

Manned Underwater Vehicles 2013

Organized by:

MTS MUV Committee



Underwater Intervention Conference

NEW ORLEANS, USA, 15-17 JANUARY, 2013

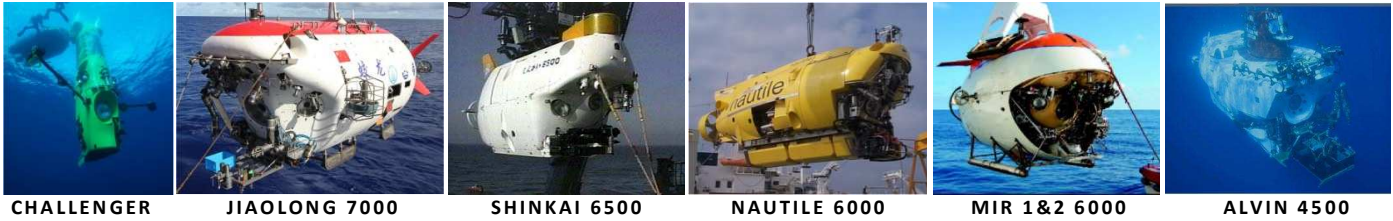
www.underwaterintervention.com

10th Annual MUV PROGRAM

2013 MUV TECHNICAL PROGRAM

Room 345	DAY 1 - TUESDAY Jan 15, 2012	DAY 2 - WEDNESDAY Jan 16, 2012	DAY 3 - THURSDAY Jan 17, 2012
8:30-9:00	World Overview of Manned Sub Activity in 2012 by: William Kohnen, Hydrospace Group	Anatomy of a 21st Century Full Ocean Depth MUV for Scientific Exploration By: James Cameron, Bruce Sutphen DEEPSEA CHALLENGER, USA	Overview of ABS Rule Change Proposals for 2013 By: Roy Thomas American Bureau Shipping, USA
9:00-9:30		Ocean Exploration of the Hadal Depths Capt. Don Walsh USN (Retired), PhD International Maritime Inc., USA	Pressure-tolerant Li-ion batteries & certification on MUV ICTINEU 3 Pere Fores, Carme Parareda ICTINEU Submarins, Spain
9:30 to 10:00	ALVIN Upgrade Project Kurt Uetz WHOI, USA	The Case of 1 ATM Diving Dr. Phil Nuytten NUYTCO Research Ltd, Canada	Pressure Tolerant Subsea LI-ION Battery System David White Southwest Electronics, USA
10:00 to 10:30	BREAK	BREAK	BREAK
10:30 to 11:00	On the Development of JIAOLONG 7000m Deep Manned Submersible Dr. WC Cui CSSRC, China	Future Regulatory Considerations for Manned Submersibles Harald Pauli Germanischer Lloyd, Germany	Technology Panel Discussion: SAFETY STRATEGIES IN CERTIFICATION SOCIETIES Moderator: William Kohnen Panelists: Roy Thomas, American Bureau Shipping Robert Surma, Germanischer Lloyd Roger W Schaffer, NAVSEA 07 Tommy Beals, US NAVY PMS399 Richard Schoenwiesner, CIV SEA 05U3 J D. Lawrence, USCG
11:00 to 11:30	The Evolution of Deep Submersible "SHINKAI 6500" Junya Niikura JAMSTEC, Japan	Under Water Flight, a New Class Graham Hawkes Hawkes Ocean Technologies, USA	
11:30 to 12:00	Nautilie - Feedbacks on 25 Years of Operations, 1850 dives Jean-Francois Drogou, Vincent Rigaud IFREMER, France	Proteus: A Dual Mode Undersea Vehicle Robert J. Geoghegan Battelle Undersea Systems, USA	
12:00 to 1:30	LUNCH	LUNCH	LUNCH
1:30 to 2:00	The Present & Future of Deep Manned Submersibles MIR-1 and MIR-2 Dr. Anatoly Sagalevich PPSIO, Russia	The Rise of Private Sector Funding for Manned Ocean Exploration Guillermo Sohnlein OceanGate USA	MTS Manned Underwater Vehicle Committee 1:30 to 2:30PM ANNUAL MUV C MEETING
2:00 to 2:30	Final Fabrication and Hydro Testing of the RHOV Personnel Sphere Jerry Henkener, Curtis Sifford SWRI, USA	Global Ocean Center Blue Industry Concept Chris Hartman Global Ocean Exchange, USA	
2:30 to 3:00	Building Process and First Dives with the LULA1000 - 1000m depth MUV Joachim Jakobsen FNR Azores, Portugal	Deep Diving: Why Flipping Vertical Could Be The Answer Karl Stanley Stanley Submarines, Honduras	
3:00-3:30	BREAK	BREAK	BREAK
3:30 to 4:00	Development of Research Submersible ICTINEU 3 Carme Parareda, Pere Fores ICTINEU Submarins, Spain	The US Navy's Submarine Safety Culture - Overview of NAVSEA Certification Process and Organizational Structure Roger W Schaffer, CIV SEA 07 07Q Tommy Beals, PMS399 Richard Schoenwiesner, CIV SEA 05U3 Naval Sea Systems Command, USA	
4:00 to 4:30	The Necessity of New Technologies for the Next Generation of Deep Submersibles Itaru Kawama JAMSTEC - Japan		
4:30 to 5:00	Deep Ocean Exploration - Flying through the World's Five Oceans Chris Welsh Virgin Oceanic, USA		
5:30 to 7:00	MTS MUV 10th Anniversary RECEPTION MARRIOTT HOTEL ATRIUM		

The Deep Ocean Submersibles



January 15, 2013

Welcome to the 10th Anniversary MTS MUV Program at UI2013

Dear Colleagues,

An idea that started in 2003 to gather the Manned Submersible community in one place is now in its 10th year. It is with tremendous pleasure that we invite all to Underwater Intervention 2013, host of our 10th annual Manned Underwater Vehicles Program. The objective was, and remains, a simple formula: To create an open atmosphere to exchange information about the latest developments in the manned submersible industry. 2012 was a year of expanded manned deep sea exploration by multiple organizations and for the next few days we invite the delegates from around the world to provide overviews of industry activities, new product presentations, opinions, technical insight, knowledge, information and, most importantly, a networking opportunity. Coupled with a showcase of exhibitors on the show floor, a full technical program on ROVs, AUV's and Diving Systems, we hope this conference will see you fly home with new contacts, ideas and technology options.

Above all, this event is meant to bring people together and find common points of interest. I encourage everyone to take full advantage of the list of speakers and delegates at this conference and if there are people you don't know, make it a point to meet them. To celebrate our 10th anniversary as an operating committee we will hold a Reception at the Marriott Hotel on the 15th. Bring your friends and have a beer or a wine on the MUV committee.

We hope you enjoy the full program and introduce yourself as this program provides photos and names of the presenters to meet them during the event. All presentations have Q&A sessions and discussions are always welcome. If you have a question you want to ask, don't hold back. Chances are it will be relevant and other delegates may be thinking the same thing.

I would first thank all the speakers for taking up the offer to present and provide such a wonderful program. Thank you for attending and for your participation. Thank you to our generous sponsors and thank you to Underwater Intervention for making this all possible.

Welcome to Underwater Intervention 2013 and our 10th MTS Manned Underwater Vehicles Program.

William Kohnen
Chair, Manned Underwater Vehicles Committee
Marine Technology Society

CONTENTS

OVERALL SCHEDULE OF MUV PROGRAM	2
DAY 1: Tuesday Jan. 15 - Paper Synopsis and Speaker Details	5
DAY 2: Wednesday Jan. 16 - Paper Synopsis & Speaker Details	14
DAY 3: Thursday Jan. 17 – Paper Synopsis & Speaker Details	21
MUV 2013 Presenter Contact Details	26
MUV Committee Details	32

10TH Anniversary RECEPTION

Manned Underwater Vehicles

Cocktail Reception
Tuesday, January 15th
Hotel Marriott Atrium
5:30 - 7:30pm



Celebrating 10 Years

Day 1

Tuesday 15 January

TUE 8.30 – 9.30

William Kohnen, MTS Manned Underwater Vehicles, Chair



William Kohnen is President of Hydrospace Group specialized in high reliability underwater vehicle systems and integrated solutions for using manned submersible intervention. Mr. Kohnen combines 25 years of engineering experience in submersible vehicle design. He directs technology and business development for underwater vehicles, PVHO pressure vessels and electric propulsion systems. He is co-founder of SEAmagine Hydrospace Corp manufacturer of manned submersibles which delivered nine ABS classed submersibles to date. Mr. Kohnen has a background in aerospace with a M.Sc. Elec. Engr. from McGill University, Canada. He has been chair of the Marine Technology Society Manned Underwater Vehicles Committee since 2003 leading the MUV program at Underwater Intervention conference to represent the manned submersible industry. Mr. Kohnen is an active member of the ASME Pressure Vessel for Human Occupancy (PVHO) Committee with over 15 years experience working with the US Coast Guard and ABS rules and regulations for building submersibles.

World Overview of Manned Sub Activity in 2012

by: William Kohnen
Hydrospace Group, USA
Email: wkohnen@HydrospaceGroup.com

A yearly review of the state of the Manned Submersible industry in 2012. The overview will look at developments in all branches, including international research, tourism activity, leisure and security developments. This will include a summary of submersibles under Classification, operating and in construction, review of the industry trends and regulatory highlights for the year.

TUE 9.30 – 10.00

Kurt Uetz, Woods Hole Oceanographic Inst., USA



Kurt Uetz spent 20 years as a Navy officer with tours of duty aboard ships in engineering and operations as well as in shipyards managing shipbuilding and repair projects. He then worked for several years in the telecommunications industry as a project manager, network planner, and operations manager. Kurt is an experienced practitioner in project management and applying his skills to the DSV Alvin Upgrade project.



