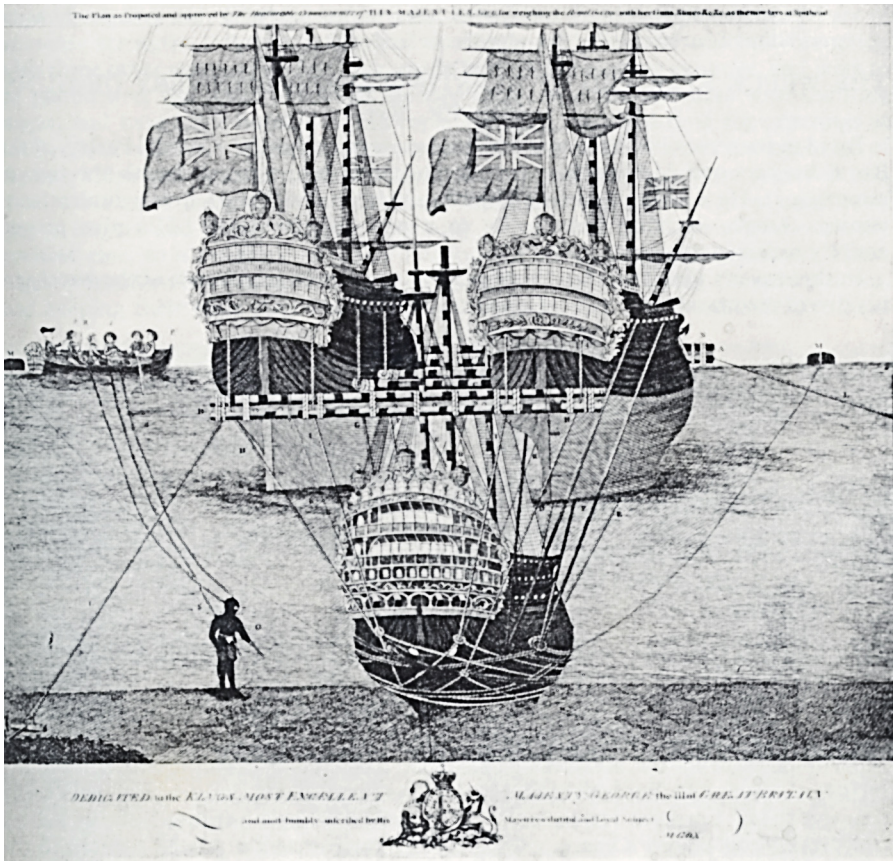
1. Maintain your hydration. Drink plenty of water and check that your urine is no darker than a pale straw colour.
2. Avoid VMs for ear-clearing – use a procedure such as swallowing.
3. Skip-breathing causes $CO_2$ retention. Breathe long and slowly, using your diaphragm, not your upper chest.
4. Don't dwell at depth, and ascend at 10m/minute.
5. Use deep stops to help manage your ascents.
6. Have longer surface intervals – three hours or more, the length of time it generally takes for MBs to disperse.
7. Avoid hot baths/showers and sunbathing for three hours after diving – heat promotes bubbling.
8. Avoid unnecessary carrying or lifting of heavy items for at least three hours.
9. Avoid straining during a bowel movement after diving.

## IF YOU HAVE A PFO, AND MEDICAL CLEARANCE TO DIVE:

10. Breathe pure oxygen for about 15 minutes with a nose-clip fitted before diving.
11. Use the richest nitrox possible for the planned depth.
12. Treat the nitrox as if it were air and decompress accordingly.
13. Breathe pure oxygen for about 30 minutes with a nose-clip fitted after diving.
14. For the first three hours get someone else to do your lifting and carrying.
15. Avoid deep or long dives, too many dives in one day, stage-stop diving and reverse dive profiles.

# TWO SIDES OF THE COIN
# CONSTRUCTION AND SALVAGE DIVING

An early attempt to salvage the Royal George



Salvage of sunken ships and their cargoes can be seen as the cradle of commercial diving. It goes back to the early days of unskilled diving, long before the days when modern and effective diving gears and equipment were devised and introduced.

Even H.M.S. "Mary Rose", sunk in 1545, was the early target of several salvage schemes and attempts. It is to be regretted, however, that inspite of the efforts all these schemes failed. It is important to consider another more recent but scene setting salvage attempt.

