

16th Annual

**MANNED  
UNDERWATER VEHICLES  
SYMPOSIUM**

**2019**



Underwater Intervention, February 5-7 New Orleans, LA USA

# 2019 MTS MUV SCHEDULE

## DAY 1 FEB-5-2019 ROOM 343

No	Session	Speaker	Company	Presentation Title
1	8:30 to 9:15	William Kohlen	Hydrospace Group Inc	2018-2019 MUV Industry Overview
1	9:15 to 9:30	Susan Casey	Special Guest & Author	In Praise of Descent: An Outsider's View
2	9:30 to 10:00	Francis Elder	WHOI	DSV Alvin 2018 operations summary and design progress for 6500 meter operations
3	10:00 to 10:30	Ladd Borne	Triton Submarines	Building a Classed Manned Hadal Exploration System
10:30 to 10:45			COFFEE BREAK	
4	10:45 to 11:15	Masanobu Yanagitani	JAMSTEC	2018 Shinkai6500 Starting a Single pilot operation overview
5	11:15 to 11:45	Yukihiro Kida	JAMSTEC	Underwater acoustic image transmission system for manned submersible Shinkai6500
6	11:45 to 12:15	Francis Elder	WHOI	A new 6500m Variable Ballast System for DSV ALVIN
12:15 to 1:00			LUNCH	
1:00 to 1:30				
7	1:30 to 2:00	William (Bill) Marr	Navy Experimental Diving Unit	Overview of the Capabilities of the U.S. Navy Experimental Diving Unit (NEDU)
8	2:00 to 2:30	Jarl Stromer	Triton Submarines	Overview of Deep Ocean Simulation Test Facilities around the World
9	2:30 to 3:00	Paul Garza	Southwest Research Institute	Overview of Deep Ocean Testing Capabilities in the U.S.
3:00 to 3:30			COFFEE BREAK	
10	3:30 to 4:00	Roy Thomas	ABS	ABS Industry Annual Meeting -
11	4:00 to 4:30			Overview of ABS Underwater Rule Change Proposals for 2019
4:30 to 5:30				
14	5:30 to 7:30	<b>MTS MUV</b>	<b>MUV Cocktail Reception</b>	<b>HILTON GARDEN INN HOTEL Reception</b>

## DAY 2 FEB-6-2019 ROOM 343

1	9:00 to 9:30	Charles Westerfield	AMETEK SCP	Pressure Hull Penetrators - critical components for undersea mission success
2	9:30 to 10:00	Capt. Robert Wolf	NAVSEA PMS391	Submarine Escape and Rescue Recent and Future Developments
3	10:00 to 10:30	Greg Cotten	JFD Ltd	Manned Submersibles for Submarine Rescue-Fly-away System Optimization
10:30 to 10:45			COFFEE BREAK	
4	10:45 to 11:15	Scott Waters	Deep Sea Submarine	Pisces VI ready for sea trials
5	11:15 to 11:45	Jess Totten	ABS	ABS for Manned Submersibles
6	11:45 to 12:15	Michael Klein	Lloyds Registry	Classing outside the Rules: Non-prescriptive routes to submersible classification
12:15 to 1:00			LUNCH	
1:00 to 1:30				
7	1:30 to 2:00	Will Kohlen - Panel Chair	MTS MUV - MTG PANEL ROOM	MUV OPERATIONS Consensus Standard
8	2:00 to 2:30	Jarl Stromer, Roy Thomas, Gard Clark, Mike Caudle,		WORKSHOP & Panel Discussion
9	2:30 to 3:00	Kip Peterson, Dan Lawrence		
3:00 to 3:30			COFFEE BREAK	
10	3:30 to 4:00	William Kohlen	MTS MUV - MTG PANEL ROOM	MTS MUV ANNUAL COMMITTEE MEETING
11	4:00 to 4:30			

## DAY 3 FEB-7-2019 ROOM 343

1	8:30 to 9:00	Carme Parareda	Ictineu Submarins SL	ICTINEU New High Voltage 300VDC LiPo Battery for Underwater Systems
2	9:00 to 9:30	Leon Adams	Southwest Electronic Energy	Novel ABS Approved Pressure Tolerant Lithium Ion Battery Modules for MUVs
3	9:30 to 10:00	Justin Farrelly	Innerspace Corp	Innovation and Advances in Propulsion and Control
4	10:00 to 10:30	Will Ricci	Trelleborg Foam	Syntactic foam for Dummies and New Technologies in design
10:30 to 10:45			COFFEE BREAK	
5	10:45 to 11:15	Bart Kemper	Kemper Engineering	Joint Mechanics in Polymer Hulls and Viewports
6	11:15 to 11:45	Thomas Trudel	Outside Innovation	Hybrid Dome Windows – Are they domed, flat, or both?
7	11:45 to 12:15	Raja Singh	IoT Wizards LLC	IoT for Underwater Assets and Data Management
12:15 to 1:00			LUNCH	

## Welcome to the 2019 MTS MUV SYMPOSIUM

Dear Members and Attendees,

Once again, we have assembled for UI 2019. Welcome to the 16th annual symposium hosted by the Marine Technology Society Committee on Manned Underwater Vehicles. Since 2003, this committee works hard to bring together an international group of manufacturers, operators and pilots, and support service providers who thrive in the intersection of engineering, technology advancements and the spirit of subsea innovation.

This year we have a program with twenty-eight speakers. Tuesday opens with an inside look at the MUV industry, followed by an assessment of the industry as viewed through an outside journalistic lens with Susan Casey. The rest of the day has a focus on deep ocean submersibles. The highlight is Triton Submarines who has engineered remarkable full ocean depth MUV, DNVGL classed for two person and engineered for multiple dives, remarkable because since the 1960's, only the Trieste and James Cameron's Deepsea Voyager have accessed the full deep ocean. The Triton hadal presentation is followed by updates from vanguards of deep ocean research, Woods Hole's DSV ALVIN and JAMSTEC's Shinkai 6500. In the afternoon, the program reviews the worldwide inventory of deep ocean simulation test facilities for manned submersibles. This should be of interest to everyone.

Be sure to set aside Tuesday evening for the MUV Cocktail Reception at the Hilton Garden Inn from 5:30 to 7:30 pm. It's an informal way to foster networking and business development opportunities.

Special consideration on Wednesday should be given to Captain Robert Wolf, who is presenting submarine escape and rescue, past and future developments. News from NAVSEA is always a welcome addition to the symposium. The afternoon features a panel discussion/workshop on our MUV Operations Consensus Standard. This is a work in progress and everyone is encouraged to contribute.

Thursday is all about the state of technology, with a focus on components: batteries, motor drivers and syntactic foam, viewports and emerging directions of IIOT, the Industrial Internet of Things.

In between our busy program, your office responsibilities and the good eats in New Orleans, don't forget to visit the show floor, whatever your focus: business-to-business, business-to-government or business-to-consumer, you will find solutions and innovation there.

Thank you to all our dedicated speakers for their time and efforts. Speakers are the heart of this symposium and we are grateful that they share their expertise. Special shout-out to committee members; Kip Peterson, Colleen Hahn, Veronica Hernandez, Gard Clark and Daniel Lance for making this all possible. I look forward to meeting up with everyone.

William Kohnen  
Chair, Manned Underwater Vehicles  
**Marine Technology Society**

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# MANNED UNDERWATER VEHICLE PROGRAM

Day 1 - Room 357 - Tuesday, February 5

8:30 – 9:15 **2018-2019 MUV Industry Overview**  
By: William Kohnen, Hydrospace Group, USA

A yearly review of the state of the Manned Submersible industry in 2018/2019. 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.

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9:15 – 9:30 **In Praise of Descent: An Outsider's View**  
By: Susan Casey, Ocean Author - Hawaii, USA

Susan Casey is currently working on a book about the deep ocean and will present an outsider's view as a modern context to the MUV industry. She is the author of three New York Times' bestselling books: *The Devil's Teeth*, *The Wave*, and *Voices in the Ocean*, the former editor-in-chief of *O, The Oprah Magazine*, and an award-winning journalist whose work has been featured in *The Best American Science and Nature Writing*, *The Best American Sports Writing*, and *The Best American Magazine Writing* anthologies; and has appeared in *Esquire*, *Sports Illustrated*, *Fortune*, *Time*, *Outside*, and *National Geographic*.

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9:30 – 10:00 **DSV Alvin 2018 operations summary and design progress for 6500 meter operations**  
By: Francis Elder, Alvin Group, WHOI, USA

This presentation will detail DSV Alvin operations through early 2019, including the completion of Alvin's 5000 dive in late November 2018. Additionally, the engineering efforts to complete remaining systems conversion for 6500 meters operations are in the final stage, with mature designs nearing completion, and procurement of new components and materials underway. The presentation will provide information on the progress of these efforts, and the Alvin program's plans to complete integration in 2020, and initial operations to 6500 meters scheduled in early 2021.

10:00 – 10:30 **Building a Classed Manned Hadal Exploration System**

By: Ladd Borne, Triton Submarines, USA

Triton Submarines has built the world's first manned submersible commercially certified for repeatable exploration to the deepest point in the ocean. Over 150 suppliers from 36 different countries contributed to the project; in many cases re-thinking the technologies used to develop weight-critical and precision components in compliance with stringent quality requirements. This talk will detail the building and proof testing of the submersible.

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10:30 – 10:45

COFFEE BREAK

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10:45 – 11:15 **2018 Shinkai 6500 starting a single pilot operation overview**

By: Masanobu Yanagitani, Japan Agency for Marine-Earth Science and Technology, JAPAN

JAMSTEC remodeled the inside of the "SHINKAI 6500" personnel sphere, and prepared guidelines for implementation of a single pilot operation. This allows the deep research submersible to carry two scientist and one pilot. For more than 25 years, the submersible was controlled by one pilot and one co-pilot. The first single pilot operations were carried out in 2018. The presentation will review the year's activity and introduce future improvement points for single pilot operation.