Anthony Tarantino is an electrical engineer with over 18 years of experience in test, service, and production. Prior to this, he spent 6 years with the Alvin Operations Group as the Electrical Section Leader and completed over 100 dives as an Alvin pilot. He has been with the project since 2007, and has provided technical and programmatic oversight and support.

ALVIN Submersible Upgrade Program Overview for 2012

Kurt Uetz, Program Manager
Woods Hole Oceanographic Inst., USA
Email: kuetz@whoi.edu

Anthony Tarantino, Asst Program Mgr.
Woods Hole Oceanographic Inst., USA
Email: atarantino@whoi.edu

Woods Hole Oceanographic Institution (WHOI) is developing a new deeper diving submersible by upgrading the present ALVIN in stages. The upgraded ALVIN will ultimately have an increased operating depth from 4500 MSW to 6500 MSW. The project at WHOI is being accomplished in two phases and the submersible will be classed to ABS and certified by NAVSEA. The presentation will discuss the finalization of the upgrade program with NAVSEA certification and the sea trial schedule for 2013.

10.00 – 10.30

COFFEE BREAK

TUE 10.30 – 11.00

Weicheng Cui, CSSRC, China



Mr. Cui Weicheng was born in 1963 and is currently research professor at the China Ship Scientific Research Center. He is the project leader and the first deputy chief designer of Jiaolong submersible. He had made some contributions in the areas of the prediction of the ultimate strength of intact and damaged ship structures, fatigue strength assessment of ship structures and reliability based analysis and design of ship structures. He is a standing committee member of ISSC, PRADS and UT conferences. He is a member of the editorial board of five international journals and three national journals. He has published about 350 technical papers in various technical journals and conferences.

On the Development of Jiaolong Deep Manned Submersible

By: Dr. Weicheng Cui
CSSRC (China Ship Scientific Research Center) Wuxi, China
Email: wccui@sjtu.edu.cn

Deep sea exploration and exploitation are of an increasingly interest to human beings in the 21st century. Manned and unmanned deep submergence vehicles are necessary means for deep sea explorations. In order to fulfill the requirements of deep sea explorations of COMRA (China Ocean Mineral Resources R&D Association), a deep manned submersible is developed in China from 2002 to 2012 and it is now named “Jiaolong”. The purpose of this paper is to introduce the development process from a historical point of view, including design, construction of components, assembly, open water tank test and sea trials of Jiaolong deep manned submersible.

TUE 11.00 – 11.30 Junya Niikura, JAMSTEC, Japan



Mr. Junya Niikura is Engineer of Marine Technology and Engineering Center in Japan Agency for Marine-Earth Science and Technology (JAMSTEC). He is in charge of upgrade and maintenance planning for JAMSTEC's underwater vehicles which include the SHINKAI 6500 submersible and the AUV URASHIMA. Mr. Niikura graduated from Yokohama National University in 2010 with a Masters degree in naval architecture and aerospace engineering.

He joined JAMSTEC in April 2010 and was involved in the improvement of HDTV system for SHINKAI 6500 as well as an overhaul and reconstruction of the URASHIMA AUV. This included responsibility for the renewal of the Optical-Electric composite armored cable for Deep-Tow system. He continues to be involved in a wide range of research fields involving JAMSTEC's underwater vehicles.

The Evolution of Deep Submersible "SHINKAI 6500"

By: Junya Niikura

JAMSTEC (Japan Agency for Marine-Earth Science and Technology), Japan

Email: j-niikura@jamstec.go.jp

Manned Research Submersible "SHINKAI 6500" was built in 1989, and has been operated by the Japan Agency for Marine-Earth Science and Technology (JAMSTEC) for 23 years. Over the past 23 years, the submersible performed over 1300 dives and several instruments have been replaced for higher functionality. For example, the TV camera system was changed from NTSC to HDTV, the battery system was changed from Silver Oxide Zinc batteries to Lithium-Ion batteries. JAMSTEC has made great efforts to replace these instruments and in some cases take a leading position in development of new technologies. The latest upgrade made by JAMSTEC was to tackle the replacement of the maneuvering system including the thrusters. This upgrade was considered very important for the improved control and motion performance of the submersible. JAMSTEC started preparing and planning for this replacement in 2008. The new thrusters and maneuvering system was finally installed on "SHINKAI 6500" in 2012. This presentation will report the details of the maneuvering system replacement.

TUE 11.30 – 12.00

Jean-François Drogou, IFREMER, France



Jean-François Drogou joined the CNEXO (Centre National pour l'Exploitation des Océans) in 1972, where he participated to the development and operating of the scientific equipments of the bathyscaph « Archimede » first, then the first manned submersible "Cyana", participating in the french/american expedition "FAMOUS" on medio-atlantic ridge in 1974. From 1980 to 1985 he was project manager for the development of the 6000 m submersible Nautille, and participated in the first "Kaiko" operational mission in Japan during summer 1985. He was in charge of the maintenance and evolutions of the underwater systems for IFREMER in Toulon, from 1986 to 1991, then Head of Underwater Engineering within the Underwater Systems Department, where he was project manager for the development of the ROV "Victor 6000", operational since 1998. Since 2000 he was responsible for different studies and projects concerning underwater systems, and participated as head of mission in many expeditions. He is presently project manager for the new "Hybrid ROV" project for IFREMER.

NAUTILLE - Feedbacks on 25 Years of operations, 1850 dives

About 600 Days Under waves, and 7000 Days on deck of support vessels

By: Jean François Drogou, Claude Lévêque, Vincent Rigaud

IFREMER (Institut Français pour l'Exploitation de la Mer), France

Email: jean.francois.drogou@ifremer.fr

Since its operational birth in December 1984, Nautille has been engaged in 137 campaigns and 1850 dives. The fourth big overhaul has been realized in 2008, with a global upgrade of several systems and subsystems and a full inspection and control of the main hull, and of the equatorial joint. Between mid 2008 and the end of 2012 Nautille has been operated on 160 dives. Before the next overhaul planned in 2013, cracks were detected on the main frame in 2010, on some joints and intersections. This unforeseen event, lead us to run a technical stop in 2011. The studies show that these cracks were due to fatigue phenomena, linked to the alternative constraints supported by the frame when the submersible is living on board the deck of a ship cruising 300 Days a Year over 20 Years, and "suffering" the ship dynamic on very long period.

Concerning the present and future operational utilization of the submersible, in parrallel with regular upgrade of the equipments to maintain the submersible at a high level for scientific operations, there is emphasis on two types of actions: the optimization of the performances of the couple ship / submersible during operation, and the costs reduction of the part of activities dedicated to the infrastructure (maintenance, overhaul,..). The first type is linked to a combined use of the submersible (during the day) and the AUV (during the night). The second type, supported by feedbacks on 25 years of operations, leads to optimize the maintenance program, with emphasis on priority actions and studies on main hull, buoyancy foam and main frame ageing. This talk will present the general activity and evolutions of the submersible, and detail these two levels of actions listed above.

12.00 – 1.30

LUNCH BREAK

TUE 1.30 – 2.00

Anatoly Sagalevich, PP Shirshov Inst. Oceanology, Russia



Dr. Anatoly Sagalevich is a Deep Ocean explorer and has been Head of the Deepwater Manned Submersible Laboratory at the Shirshov Institute of Oceanology of the Russian Academy of Sciences, in Moscow, since 1979. Dr. Sagalevich took part in the construction of Pisces VIII, Pisces IX and both MIR-1 and MIR-2 Deep Submergence Vehicles (DSV) on which he has completed more than 300 submersions as the chief pilot of DSVs. Between 1989 and 2005 he led 28 expeditions on MIR submersibles. He was the pilot of MIR during expeditions to RMS Titanic, Bismarck, Soviet submarine K-278 Komsomolets, I-52,[2] Russian submarine K-141 Kursk. Dr. Sagalevich holds the world record for the deepest fresh water dive, at 1,637 meters (5,371 ft) and on August 2, 2007 he was the pilot of MIR-1 DSV, that reached the seabed at the North Pole during Arktika 2007 expedition. On January 10, 2008 Anatoly Sagalevich was awarded the title Hero of the Russian Federation for "courage and heroism showed in external conditions and successful completion of High-Latitude Arctic Deep-Water Expedition."

Present and Future of Deep Manned Submersibles MIR-1 and MIR-2: 25th Anniversary

By: Dr. Anatoly Sagalevich, Head of Deep Manned Submersibles Laboratory
 P.P.Shirshov Institute of Oceanology Russian Academy of Sciences, Russia
 Email: sagalev1@yandex.ru

In December 2012 the MIR submersibles (operating depth 6000 m) celebrate 25th Anniversary of the creation. Test dives on 6170 (MIR-1) and 6120 m (MIR-2) in Atlantic ocean started long way of MIR's operations. For 25th years the MIRs fulfilled wide scale of deep ocean operations, open many new pages in world submersibles history. Big volume of unique scientific data obtained during the dives on hydrothermal fields on ocean bottom (over 20 sites), sea mounts, abyssal etc. Well known movies with deep ocean images like Titanic, Bismarck, Ghost of the Abyss, Aliens of the deep (James Cameron), Treasure of the Deep (Al Giddings), Titanica (IMAX, Stephen Low) as well as documentaries were produced using the MIR submersibles. Principally new deep ocean technology was developed and implemented during MIR's operations on sunken nuclear submarines Komsomolets and Kursk.

The MIRs were only submersibles which made deep dives on 4300 m under thick entire ice in geographical point of North Pole (2007); provided live TV broadcast from the Titanic wreck via satellite to the land (2005); took the tourists to great depth on Titanic, Bismarck, hydrothermal vents. No any manned submersible in the world made such diversity of deep ocean operations like the MIRs. Last four years interesting discoveries were done on the Baikal and Geneva lakes. For 25 years history for the MIRs weren't any unsolved tasks during ocean operations.