H.M.S. "Royal George" of 108 guns, whose keel had been laid in 1746, was sunk at Spithead on August 29th, 1782 and became a serious danger to anchorage and navigation. Early salvage attempts failed but, some years later, the new born diving gear devised by the Deane brothers (1831) and improved by A. Siebe (1839) could be used by the divers of the Royal Sappers and Miners who, directed by Colonel Pasley between 1839 and 1842, could dive to recover brass and iron guns and cannons from the wreck and then to remove it by blasting. Salvage diving was officially born and kept developing and improving with a growing panoply of tools, operating schemes, diving methods. We now understand clearly how delicate and how highly professional is this type of diving which calls for appropriate and dedicated training, sound competence, deep preparation and wide experience.

In those early days, while salvage diving was taking the lion's share of underwater intervention, there was another growing activity: construction of harbour facilities and structures. This activity too included a considerable amount of time spent underwater by workers in hyperbaric conditions, but seldom was the helmet diver the scene setting figure. Most of the underwater work, quite often at appreciable depths of 70 – 90 FSW for several hours in a row, was being done by compressed air workers inside sinking caissons where they did endless digging work in order to make the caisson sink into the seabed. The pressure inside the caisson was equivalent to the external one at the level of the seabed and when, at the end of their shift, the compressed air workers came back to the surface through air-locks, where they were quickly decompressed, decompression disease produced the symptoms which were later noticed also on helmet divers. For nearly a century this type of underwater work and intervention was referred to as the only type of construction diving.

In the early 1940s, during WW 2, in the USA the growing concern for the production of crude oil from the areas where drilling on land had been active for many decades started pushing towards the idea of drilling underwater. Two heavy gear divers in lake Erie at a depth of 30 FSW installed a 'Xmas tree of the type used on land. It was merely an experiment based on the installation of a mock-up, but it was the beginning of a new era. Nowadays, the two sides of the coin, construction diving on one side and salvage diving on the other, are reasonably clear and the differences are also clear, together with their consequences for training, education, certification, application of safe work procedures.

It might be of advantage remembering that CMAS (Confédération Mondiale des Activités Subaquatiques) was created in 1959, ADC International was founded in 1968, AODC (Association of Offshore Diving Contractors) was born in 1972, IMCA (International Marine Contractors Association) in 1995 taking up the work of AODC and of DPVOA (the Dynamic Positioning Vessel Owners Association founded in 1990).

Many years ago IDSA introduced the concept of the complexity of competence in diving and of the need for multifaceted educational standards grounded on a sound platform of basic training (i.e. competence to dive correctly and safely) on the top of which dedicated specialized modules (i.e. competence to perform work tasks correctly and safely) can be taught. This development did turn the original concept of the "diving licence" into the concept of the "diving passport" with a number of "visas" enabling the diver to entry specific "countries" and "areas" of activity. Already years ago IDSA considered that apart from the more traditional diving activities in the Inshore and Offshore Industry, today Industrial Working Divers take part in a wide variety of activities, such as: Construction and Assembly, Television and film making, Demolition and Salvage, Archaeological investigation, Search Survey and Recovery, Fish Farming, Remedial work in Lakes Reservoirs Canals, Rescue Services, Scientific data collection and observation, Professional Recreational Services, Nuclear Power Plant Maintenance, Bridge Structure Inspection, Underwater Civil Engineering Inspection and Repair and Maintenance.

Construction diving has the advantage of a well developed and

accurate engineering preparation relying on precise calculations of sizes and weights of the components to be installed underwater. Salvage diving cannot usually afford the support of an equivalent preplanned engineering and most of what is to be considered in terms of sizes and weights of the components to be disassembled and recovered must be done at the worksite with operations in progress. Completely different for the two types of activity are the rigging and handling of the components to be either lowered to the seabed or lifted to the surface.
These two examples, from many,illustrate the essential difference between construction and salvage and the need for specific education and training of divers for both sides of the coin.