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11:15 – 11:45 **Underwater acoustic image transmission system for manned submersible Shinkai6500**

By: Yukihiro Kida, Japan Agency for Marine-Earth Science and Technology, JAPAN

JAMSTEC is the national deep ocean research organization in Japan operating the 6500m rated SHINKAI 6500 manned submersible. JAMSTEC continues to improve the technology for deep sea research and this presentation will demonstrate the performance of a new underwater acoustic communication system, which was developed for image transmission from a manned submersible Shinkai 6500 to the surface ship. The presentation will discuss the capabilities to capture a still image from a camera on the submersible and send the image data at the data rate of 40kbps.

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11:45 – 12:15 **A new 6500m Variable Ballast System for DSV ALVIN**

By: Francis Elder, Alvin Group, WHOI, USA

Alvin's Variable-Ballast system is one of several systems limiting dive depths to 4500m. New designs are being implemented to complete the conversion of remaining systems for operations to 6500 meters. This presentation will highlight system requirements, design rational, and new components for a 6500 meter Variable Ballast system.

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12:15 – 1:30

LUNCH BREAK

## **DEEP OCEAN SIMULATION TEST FACILITIES**

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1:30 – 2:00

### **PART 1:**

#### **Overview of the Capabilities of the U.S. Navy Experimental Diving Unit (NEDU)**

By: William (Bill) Marr, Navy Experimental Diving Unit, USA

The Navy Experimental Diving Unit, located in Panama City Florida, is a multi-faceted National Asset. Primary facilities include the manned Ocean Simulation Facility (OSF), an Unmanned Test Facility, the Saturation Fly Away Diving System (SATFADS), the Test Pool, and the Fluctuating Altitude Simulation Technology (FAST) System. The capabilities and parameters of the major NEDU assets will be presented.

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2:00 – 2:30

### **PART 2:**

#### **Overview of Deep Ocean Simulation Test Facilities around the World**

By: Jarl Stromer, Triton Submarines, USA

The manned submersible industry has experienced significant growth over the past decade thanks to the increasing acceptance and popularity of privately owned yacht-based submersibles. Common among all new manned submersibles is the requirement to conduct external hydrostatic testing on submersible pressure hulls as well as all pressure resistant equipment and housings installed on the submersible. These tests may be conducted by dropping the un-manned submersible to a depth corresponding with the test pressure, or they can be pressure tested in large chambers specifically designed and built for such a purpose. These large chambers can simulate the pressures and temperatures in the deep ocean in a controlled environment. This paper discusses the procedures and requirements for external hydrostatic testing of submersible hulls and equipment It also presents an overview of deep ocean simulation chambers and test facilities around the world.

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2:30 – 3:00

### **PART 3:**

#### **Overview of Deep Ocean Testing Capabilities in the U.S.**

By: Paul Garza, Southwest Research Institute, USA

Southwest Research Institute (SwRI) in San Antonio, Texas provides testing and engineering services in a variety of fields from deep sea to deep space. The Ocean Simulation Laboratory at SwRI maintains and operates dozens of pressure chambers used to simulate deep ocean environments for submersible vehicle and component validation testing. SwRI has also collaborated with other test labs around the U.S. that provide similar services. Laboratories like these are vital to the future of research and development into subsea technologies. These facilities and their importance to the industry will be presented.

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3:00 – 3:30

COFFEE BREAK

3:30 – 4:30

**ABS Industry Annual Meeting -  
Overview of ABS Underwater Rule Change Proposals for 2019**  
By: Roy Thomas, American Bureau of Shipping, USA

The American Bureau of Shipping (ABS) Rules for Building and Classing Underwater Vehicles, Systems and Hyperbaric Facilities, commonly known as the “Underwater Rules”, are the primary ABS Rules for classification of underwater units. These underwater units include manned submersibles, lock-out submersibles, diving systems, atmospheric diving suits, remotely operated vehicles (ROVs), autonomous underwater vehicles (AUVs), and so forth that are used for commercial, scientific, and government applications. This session commences with an overview of the ABS Underwater Rule change proposals for 2019 and provides the rationale and basis for each proposed Rule change. Thereafter, this session includes a question-answer session and facilitates an open dialogue with the industry on current technical issues that work well or may be problematic. All active designers, fabricators, owners and operators are invited to attend and provide feedback.



Please Join us for the  
***MTS MUV Cocktail Reception***  
HILTON GARDEN INN – 5:50 to 7:30



5:30 – 7:30 JOIN US – Everyone are invited to the HILTON GARDEN INN Courtyard for Cocktails, Refreshments and catching up with the MUV colleagues and friends. All are invited. The Hotel is just across the street from the Convention Center, 1 block up.

**HILTON GARDEN INN COURTYARD - RECEPTION**



## Day 2 - Room 357 - Wednesday, February 6

9:00 – 9:30 **Pressure Hull Penetrators - critical components for undersea mission success**  
By: Charles Westerfield, AMETEK SCP, USA

Pressure Hull Penetrators are critical components for undersea mission success for any manned, unmanned, or fixed infrastructure system. Penetrators maintain pressure boundaries between the inside and the hostile outside environment. Penetrators protect humans as well as sensitive electronics. A failure may cause a mission failure or have life-threatening effects.

9:30 – 10:00 **Submarine Escape and Rescue Recent and Future Developments**  
By: Capt. Robert A. Wolf, US Navy, NAVSEA PMS391, USA

This presentation will serve to update government and industry partners on the status of our capabilities, current acquisitions and procurements, lessons learned from the ARA SAN JUAN incident, highlights from recent Operation Gray Lady and CHILEMAR 2018 exercises and to share perspective on future technology objectives.

10:00 – 10:30 **Manned Submersibles for Submarine Rescue-Fly-away System Optimization**  
By: Gregory Cotten, JFD Ltd, UK

JFD, Ltd., who designs build, maintains and operates globally three generations of manned submersibles for submarine rescue, intends to discuss the many challenges associated with designing and operating a deep diving (600m+) manned submersible which needs to be optimized for fly-away and quick mobilization on a vessel of opportunity.

10:30 – 10:45

COFFEE BREAK

10:45 – 11:15 **Pisces VI ready for sea trials**  
By: Scott Waters, Deep Sea Submarine, USA

This is an update on Pisces VI and speech about getting ready for sea trials and about the Pisces VI capabilities.

11:15 – 11:45 **ABS for Manned Submersibles**  
 By: Jess G. Totten, American Bureau of Shipping, USA

Presentation includes background on ABS and the origins and purpose of class societies. Describes the process of classing a vessel or platform with ABS. Finally, discusses pros and cons of classing manned submersibles as well as alternatives and special considerations.

11:45 – 12:15 **Classing outside the Rules: Non-prescriptive routes to submersible classification**  
 By: Michael Klein, Lloyd's Register North America, Inc., USA

Given the unique nature of submersible designs as well as rapid advancements in material and power technologies, a prescriptive Rules-based approach to classification may not be adequate. By considering the fundamental purpose of classification, this talk outlines alternative routes to classification and clarifies such questions as:

- How does classification reduce risk and cost to submersible owners, operators, and insurers?
- How does Class accept vessel designs that fall outside the scope of the prescriptive Class Rules?
- What are the right questions when considering Class for a new or existing submersible?

This talk will incorporate case studies involving LR-classed manned submersibles as well as similar approaches to classification in other segments of the maritime industry.

12:15 – 1:30 **LUNCH**

### MUV Operations Consensus Standard CATEGORY OUTLINE

No	Operating Category	Current US Coast Guard Designation	APPLICABILITY
1	<b>Tourism Submersibles</b>	USCG Subchapter T Small Passenger Inspected Vessels	Submersibles built for commercial tourism - Carrying Tourists from General Public - Inspected Vessel COI (FLAGSTATE) - Classed Vessels (IACS)
2	<b>Un-Inspected Classed Submersibles</b>	USCG Subchapter C Uninspected Vessels	Commercial, Private & Research MUVs - Classed Vessels (IACS) - 6 or less Participant Allowance - Can Operate commercially
3	<b>Un-Inspected Unclassed Submersibles</b>	USCG Subchapter C Uninspected Vessels	Private & Commercially built MUVs - Unclassed Vessels - No third party documentation - Definition of Commercial Operation
4	<b>Personal Submersibles</b>	Recreational Submersibles	Home built, self-operated personal subs - Unclassed Vessels - Not Valid for commercial operation
5	<b>Submarines</b>	Submarines	Classed Submarines / Work / Passengers - Inspected Vessels COI (FLAGSTATE) - Classed Vessels (IACS)

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## ***MUV WORKSHOP and PANEL DISCUSSION***

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1:30 – 3:00 **MUV Operations Consensus Standard Working Session**

By: Will Kohnen, MTS MUV, Chair

The MUV industry continues its work on the development of an Industry Best Practices based consensus standard for the operation of manned underwater vehicles. This does not address the issues related to design standards but does consider the level of third party review and certification of a specific vessel. This first level work consists of defining the different Categories of MUV operations.

(1:45 - 1:50) **Category 1 – Tourism Submersibles**

By: Roy Thomas, American Bureau Shipping, USA

(1:50 – 1:55) **Category 2 – Uninspected Classed Submersibles**

By: Jarl Stromer, Triton Submarines, USA

(1:55 – 2:00) **Category 3 – Uninspected UN-Classed Submersibles**

By: Gard Clark, Captain, USN (Ret.), USA

(2:00 – 2:05) **Category 4 – Personal Submersibles**

By: Mike Caudle, Tank Doctor, CANADA

(2:05 – 2:10) **Category 5 – Submarines**

By: Kip Peterson, Capt. USMM, Thorsborg LLC, USA

(2:10 – 2:20) **Manned Submersible Regulations in US Waters**

By: James D. Lawrence, US Coast Guard Head Quarters, USA

(2:25 – 3:00) **PANEL DISCUSSION**

Discussion of term definitions, category structures and scope of each definition. Open comment session and industry member input.