Beginning from 1992 the scientists of P.P.Shirshov Institute of Oceanology RAS are developing world wide project of scientific research of the ocean using the MIRs and possibly other submersibles of the world. During around the world sailing on research vessel Akademik Mstislav Keldysh with the MIRs on board is supposed to provide the investigations of hydrothermal vents on ocean bottom, sea mounts, abyssal etc., made the dives on remarkable wrecks and other operations. The program includes the visits and research on many sites, connected with Russian and international maritime heritage, historical discoveries. The implementation of proposed program will bring great contribution to the world science, culture, history. At present time the program includes over 100 sites in different areas of World ocean. The fulfillment of the project is calculated for 3 years. Mentioned above matters are considered in proposed paper on UWI-2013.

TUE 2.00 – 2.30

Jerry Henkener, Southwest Research Institute, USA



Jerry Henkener is a staff Engineer at Southwest Research Institute. He has been involved in the development of underwater systems for many years including diving equipment development for the US Navy during more than 12 years at Battelle and the development of manned and unmanned submersibles at Southwest Research Institute (SwRI) for the past 30 years. He is presently the lead engineer in the design, fabrication and test of the replacement personnel sphere for the ALVIN submersible and previously at SwRI he was the lead engineer for the design, fabrication and testing of the hull structure and frame for the PRMS, the US Navy's new Submarine rescue vehicle.



Curtis Sifford is a Senior Research Engineer with Southwest Research Institute located in San Antonio, Texas. His primary responsibility is the design and analysis of pressure vessels and submersible hull structures for the government and commercial industry. He has worked on numerous projects designing pressure vessels for clients in the oil and gas industry and has been a key contributor to the RHOV project. Curtis is knowledgeable about the rules for the Design and Construction of Pressure Vessels in the ASME Boiler and Pressure Vessel Code as well as the API 579/ASME FFS standard on performing fitness-for-service assessments of in-service pressure containing equipment.

Final Fabrication and Hydro Testing of the RHOV Personnel Sphere

Jerry Henkener
Southwest Research Institute, USA
Email: jerry.henkener@swri.org

Curtis Sifford
Southwest Research Institute, USA
Email: curtis.sifford@swri.org

Southwest Research Institute® (SwRI®) has been under contract to WHOI to design, fabricate and test the titanium personnel sphere that will be installed in the upgraded ALVIN submersible. SwRI completed fabrication and performed the final hydrostatic testing of the new personnel sphere at the Northrop Grumman Test Chamber in Annapolis, Maryland in June 2012. Final fabrication and testing were completed in accordance with the requirements for certification of both ABS and NAVSEA P9290. The hydrotesting was performed to validate the following three major ABS and NAVSEA requirements:

- (1) No discernible material creep at the 6500 MSW max operating depth (1 MOP)
- (2) Minimal material creep such that if projected out to 88 hours would not potentially result in collapse failure of the sphere at an emergency depth of 6800 MSW (1.05 MOP)
- (3) No structural damage to the personnel sphere at a hydro pressure of 12,000 psig which is 1.24 MOP.

All three of the major hydro tests were performed in accordance with a comprehensive test procedure that was reviewed and approved by both ABS and NAVSEA. A special variance was requested from ABS and granted for testing to 1.24 MOP instead of the usual ABS requirement of 1.25 MOP because the test pressure in the Annapolis chamber was limited to 12,000 psig and 1.25 MOP is 12,090 psig. The creep measurements, especially at 1 MOP where essentially zero creep was the requirement, were a considerable challenge. The challenge was in being able to discern the difference between small values of creep and the common variations and anomalies in the strain gauge readings. An additional 1.0 MOP creep hold test was conducted after the 1.24 MOP test. The hydro tests and post-hydro test inspections were successful and the personnel sphere was delivered to Woods Hole Oceanographic Institution (WHOI) for them to outfit and install into their modified frame. The completion of fabrication, the pre-hydro testing of the hatch assembly and the hydrostatic test results for the personnel sphere will be discussed.

TUE 2.30 – 3.00

Joachim Jakobsen, Rebikoff-Niggeler Foundation, Portugal



Mr. Jakobsen manages the Lula submersible which belongs to the Rebikoff-Niggeler Foundation, stationed in the Azore Islands. Since 2000, the organization carried out multiple projects such as bio-erosion studies, habitat mapping on deep water corals, sampling of deep water species for genetics and underwater archaeological work for the Azorean Government. Foundation Rebikoff-Niggeler (FRN) is a non-profit organization for marine science with the purpose of assisting in research and protection of the oceans. One of the Foundation's goals is to facilitate research by providing deep water submersible capabilities. FRN is based on the life and work of Dimitri and Ada Rebikoff-Niggeler, a Franco-Suisse couple who dedicated their lives to the development of underwater technology. FRN has been officially recognised by Portugal's Ministry of Internal Affairs and declared an Institution of Public Benefit by the Azorian Government. Besides carrying out research projects, including joint projects with other scientific institutions, FRN publishes educational material such as photographs, films, etc. on the marine environment.

Building process and first dives with the LULA1000

Manned research submersible for 1000m depth, operating in the Azores

By: Joachim Jakobsen, Kirsten Jakobsen

Rebikoff-Niggeler Foundation, Azores, Portugal

Email: info@rebikoff.org

LULA1000 (crew of 3-4, 1000 metres of depth) has now started diving in the sea area of the Azores. All factory and harbour acceptance tests have been done successfully. Sea trials started in September under surveillance of the classification bureau Germanischer Lloyd (Hamburg). The LULA1000 system is unique regarding its operational format. With its sub carrier, a 17 metre catamaran (crew of two), the submersible can be towed and operated off-shore at remote dive sites. LULA1000, as its predecessor, is specialized in quality video documentation and sampling of deep water species. The vessel's design and building benefitted greatly from the know-how and practical experience gained with the previous sub, LULA. LULA1000 was designed and built and is operated by the Rebikoff-Niggeler Foundation, a non-profit institution based in the Azores/Portugal.

3.00 – 3.30

COFFEE BREAK

TUE 3.30 – 4.00

Carme Parareda, Ictineu Submarins SL, Spain



Carme Parareda. Co-founder, administrator and COO of ICTINEU Submarins SL. As a Surveying Engineer she worked in the service of the Cartographic Institute of Catalonia for 15 years, since 1992, in the field of geodesy, high accuracy positioning and GPS navigation techniques. In 2004 she re-oriented her career to ocean observation and underwater technology, co-founding in 2004 the Ictineu Institute, Catalan Submarine Research Centre where she is the Secretary, and in 2007 ICTINEU Submarins SL. At the same time she coordinated the Argo Maris Foundation activities (sea exploration and outreach). She is a board member of the Catalan Maritime Cluster. A traveller who loves adventure sports and mountaineering, after crossing Mongolia by bike, she sailed across the Atlantic twice. She co-wrote a book *l'Atlàntic a quatre mans* (The Atlantic four hands).

Development of Research Submersible ICTINEU 3

By: Carme Parareda, Pere Forès
ICTINEU Submarins SL, Spain
Email: cparareda@ictineu.net

Ictineu Submarins SL was founded in 2007 to develop and built the ICTINEU 3: a scientific manned submersible, a work class vehicle with high capabilities for work, observation and intervention, also suitable for filming and leisure. It has been designed for 1.200 meters depth, and a crew of three: one pilot and two observers (passengers). It will be certified and classified by Germanischer Lloyd. The challenge was to achieve a very versatile and highly operational vehicle, with the aim to improve the capabilities of existing submersibles in this depth rate. Cutting-edge technology has been used in the design and construction and several innovations have been introduced. These include: innovations in stainless-steel materials and design for an unparalleled volume to weight ratio of the pressure hull; composites (CFRP) have been largely used as structural and constructive material; it will incorporate the first certified, pressure-tolerant lithium-ion-polymer battery system for high energy capacity; and it includes improvements in the design and ergonomics of work-class submersibles (better performance, safety and comfort). The result is a small and very lightweight vehicle (less than 5300 kg) that can be easily operated from most research vessels; passengers can enter/exit from the surface of the water; it has a high power capacity (10 hours full autonomy at normal load capacity), and it is expected to be able to travel up to 20 nautical miles underwater; power and communications system has been dimensioned so they can adapt to any task and mission requirements with capability to upload any instrument or sensor from the client in an easy and quick way; propulsion and maneuvering are based on a complete 6 controllable degrees of freedom system, with a configuration of 8 thrusters, 2.5kW each with proportional control, and internal buoyancy tanks. A wide field of view is provided by a large (1.5m dia) acrylic dome.

TUE 4.00 – 4.30

Itaru Kawama, JAMSTEC, Japan



Mr. Itaru Kawama is Senior Engineer of Marine Technology and Engineering Center in Japan Agency for Marine-Earth Science and Technology (JAMSTEC). Currently he is in charge of maintenance control and planning for JAMSTEC fleet as a coordinator in the Research Fleet Dept. He joined the SHINKAI operations team as a deep sea pilot and mechanic over 15 years ago and has logged a wide range of experiences in the field of a deepsea research. His first presentation for UI conference was about a development of lithium-ion battery for SHINKAI in 2005. After this conference, he joined MTS and MUV committee. He also has experience joining a cruise with the Johnson-Sea-Link Submersible, and remains interested in various technologies for deepsea submersibles. He graduated from National Merchant Marine College and his original major was ship navigation

The Necessity of New Technologies for the Next Generation of Deep Submersibles

By: Itaru Kawama
JAMSTEC (Japan Agency for Marine-Earth Science and Technology), Japan
Email: itaru@jamstec.go.jp

Japan is uniquely surrounded by many deep underwater canyons and is very sensitive to their tectonic activity. The disaster of 2011 has only highlighted the potential economic impact of these unpredicted underwater events. The study and understanding of the seismic activity has always been and remains central to the national interest of Japan. Deep manned submersible "SHINKAI 6500" was built in 1989, and has been operated by JAMSTEC still now. It has contributed to many scientific research projects in the past and has evolved technically to match the progressing needs of scientists

and operator. The maneuvering system including all thrusters was replaced in the last year as part of the latest such upgrades. However, Chinese deep manned submersible "Jiaolong" succeeded in reaching the deep sea floor deeper than SHINKAI 6500, and Jim Cameron reached the deepest point on the seafloor using new technologies and ideas. In order to open the door of a new generation of deep submersibles, we need to develop several new technologies for a breakthrough. While there are no concrete plans for the future development of a new generation deep submersible, this presentation will discuss a perspective from the standpoint of JAMSTEC as the operator of "SHINKAI 6500".