The first one happened in West Africa (Dyeno Field December 16th 2002) where a salvage diving company stepped into construction diving activities to install a 20" flexible hose between a surface buoy and a PLEM on the seabed at 115 FSW. The bottom flange of the hose was covered by a solid and thick wooden plate to protect the O-ring even this was not part of the original installation procedure. The bottom flange was then pulled down by a cable operated by a winch. At some 45 FSW the hose stopped due to the buoyancy forces of the hose which had not flooded because of the wooden plate perfectly sealing the flange. A diver tried to remove the plate by using his knife and in so doing broke the blade. He then kept trying by hammering the broken knife with energy. All of a sudden there was a loss of communication with the diver and there was a fast payout of the diver's umbilical. The umbilical was recovered with the damaged soft hood and face plate. The body of the diver was the recovered after a little time searching and massive head injuries were noticed. Death had been immediate when, damaging and removing the wooden plate, the diver had been sucked into the hose by the sudden inflow of water.
The second one happened in the Gulf of Mexico (GOM September 03rd 2007) where a construction diving contractor stepped into salvage diving to recover a sunken platform destroyed by hurricane in August 2005. Saturation divers where working at 185 FSW to cut, rig and recover the deck. A diver locked out of the bell, inspected the deck, reported the presence of crude oil under the deck . During the inspection he had been exhaling some considerable amount of heliox as he was using a free flow breathing system. The supervisor told him to proceed with cold cutting methods and to prepare the deck for rigging. The hydraulic cutting wheel was used and all of a sudden an explosion was heard. The second diver locked out of the bell and found his friend laying dead on the deck with his helmet damaged. The hydraulic wheel, when cutting through the steel of the deck, had met the large bubble of heliox and gaseous hydrocarbons creating a dry environment where some sparks were produced. The unavoidable explosion followed.

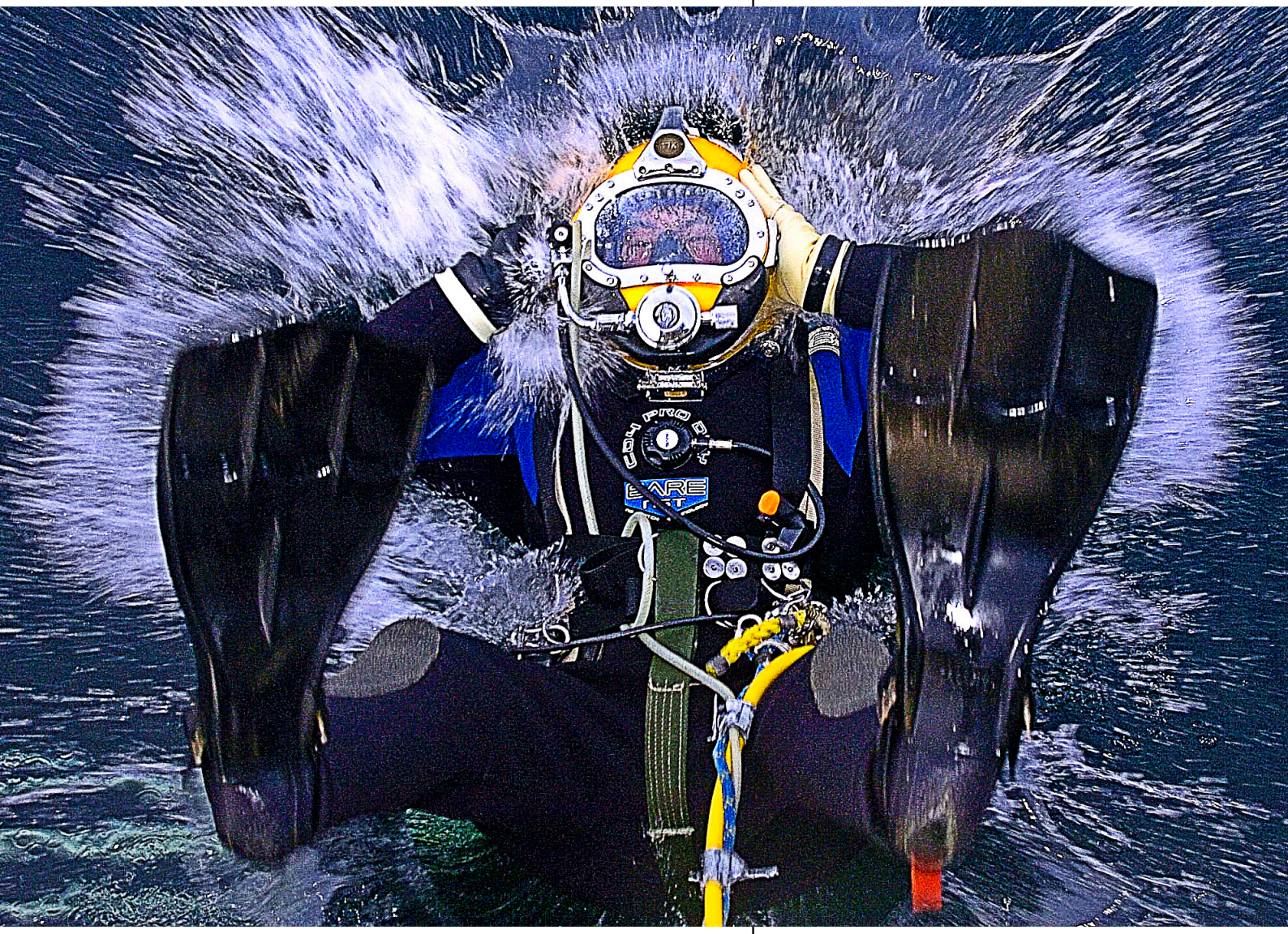
# DIVE SAFE INTERNATIONAL

Dive Safe International is a leading commercial diver training school on the West Coast of Canada.