3:15 – 3:30

COFFEE BREAK

3:30 – 4:30 **MTS MUV ANNUAL COMMITTEE MEETING**

By: Will Kohnen, Chair, Manned Underwater Vehicles, MTS, USA

ALL MTS MUV Members and Industry delegates are invited to attend, participate and join in the planning for the committee work for 2019.

## Day 3 - Room 357 - Thursday, February 7

8:30 – 9:00 **ICTINEU New High Voltage 300VDC LiPo Battery for Underwater Systems**

By: Carme Parareda, and Pere Fores, ICTINEU, Spain

ICTINEU Submarins, the Barcelona based builders of deep sea manned submersibles, continue the pioneering work of deep ocean Lithium battery modules for operation up to full ocean depth. Ictineu's latest battery is a high voltage pressure-compensated Lithium-polymer battery module producing 296V DC and delivering 9,18 kWh, a further progress in the line-up of ICTINEU's existing 6,000m and 11,500m rated 148 VDC batteries. This new development, the 4<sup>th</sup> generation batteries, is the results of more than 10 years of research, development and engineering for the production and certification of lithium batteries with extensive heritage of operation and supported by proprietary specifications and closely guarded proprietary rights. This new generation is designed taking in account the evolution of the rules from maritime classification societies for lithium batteries in the last years, which have incorporated withstanding new requirements. The unit will undergo ICTINEU Submarins extensive validation and test program which aims to ensure the maximum safety and reliability of the products delivered. The presentation will focus on the new features and design specifications as they apply to larger manned or unmanned underwater vehicles and systems.

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9:00 – 9:30 **Novel ABS Approved Pressure Tolerant Lithium Ion Battery Modules for MUVs**

By: Leon Adams, Southwest Electronic Energy Group, USA

Regarding powering Manned Submersibles, Safety is paramount. Reliability is critical. Efficiency is important. Ease of use is valuable. How do you assure that innovations designed to provide power to manned submersibles address such Safety and Reliability? One such way is to rely on credible Industry Standard testing and certification organizations, such as the American Bureau of Shipping (ABS) to "vet" the innovations.... put them through their paces of spec reviews and tests to get their seal of approval.

ABS has completed a Certification for the SWE SeaSafe II and SeaSafe Direct subsea battery modules for product design assessment applied in 4 different marine and subsea vessel classes, and the ABS Lithium Battery Guide. This rigorous review and testing includes the class and use case covering Manned Submersible Vehicles. With the SeaSafe Battery Modules, this ABS Certification process, tests completed, and successful results will be discussed and highlighted, including a critical new IEC safety test and video of successful results.

It will become clear how Safety and Reliability are additionally validated with these ABS certification and IEC reviews and tests. Efficiency and Ease of Use will also be summarized to show how SeaSafe II and SeaSafe Direct subsea battery modules are technically and operationally changing the playing field of powering manned submersibles.

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9:30 – 10:00 **Innovation and Advances in Propulsion and Control**  
By: Justin Farrelly, Innerspace Corporation, USA

In recent times thruster manufacturers and system designers have been developing new approaches to the implementation of electric propulsion. All aspects - electrical, electronic, mechanical and system software/firmware have come under scrutiny as used on ROV and manned submersibles. The presentation looks at recent system level developments and discusses factors driving design, and the resulting products now entering the market. We consider the influence of new technology and methods used to streamline implementation, maintenance, reliability and safety.

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10:00 – 10:30 **Syntactic foam for Dummies and New Technologies in design**  
By: Will Ricci, Trelleborg Applied Technologies, USA

Buoyancy material is a crucial component of subsea vehicle design. The composite "syntactic" foam material maintains the positive buoyancy at depth for vessel vehicle designs which can't rely entirely on pressure vessels. Although the first use of syntactic foams in subsea buoyancy applications began in the 1950's, the first mention of a syntactic foam in scientific publication was not until 1965 which was for non-subsea applications by the U.S. Air Force. To this day, many frequent operators of syntactic foam bearing vehicles are unfamiliar with the most basic technological drivers of this critical material.

Syntactic foams are a unique type of composite material and as with all composites they have constituent components whose individual characteristics and interplay drive their macroscale material performance. This presentation will delve into those constituent materials and discuss how they impact end material performance and help dictate end-user demanded specifications.

Building from the understanding of the background material science we will discuss the current state of buoyancy foams including types, capabilities, and applications and end with future technology. Drivers of next generation technology include the raw materials for super high strength to weight ratio materials which utilize highly functionalized micro particles, as well as, thermoplastic syntactic components as both structurally integral metal/plastic replacements and lightweight fairings.

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10:30 – 10:45

COFFEE BREAK

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10:45 – 11:15 **Joint Mechanics in Polymer Hulls and Viewports**  
By: Bart Kemper and Krista Kemper, Kemper Engineering Services, LLC, USA

Very large acrylic spheres are used as both a "hull" and a "viewport" in many modern submersibles. The aspect ratio of wall thickness-to-curvature violates the "thin wall pressure vessel" assumption used for metallic hulls. This presentation provides the analytical basis for proposed changes to ASME PVHO-1 and related codes.

11:15 – 11:45 **Hybrid Dome Windows – Are they domed, flat, or both?**

By: Thomas Trudel, Outside Innovation, USA

This paper provides an overview of the current state of “hybrid dome” windows in the deep sea submersible industry. A “hybrid dome” window is a one that has a conical seat, flat low pressure face, and semi-spherical high pressure face. The intended advantage of these windows is that they provide the structural advantages of semi-spherical windows while maintaining flat optics. These windows have become increasingly popular in recent years (Oceangate, Triton, Deepsea Challenger) despite the ambiguity surrounding how to properly design and certify the windows. The primary source of contention is the debate over whether the window design should adhere to ASME guidelines for semi-spherical or conical frustum windows. The design criteria for semi-spherical windows allows for larger internal diameters and is attractive to designers, but early analysis indicates that the strain distributions within the windows have a mix of semi-spherical and flat characteristics. Analysis results are presented and compared to ASME code as well as legacy work by Stachiw. Analytical and industry level discussion follows. Context on the current views of the ASME-PVHO subcommittee on viewports is also provided.

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11:45 – 12:15 **IOT for Underwater Assets and Data Management**

By: Raja D. Singh, IoT Wizards LLC, USA

IoT is a buzz word that is used everywhere, yet few can put their fingers on exactly what it is. Part of the issue is that when it works well, it becomes completely transparent to the user. Sharing data has become easy. Sharing vast amounts of data is harder and doing it large scale through the “Cloud” is the modern challenge. Data safety is at the centre of this technology. The technology is rooted in encryption technology, artificial intelligence, big data computing maintained by very large organizations (such as google) to support a powerful array of services with state-of-the-art security infrastructure. IoT can aggregate the dispersed device data into a single global system and use the IoT data stream for advanced analytics, visualizations, machine learning. It can improve operational efficiency, anticipate problems, and build rich models that better describe and optimize your business. At the core of the technology is the security infrastructure that allows you to securely connect a few or millions of devices to ensure smooth data ingestion under any condition. The presentation will discuss how IoT is a technology that brings device data into your everyday business through a secure, intelligent, and responsive IoT data pipeline.

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12:15 – 1:00

LUNCH

***Become MTS MUV Member***



## 2019 MUV SPEAKER BIOS



**LEON ADAMS**

Southwest Electronic Energy Group  
P.O. Box 31340  
Houston, TX 77231  
Tel: 281-240-4000  
Direct: 281.240.3670  
Email: ladams@swe.com  
www.swe.com

**Leon Adams** is a Vice President at Southwest Electronic Energy. He has 7+ years' experience in Lithium and Lithium Ion battery applications, product definition, and technical customer support and sales. Prior, Leon had 28 years experience at Texas Instruments as a Systems Engineer, and managed applications, marketing, and business in DSP and embedded processing. Leon has authored/presented technical papers and articles on Lithium Ion subsea battery technology and applications, DSP and embedded processing solutions, DSP power management, and software development tools. Leon is a member of MTS, SUT, AADE, and IEEE. Leon has an MBA and a BS in Engineering Physics.

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**LADD BORNE**

Triton Submarines, LLC  
10055 102nd Terrace  
Sebastian, FL 32958  
Tel: (772) 494-5722  
Mobile: (772) 285-8308  
Email: ladd@tritonsubs.com  
www.tritonsubs.com

**Ladd Borne** is a project manager / mechanical engineer for Triton submarines and has 25+ years of manned submersible engineering and ocean industry experience. Formerly he worked as an ocean engineer, project manager and director for Harbor Branch Oceanographic and as president and editor of Ocean News & Technology Magazine. Ladd holds a B.S. in Aerospace Engineering from Embry-Riddle Aeronautical University and is a registered professional engineer in the state of Florida.

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**SUSAN CASEY**

Ocean Author  
17 Malie Place  
Paia, Hawaii 96779 USA  
Tel : 808.280.1417  
Email: susancasey@mac.com  
www. susancasey.com

**Susan Casey** is the author of three *New York Times*' bestselling books: *The Devil's Teeth*, *The Wave*, and *Voices in the Ocean*. Casey is the former editor-in-chief of *O*, *The Oprah Magazine*, and an award-winning journalist whose work has been featured in *The Best American Science and Nature Writing*, *The Best American Sports Writing*, and *The Best American Magazine Writing* anthologies; and has appeared in *Esquire*, *Sports Illustrated*, *Fortune*, *Time*, *Outside*, and *National Geographic*. She is currently working on a book about the deep ocean.

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**MIKE CAUDLE**

Tank Doctor  
Aerotech Dr  
Goffs, NS B2T 1K3, Canada  
Tel: 902 873-3939  
Email: tankdoctor@msn.com

**Mike Caudle** has owned and operated Tank Doctor Aquatic Systems Inc since 1986. Manufacturing live holding systems, specializing in titanium heat exchangers for customers around the world.