TUE 4.30 – 5.00

Chris Welsh, Virgin Oceanic, USA



Chris Welsh is co-founder and pilot for Virgin Oceanic. He is an accomplished entrepreneur, sailor and aviator who recently finished 25,000 miles of intense competitive sailing. Born and raised in Newport Beach, CA, Chris has made five LA-Hawaii crossings and one LA-Tahiti-Tonga-Auckland-Tasmania crossing. These trips included skippering his 65' (20M) race boat "Ragtime" to winning class in the 2008 Sydney-Hobart Race and winning overall the 2008 LA-Tahiti Transpac Race. Chris also won the 2010 Double Handed Guadalupe Island Race. Chris has raced Ragtime in all west coast venues from San Francisco to Cabo San Lucas. Adventure travel has included swimming with Great White sharks at Guadalupe Island, several cross country dirtbike trips including two 2,000 mile journeys exploring Baja California and two trips in the dirt from LA to Phoenix. Chris is also a pilot with Single Engine, Multi-Engine, IFR, Glider, Seaplane and Helicopter ratings and has flown extensively in the Western United States, Alaska and Baja. He has flown his twin engine plane and his helicopter across the continental U.S.

Deep Ocean Exploration - Flying through the World's Five Oceans

By: Chris Welsh

Virgin Oceanic, USA

Email: fivedives@gmail.com

Virgin Oceanic's one-person sub is scheduled in the next year and beyond to journey to the deepest part of each of Earth's five oceans. After finishing development dives by Chris Welsh the first record dive will be to the bottom of the Puerto Rico Trench – will be piloted by Sir Richard Branson, and a day later, by Chris Welsh. This trench is the deepest spot in the Atlantic Ocean at over 8 kilometers (more than 5 mi). This location is also near to Branson's home on Necker Island in the British Virgin Islands. The Deep Challenger's unique capability beyond depth is its flying nature and range of 10-12 miles on the seafloor. Subsequent dives will carry a human pilot to the bottom of the Pacific, Arctic, Southern and Indian oceans. Less than 3% of the seafloor has been explored, and none of the deepest points of the planet have ever been explored beyond a brief visit to one. The presentation will provide a full overview of the technical and logistics plans for these dives.

5:30 – 7:00

MTS MUV 10th Anniversary RECEPTION

COME and JOIN US – Complimentary Drinks & Food

Sponsored by Germanischer Lloyd, ABS, OceanGate

WHERE: MARRIOTT HOTEL ATRIUM

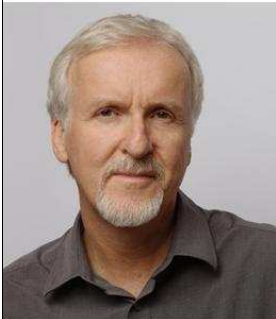
WHEN: 5:30-7:00PM

Day 2

Wednesday 16 January

WED 8.30 – 9.00


James Cameron, DEEPSEA CHALLENGER, USA



Born in Kapuskasing, Ontario, Canada, James Cameron grew up in the historic village of Chippawa, near Niagara Falls. In 1971, he moved to Brea, California where he studied physics at Fullerton Junior College while working as a machinist and, later, a truck driver. Cameron quit his trucking job in 1978 and raised money from local dentists to produce a 35mm short film. His films have blazed new trails in visual effects and set numerous performance records both domestically and abroad. AVATAR is the highest grossing film in history, having grossed \$2.8 billion at the global box office, beating the previous record holder, Cameron's own TITANIC, which held that record for 12 years. Cameron has been an avid scuba diver since 1969, logging over 3000 hours underwater, including 500 hours in helmets. Seeking to combine his two great passions - diving and filmmaking - he directed THE ABYSS, which broke new ground in underwater cinematography and lighting.

In 1995, Cameron made 12 manned-submersible dives to the Titanic in preparation for his feature film. For that expedition Cameron developed unprecedented filming, lighting and robotic equipment for use in the extreme pressures of the deep. The technical success of that expedition fueled his desire to bring the experience of deep ocean exploration to audiences around the world. In preparation for his 2001 expedition to the Titanic wreck, Cameron developed revolutionary fiber-optic-spooling mini-ROV's called "Spiderbots" as well as other deep ocean lighting and photographic technology, including a digital 3D camera system with a depth rating of 20,000'. Cameron piloted his tiny camera vehicle deep inside the wreck to reveal well-preserved architectural elegance which stunned the Titanic exploration community. His team's historic survey of the inside of Titanic wreck was the subject of Cameron's 3-D Imax film, GHOSTS OF THE ABYSS. In May of 2002, Cameron piloted his robotic cameras inside the wreck of Bismarck, which resulted in groundbreaking discoveries about the sinking of the legendary German battleship, and the Discovery Channel documentary, JAMES CAMERON'S EXPEDITION: BISMARCK. Cameron's team then made 3 expeditions to deep hydrothermal vent sites in the Atlantic, Pacific and Sea of Cortez over a two-year period, which became the subject of ALIENS OF THE DEEP, also released in 3D Imax. He was joined in his exploration of these extreme environments by a team of young scientists to study how life forms discovered there might represent life we may one day find on other planets and moons in our solar system.

Most recently, Cameron led his eighth deep ocean expedition. His engineering team spent seven years building a unique manned submersible, called the Deepsea Challenger, capable of diving to the ocean's greatest depths. During sea trials in March of 2012 Cameron piloted the Deepsea Challenger on 4 deep dives in the New Britain Trench, in Papua New Guinea, culminating in a dive to 27,000' which was the deepest solo dive in history. This made the Deepsea Challenger the deepest diving manned vehicle operating in the world. On March 26 Cameron made a record-breaking solo dive to the earth's deepest point, successfully piloting the sub 7 miles (11 kilometers) to the bottom of the Challenger Deep in the Mariana Trench.

	<p>The expedition included biologists and geologists from Scripps Institute, University of Hawaii, and the Jet Propulsion Laboratory. The Deepsea Challenger was augmented by two robotic lander vehicles. The samples and images collected by this small fleet of vehicles are shedding unprecedented light on the virtually unknown habitats of the New Britain Trench, Challenger Deep and Sirena Deep.</p> <p>In total Cameron has made 85 deep submersible dives, most of them to depths below two miles. He is a member of the Deep Submersible Pilots Association. He is currently writing the scripts for Avatar 2 and 3, and will begin production on those films in 2013.</p>
	<p>San Diegan Bruce Sutphen has 25 years in scaled modeling and technical project management including composite, design, fabrication, hydrodynamic stabilization, and subsea robotic programs. A physicist by education, Bruce's experience includes Production Director and Composite Optimization Specialist for the build of Stiletto (OSD Advanced Composite Insertion Craft); Steve Fossett's Marathon Racing Maxi-Catamaran build of PlayStation (aka Cheyenne or Virgin Oceanic), as well as, Grand Prix Yachting including four America's Cup campaigns. Bruce was the U.S. Project Manager for DEEPSEA CHALLENGE; his responsibilities ranged from running the scaled-model vehicle dynamic stability testing to managing the U.S. composite development, Lower Pod robotics fabrication, including the Lander Systems. He was also a member of the DeepSea Challenge Expedition Team in the successful dives to the Mariana and New Britain Trench's.</p>

Anatomy of a 21st Century Full Ocean Depth Manned Underwater Vehicle for Scientific Exploration

James Cameron
 DEEPSEA CHALLENGER
 USA

Bruce Sutphen
 DEEPSEA CHALLENGER, USA
 Email: brucesutphen@cox.net

On 26 March 2012, James Cameron (National Geographic Explored in Residence) became the first person in history to reach the Earth's deepest known point as a solo pilot, successfully piloting the DEEPSEA CHALLENGER nearly 11 kilometers, almost 36,000 feet, to the Challenger Deep in the Mariana Trench. The dive was part of the DEEPSEA CHALLENGE Expedition, a series of dives to investigate the New Britain and Mariana Trenches, mounted by Cameron and a team of engineers, scientists and educators supported by National Geographic and Rolex. Of notable accomplishment was the sub's ability to remain at the bottom of the Challenger Deep, explore, sample and film for nearly 3 hours. Data from the sub was integrated with 19 free-falling lander deployments.

Bruce Sutphen will be presenting on behalf of Jim and the Expedition Team a brief overview of the technical elements, fabrication, assembly and operation of the DEEPSEA CHALLENGER submersible.