Located on Vancouver Island, students are able to dive the best cold water diving in the world (according to Jacques Cousteau).

As far as dive schools go, DiveSafe International is rather unique in that we train divers for work in inshore (or inland) industries as opposed to off-shore oilfield diving.

Owner and Director of Training, Kelly Korol has made a strategic decision to offer training that is different to conventional diving schools.




"Most all dive schools are targeting their training to the offshore oilfield industry", Korol says. "At DiveSafe International we recognize the need to train divers for inshore work such as aquaculture diving, seafood harvesting, environmental and engineering inspection diving, potable water and light construction diving". The proof is in the pudding as DiveSafe can boast an extremely high success rate in placing graduates with work within a few days after the course.

DiveSafe International's school is located in a large float house in the center of the city of Campbell River (Salmon Capital of the World). Diving is conducted in Discovery Pass, a section of water known for fast current and abundant marine life. Students dive in all real-world conditions including low and no visibility, fast current and cold water (7°C). "If you can dive here, you

can dive anywhere" Korol says.

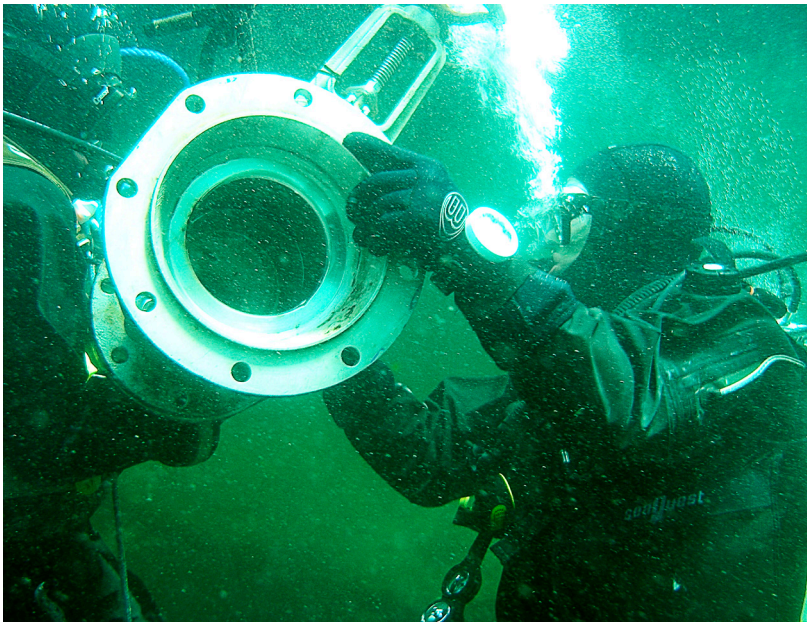
The west coast of British Columbia, Canada hosts a very robust salmon farming industry and most graduates find work here immediately. Aquaculture divers do a lot of technical work including net inspections, pressure washing, anchoring, and monitoring fish health. Pay is very good in the aquaculture industry and work conditions are very safe with most contractors using nitrox as a breathing gas.

In the inshore diving industry, there is need for divers to work in pulp mills, on Hydro dams, drinking water reservoirs (potable water diving), and video inspection. "We have many graduates who find careers in diving no deeper than 20 meters", Korol says.

DiveSafe International is accredited by the Diver Certification Board of Canada to offer certification in Occupational Scuba and Restricted (inshore) Surface Supply diving to the Canadian (CSA) Standards. "IDSA is another important part of our certification scheme as many of our students come from all over the world" says Korol. "We have had students from Russia, Serbia, Trindad-Tobago, England and many other countries".

DiveSafe also works training divers internationally. "We are currently working on a project with the World Bank to train local artisan fishers in Senegal to recover fishing nets from numerous ship wrecks in the area around Dakar" Korol says. "Not only is this project helping local fishers, it also is great for the environment."

But the most successful market for DiveSafe graduates has been environmental assessment and engineering inspection diving. There is plenty of work with in-land diving for those students who do not want to go offshore and the inshore certification is all that is required. With DiveSafe courses being shorter and less expensive than most offshore courses, DiveSafe offers the right training for the right job.