He has been Scuba diving for over 40 years and involved with building and operating Submarines for over 30 years.



**GARD CLARK PMP**  
Captain, USN (Ret.)  
7104 Trillium Ct.  
Owens Cross Roads, AL 35763  
Tel: 860-460-6348  
Email: gard.clark@juno.com

**Captain Clark** is a career submariner whose undersea experience includes 31 years in the United States Navy culminating with command of the USS DALLAS (SSN-700), a fast attack nuclear powered submarine specially equipped to carry the Seal Delivery Vehicle (SDV). The SDV is a deployable MUV housed in a Dry Deck Shelter on the deck of the larger submarine and is a "wet submersible" where operators wear scuba gear and are exposed to the ocean environment. While in command, Captain Clark conducted operations with special forces using the SDV during two six-month deployments to the Middle East and Indian Ocean. Following command at sea Captain Clark served as the Major Program Manager for Naval Sea Systems Command (NAVSEA) PMS-399--Special Operations Forces Undersea Mobility Program Office. There he was responsible for sustainment and development of Dry Navy Submersibles as well as Dry Deck Shelters and other submarine Deep Submergence Systems including maintaining Scope of Certification for manned operations. Following retirement from the Navy in 2012, he joined Teledyne Brown Engineering, Inc. where he currently serves as Vice President leading the Energy and Environment Business Unit. Teledyne Brown Engineering is the designer and manufacturer of the US Navy Shallow Water Combat Submersible which is the follow-on vehicle to the SDV. Captain Clark is a member of the Marine Technology Society's Manned Underwater Vehicle Committee.



**GREG COTTEN**  
JFD SERS Head of Capability  
Chief Engineer, and ISM DPA  
Tel. +1 619 450-4412  
Mob. +1 410 533-1683  
Email: G.Cotten@jfdglobal.com

JDF  
Cartside Avenue,  
Inchinnan Business Park,  
Glasgow, PA4 9RW  
United Kingdom  
Tel: +44 (0) 141 812 8700  
Fax: +44 (0) 141 812 4004  
www.jfdglobal.com

**Dr. Greg Cotten** graduated from the United States Naval Academy in 1987 with a B.S. in Systems Engineering. He completed 5 strategic deterrent patrols on USS JAMES MADISON (SSBN-627), ultimately as Strategic Weapons Officer. Transferring to the Naval Reserve in 1993 he completed his M.E. and Ph.D. in Chemical Engineering from the University of Idaho in 2000.



**FRANCIS ELDER**

Woods Hole Oceanographic Institution  
DSV Alvin Group Submersible Engineering and Operations  
266 Woods Hole Road  
Woods Hole, MA 02543-1050 USA  
Tel: (508) 548-1400  
Email: [felder@whoi.edu](mailto:felder@whoi.edu)  
[www.whoi.edu](http://www.whoi.edu)

**Francis Elder** has been working as a mechanical engineer at the Woods Hole Oceanographic Institution since 2009, working on a variety of projects including instruments and deep submergence vehicles. He has been working in the Alvin group since 2012 and has been the Lead Mechanical Engineer since 2016.



**JUSTIN FARRELLY**

Innerspace Corporation  
1138 East Edna Street  
Covina CA 91724  
Tel: (626) 331-0921  
Mobile: +1 832 462 5041  
Email: [jfarrelly@vercet.com](mailto:jfarrelly@vercet.com)  
[www.innerspacethrusters.com](http://www.innerspacethrusters.com)

Technology Research Lead for the research and development company Vercét LLC in the United States, Justin has enjoyed a long career in electronics, mechanical and system design. Raised and educated in New Zealand, Justin has travelled the world working in a variety of technical and management roles, both for Vercét and representing others. Recent years have seen Justin as an active designer in sub-sea sensing and data acquisition systems, and in the development of pressure tolerant electronic control systems. Vercét and Justin have been instrumental in the development of a variety of innovative new technology now actively used by companies in the oil, gas, medical, sub-sea and alternative energy sectors. Living in Dallas since 2004, Justin and wife Catherine spend time trying to keep track of an active daughter, Grace, and when time permits enjoys sailing, a lifelong interest



**PAUL GARZA**  
Southwest Research Institute  
Ocean Simulation Laboratory  
6220 Culebra Rd.  
San Antonio, Texas 78238-5166  
Tel: 210-522-5112  
Fax: 210-522-3485  
Email: paul.garza@swri.org  
www.swri.org

**Paul Garza** is a test engineer and project manager at Southwest Research Institute. He received his B.S. in Aerospace Engineering from Florida Institute of Technology in 2007, and completed his M.S. in Mechanical Engineering from the University of Texas at San Antonio in 2016. Paul joined Southwest Research Institute in 2009 after briefly working for Northrop Grumman Shipbuilding in the Composites Engineering group. At SwRI, he initially worked in the Marine Structures and Engineering group where he provided design and analysis support for numerous projects. One of his first assignments was to provide testing support for the DSV Alvin replacement personnel sphere. Shortly afterward, he moved to the Ocean Simulation Laboratory where he has been managing validation testing of submersible vehicles, oil and gas equipment, and other related components.

---



**BART KEMPER**  
Kemper Engineering Services, LLC  
4520 Jamestown Ave, #3  
Baton Rouge, LA 70808  
Tel: (225) 923-2945  
Email : bkemper@kempereng.com  
www.kempereng.com

**Bart Kemper, P.E.** is the principal engineer of Kemper Engineering Services. He is also a member of the ASME Codes & Standards for PVHOs and Chair of the Viewports Subcommittee as well as part of the Emerging Technologies Task Force for the National Society of Professional Engineers. Krista Kemper is president of Kemper Engineering and a contributing member of PVHO and its various subcommittees. Both have been working in the diving and subsea industry for many years, ranging from 3<sup>rd</sup> party review of systems to engineering support for dive operations to new equipment development.



**YUKIHIRO KIDA**

Japan Agency for Marine-Earth Science and Technology (JAMSTEC)  
2-15 Natsushima-cho  
Yokosuka 237-0061, Japan  
Tel: +81 46 867 9936  
Email: [kiday@jamstec.go.jp](mailto:kiday@jamstec.go.jp)  
[www.jamstec.go.jp](http://www.jamstec.go.jp)

**Yukihiro Kida** received B.E. degree and M.E. degree in civil and earth resource engineering from Kyoto University, Kyoto, Japan in 2011 and 2013, respectively. He is currently working at acoustics and telecommunication Group of Japan Agency for Marine-Earth Science and Technology (JAMSTEC). His research interests include underwater acoustic navigations/communications, underwater acoustic transducers, acoustical simulations, geophysical signal processing, non-linear inversion problems.

---



**MICHAEL KLEIN**

Lloyd's Register North America, Inc.,  
1621 114th Avenue SE, Suite 118,  
Bellevue, Seattle, WA 98004 USA  
Tel: +1 425 440 0323  
Mobile: +1 832 462 5041  
Email: [michael.klein-urena@lr.org](mailto:michael.klein-urena@lr.org)  
[www.lr.org](http://www.lr.org)

**Michael Klein-Ureña** heads marine and offshore business development for western North America at Lloyd's Register and has worked with local submersible builders, diving system manufacturers, and component fabricators in the US and Canada. Prior to his current role, Michael headed business development for SanSailTEC LLC, focusing on projects involving LNG, hydrogen, and battery power technologies. Though not a submariner, Michael quickly came to appreciate the world of submersibles starting with his childhood fascination with the *Titanic*. He holds a degree in naval architecture and marine engineering from Webb Institute.



**WILLIAM KOHNEN**

HYDROSPACE Group Inc.  
9559 Center Avenue, Ste.P  
Rancho Cucamonga, CA 91730 USA  
Tel. +1 (909) 989-7773  
Email: [wkohnen@hydrospacegroup.com](mailto:wkohnen@hydrospacegroup.com)  
[www.hydrospacegroup.com](http://www.hydrospacegroup.com)

**William Kohnen** is President of Hydrospace Group, specializing in submarines, submersibles and other high reliability underwater vehicles, integrated solutions for manned submersibles and human occupied systems for diving, medical and aerospace applications. He has 30 years of engineering experience in aerospace and submersible vehicle design and development which include propulsion systems for manned and unmanned vehicle, pressure vessels for human occupancy, high reliability electric motors and actuators as well as optical lenses and acrylic windows for subsea and hyperbaric systems. With technical expertise in both electrical and mechanical engineering, this enables the development of ever evolving turn key solutions for customers. Mr. Kohnen was CEO and co-founder of Seamagine Hydrospace Corp. that led the design, production and certification of ten commercial, ABS classed submersibles since 1995. Mr. Kohnen is a Marine Technology Society (MTS) fellow and chair of the MTS Manned Underwater Vehicles Committee since 2003. Mr. Kohnen has given many presentations around the world and published multiple articles on State of Technology of Manned Submersible technology. He has over 20 years' experience working with the US Coast Guard and American Bureau of Shipping (ABS) rules as a member of the ABS Special Committee for Underwater Systems and Vehicles. He is also a Standards Committee member of the ASME Pressure Vessel for Human Occupancy Committee and industry technical contributor to DNVGL regarding new rules and regulations for underwater systems.