WED 9.00 – 9.30

Cpt. Don Walsh, International Maritime Inc., USA



Don Walsh is head of the Oregon based consulting company, International Maritime Inc., a business he founded in 1976. He was born in Berkeley California and grew up in the San Francisco Bay Area. Joining the US Navy at Naval Air Station Oakland in 1948 he became an aircrewman in torpedo bombers before entering the Naval Academy in 1950. From 1959-1962 Lieutenant Walsh was the first Officer-in-Charge of the Bathyscaph Trieste at the Navy Electronics Laboratory in San Diego. Designated USN Deep Submersible Pilot #1 he was also the first submersible pilot in the US. In January 1960, he and Jacques Piccard dove Trieste to the deepest place in the World Ocean: 35,840 feet. For this achievement, Lieutenant Walsh received a medal from President Eisenhower at ceremonies in the White House. From 1970-75, Commander Walsh was on duty in Washington DC serving as Special Assistant (Submarines) to the Assistant Secretary of the Navy for Research and Development (ASNR&D) and later as Deputy Director of Navy Laboratories. During his 24-year naval career he served in both the Korean and Vietnam wars. In 1975 he retired as a captain to accept a professorship of ocean engineering at the University of Southern California (USC). There he became founding Director of the Institute for Marine and Coastal Studies (IMCS) with rank of dean. He left USC after 8 years to form IMI, his present consulting practice. Since its founding, IMI has completed nearly 100 projects in 20 countries. Since 1959 Walsh has participated in diving operations with over two dozen manned submersibles, piloting seven of them.

For the past four decades, Dr. Walsh has worked in both Arctic and Antarctic regions including the North (5 trips) and South Poles. To date he has participated in over 50 polar expeditions. Since graduation from the Naval Academy, his travels have taken him to about 112 nations throughout the world. In 1999, using a Russian Mir submersible, he dove 8,000 feet to the Mid-Atlantic Ridge near the Azores at the Rainbow Vents hydrothermal vents field. Later, in July 2001, he dove 12,500 feet to the wreck of RMS Titanic and the next year to the WWII German Battleship Bismarck at 15,500 feet. Most recently he has dived in Lake Geneva in a Mir submersible.

Exploration of the Hadal Depths – Looking Backwards at the Future

By: Captain Don Walsh USN (Ret), PhD

International Maritime Inc, USA

Email: imiwalsh@mac.com

The presentation will review the science, technology, and techniques of exploring the deep ocean abyss. The presentation will cover developments from the Navy's Trieste dives of 1960 to the recent deep dives of James Cameron's Deepsea Challenger submersible.

At the conclusion Capt Walsh will attempt to forecast what the future holds for exploration of our ocean's deepest depths.

WED 9.30 – 10.00

Phil Nuytten, NUYTCO Research Ltd., Canada



An internationally recognised pioneer in the diving industry, Phil Nuytten has spent 40 years creating deepwater dive products that have opened the ocean's depths to exploration and industry. Through his companies, Nuytco Research and Can-Dive, he has developed the technology to allow longer-length diving expeditions with increased safety. Nuytten's one-atmosphere systems – the hard-suits 'Newtsuit' and 'Exosuit', and his deep-diving "DeepWorker" submersibles – are renowned internationally. This deep diving equipment, along with Nuytten's military submarine rescue system (designated 'Remora' by the Royal Australian Navy and 'PRMS' by the US Navy), is standard in nearly a dozen of the world's navies. Contract work has taken him to oilfields, submarine construction sites and sunken wrecks around the world. Phil Nuytten has spent over forty years developing undersea systems that have the safety of the diving technician as their common theme. His goal has been to provide scientific, technical, military, and sport divers full access to continental shelf depths without the hazards of decompression, so that humans can explore, learn about, and protect the world's oceans.

NUYTCO Overview of Submersible Operations in 2010

By: Phil Nuytten

Nuytco Research Ltd., Canada

Email: nrl@nuytco.com

A major obstacle in the development of manned submersibles involves the removal of metabolically-produced carbon dioxide from the cabin environment, particularly during long-duration, cold water operations. Traditional CO₂ absorption methods utilized in underwater life support systems use alkali metal hydroxide chemical beds "mostly calcium hydroxide" which have been shown to have poor absorption efficiencies in cold environments. Experimental evidence suggests that seawater, a readily accessible medium during submersible operations, could be a highly effective alternative scrubbing medium to remove metabolically-produced carbon dioxide. Laboratory CO₂ absorption trials are currently being conducted in a joint research effort between Duke University and the University of Bath in the United Kingdom, under sponsorship by the Office of Naval Research. An overview of these absorption trials will be presented and the physical principles governing this absorption technique will be explained. Alternative concept designs will be introduced and the suitability of these concepts for open and closed-circuit breathing systems will be discussed.

10.00 – 10.30

COFFEE BREAK

WED 10.30 – 11.00

Harald Pauli, Germanischer Lloyd (GL), Germany



Harald Pauli is the head of Department for Pressure Vessels and Underwater Technology, Diving Technology, Hyperbaric Chambers, EU Directives and Certification. Mr. Pauli has been with GL for 24 years and has been central to the development and expansion of the manned submersible rules at GL. In the field of underwater technology, Germanischer Lloyd deals with all kinds of diving systems, submarines, submersibles, underwater vehicles, underwater equipment and underwater working machines. Germanischer Lloyd classification society has existing and published construction rules for both commercial submersibles as well as naval submarines. The scope of certification is broad and includes rules for Diving Systems, Manned Submersibles, Submarines, Unmanned UW vehicles and working machines, hyperbaric chambers and personal diving systems. GL has certified among others from the early Mermaid series to the famous MIR Submersibles which were constructed in 1987 and rated to a maximum depth of 6000m.

Future Regulatory Considerations for Manned Submersibles

By: Harald Pauli
Germanischer Lloyd, Germany
Email: harald.pauli@gl-group.com

This presentation will provide an overview of present regulations for manned submersibles and review future challenges facing new technologies for very deep ocean diving as well as for naval submarines. Germanischer Lloyd provides classification review for a very wide range of underwater vehicles and is at the leading edge of new research and technology developments in the subsea industry. While material, fabrication and operational practices keep evolving, there is a growing demand for new technologies that will enable deeper and longer underwater expeditions. These progressions will need to be matched by a similar level of regulatory foresight that will ensure the safety and reliability of operation to support worldwide research organizations.

WED 11.00 – 11.30 Graham Hawkes, Hawkes Ocean Technologies, USA



Graham Hawkes, an internationally renowned ocean engineer, has been responsible for the design of a significant percentage of all manned (and more than 300 remote) underwater vehicles built for research or industry worldwide, including the Deep Flight series of winged submersibles. With DeepFlight, Mr Hawkes has successfully introduced four generations of ultra-lightweight, cost effective vehicles, including the 36,000 foot submersible, DeepFlight Challenger, which was originally built for the late adventurer, Steve Fossett, and has since been taken over by Deep Sub LLC and Virgin Oceanic. Mr. Hawkes has successfully founded several ocean engineering/exploration companies, including Hawkes Ocean Technologies, and is widely considered to be the leader in his field. He is currently offering Flight School courses for individuals, as well as Underwater Flight experiences for corporate retreats, and is also building the prototype of a new generation of highly advanced Remotely Operated Vehicle.

Under Water Flight, a New Class

By: Graham Hawkes
Hawkes Ocean Technologies, USA
Email: graham@deepflight.com

The objective of this paper is to publish, within the manned submersible community and public forum, the bench-line status and update of underwater flight activity, performance, and notable achievements to date, as well as the approach to safety and certification issues adopted by Hawkes Ocean Technologies. The new technologies for submergence of positively buoyant craft employ higher levels of innovation and more modern materials than supported by previously published standards for manned submergence. This has required a new approach to safety and certification, while remaining in compliance with current US Government regulations, published in NVIC 5-93. This paper will discuss the adoption of several safety certification concepts taken from other disciplines, such as “proof positive pressure testing,” which, as assimilated into Hawkes Ocean Technologies’ internal standards, has allowed for a high level of innovation to be acceptable to private insurance and owners as an alternative to traditional methods.

WED 11.30 – 12.00 **Robert J. Geoghegan, Battelle Undersea Systems, USA**



Bob Geoghegan leads Battelle's Mechanical & Systems Engineering group in the Undersea Systems business, with 30+ staff engaged in the design, development, and fielding of equipment for use in maritime environments. He has over thirty years of technical and leadership experience in the practice, management, and marketing of mechanical engineering and product delivery, most recently focusing on ocean engineering and related systems. This has involved development and fielding of maritime systems, including specialized large electro-mechanical systems, ocean-borne sensors, and submarine and submersible components for government and industrial clients.

Proteus: A Dual Mode Undersea Vehicle

Robert J. Geoghegan
Battelle Undersea Systems, USA
Email: geoghegr@battelle.org

Dual Mode Undersea Vehicle (DMUV) Proteus is currently undergoing at-sea testing in Panama City, Florida. It is a large flooded vehicle measuring 5 feet in diameter and 25 feet long, capable of manned or unmanned operation. Developed in a collaborative effort between Battelle, The Columbia Group, and Bluefin Robotics, DMUV Proteus has a 170 cubic foot payload volume, 550 lb ballasting capability and a range of over 500 miles. In addition to vehicle characteristics, several operational scenarios will be discussed, including a mother-ship concept for deployment of small AUVs, seafloor docking and recharging, a test-bed for new power systems, large payload delivery, and long-range autonomous sampling.

12.00 – 1.30

LUNCH BREAK

WED 1.30 – 2.00

Guillermo Sohnlein, OceanGate, USA



Guillermo Söhnlein is Co-Founder and COO of OceanGate, Inc., a global provider of deep ocean manned submersible solutions for multiple industries. He is also Founder and Chairman of the Sea-Space Initiative and Chairman of the Marine Technology Society's Ocean Exploration Committee. He has spent over ten years in leadership roles with various early stage technology ventures in early-stage aerospace ventures, Silicon Valley and the Washington DC area. He has consulted extensively with entrepreneurs, startups, angel investor groups, venture capital firms, hedge funds, and nonprofit organizations, and he currently serves on the advisory boards of several technology ventures. Guillermo earned an AB in Economics from the University of California at Berkeley and a JD from the University of California Hastings College of the Law, after which he served on active duty in the United States Marine Corps as a Judge Advocate.