# THE ISRAELI PROFESSIONAL DIVING ACADEMY

Ex-students from the Israeli Professional Diving Academy have recently been involved the salvage of the 4000 ton Russian vessel 'SHELLI.

Two years ago the 'SHELLI' was anchoring near the breakwater of Haifa port, when a passenger ship collided with her and she sank in only a few minutes. The problem was that it sank in the middle of ships' route into the port, in such a position that it was impossible either to float her off or to blow her up due to environment groups' objections. The only solution was to cut it piece by piece into 30-40 Ton pieces, which mean the job was extremely dangerous and time consuming. The divers had to go into the different cabins to perform the cutting and to disconnect each piece. The whole project took a whole year to complete. Other projects include the Hadera Distillation Plant. This plant is the largest distillation plant in the world and produces 100 million cubic meters of fresh water a year. The job was to place 3 pipes of 2m diameter, 1800m long near the shore.The work had to be perfectly performed as each pipe had to be connected to an extremely large pump. The job was finished within 6 months.

# THE INTERNATIONAL DIVING SCHOOLS ASSOCIATION (IDSA) LIST OF MEMBERS

### FULL MEMBERS: DIVER TRAINING

| | |
|---|---|
| Nautilus Dive Company | Austria |
| Centre de Formations pour Petites et Moyennes Enterprises (CFPME) | Belgium |
| SYNTRA | Belgium |
| Royal Danish Navy Diving School | Denmark |
| Innofocus | Finland |
| Institut National de Plongee Professionnelle (INPP) | France |
| YAK Diving Academy | India |
| CEDIFOP | Italy |
| Hydrolab-Hydrocat | Italy |
| Netherlands Diving Centre (NDC) | Netherlands |
| Norwegian Commercial Diving School, Oslo (NYD) | Norway |
| Farjenas Diving School | Sweden |
| Swedish Armed Forces Diving and Naval Medicine Centre | Sweden |
| Divers Academy International | USA |
| The Ocean Corporation | USA |

### FULL MEMBERS: SPECIALIST TRAINING

| | |
|---|---|
| KB Associates | Singapore |
| Interdive Services Ltd | UK |

### INDUSTRIAL MEMBERS

| | |
|---|---|
| Alpe SUB Srl | Italy |
| Palumbarus Diving Works | Italy |
| Hytech | Netherlands |
| Pommec BV T.D.E. | Netherlands |
| Norwegian Association of Underwater Entrepreneurs (NBU) | Norway |
| Cassaras AB | Sweden |
| Svensk Sjoentreprenad | Sweden |

### ASSOCIATE MEMBERS

| | |
|---|---|
| University of Southern Denmark | Denmark |
| Arab Academy for Science, Technology & Maritime Transport (AASTMT) | Egypt |
| International Academy for Diving Technology (IADT) | Egypt |
| Diver Ltd | Hungary |
| Marine Centre, Mumbai | India |
| Darya Koosh Marine Co | Iran |
| Israeli Professional Diving Academy | Israel |
| Marine Consulting Srl | Italy |
| Sub Sea Services SNC | Italy |
| Caspian Dive School | Kazakhstan |
| Regional Centre for Underwater Demolition (RCUD) | Montenegro |
| Centre Méditerranéen de Plongée Professionnelle (CMPP) | Morocco |
| Namibia Commercial Diving School | Namibia |
| Podvodrechstroy Diving School | Russia |
| Forespro | Spain |
| Diving Diseases Research Centre (DDRC) | UK |
| London Diving Chamber | UK |
| International Diving Institute | USA |
| Santa Barbara City College | USA |

### AFFILIATE MEMBERS

| | |
|---|---|
| Safe Air Diving | Denmark |
| NAVFCO Military Diving School | France |
| DERA Diving | Indonesia |
| Nautiek | Netherlands |
| BPN Explorer | Poland |
| Aqua Mont Service | Serbia |
| Composite-Beat Engel | Switzerland |
| Hydroweld | UK |
| Speciality Welds | UK |
| Underwater Centre | UK |
| University of Plymouth | UK |
| Searchwise Ltd | UK |
| Minnesota Commercial Diver Training Centre | USA |

### RECIPROCAL MEMBERS

| | |
|---|---|
| Association of Diving Contractors (ADC UK) | UK |
| Association of Diving Contractors International (ADCI) | USA |
| Association of Commercial Diving Educators (ACDE) | USA |