**JAMES (DAN) LAWRENCE**

Coast Guard Headquarters  
Coast Guard Offshore Engineer CG-OES-2  
Vessel & Facility Operating Stds  
Tel: 202-372-1382  
Email: [james.d.lawrence@uscg.mil](mailto:james.d.lawrence@uscg.mil)  
[www.uscg.mil](http://www.uscg.mil)

**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.



**WILLIAM J. MARR Ph.D**

Supervisory General Engineer (NEDU 04)  
Navy Experimental Diving Unit  
321 Bullfinch Road  
Panama City, Florida 32407  
Work: 850.230.3189  
Email: william.marr@navy.mil

**W.J. Marr, Ph.D., P.E.** completed a career as a U.S. Navy officer with extensive experience as a Navy diver and Explosive Ordnance Disposal Technician. He taught Ocean Engineering at the U.S. Naval Academy for more than a decade and also served as the Associate Chairman of the Naval Architecture, Ocean, and Marine Engineering Department. Following his retirement from USNA as a Permanent Military Professor, he continued his academic contributions as a part-time Lecturer for the Whiting School of Engineering at The Johns Hopkins University. His various civilian commercial pursuits have been focused on the maritime environment, including inspections of coastal and harbor structures for the U.S. Coast Guard, underwater inspections of highway bridges (by NBIS standards), ship engineering support for the Military Sealift Command, and investigation of barge/levee interactions for the U.S. Army Corps of Engineers. He was a certified commercial diver qualified through the Association of Diving Contractors International (ADCI). Dr. Marr earned his doctorate in Mechanical Engineering from the U.S. Naval Postgraduate School in Monterey, California and is a Registered Professional Engineer in California and Maryland. He is currently the Supervisory General Engineer at the Navy Experimental Diving Unit in Panama City, Florida.



**CAPTAIN ROBERT A. WOLF**

SUBMARINE ESCAPE & RESCUE PROGRAM MANAGER (PMS 391)

US NAVY

NAVSEA PMS391, Submarine Escape and Rescue

1333 Isaac Hull Ave., SE

Washington Navy Yard, DC 20376, USA

Tel: (202) 781-2356

Email: robert.a.wolf@navy.mil

**Captain Robert Wolf** of Fort Worth, Texas, graduated from the U.S. Naval Academy in 1995 with a Bachelor of Science degree in Systems Engineering. He also holds a Master of Science in Engineering Management from Catholic University of America and Naval Engineer and Master of Science in Systems Engineering degrees from the Massachusetts Institute of Technology.

Upon commissioning, Wolf completed nuclear power training and submarine school and reported to USS KEY WEST (SSN 722) where he qualified in submarines and served as a division officer in engineering and weapons departments deploying twice to the Western Pacific. Wolf then served as an action officer for the Director, Submarine Warfare Division (OPNAV N87) for submarine escape & rescue and Arctic programs. He transferred into the Engineering Duty Officer (EDO) community and completed his EDO qualifications at Norfolk Naval Shipyard where he was the deputy project superintendent for the USS CHARLOTTE (SSN 766) depot modernization period. Subsequently, Wolf served at Program Executive Officer (PEO) Carriers, as the assistant program manager for testing and technical issues for USS GEORGE H. W. BUSH (CVN 77); at PEO Submarines as the executive assistant to the PEO and as the assistant program manager for Post-Delivery VIRGINIA Class submarines; at Supervisor of Shipbuilding, Conversion & Repair in Newport News, Virginia as the Submarine Project Officer and VIRGINIA Class Submarine Program Manager's Representative where he work on 12 new construction submarines, delivering two as well as completing two major submarine repair availabilities; and at Director, Submarine Warfare (OPNAV N97) as the branch head for VIRGINIA Class new construction and in-service submarine hull, mechanical & electrical maintenance and modernization.

Wolf currently serves as the Program Manager for Submarine Escape and Rescue (PMS 391) where he is responsible for advanced development initiatives, acquisition, test and evaluation, in-service support, international engagement, foreign military sales and certification for all undersea escape, rescue and survivability systems for the US Navy.

Wolf has received various personal and campaign awards, including the Meritorious Service Medal with two gold stars and Navy Commendation Medal with three gold stars.



**CARME PARAREDA**

ICTINEU Submarins SL  
Industria 12, 08980  
St. Feliu de Llobregat, Spain  
Tel: +34 933 094 274  
Email: cparareda@ictineu.net  
www.ictineu.net

**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 (Government agency) 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, and in 2007 ICTINEU Submarins SL where she develops her main professional activity as chief operations manager, sales, certification procedures and DNVGL certified pilot. In parallel from 2007 to 2009 she coordinated the Argo Maris Foundation activities (sea exploration and outreach) and from 2009 to 2016 she was a board member of the Catalan Maritime Cluster. Member of the Marine Technology Society since 2009. 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).

---



**KIP PETERSON**

Thorsborg Institute, LLC  
P.O. Box 2017  
Brunswick, Georgia 31521 USA  
Tel: 1 770 518-0704  
Email: KEP@Thorsborg.com  
www.thorsborginstitute.com

As founder and CEO of *Thorsborg Institute, LLC*, Captain Peterson has conducted business in 99 countries since 1979 directing this global strategic intelligence/research/analytical institution for: government resource options, hydrospace development/research/training and intelligence research for global threat analysis. Captain Peterson is an accomplished: global maritime intelligence professional; degreed marine biologist; sea captain; underwater archeologist; underwater photographer; advanced scuba instructor; research/scientific diver instructor and dive safety officer who has sailed world's oceans on commercial and research vessels for the past 47 years. He is a member of the Marine Technology Society's Manned Underwater Committee, member of American Academy of Underwater Society and serves as an Area Commodore in the Southern Region of the Sea Scouts.

---



**WILL RICCI**  
Business Development Manager  
Trelleborg Applied Technologies  
58 Teed Drive  
Randolph MA 02368  
Tel. +1 774 444 5160  
Email: will.ricci@trelleborg.com  
www. trelleborg.com

**Will** has worked in the field of syntactic foams since his undergraduate work at the NYU- Composite material laboratory. Shortly after joining Trelleborg in 2006 he finished his graduate degree in Materials engineering with his thesis topic centering on advanced functional microparticles.

Will has worked at Trelleborg in engineering, sales, and business development roles and is the company technical expert on hollow glass microspheres which are manufactured in-house, and is the critical material used in deep sea buoyancy, as well as many non-structural aerospace composites. He took a brief break from Trelleborg during which he worked for Gurit Composite Materials on lightweight core and long fiber structural composites for the wind power, marine and automotive industries. Today, Will is the head commercial member of Trelleborg Boston's team and has a unique vantage on the subsea industry due to his role servicing myriad subsea vehicle and equipment builders utilizing deep sea buoyancy materials.



**RAJA SINGH**  
IoT Wizards LLC  
9559 Center Avenue, Ste O  
Rancho Cucamonga, CA 91730 USA  
Tel: 909.896.5520  
Email: rdsingh@iotwizards.com  
www.iotwizards.com

**Raja Singh** is founder and CTO of IoT Wizards LLC, an advanced engineering design house in the world of systems controls, electronics and software. For more than 25 years, Mr. Singh has been responsible for innovative new product development efforts with high growth technology companies that are spanned across the globe. Mr. Singh has lead international teams of engineers in developing Intellectual Property (IP) for solving demanding problems within semiconductor, automotive and process control industries. This experience and expertise established IoT Wizards to support companies with effective and reliable new product development efforts. Mr. Singh is a Senior Member of IEEE and served as chapter co-chairman of IEEE computer society in southern California (Inland Empire) for more than 10 years and has given many presentations on advanced IoT technologies. IoT Wizards is at the forefront of the IoT movement specializing in Cloud IoT technology and provisioning services for IoT installations. Mr Singh is a specialist in new product development methodologies (NPI), Statistical Process control and Six sigma and active in every aspects of Product Life Cycle (PLC) starting from conception to end of life. At the core of the company is the expertise in custom electronic and control hardware using Microcontrollers, FPGAs, CPLDs and Single board computers and Embedded Linux. Mr. Singh has a bachelor's degree in Electronic & communication Engineering from Institution of Engineers, Calcutta, India. Mr. Singh is US citizen, married and lives in Southern California with his two children.



**JARL STROMER**

Triton Submarines, LLC  
10055 102nd Terrace  
Sebastian FL, 32958  
Tel: 772-494-5712  
Mob: 484-942-9680  
Email: jarl@tritonsubs.com  
www.tritonsubs.com

**Jarl Stromer** is Manager of Class and Regulatory Compliance at Triton Submarines where he is responsible for conducting hydrostatic tests on manned submersible pressure hulls and equipment. His duties include the development of test procedures, the evaluation and selection of testing facilities, the execution of the hydrostatic tests, and the evaluation of test results. Mr. Stromer serves on the PVHO Standards Committee and the ABS Special Committee on Underwater Vehicles, Systems, and Hyperbaric Facilities. He graduated from Rutgers University College of Engineering and specializes in pressure vessel technology, codes, and standards. Mr. Stromer has earned numerous professional certifications and accreditations during his 32 years in the submersible and pressure vessel industry, including: National Board Authorized Inspector and AWS Certified Welding Inspector. He’s published several papers and delivered numerous lectures on the subject of manned submersibles for industry, academia, and MENSA.

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**ROY THOMAS**

ABS Americas  
1701 City Plaza Drive  
Spring, Texas 77389  
Tel: 281-877-6384  
Email: rthomas@eagle.org  
www.eagle.org

**Roy Thomas** has worked with the American Bureau of Shipping (ABS) for the past 16 years and serves as a Senior Principal Engineer with ABS Global Engineering. He has formerly served as the Manager of the ABS Corporate Chief Engineer’s Office and Managing Principal of the ABS Underwater Systems and Lifting Appliances Group.

Mr. Thomas is actively involved with various industry committees and currently serves as the Chair of the ASME PVHO - Subcommittee on Diving Systems, as well as the Subcommittee on Submersibles. He also currently serves as the representative of the International Association of Classification Societies (IACS) on the IMO Working Group for Lifting Appliances and Anchor Handling Winches.

Mr. Thomas has extensive experience with the certification of underwater vehicles, systems and hyperbaric facilities for commercial and military applications. He has served as the lead design review engineer at ABS on numerous projects involving underwater vehicles, systems and hyperbaric facilities of every possible form and design. Over the years, he has played an active role in updating the ABS Rules for Underwater Vehicles, Systems and Hyperbaric Facilities and has authored new sections on Underwater Habitats, Diving Systems, Lock-Out Submersibles, Ambient-Pressure Submersibles, Atmospheric Diving Suits, AUVs, ROVs, Lithium Batteries, etc. Mr. Thomas holds a master’s degree in Ocean and Naval Architectural Engineering from Memorial University of Newfoundland, Canada.

---



**JESS TOTTEN**

ABS  
Managing Principal Engineer  
Engineering Services Department (ESD)  
16855 Northchase Drive  
Houston, TX 77060  
Tel: +1-281-877-6075  
Mob: +1-346-262-4141  
Email: jtotten@eagle.org  
www.eagle.org

**Jess G. Totten** is a Managing Principal Engineer with the American Bureau of Shipping. Jess has worked for ABS for 10 years and is a subject matter expert on underwater vehicles and systems. Jess graduated from UT Austin with a BS in Mechanical Engineering in 2004. Before coming to ABS he worked a variety of jobs in Houston, ranging from reverse osmosis to pipeline intervention to pizza delivery. Jess was born in Panama City, Panama, is married, and is the father of two children, ages 6 and zero.



**THOMAS TRUDEL**

Aerospace Engineer  
Outside Innovation  
Half Moon Bay, Honduras  
Tel: 011-504-3359-2887  
Email: outside.innovation@gmail.com

**Thomas Trudel** is the Head of R&D at Outside Innovation, a contract engineering company that focuses on projects related to human exploration of the sea and space. He has previously served as the Head Engineer and Pilot at the Roatán Institute of Deepsea Exploration (RIDE) and has collaborated on a variety of projects with several other manned submersible groups. During his 8 years at RIDE, Thomas was responsible for numerous safety and mission critical improvements to Idabel (RIDE's flagship submersible). In 2017, he designed and built custom scientific equipment used to collect biological samples for the Smithsonian Tropical Research Institute and University of Washington. To date, this streamlined system has enabled the scientists from STRI and UW to capture over 40 fish samples, 7 of which are new species, at a significantly lower cost than competitive systems. Thomas also leads several research efforts at Outside Innovation focused on improving the fundamental performance of deep sea submersibles.



**SCOTT WATERS**

Deep Sea Submarine Pisces VI  
1725 Ottawa Rd  
Salina KS 67401, USA  
Tel: (785) 822-2087  
Email: [swaters@piscesub.com](mailto:swaters@piscesub.com)  
[www.piscesub.com](http://www.piscesub.com)

**Scott Waters** is the president of the deep seas submarine Pisces VI. He has been involved with human occupied submersibles since 2008 and specializes in business and law. He also works in human space flight helping other countries start space programs. Scotts main goal is to make submarines more available and more affordable to the general public.



**CHARLES WESTERFIELD**

AMETEK Subsea Connector Products (SCP)  
Director of Business Development  
52 Airport Road  
Westerly, RI 02891  
Tel: 321-266-6658  
Email: [charles.westerfield@ametek.com](mailto:charles.westerfield@ametek.com)  
[www.ametek-ecp.com/about-us/scp](http://www.ametek-ecp.com/about-us/scp)

**Mr. Westerfield** is the Director of Business Development for the AMETEK Subsea Connector Products (SCP) division.

He is responsible for securing new programs and introducing new products to undersea markets. He has secured new programs-of-record for missions such as mine hunting, counter measures, decoys, and towed arrays.

He served on a Congressional Advisory Committee for the 15th Congressional District and was an appointee to Economic Development Commission of East Central Florida. He currently serves as a Board member for the Bethune Cookman University Industry Advisory Committee for Engineering. He has a engineering degree from Auburn University.



**MASANOBU YANAGITANI**

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

2-15 Natsushima-cho  
Yokosuka City, Kanagawa,  
Japan 237-0061

Tel : +81-46-867-9914

Fax : +81-867-9215

E-mail : yanagitani@jamstec.go.jp

www.jamstec.go.jp

**Mr. Masanobu Yanagitani** is Senior Engineer of Marine Technology and Engineering Center in Japan Agency for Marine-Earth Science and Technology (JAMSTEC). He is currently in charge of underwater vehicle engineering and operations for JAMSTEC's underwater vehicles In Marine technology Dept., and he had joined SHINKAI operations team as a pilot and mechanic, so he has an experience 11 years in a field of a deep-sea research.



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**ABS**  
American Bureau of Shipping  
Roy Thomas, Engineering Manager  
ABS Plaza, 16855 Northchase Drive  
Houston, Texas 77060 USA  
Tel: 1-281-877-5800  
Email: rthomas@eagle.org  
www.eagle.org



**Atlantis Submarines Int'l Inc.**  
John Witney, VP Engineering  
West 6th Avenue  
Vancouver, BC V5Y 1K8 Canada  
jwitney@atlantissubmarines.com  
www.atlantissubmarines.com



**ALS MARINE LTD**

**ALS Marine**  
Spyridon Volonakis,  
Managing Director  
85 Vouliagmenis Ave Glyfada  
Athens, GR 16674, Greece  
Tel: +30 210 960 7077  
Email: svol@alsmarine.gr  
www.alsmarine.gr



**Battelle**  
Tim Rennick, P.E., Manager,  
Maritime Systems  
505 King Avenue  
Columbus, Ohio 43201, USA  
Tel: +1 614 424 5865  
Email: rennickt@battelle.org  
www.battelle.org



**M/V Alucia**  
Mark (Buck) Taylor  
Beta Maritime Ltd, 1 Glendinning Pl  
Westport, Connecticut 06880 USA  
Tel: +1 510 940 3416  
Email: subteam@mvalucia.com  
www.mvalucia.com



**Blanson Ltd.**  
Andy Turner, Managing Director  
Unit B, Coventry Road Narborough  
Leicester LE19 2GG UK  
Tel : +44 (0) 0116 286 7007  
Email: andy.turner@blanson.com  
www.blanson.com



**AMETEK Subsea Connector  
Products (SCP)**  
Charles Westerfield  
Director of Business Development  
52 Airport Road, Westerly, RI 02891  
Tel: 321-266-6658  
charles.westerfield@ametek.com  
www.ametek-ecp.com/about-us/scp



**Blue Marble Exploration LLC**  
Guillermo Sohnlein,  
Co-Founder & CEO  
310 Westbury Lane  
Alpharetta, GA 30005  
Tel: +1 (703) 346 3041  
guillermo@bluemarbleexploration.com  
www.bluemarbleexploration.com



**Aquatica Submarines Int'l Inc.**  
Harvey Flemming, President  
418, 1489 Marine Drive  
West Vancouver, B.C.,  
Canada, V7T 1B8  
Tel: 587 333 6062  
harvey@aquaticasubmarines.com  
www.aquaticasubmarines.com



**Blue Turtle Engineering**  
Lee Frey, President & Chief Engineer  
6430 Floridana Avenue  
Melbourne Beach, FL 32951 USA  
Tel: +1 321 917 1624  
lee@blueturtleengineering.com  
www.blueturtleengineering.com



**Brownies Global Logistics**  
 Robert Carmichael,  
 Director of Global Logistics  
 3005 NW 25<sup>th</sup> Avenue  
 Pompano Beach, FL 33069 USA  
 Tel: +1 954 299 8181  
 Email : robert@globalsubdive.com  
 www.globalsubdive.com



**Bulgarian Academy of Sciences  
 Institute of Oceanology**  
 Iliya Shtirkov, Head of Research  
 Submersible Department  
 PO Box 152 Varna 9000 Bulgaria  
 Tel: +359 52 370 483  
 Email: ilkoshtok@yahoo.com  
 www.io-bas.bg



**Cayman Islands Shipping Registry**  
 John Aune, Deputy Director  
 Global Operations and Services  
 133 Elgin Avenue, P.O. Box 2256  
 Grand Cayman KY1-1107  
 Cayman Islands  
 Tel: +1 345 949 8831  
 Email: john.aune@cishipping.com  
 www.cishipping.com



**China National Deep Sea Center**  
 Feng Liu  
 # 6 Xianxialing Road  
 Qingdao P.R. China  
 Email: liufeng@comra.org  
 www.ndsc.org.cn



**China Ship Scientific Research  
 Center**  
 Ye Cong, Director Engineering  
 222 East Shanshui Road, Binhu  
 District  
 Wuxi, Jiangsu 214082 P.R. China  
 Email: yec@vip.163.com  
 www.cssrc.com.cn



**Deep Sub/Pentarius LLC**  
 Chris Welsh, Sub Owner  
 PO Box 12723  
 Newport Beach, CA 92658, USA  
 Tel: +1 949 278 2012  
 Email: chris@deepsullc.com  
 www.deepsullc.com



**DNV - GL**  
 Harald Pauli, Department for Pressure  
 Vessels & Underwater Technology  
 Brooktorkai 18  
 20457 Hamburg, Germany  
 Tel: +46 40 36149 8925  
 Email: harald.pauli@dnvgl.com  
 www.dnvgl.com



**DOER Marine**  
 Lis Taylor, President  
 1827 Clement Ave.  
 Building 19, Alameda CA 94501 USA  
 Tel: +1 510 530 9388  
 Email: liz@doermarine.com  
 www.doermarine.com



**Evonik Cryo LLC**  
 Britt Nordby, Strategic Markets  
 Manager  
 299 Jefferson Road  
 Parsippany, NJ 07054 USA  
 Tel: +1 973 929 8200  
 Email: britt.nordby@evonik.com  
 www.evonik.com



**EYOS Expeditions Ltd.**  
 Rob McCallum, Founding Partner  
 Kissack Court, 29 Parliament St.  
 Ramsey, Isle of Man, IM8 1AT,  
 Tel: +1 801 390 7025  
 Email: rob@eyos-expeditions.com  
 www.eyos-expeditions.com



**FAU Harbor Branch Oceanographic  
 Institute**  
 5600 US 1 North  
 Fort Pierce, FL 34946 USA  
 Tel: 772 466 9876  
 www.fau.edu/hboi



**FMS Engineering**  
 Bret Faircloth, P.E.  
 2509 Commercial Park Drive  
 Mobile, AL 36606 USA  
 Tel: 251 450 2377  
 Email:  
 bfaircloth@fmsengineering.com  
 www.fmsengineering.com



**General Dynamics Electric Boat**

Dan Gietzen  
75 Eastern Point Road  
Groton, CT 03640 USA  
Tel: 860 433 3000  
Email: dgietzen@gdeb.com  
www.gdeb.com



**Gryphon Media Strategies**

Colleen Hahn, President & CEO  
P.O. Box 1252  
Middleburg, VA 20118 USA  
Tel: 703 851 6944  
Email:  
cmhahn@gryphonmediastrategies.com  
www.gryphonmediastrategies.com



**GOEMAR Helmholtz**

Karen Hissmann,  
Tauchboot-JAGO-Team  
Zentrum fuer Ozeanforschung Kiel  
Wischhofstr. 1-3, Geb.8D/134  
24148 Kiel, Germany  
Tel: +46 431 600 2253  
Email : khissmann@geomar.de  
www.geomar.de



**GSE Trieste**

Giunio Santi  
Piazza Bergamo, 18  
24040 Ciserano BG, Italy  
Tel : +39 035 882629  
Email: info@gsetrieste.it  
www.gsetrieste.it



**Glenair Connectors**

Lutz Mueller, Product Manager  
1211 Air Way  
Glendale, CA 91201-2497 USA  
Tel: 818 247 6000  
Email: lmueller@glenair.com  
www.glenair.com



**Hawaii Undersea Research Laboratory (HURL)**

Terry Kerby, Chief Pilot, Director of  
Submarine Operations  
1000 Pope Road  
Marine Science Building (MSB) 303  
Honolulu, HI 96822 USA  
Tel : 808 956 6335  
Email : tkerby@hawaii.edu  
www.soest.hawaii.edu



**Global Dynamix**

Peter J. Fitzgerald, CEO  
7 Sycamore Way, Unit 1  
Branford, CT 06405 USA  
Tel : 860 434 5997  
Email : pfitzgerarl@gdynx.com  
www.gdynx.com



**Hawx Open Ocean**

Graham Hawkes  
1122 Brickyard Cove Road #202  
Point Richmond, CA 94801 USA  
Tel: 415 497 4193  
Email: graham@hawxopenocean.com  
www.hawxopenocean.com



**Global Ocean Design**

Kevin Hardy  
7955 Silverton Ave. Ste. 1208  
San Diego, CA 92126 USA  
Tel: 858 560 1799  
Email: kevin@globaloceanandesign.com  
www.globaloceanandesign.com



**Hickey Underwater Vehicle Consulting LLC**

Patrick Hickey  
1061 Cobb Hill Road  
Waterbury, Vermont 05676 USA  
Tel: +1 802 272 7530  
Email: jpatrickhickey@gmail.com



**Heinz Fritz Kunststoffverarbeitung**  
 Heinz Fritz  
 Gewerbestraße 11  
 DE-89542 Herbrechtingen, Germany  
 Tel: + 49 7324 988 0  
 Email: info@heinz-fritz.de  
 www.heinz-fritz.de



**Innerspace Corporation**  
 Omar Rafeh, Engineering Manager  
 1138 East Edna Place  
 Covina, CA 91724 USA  
 Tel: (626) 331 0921  
 Email:  
 omar@innerspacethrusters.com  
 www.innerspacethrusters.com



**Hellenic Center for Marine Research**  
 Dimitris Sakellariou, Research Director  
 Geologist, Coordinator of Underwater Operations Department  
 19013 Anavyssos, Greece  
 Email: sakell@ath.hcmr.gr  
 www.hcmr.gr



**International Maritime Inc.**  
 Don Walsh  
 Myrtle Point, Oregon USA  
 Tel: +1 (541) 572 2313  
 Email: imiwalsh@mac.com



**Hoffman Marine**  
 Pete Hoffman  
 2585 SE 12th Street  
 Pompano Beach, FL 33062 USA  
 Tel: (954) 943 2417  
 Email: pete@subdive.com  
 www.subdive.com



**International Ocean Science & Technology Industry Association**  
 Richard Lawson, Chief Executive Officer  
 712 H Street NE, Suite 1061  
 Washington, DC 20002  
 Tel : 202 389 9009  
 Email : rich.lawson@iostia.org  
 www.iostia.com



**HydroSpace Group Inc.**  
 William Kohnen, President/CEO  
 9559 Center Avenue, Ste.P  
 Rancho Cucamonga, CA 91730 USA  
 Tel : +1 909 989 7773  
 Email :  
 wkohnen@hydrospacegroup.com  
 www.hydrospacegroup.com



**iXBlue**  
 Oliver Cervantes, Vice President  
 34, rue de la Croix de Fer  
 78100 Saint Germain in Laye France  
 Tel : +33 1 30 08 8888  
 Email: oliver.cervantes@ixblue.com  
 www.ixblue.com



**ICTINEU Submarins SL**  
 Carme Parareda, COO  
 Industria 12, 08980  
 St. Feliu de Llobregat, Spain  
 Tel: + 34 933 094 274  
 Email: cparareda@ictineu.net  
 www.ictineu.net



**James Fisher Defence**  
 Ben Sharples, Technical Director  
 Cartside Avenue  
 Inchinnan Business Park  
 PA4 9RW, United Kingdom  
 Tel: +44 (0) 141 812 8700  
 Email: b.sharples@jfddefence.com  
 www.jfddefence.com



**IFREMER. Underwater Systems**  
 Viorel Ciausiu, Director of Nautile Operations  
 Zone Portuaire de Brégaillon  
 83507 La Seyne sur Mer, France  
 Tel : +33 (0) 49430 4966  
 Email: viorel.ciausiu@ifremer.fr  
 www.ifremer.fr



**James Fisher Defence Sweden**  
 Carl Hagman, Technical Director  
 Rindö Västra  
 185 41 Vaxholm, Sweden  
 Tel: +46 8 541 318 80  
 Email: carl.hagman@theseal.se  
 www.theseal.se



**JAMSTEC**

Masanobu Yanagitani, Senior Engineer for Marine Technology  
2-15 Natsushima-cho  
Yokosuka 237-0076, Japan  
Tel : +81-46-867-9914  
E-mail : yanagitani@jamstec.go.jp  
www.jamstec.go.jp



**Kemper Engineering Services**

Bart Kemper, Principal Engineer  
4520 Jamestown Ave, #3  
Baton Rouge, LA 70808 USA  
Tel : (225) 923 2945  
Email: bkemper@kempereng.com  
www.kempereng.com



**Lloyd's Register North America**

Michael Klein  
1621 114th Avenue SE, Suite 118,  
Bellevue, WA 98004 USA  
Email: michael.klein-urena@lr.org  
M: +1 832 462 5041  
O: +1 425 440 0323



**Lockheed Martin**

Dan Mcleod, Senior Program Manager  
Riviera Beach, FL 33404 USA  
Tel: +1 (561) 494 2064  
Email: dan.mcleod@lmco.com  
www.lockheedmartin.com



**Marine Pollution Control Corp.**

David Usher, Chairman  
8631 W Jefferson Ave.  
Detroit, MI 48209  
Tel : (313) 849 2333  
dusher@marinepollutioncontrol.com  
www.marinepollutioncontrol.com



**MECCO Inc.**

Mike Chapman, Chair MTS Cables & Connectors Cmtee.  
14244 Man Street NE  
Duvall WA 98019 USA  
Tel: (425) 788 4522  
Email: mike@meccoinc.com  
www.meccoinc.com



**Mobimar**

Pansiontie 56, 20240  
Turku, Finland  
Tel: +358 20 7698500  
www.mobimar.com



**Monterey Bay Aquarium Research Institute (MBARI)**

Megan Davis, PhD  
7700 Sandholdt Road, Moss Landing,  
CA 95039-9644 USA  
Tel: (831) 775-1700  
Email: mdavi105@fau.edu  
www.mbari.org



**Moog Space & Defense Group**

Plant 26, 400 Jamison Road  
Elma, NY 14059  
Tel: 1 (716) 652-2000  
Email: info.usa@moog.com  
www.moog.com



**MSUBS**

Brett Phaneuf, Managing Director  
42 Sina Park Road, Estover  
Plymouth UK PL6 7FH  
Tel: +44 1752 696069  
Email: info@msubs.com  
www.msubs.com



**NAVSEA**

Roger Schaffer, Deputy Director,  
Submarine Safety and Quality  
Naval Surface Warfare Center  
1333 Isaac Hull Ave, SE  
Washington Navy Yard, DC 20376  
Tel : +1 (202) 781 5425  
Email : roger.schaffer@navy.mil  
www.navsea.navy.mil



**NAVSEA. PMS399**

Special Operations Forces (SOF)  
Undersea Mobility Program  
Management  
Tommy Beals  
Tel : +1 (202) 781 0518  
Email : tommy.beals@navy.mil  
www.navsea.navy.mil



**National Institute of Ocean Technology**

Dr. M.A. Atmanand, Project Director  
 Velachery – Tambaram Road, Pallikaranai  
 Chennai 600, 100 India  
 Tel: +91 44 6678 3303  
 Email: atma@niot.res.in  
 www.niot.res.in



**Nekton**

Oliver Steeds, Mission Director  
 Tel: +44 7984 677509  
 Email: oliver@nektionmission.org  
 www.nektionmission.org



**Pacific Subsea Saipan, Inc.**

John F. (Jack) McClure, Vice President/COO  
 Lowerbase, Mangrove Place, Seaplane  
 Ramp, PPP-672, PO Box 10000, Saipan, MP  
 96950 USA  
 Tel: 670 322 7734  
 Email: jack@saipansubmarine.com  
 www.saipansubmarine.com



**NOAA Office of Ocean Exploration and Research**

Karen Kohanowich, Acting Director of the  
 National Undersea Research Program.  
 1315 East West Highway, SSMC III,  
 10<sup>th</sup> Floor, Silver Spring, Maryland 20910  
 USA  
 Tel: (301) 734 1010  
 Email: karen.kohanowich@noaa.gov  
 www.explore.noaa.gov



**Patriot Engineering Co.**

Fred Jensen, Co-Founder  
 16937 Munn Road  
 Chagrin Falls, Ohio 44023  
 Tel: 1 440 543 3100  
 Email: jensen@patriotengineeringco.com  
 www.patriotengineeringco.com



**Nuytco Research Ltd.**

Phil Nuytten  
 216 East Esplanade,  
 North Vancouver, B.C. V7L 1A3, Canada  
 Tel: +1 (604) 980 6262  
 Email: nrl@nuytco.com  
 www.nuytco.com



**Phoenix International Holdings**

Wally Jones, SRDRS Maintenance  
 Manager / PRM Pilot  
 P.O. Box 181110  
 Coronado, CA 92178 USA  
 Tel: (619) 545 6901  
 Email:  
 wjones@phnx-international.com  
 www.phnx-international.com



**Oceaneering Advanced Technologies**

David Reid, Deputy Program Manager of  
 Submarine Rescue Systems  
 7001 Dorsey Road  
 Hanover, Maryland 21076 USA  
 Tel : (443) 459 3700  
 Email : dreid@oceaneering.com  
 www.oceaneering.com



**PSUBS**

Jon Wallace, Co-Founder  
 P.O. Box 53 Weare, NH .3281 USA  
 Tel: (603) 232 9157  
 Email: jon@psubs.org  
 www.psubs.org



**OceanGate Inc.**

Stockton Rush, CEO  
 Craftsman Way, Suite 112  
 Everett, WA 98201 USA  
 Tel: +1 (425) 939 8409  
 Email: stockton@oceangate.com  
 www.oceangate.com



彩虹鱼 - RAINBOWFISH

**Rainbowfish Ocean Technologies**

Xin Wu, CEO  
 Rm. 1901-1905, No. 777 Hong Qiao Road,  
 Shanghai 200031, PR CHINA  
 Tel: 86 021 64 73 5205  
 Email: xin.wu@rainbowfish11000.com  
 www.rainbowfish11000.com



**Rayotek Scientific Inc.**

Bill Raggio, CTO & President  
11499 Sorrento Valley Rd  
San Diego, CA 92121 USA  
Tel: +1 858 558 3671  
Email: bill@rayotek.com  
www.rayotek.com



**Shanghai Ocean University**

Dr. Weicheng Cui, Dean, Hadal  
Science and Technology Research  
Center  
No.999, Hucheng Huan Road  
Shanghai, 201306 P.R. China  
Email: wccui@shou.edu.cn  
www.shou.edu.cn/eng



**Rebikoff-Niggeler Foundation**

Joachim and Kirsten Jakobsen  
Rocha Vermelha, Apt. 249  
Praia do Almoxarife  
P – 9900-451 Horta, Portugal  
Tel: +351 91 985 8539  
Email: info@rebikoff.org  
www.rebikoff.org



**Sidus Solutions**

Leonard Pool, Managing Director  
7352 Trade Street  
San Diego, CA 92121 USA  
Tel: 1 619 275 5533  
Email: l.pool@sidus-solutions.com  
www.sidus-solutions.com



**Remote Ocean Systems**

5618 Copley Drive,  
San Diego, CA 92111 USA  
Tel: +1 (858) 565 8500  
Email: sales@rosys.com  
www.rosys.com



**SIRIUS MICROTECH LLC**

Raja Singh  
9559 Center Avenue, Ste O.  
Rancho Cucamonga, CA 91730 USA  
Tel: 909.896.5520  
Email: rdsingh@siriusmicrotech.com  
www.siriusmicrotech.com



**RINA - USA**

Bruce Garabaghi  
13450 W Sunrise Blvd #350  
Fort Lauderdale, FL 33323 USA  
Email : fortlauderdale.office@rina.org  
www.rina.org



**Southwest Electronic Energy Group**

Leon Adams  
P.O. Box 31340  
Houston, TX 77231  
Tel: 281.240.4000  
Email: ladams@swe.com  
www.swe.com



**Russian Academy of Science, P.P.  
Shirshov institute of Oceanology**

Anatoly Sagalevich, Head of Deep  
Manned Sub Laboratory  
Nakhimovsky prospect 36  
Moscow 117997, Russia  
Tel : +7 499 124 7994  
Email : sagalev1@yandex.ru  
www.ocean.ru/eng



**Southwest Research Institute**

Joe Crouch, Program Director  
6220 Culebra Rd.  
San Antonio, TX 78238 USA  
Tel: +1 210 522 4295  
Email: joseph.crouch@swri.org  
www.swri.org



**SEAmagine Hydrospace Corp**

Charles Kohnen, President  
2133 Porterfield Way, Unit A  
Upland, CA 91786  
Tel: +1 909 626 6262  
charles.kohnen@seamagine.com  
www.seamagine.com



**Stanley Submarines**

Karl Stanley  
Half Moon Bay, Honduras  
Tel: 011 504 3359 2887  
Email: karl@stanleysubmarines.com  
www.stanleysubmarines.com



**State Marine Technical University,  
St. Petersburg**  
Kryll V. Rozhdestvensky,  
International Science & Education  
3, Lotsmanskaya,  
Saint Petersburg, 190008 Russia  
Tel: +7 812 714 2923  
Email: kvrxmas@yahoo.com  
www.smtu.ru



**Teledyne Brown Engineering**  
Earl Presson, Director  
300 Sparkman Drive NW  
Huntsville, AL 35805 USA  
Tel : 256 726 1000  
Email : earl.presson@tbe.com  
www.tbe.com



**Sub Aviator Systems**  
Jay Wade  
336 36<sup>th</sup> Street, Suite #379  
Bellingham, WA 98225 USA  
Tel: +1 888 809 7948  
Email: info@subaviators.com  
www.subaviators.com



**Trelleborg Applied Technologies**  
Will Ricci, Business Development  
Manager  
58 Teed Drive  
Randolph MA 02368  
Tel. +1 774 444 5160  
Email : will.ricci@trelleobrg.com



**Sub Mare Technologies**  
Fredrik Gerhardsson  
Sweden  
Tel: +46 491 760 217  
Email: cjf@submaretechnologies.com  
www.submaretechnologies.com



**Triton Submarines**  
Patrick Lahey, President  
9015 17<sup>th</sup> Place  
Vero Beach, Florida 32966 USA  
Tel: +1 772 770 1995  
Email: patrick@tritonsubs.com  
www.tritonsubs.com



**Submergence Group**  
Brett Phaneuf, President  
4 Water Street  
Chester, CT 06412 USA  
Tel: +860 526-4911  
brett@submergencegroup.com  
www.submergencegroup.com



**U – Boat Worx B.V.**  
Erik Hasselman  
Sales & Marketing Manager  
Oosterhoutseweg 77  
4816 KC Breda, The Netherlands  
Tel: +31 (0) 76 571 3096  
Email: e.hasselman@uboatworx.com  
www. uboatworx.com



**Tank Doctor Aquatic Systems**  
Mike Caudle, President  
209 Aerotech Drive, Unit #8  
B2T 1J4 Canada.  
Tel : (902) 873 3939  
Email : tankdoctor@msn.com



**Navy Experimental Diving Unit**  
William J. Marr, PhD  
321 Bullfinch Road  
Panama City, Florida 32407  
Tel: 850.230.3189  
Email: william.marr@navy.mil



**Thorsborg Institute, LLC**  
Captain Kip Peterson (USMM) CEO  
P.O. Box 2017  
Brunswick, Georgia 31521 USA  
Tel : 770 518 0704  
Email : KEP@thorsborg.com  
www.thorsborg.com



**Coast Guard Headquarters**  
James (Dan) Lawrence, Coast Guard  
Offshore Engineer CG-OES-2  
Vessel & Facility Operating Stds  
Tel: 202-372-1382



**Undersea Hunter Group**

Shmulik Blum  
#SJO 314  
P.O. Box 025331  
Miami, FL 33102-5331 USA  
shmulikbl@underseahunter.com  
www.underseahunter.com



**Vulcan Inc.**

Robert Kraft, Director Subsea  
Operations  
505 Fifth Ave S., Suite 900  
Seattle, WA 98104  
Tel: (206) 342 2000  
Email: robk@vulcan.com  
www.vulcan.com



**Woods Hole Oceanographic  
Institution**

Bruce Strickrott, Manager and Senior  
Submersible Pilot, DSV Alvin  
266 Woods Hole Road,  
Woods Hole, MA 02543-1050 USA  
Tel: 508 289 2252  
Email: strickrott@whoi.edu  
www.whoi.edu



**XPrize**

Jyotika Virmani  
Senior Director in Prize Operations  
800 Corporate Pointe, Suite 350  
Culver City, CA 90230 USA  
Tel: +1 424 228 1945  
Email: jyotika.virmani@xprize.org  
www.xprize.org



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5:30 – 7:30 JOIN US – Everyone are invited to the HILTON GARDEN INN Courtyard for Cocktails, Refreshments and catching up with the MUV colleagues and friends. All are invited. The Hotel is just across the street from the Convention Center, 1 block up.

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# **MARINE TECHNOLOGY SOCIETY**

## **MANNED UNDERWATER VEHICLES COMMITTEE**

### **Chair**

William Kohnen  
Hydrospace Group Inc  
Tel: (951) 323-5377  
wkohnen@hydrospacegroup.com

### **Treasurer**

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

### **Secretary**

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

Committee Web Site: [www.mtsmuv.org](http://www.mtsmuv.org)

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