The Rise of Private Sector Funding for Manned Ocean Exploration

By: Guillermo Sohnlein

OceanGate Inc., USA

Email: guillermo@opentheoceans.com

During the heyday of global exploration, valiant adventurers like Magellan and Columbus turned to wealthy individuals and businesses for funding their voyages of discovery. Over the past couple of centuries, these types of efforts have gradually become the purview of national government programs. However, for a variety of reasons, the 21st century is ushering in a new age of ocean exploration that harkens back to the glory days of human expansion, migration, and colonization. A growing trend among explorers, especially those utilizing manned submersibles, is to solicit financial backing from wealthy individuals and corporate sponsors. This presentation will examine some of the drivers, review several case studies, and propose helpful guidelines for successful projects.

WED 2.00 – 2.30

Chris Hartman, Global Ocean Center, USA



Mr. Hartman has on-site, operational level experience on major industrial, scientific and military projects.

His projects: Indo-Pacific - manned submersible diving for NCI seeking medicinal discoveries. Siberia - delivering the world's longest extended-reach well and preparing the oilrig Orlan to travel overseas for Exxon Neftegas. Beaufort Sea - barge master for vessels transporting cargo from the Arctic mainland to BP's man-made island Northstar. GoM - subsea construction tasks for BP's Thunderhorse to manned submersible operations investigating the Deepwater Horizon incident. His most recent venture: Global Ocean Center (GOC) - an oceanic data and operations management organization. He's a graduate of Marine Diving Technology-Santa Barbara and holds a Bachelor of Science degree in Technology-MSU.

Global Ocean Center (GOC): Large-scale Blue Industry concept, PHASE II

By: Chris Hartman

Global Ocean Center, USA

Email: cdhartman@gmail.com

Global Ocean Center explained--concepts, developments and why GOC will be integral to the development of Blue Industries throughout the 21st century. GOC will provide linkages among industry, academia, military, government and public. Mr. Hartman will present GOC's future strategic development and upcoming requirements necessary to complete Phase-II and how you, your company and country can become involved.

WED 2.30 – 3.00

Karl Stanley, Stanley Submarines, Honduras



Karl Stanley got the idea to make a submersible when he was 9 years old and started construction of his first vehicle when he was 15 years old. This winged, gliding sub made it's maiden voyage the same week he graduated college. It went on to make over 550 dives in 3 countries and paved the way for the construction of his latest vessel, Idabel. Karl has been taking tourists, film-makers and scientists on dives up to half a mile deep off the island of Roatan, Honduras since 1998. This is the longest operating and deepest diving operation of its kind. Karl is continually frustrated with the logistics of cost-effective deep ocean exploration and strongly believes a diesel electric sub capable of extended missions is the ultimate solution.

Deep Diving: Why flipping vertical could be the answer

By: Karl Stanley

Stanley Submarines, Roatan, Honduras

Email: karl@stanleysubmarines.com

Submersible design has long seemed a frustrating study in compromise, with the most successful designs having changed little for over 50 years. “Flying” subs offer an illusion of freedom with their speed, but face severe limitations in their practical uses. James Cameron took a conservative approach to pressure hull design, but by designing “outside the box” with a vertically oriented sub, he has shown the way for a new generation of sub design that offer the best solutions we have all been searching for with the best of the following characteristics: surface speed, towability, underwater maneuverability with the least possible number of motors, and reduced times in transit to the sea floor.

3.00 – 3.30

COFFEE BREAK

US NAVY CERTIFICATION PROCESS

WED 3.30 – 4.30

Roger W. Schaffer, Naval Sea Systems Command 07QB, USA



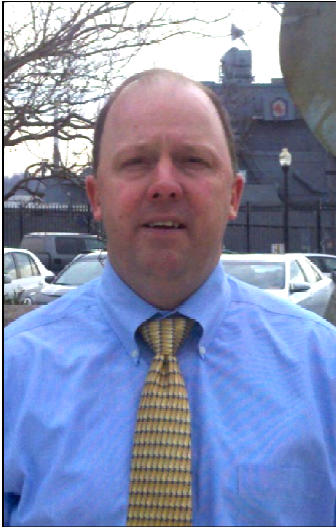
Mr. Schaffer is the senior civilian responsible for the U.S. Navy’s SUBSAFE Requirements Manual, and for formulating and enforcing compliance with the USN’s Submarine Safety (SUBSAFE), Deep Submergence Systems (DSS), and Fly-by-Wire Ship Control Systems (FBW-SCS) safety policies, procedures, and practices for both new construction and in-service platforms. Mr. Schaffer directs the Navy’s SUBSAFE, DSS, and FBW-SCS audit programs. Mr. Schaffer has served as the senior representative for our country in several international cooperative efforts with our allies in the area of submarine safety. His experience as an engineer, manager and leader spans more than twenty five years and consists of a combination of Navy contractor experience and Naval Sea Systems Command (NAVSEA) Headquarters experience. In 2000, Mr. Schaffer entered government service when he was selected for a position within the Deep Submergence Systems Branch of the Submarine Safety and Quality Assurance Division of NAVSEA Headquarters in Washington, DC.

Richard Schoenwiesner, Naval Sea Systems Command 05U3, USA



Richard Schoenwiesner is currently the Technical Warrant Holder for Deep Submergence Systems Scope of Certification (DSS-SOC) Technical Requirements for Naval Sea Systems Command (NAVSEA). As the Technical Warrant Holder, he is in charge of interpreting and maintaining DSS-SOC technical and material control requirements for certified US Navy DSS and approving the adequacy of such requirements in their design, fabrication, testing, material certification, maintenance, safety analyses and procedures. Previously, Mr. Schoenwiesner was a Project Manager for NAVSEA OOC in the Underwater Ship Husbandry Division developing techniques, procedures, and equipment to perform submarine repairs waterborne. While on active duty, he qualified submarines aboard one of the first submarines to deploy a Dry Deck Shelter (DDS), qualified as a Navy Diver and served at the U.S. Naval Academy as a Master Instructor of Naval Architecture and Ocean Engineering. Mr. Schoenwiesner holds a Professional Engineer’s License in Mechanical Engineering, a master’s degree in Nuclear Engineering from the University of Maryland and a bachelor’s degree in Ocean Engineering from the United States Naval Academy.

Tommy Beals, PMS399 - Undersea Mobility Program Mgmt Office



Tommy Beals is currently the Deep Submergence System Point of Contact (DSS POC) for PMS399, the Special Operations Forces (SOF) Undersea Mobility Program Office (PMS399) within Naval Sea Systems Command (NAVSEA). As the DSS POC, he is the PMS399 focal point for all DSS SOC matters and is accountable and responsible for implementation and proper execution of the DSS SOC Program within PMS399. Mr. Beals is also the Deputy Principal Assistant Program Manager responsible for the management of various Small Business Innovation Research and SOF submersible certification projects under NAVSEA and US Special Operations Command cognizance. Prior to joining NAVSEA's team in 2010, Mr. Beals was an active duty Submarine Engineering and Repair Limited Duty Officer and a qualified Submarine and Surface Warfare Officer. In this capacity he was assigned to various ships, submarines and submarine repair activities. Prior to receiving a commission in 1997 he was a submarine Machinist Mate responsible for maintenance and operation of various submarine auxiliary systems. Mr. Beals has achieved Program Management Level III certification and has a bachelor of science in Occupational Education from Wayland Baptist University.

The US Navy's Safety Culture and how we sustain it.

By : Roger W. Schaffer, CIV SEA 07 07QB
Deputy Director, Submarine Safety & Quality Assurance
Naval Sea Systems Command, USA
Email : roger.schaffer@navy.mil

Rear Admiral (Sel) David M. Duryea
Deputy Commander for Undersea Warfare
Naval Sea Systems Command
Department of the Navy

Richard Schoenwiesner, CIV NAVSEA 05U3
NAVSEA HQ, Technical Office
Naval Sea Systems Command, USA
Email : richard.a.schoenwiesner@navy.mil

Tommy Beals - PMS399 Undersea Mobility
Program Management Office
Special Operations Forces (SOF)
Email: tommy.beals@navy.mil

The principal objective of this presentation is to provide participants an complete overview of the U.S. Navy's Safety Culture and how we sustain it for Submarines and Manned Deep Submergence Systems. This includes the Navy's approach to manned deep submergence systems safety and the responsibilities of NAVSEA05, NAVSEA07 and the Program Office. The Navy's fundamental principles for safety certification of manned deep submergence systems will be reviewed and key departments will be defined, such as NAVSEA 05, NAVSEA 07Q, and Program Executive Office. The Navy desires to familiarize the maritime industry with why the US Navy invests so much in compliance verification within its undersea safety programs.

Day 3

Thursday 17 January

WED 8.30 – 9.00

Roy Thomas, American Bureau of Shipping (ABS), USA



Roy Thomas is a Managing Principal Engineer with the American Bureau of Shipping (ABS), Houston, TX. He has worked with ABS for the past 10 years and serves as the head of the Underwater Systems and Lifting Appliances Group. Mr. Thomas has extensive experience with the Classification of underwater vehicles, systems and hyperbaric facilities for commercial and military applications. He has served as the lead design review engineer on numerous projects involving underwater vehicles, systems and hyperbaric facilities of every possible form and design. He has played an active role in updating the ABS Rules for Underwater Vehicles, Systems and Hyperbaric Facilities and has authored new sections on Diving Systems, Lock-Out Submersibles, Lithium Batteries, etc. Mr. Thomas conducts the ABS - Industry meeting at the Underwater Intervention Conference on an annual basis to discuss Rule changes with the industry. He also moderates the annual meeting of the ABS Special Committee on Underwater Systems and Vehicles. In addition, Mr. Thomas participates on industry committees and is a member of the ASME Committee on Pressure Vessels for Human Occupancy. Mr. Thomas also teaches the design aspects of underwater vehicles and systems at the courses "Classification of Submersibles" and "Classification of Diving Systems" conducted by the ABS Academy. Mr. Thomas has previously worked as a seagoing marine engineer on board tankers and has hands-on experience in the running, maintenance and overhaul of marine machinery. Mr. Thomas holds a master's degree in Naval Architecture from Memorial University of Newfoundland, Canada with a specialization in underwater vehicles. He also holds a bachelor's degree in Marine Engineering from Marine Engineering and Research Institute, India.

Overview of ABS Rule Change Proposals for 2013

By: Roy Thomas

American Bureau Shipping, Houston, USA

Email: rthomas@eagle.org

Open meeting of the American Bureau of Shipping (ABS) with the subsea industry to review proposed rule changes to the ABS Rules for Building and Classing Underwater Vehicles, Systems and Hyperbaric Facilities. The meeting facilitates an open dialogue with the industry on current issues that work well or do not work. All active designers, fabricators, owners and operators are invited to attend and provide feedback. This session is an OPEN DISCUSSION meeting with all members of the subsea industry to discuss the latest rules and regulations and provide feedback on new or old issues related to Manned Submersibles, Diving Systems or Hyperbaric Systems.

THU 9.00 – 9.30

Pere Fores, Ictineu Submarins SL, Spain



Pere Forès. Industrial Designer. Co-founder, administrator and director of ICTINEU Submarins SL and co-founder of the Ictineu Institute, Catalan Submarine Research Centre in 2004. He has worked as an industrial designer, model maker, modeller, and after studying naval design has worked in the construction of recreational sailing and racing vessels for 15 years. He specialized in construction materials and processes involving composites and new materials. He built his first submarine at the age of 11, and later has designed and built his own sailing boats, being the last one an open racing ship with which he has crossed the Atlantic twice. He has conceived and designed the ICTINEU 3 and its functionalities. He co-wrote the book *L'Atlàntic a quatre mans* (The Atlantic four hands).

Pressure-tolerant Li-ion batteries, implementation and certification on MUV ICTINEU 3

By: Pere Forès, Carme Parareda, Miquel Àngel Rodríguez
ICTINEU Submarins SL, Spain
Email: pfores@ictineu.net

During the design of the ICTINEU 3 submersible a particular lack was detected if a really highly operational vehicle was to be achieved: the need for a more efficient and powerful battery system than those existing models based on lead-acid batteries. After reviewing the state of the art, in 2007 Ictineu Submarins decided to develop its own pressure-tolerant battery system based on li-ion-polymer cells. After 5 years of research and development, a prototype system is undergoing final testing it will be implemented in the manned submersible ICTINEU 3 and certified by GL. The system is based on modules that contain all elements needed for functioning and safety (cells, electronics, control and safety devices). Main facts of the battery system are: compact, robust, pressure tolerant, safe and certifiable modules; a total of 42kWh, 150V, in only 400kg of weight. A satisfactory weight/power ratio of 9.5 kg for each kWh has been achieved, while typical lead-acid systems provide a mean of 30kg/kWh. The development has been done according to different standards (IEC, UL, UN...) and GL rules. Intensive testing according to rules and standards has been applied to all elements of the system, including cells, BMS, safety elements and housing materials. Once the system has been validated, it could be easily adapted and certified to other underwater vehicles, manned or unmanned, due to the modularity of the system and the compliance with international rules and standards.

WED 9.30 – 10.00

David White, Southwest Electronic Energy Group, USA



David White graduated from Texas A & M University in 1970 with a BS in Electrical Engineering. David's practical design experience is in large, high capacity, high reliability computer and system designs used in battery operated, man portable applications that must work in any environment above, on, or under the earth. David is named with other colleagues at SWE on over 9 patents or patent applications covering inventions for Continuous Cell Balancing Methods, Module Balancing Methods, and BMS algorithms for extending Li-Ion battery life, reliability, and safety. David is a member of the MTS, an emeritus member of the Society of Exploration Geophysics and a Life Senior member of the IEEE, and has been recognized during his employment at Texas Instruments, as a Texas Instrument's Senior member of Technical staff.

**Technical Overview Of SWE SEASAFE™;
A Safe, Flexible, Pressure Tolerant, Subsea Li-Ion Battery System**

By: David White
Southwest Electronic Energy Group
Email: dwhite@swe.com

This presentation is a technical description of the SWE SeaSafe™ pressure tolerant Lithium –Ion battery module and battery system components that will be introduced at UI2013. This battery system delivers features based on prior year SWE presentations on safe Lithium-Ion battery systems for general and MUV subsea use. It will reveal new, patent pending safety algorithms for Lithium-Ion batteries. ABS type certification and US DOT certification status will be

presented. Examples of how small and large battery systems can be configured to order using only a few system components will be shown. Photos of the manufacturing of the standardized battery module and system components will be shown to reveal what's inside. Finally, expectations for use in various unmanned vehicles and manned underwater vehicles such as the Alvin will be presented.

10.00 – 10.30

COFFEE BREAK

10.30 – 12.00

MUV PANEL DISCUSSION

SAFETY STRATEGIES IN CERTIFICATION SOCIETIES

PANELIST 1

Roy Thomas, ABS - American Bureau Shipping, USA



Roy Thomas is a Managing Principal Engineer with the American Bureau of Shipping (ABS), Houston, TX. He has worked with ABS for the past 10 years and serves as the head of the Underwater Systems and Lifting Appliances Group. Mr. Thomas has extensive experience with the Classification of underwater vehicles, systems and hyperbaric facilities for commercial and military applications. He has served as the lead design review engineer on numerous projects involving underwater vehicles, systems and hyperbaric facilities of every possible form and design. He has played an active role in updating the ABS Rules for Underwater Vehicles, Systems and Hyperbaric Facilities and has authored new sections on Diving Systems, Lock-Out Submersibles, Lithium Batteries, etc. Mr. Thomas conducts the ABS - Industry meeting at the Underwater Intervention Conference on an annual basis to discuss Rule changes with the industry. He also moderates the annual meeting of the ABS Special Committee on Underwater Systems and Vehicles. In addition, Mr. Thomas participates on industry committees and is a member of the ASME Committee on Pressure Vessels for Human Occupancy. Mr. Thomas also teaches the design aspects of underwater vehicles and systems at the courses "Classification of Submersibles" and "Classification of Diving Systems" conducted by the ABS Academy.

PANELIST 2

Robert Surma, GL – Germanischer Lloyd, Germany



Dr. Robert Surma is Vice President of GL Materials and Products group which include the boiler and pressure vessel and underwater vehicles departments. Dr. Surma leads and manages 4 multidisciplinary engineering teams with a total of 60 employees to exceed customer expectations, financial goals, quality standards within a fast developing and extremely competitive environment. The GL Group operates in three main areas: maritime, oil and gas and renewable energy. In the business segment Maritime Services Germanischer Lloyd provides traditional classification services, certification of international of maritime and industrial standards, fleet service and condition monitoring, and training. Advanced engineering and consulting, maritime software and support are provided by the Maritime Solutions unit. The GL Group employs nearly seven thousand people working in more than eighty countries..

PANELIST 3

Roger Schaffer, Naval Systems Sea Command, USA



A 1971 engineering graduate of the University of South Carolina, Mr. Ford served in various technical, supervisory and managerial positions, including Submarine Safety Program Director, at Charleston Naval Shipyard in Charleston, SC. In 1993 he moved to the Naval Sea Systems Command in Washington, DC to become the Safety and Quality Assurance Manager for construction of SEAWOLF Class submarines. This was followed in 1996 with an assignment as the senior civilian responsible for managing the Navy's Safety and Quality Assurance Programs for all submarines and deep submergence systems. In 2010 Mr. Ford assumed the role of senior advisor to the Undersea Warfare Directorate on matters of submarine and deep submergence systems safety, quality assurance, and certification.

PANELIST 4

Dan Lawrence CG-OES-2, US Coast Guard Headquarters, USA



Dan joined the U. S. Coast Guard in 1974. He completed 29 years of active duty service. His first 16 years serving in various engineering and surface operations billets, and then his final 13 years serving in marine safety and occupational health, including a tour, as the senior inspector, at the Coast Guard Inspection and Investigations School. Upon retirement from active duty Dan joined the civilian staff, at the Coast Guard Headquarters Office of Design and Engineering Standards, serving as the small vessel, environmental, submersible and special projects engineer. He currently serves as the Coast Guard Offshore Engineer and leads the Offshore Branch of the Coast Guard Headquarters Vessel and Facility Operating Standards Division. He is a member of several professional engineering associations including ASME PVHO and ASTM. He also serves on the ABS Special Committees for Mobile Offshore Units and Underwater Systems and Vehicles.

CULTURE of SAFETY for MUV Certification

- Chaired by: Will Kohnen, MTS MUVC

- Panelist No. 1: Roy Thomas, Managing Principal Engineer
American Bureau Shipping, USA
Email: rthomas@eagle.org

- Panelist No. 2: Robert Surma, Vice President, Materials & Product
Germanischer Lloyd, Germany
Email: robert.surma@gl-group.com

- Panelist No. 3: Roger W. Schaffer, CIV SEA 07QB
Naval Sea Systems Command, USA
Email: roger.schaffer@navy.mil

- Panelist No. 4: Dan Lawrence CG-OES-2
Office of Vessel & Facility Operating Standards
US Coast Guard, USA
Email: james.d.lawrence@uscg.mil

Sponsored by the MTS Manned Underwater Vehicles committee, the Technology Panel in 2013 will discuss the fundamental philosophies that guide each organization in the definition and creation of new rules towards the quest of

greater safety. The panel is an attempt to present many different approaches towards safety and how certain philosophies can be optimized for specific applications. It is the hope to provide a better understanding of the various certification tools available to designers, operators and owners to ensure the best road to safety of operation for underwater vehicles.

12.00 – 1.30

LUNCH BREAK

1.30 – 2.30

MTS MUV ANNUAL COMMITTEE MEETING

Chair: William Kohnen
Email: wkohnen@HydrospaceGroup.com

Secretary: Daniel Lance
Email: lanceind@gmail.com

Annual meeting of the MTS MUV committee. Annual review of 2012 and objectives for 2013. All subsea community members are invited to attend and help grow the organization of the Manned Underwater Vehicles world for its board structure, conference planning, web site content, regulatory discussions and industry support resources.

MTS MUV 2013 PRESENTERS

Beals, Tommy

PMS399 - Special Operations Forces (SOF)
Undersea Mobility Program Management Office
Tel: +1(202) 781-0518
Email: tommy.beals@navy.mil

Cui, Weicheng

Deputy Chief Designer - JIAOLONG
China Ship Scientific Research Center
No.222 East Shanshui Road
Wuxi, Jiangsu, 214082
China
Email: wccui@sjtu.edu.cn

Drogou, Jean-Francois

Project Manager – UW Systems Dept
IFREMER
Zone Portuaire de Brégaillon
83507 La Seyne sur Mer
France
Tel. +33 494 304 839
Email: jean.francois.drogou@ifremer.fr
www.ifremer.fr/cmsm/

Fores, Pere

Co-Founder & Director
ICTINEU Submarins SL
Barcelona
Spain
Tel: +34 933 094 274
E-mail: pfores@ictineu.net
www.ictineu.net

Geoghegan, Robert J

Battelle Undersea Systems
505 King Avenue
Columbus, Ohio 43201
USA
Tel: +1(614) 424-7963
Email: geoghegr@battelle.org
www.battelle.org

Hartman, Chris

President
Global Ocean Center
14781 Memorial drive
Houston, TX 77079
USA
Tel: +1(713) 416-4484
E-mail: cdhartman@gmail.com

Hawkes, Graham

President
Hawkes Ocean Technologies
San Anselmo, CA
USA
Tel: +1(415) 256-9273
E-mail: graham@deepflight.com
www.deepflight.com

Henkener, Jerry

Structural Engineering Department
Mechanical Engineering Division
Southwest Research Institute
6220 Culebra Rd.
San Antonio, Texas 78238
USA
Tel: +1(210) 522-3350
Email: jerry.henkener@swri.org
www.swri.org

Jakobsen, Joachim

Director
Foundation Rebikoff-Niggeler
Rocha Vermelha, Apt. 249
Praia do Almoxarife
9900-451 Horta - Faial - Azores
Portugal
Tel: +351 292 949 505
Email: info@rebikoff.org
www.rebikoff.org

Kawama, Itaru

Senior Engineer
Research Fleet Department
Marine Technology and Engineering Center
Japan Agency for Marine-Earth Science and
Technology (JAMSTEC)
2-15 Natsushima-cho Yokosuka 237-0076
Japan
Tel: +81-46-867-9936
Email: itaru@jamstec.go.jp
www.jamstec.go.jp

Kohnen, William

President
HYDROSPACE Group
PO Box 1952
Claremont CA 91711
USA
Tel. +1(951) 323-5377
Email: wkohnen@HydroSpaceGroup.com
www.hydroSpacegroup.com

Lawrence, J. Dan CG-OES-2

Coast Guard Offshore Engineer
Office of Vessel & Facility Operating Standards
U.S. Coast Guard
2100 Second Street SW.
Washington, DC 20593
USA
Tel: +1 (202) 372-1382
Email: james.d.lawrence@uscg.mil

Niikura, Junya

Engineer,
Research Fleet Department
Marine Technology and Engineering Center
Japan Agency for Marine-Earth Science and
Technology (JAMSTEC)
2-15 Natsushima-cho Yokosuka 237-0061
Japan
Tel: +81-46-867-9863
Email: j-niikura@jamstec.go.jp
www.jamstec.go.jp

Nuytten, Phil

Nuytco Research Limited
216 East Esplanade
North Vancouver, BC, V7L 1A3
Canada
Tel: +1(604) 980-6262
Email: nrl@nuytco.com
www.nuytco.com

Parareda, Carme

Co-Founder & COO
ICTINEU Submarins SL
Barcelona
Spain
Tel: +34 933 094 274
E-mail: cparareda@ictineu.net
www.ictineu.net

Pauli, Harald

Head of Dept., Underwater Technology
Germanischer Lloyd SE
Brooktorkai 18
20457 Hamburg
Germany
Tel: +49 40 361 490
Email: harald.pauli@gl-group.com
www.gl-group.com

Rigaud, Vincent

Director of the Underwater Systems Dept.
IFREMER
Zone Portuaire de Brégaillon
83507 La Seyne sur Mer
France
Tel. +33 494 304 893
Email: vincent.rigaud@ifremer.fr
www.ifremer.fr/cmsm/

Sagalevich, Anatoly

Head of Deep Manned Sub Laboratory
P.P.Shirshov Institute of Oceanology
Russian Academy of Sciences
Nakhimovsky prospect, 36
117997 Moscow
Russia
Tel: +7 (499) 124 79 94
Email: sagalev1@yandex.ru
www.ocean.ru/eng/

Schaffer, Roger W CIV SEA 07 07Q

Deputy Director
Submarine Safety & Quality Assurance
Naval Sea Systems Command
614 Sicard Street S.E.
Washington Navy Yard, DC 20376-7030
USA
Tel: +1(202) 781-1336
Email: roger.schaffer@navy.mil

Schoenwiesner, Richard A CIV SEA 05U3

Naval Sea Systems Command
Technical Office
Washington Navy Yard, DC 20376 USA
Tel: +1(202) 781-3393
Email: richard.a.schoenwiesner@navy.mil

Sifford, Curtis

Senior Research Engineer
Southwest Research Institute
6220 Culebra Rd.
San Antonio, Texas 78238 USA
Tel: +1(210) 522-3475
Email: curtis.sifford@swri.org
www.swri.org

Sohnlein, Guillermo

Co-Founder & COO
OceanGate
1000 Second Avenue
Suite 3500
Seattle, Washington 98104 USA
Tel: +1(703) 346-3041
Email: guillermo@opentheoceans.com
www.opentheoceans.com

Stanley, Karl

President
Stanley Submarines
Roatan
Honduras
Tel: +504 3359-2887
Email: karl@stanleysubmarines.com
www.stanleysubmarines.com

Surma, Robert

Vice President, Materials & Products
Germanischer Lloyd SE
Brooktorkai 18
20457 Hamburg
Germany
Tel: +49 40 36149-7917
Email: robert.surma@gl-group.com
www.gl-group.com

Sutphen, Bruce

Project Manager
Earthship Productions Inc.
4990 North Harbor Drive
Suite 200
San Diego, CA 92106
USA Tel: +1(619) 436-8444
Email: brucesutphen@cox.net

Tarantino, Anthony

Asst Program Manager
ALVIN RHOV Program
Woods Hole Oceanographic Institution
266 Woods Hole Road
Woods Hole, MA 02543-1050 USA
Tel: +1(508) 289.2786
Email: atarantino@whoi.edu
www.whoi.edu

Thomas, Roy

Managing Principal Engineer
ABS Americas Division
ABS Plaza, 16855 Northchase Drive
Houston, TX 77060 USA
Tel: +1(281) 877-6384
Email: rthomas@eagle.org
www.eagle.org

Uetz, Kurt

Program Manager
ALVIN RHOV Program
Woods Hole Oceanographic Institution
266 Woods Hole Road
Woods Hole, MA 02543-1050 USA
Tel: +1(508) 289.2712
Email: kuetz@whoi.edu
www.whoi.edu

Walsh, Don

Capt. USN (Ret), PhD
International Maritime Inc
Myrtle Point, Oregon
USA
Email: imiwalsh@mac.com
Tel: +1(541) 572-2313
Email: imiwalsh@mac.com

Welsh, Chris

Co-Founder / Pilot
Virgin Oceanic
Newport Beach, CA USA
Tel: +1(949) 278-2012
Email: fivedives@gmail.com
www.virginocenic.com

White, David

Senior Member Technical Staff
Southwest Electronic Energy Group
12701 Royal Dr.
Stafford, TX 77477 USA
Tel: +1(281) 240-4000
Email: dwhite@swe.com
www.swe.com

In Memoriam

Henri Germain Delauze (1929-2012)

The cover picture is the COMEX Remora 2000 in memory of Mr. Henri Delauze who left the world in our hands in 2012. He was a pioneer of the underwater world and demonstrated this passion in his unstoppable energy of innovation.



Mike deGruy, 1951 - 2012
Pilot and Underwater
Cinematographer



Andrew Wight: 1959 – 2012
Underwater Explorer and
Filmmaker

Both men were passionate underwater cinematographers who spent three decades making documentary films about the ocean. They were killed in a helicopter crash in eastern Australia.

MTS MUV MEMBERSHIP – Join us NOW



www.mtsociety.org/membership/new/add.aspx

**MARINE TECHNOLOGY SOCIETY
MANNED UNDERWATER VEHICLES COMMITTEE**

Chairman William Kohnen
HYDROSPACE Group
Tel (951) 323-5377
Email: wkohnen@HydrospaceGroup.com

Co-Chair Vance Bradley
Tel (772) 812-0260
Email: vbra676539@aol.com

Treasurer Kip Peterson
Thorsborg Institute, LLC
Tel (770) 518-0704
Email: KEP@Thorsborg.com

Secretary Daniel Lance
Lance Industries
Tel (609) 805-1644
Email: lanceind@gmail.com

Committee Web Site: www.mtsmuv.org

MTS Website: www.mtsociety.org



SPONSORED BY:

