

AT THE HEART  
OF THE MISSION

**NDIA**

1919



2019

UPDATED 9.13.19



# 2019 **UNDERSEA WARFARE TECHNOLOGY** FALL CONFERENCE

Preserving Undersea Superiority –  
A System of Systems Approach

September 16 – 18 | Groton, CT | [NDIA.org/USWFall](https://ndia.org/USWFall)

# REMUS UNMANNED UNDERWATER VEHICLES



*Uncommon Reliability in a Common Platform*

[www.HYDROID.com/NewGenPlatform](http://www.HYDROID.com/NewGenPlatform)

## NEW GENERATION REMUS PLATFORM

What's 'Under the Hood'

Proven technology is the backbone of Hydroid's REMUS line of Unmanned Underwater Vehicles (UUVs). It has shaped the company's reputation for unmatched reliability and performance. The legacy technology, originally developed at Woods Hole Oceanographic Institution in 1991, is the key building block for the New Generation REMUS platform that comes standard in Hydroid UUVs today. REMUS has been used by the U.S. Navy for thousands of missions since its combat debut in 2003.

### THE REMUS PLATFORM: WHAT MAKES IT DIFFERENT?

The New Generation REMUS Platform technology is the same 'under the hood' for every REMUS vehicle. It is designed for modularity and manufacturability and is scalable across all Hydroid UUVs, regardless

of size. Redesigned to meet customer demands for a Modular, Open Systems Architecture (MOSA), it paves the way for consistent performance and results in a streamlined user experience.

It is the internal architecture and cutting-edge processing capability of the new platform that ensures a trusted control system for accurate vehicle navigation and behavior. The electronics provide a generational leap in on-board processing capability while consuming less power and providing greater endurance.

Through UUV commonality and interoperability, the open systems architecture provides maximum hardware capability and software flexibility to allow for the rapid implementation of enhanced autonomy and third-party software applications. This enables a modular software architecture that reduces

REMUS mission risk and lowers the development and life-cycle costs for software.

The New Generation REMUS Platform offers reconfigurable hull sections for third-party or government payload integration with standard interfaces. This allows for common integrated logistics support across all REMUS vehicles. It equates to a lower total cost of ownership and frees up customer resources for the development of new UUV capabilities.

### WHAT'S INSIDE? THE BREAKDOWN

- Advanced Core Electronics
- Flexible Navigation Suite
- High Capacity Energy Pack and Energy Options
- Modular, Open System Architecture (MOSA)



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### WHO WE ARE

The National Defense Industrial Association is the trusted leader in defense and national security associations. As a 501(c)(3) corporate and individual membership association, NDIA engages thoughtful and innovative leaders to exchange ideas, information, and capabilities that lead to the development of the best policies, practices, products, and technologies to ensure the safety and security of our nation. NDIA's membership embodies the full spectrum of corporate, government, academic, and individual stakeholders who form a vigorous, responsive, and collaborative community in support of defense and national security. NDIA is proud to celebrate 100 years in support of our warfighters and national security. The technology used by today's modern warfighter was unimaginable 100 years ago. In 1919, BG Benedict Crowell's vision of a collaborative team working at the intersection of science, industry, government and defense began what was to become the National Defense Industrial Association. For the past century, NDIA and its predecessor organizations have been at the heart of the mission by dedicating their time, expertise, and energy to ensuring our warfighters have the best training, equipment, and support. For more information, visit [NDIA.org](http://NDIA.org)

## SCHEDULE AT A GLANCE

### TUESDAY, SEPTEMBER 17

#### Registration

Dealey Center Auditorium  
7:00 am – 5:00 pm

#### Networking Continental Breakfast

Outside Plaza  
7:00 – 8:00 am

#### Plenary Sessions

Dealey Center Auditorium  
8:00 am – 5:00 pm

#### Networking Lunch

Base Gymnasium  
11:55 am – 1:10 pm

#### \*Networking Reception

North Lake  
6:00 – 7:00 pm

#### \*Networking Dinner

North Lake  
7:00 – 9:30 pm

\*A ticket is required to attend these events and will be distributed during on-site registration.

### WEDNESDAY, SEPTEMBER 18

#### Registration

Dealey Center Auditorium  
7:00 am – 5:00 pm

#### Networking Continental Breakfast

Dealey Center Courtyard  
7:00 – 8:00 am

#### Technical Sessions

Various Base Locations  
8:00 am – 5:00 pm

#### Networking Lunch

Base Gymnasium  
12:00 – 1:00 pm



I welcome all of our attendees to the National Defense Industrial Association's 2019 Undersea Warfare Technology Fall Conference. The NDIA Undersea Warfare Division's members are proud to bring you this annual conference.

This conference concentrates on the Navy's core mission of countering submarine and mine threats to the free and open flow of sea borne commerce, and to the conduct of power projection from the sea. All Navy platforms and elements of the Navy force structure are involved in undersea warfare: submarines, surface combatants, fixed and rotary wing aircraft, surveillance units, and the Navy's command and control infrastructure. The Undersea Warfare Division has five active Technical Committees through which the Division focuses on the Navy's mission areas: Sensor Systems, Mine Warfare Systems, Undersea Vehicles (including weapons), Aviation, C4I and Combat Systems, and Warfighter Performance. The technical sessions on the second day of the conference highlight recent events, advancements, and challenges in each of these mission areas.

The mission of the Undersea Warfare Division is to focus on critical undersea warfare areas related to the development, production, testing, and logistic support of underwater combat systems. Such systems include mines, torpedoes, manned and unmanned underwater vehicles, countermeasures, sensors, weapon control, and handling equipment along with the integration of systems aboard aircrafts, ships, and submarines.

The NDIA Undersea Warfare Division fosters the exchange of technical information between government and industry in addition to the expansion of research and development in areas related to undersea warfare. To this end, the Division furthers communication by providing a variety of ways for government and industry to work together to solve problems, identify affordable solutions, and meet specific requirements. The Division also supports both government and industry by providing advice on undersea warfare policies and acquisition planning.

Your feedback is highly encouraged to ensure that we continue to meet your needs.

Sincerely,

**CAPT Robert Dunn, USN (Ret)**  
Chairman, Undersea Warfare Technology Fall Conference, NDIA  
Government Relations Manager, General Dynamics Electric Boat



UNDERSEA WARFARE

WHO WE ARE

NDIA's Undersea Warfare Division fosters both the exchange between government and industry of technical information and the expansion of research and development in areas related to undersea warfare. To this end, the Division furthers communication by providing a variety of ways for government and industry to work together to solve problems, identify affordable solutions, and meet specific requirements. The Division also supports both government and industry by providing advice on undersea warfare policies and acquisition planning.

**LEADERSHIP AND COMMITTEES**

**Mike Cortese**  
Division Chair

**Rick Breckenridge**  
Division Vice Chair

**Gregg Bauer**  
Division Deputy Chair



LOCATION
EVENT WEBSITE
EVENT THEME
ATTIRE
SURVEY AND PARTICIPANT LIST
EVENT CONTACT
PLANNING COMMITTEE
SPEAKER GIFTS
HARASSMENT STATEMENT

U.S. Naval Submarine Base New London  
1 Crystal Lake Road  
Groton, CT 06340

NDIA.org/USWFall

Preserving Undersea Superiority – A System of Systems

**Industry:** Business Casual  
**Civilian Speakers:** Coat & Tie  
**Active Duty Military:** Khakis  
**Military Speakers:** Khakis

You will receive via email a survey and list of participants (name and organization) after the conference. Please complete the survey to help make our event even more successful in the future.

**Meredith Mangas**  
Associate Director, Meetings  
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**Tatiana Jackson**  
Program Manager, Divisions  
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tjackson@NDIA.org

**Rob Dunn**  
Chair – Fall Conference

**Paul Rosbolt**  
Session Chair – C4I

**Jon Tobias**  
Session Chair – Mine Warfare

**Mike Janik**  
Session Chair – Undersea  
Sensors

**Tom Ruzic**  
Session Chair – Undersea  
Vehicles

**Dr. Robert Zarnich**  
Session Chair – Combat  
Systems

**John Linderman**  
Session Chair – Warfighter  
Performance

**Glen Sharpe**  
Session Chair – Aviation  
USW

In lieu of speaker gifts, a donation is being made to the Fisher House Foundation.

NDIA is committed to providing a professional environment free from physical, psychological and verbal harassment. NDIA will not tolerate harassment of any kind, including but not limited to harassment based on ethnicity, religion, disability, physical appearance, gender, or sexual orientation. This policy applies to all participants and attendees at NDIA conferences, meetings and events. Harassment includes offensive gestures and verbal comments, deliberate intimidation, stalking, following, inappropriate photography and recording, sustained disruption of talks or other events, inappropriate physical contact, and unwelcome attention. Participants requested to cease harassing behavior are expected to comply immediately, and failure will serve as grounds for revoking access to the NDIA event.



**Aviation USW**  
**Glen Sharpe**  
Lockheed Martin Corporation

The Aviation session focuses on the capability, integration and synergies that the airborne Undersea community brings to the

fight. Because of the wide range of “aviation platforms,” from wide-body fixed wing to rotary winged, as well as the gamut of unmanned systems, the committee is interested in articulating the contributions and potential of these weapons systems. Desired technical subjects cover the broad areas of signal processing, human factors, training, undersea capable weapons, sensors, man-machine interface, littoral and large area search as well as the networking required to make all of this happen. The presentations cover a range, including theoretical discussions by academic institutions and laboratories, reports on experimental systems and systems being developed for Fleet introduction, and discussions of Navy programs of record.



**C4I & Combat Systems**  
**Paul Rosbolt**  
Systems Planning and Analysis, Inc.

**Dr. Robert Zarnich**  
Metron, Inc.

The C4I & Combat Systems

Technical session focuses on Communications, Information Exchange, Data Fusion and Command and Control enablers for the ASW Kill Chain F2T2EA (Find, Fix, Track, Target, Engage and Assess). Committee presentations are given by academia, government and industry and cover a broad range of topics from theoretical discussions to updates on technology, programs of record and test results. A special focus for this year’s conference will be Information Assurance/Cyber-Security as it relates to Undersea Warfare.



**Mine Warfare**  
**Jon Tobias**  
ITA International, LLC

The Mine Warfare (MIW) session provides the opportunity for industry, government, and academia to exchange

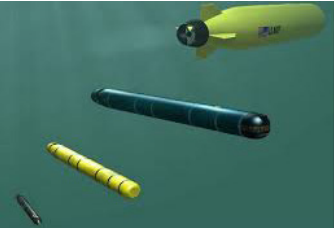
information and express their views in addressing technical, programmatic and operational issues and activities in the MIW community. The Committee addresses threats, programs, operations, CONOPS, and future technologies across the MIW spectrum of mine hunting, mine sweeping, neutralization, command and control, mining and other areas of interest.



**Undersea Sensors**  
**Mike Janik**  
Raytheon Company

The focus of the Undersea Sensors session is to provide guidance to the U.S. Navy about the application of cutting edge

technology. Abstracts submitted to this section should relate to the following: underwater acoustic transduction and acoustic sensor arrays, electro-optic sensors, magnetic sensors, electrostatic sensors, chemical sensors, gravity sensors, signal processing, test and evaluation, operational use/sea test results, and theoretical studies. This list is not exhaustive but representative of the disciplines and associated sciences.



**Undersea Vehicles**  
**Tom Ruzic**  
Huntington Ingalls Industries

The Undersea Vehicles session focuses on both large and small hull undersea vehicles (both manned and unmanned) and

unmanned surface vehicles. Technical subjects cover the broad areas of weapons, unmanned vehicles, defensive systems and hull, mechanical and electrical systems. The technical presentations range from theoretical discussions by academic institutions and laboratories, reports on experimental systems and systems being developed for Fleet introduction, to discussions of Navy programs of record.



**Warfighter Performance**  
**John Linderman**  
The Johns Hopkins University/ Applied Physics Lab

This special session on Warfighter Performance is intended to address evolving operational needs and solutions in the

area of USW Warfighter Performance which employ a combination of components such as technology, HSI, Serious Games, Virtual Worlds, and other emerging concepts. Presentations in this session will address approaches that effectively combine cross discipline techniques and methodologies to provide real capability to the Warfighter across all USW Warfare Domains/Enterprises (i.e., Submarine, Surface, Air, and MIW Enterprises).

**Human Systems Integration (HSI)** – Improving data visualization techniques and enhancing intuitive decision making; improving the reliability of critical information Operator Capability

**Training** – Establishing linkages between theory, experiments, and training system design; integrating M&S to increase realism as well as cost efficiency of onboard submarine training capability

**Health and Wellness** – Reducing or countering the negative effects of fatigue, stress, illness, etc.; improving on-board environment with respect to atmosphere, nutrition, exercise, noise exposure, etc.

MONDAY, SEPTEMBER 16

3:00 – 6:30 pm	<b>REGISTRATION</b> MYSTIC MARRIOTT	Sponsored by
5:00 – 6:00 pm	<b>WELCOME NETWORKING RECEPTION</b> MYSTIC MARRIOTT	Sponsored by

TUESDAY, SEPTEMBER 17

7:00 am – 5:00 pm	<b>REGISTRATION</b> DEALEY CENTER AUDITORIUM	Sponsored by
7:00 – 8:00 am	<b>NETWORKING CONTINENTAL BREAKFAST</b> OUTSIDE PLAZA	Sponsored by
8:00 – 8:15 am	<b>CALL TO ORDER &amp; WELCOME</b> DEALEY CENTER AUDITORIUM  <b>Mike Cortese</b> Chair, Undersea Warfare Division, NDIA  <b>NDIA OPENING REMARKS</b> <b>MG James Boozer, USA (Ret)</b> Executive Vice President, NDIA  <b>INTRODUCTION OF SPEAKERS</b> <b>Rob Dunn</b> Chair, Undersea Warfare Technology Fall Conference, NDIA	
8:15 – 8:45 am	<b>ADM James Caldwell, Jr., USN</b> Director, Naval Nuclear Propulsion Program	
8:45 – 9:15 am	<b>VADM Charles “Chas” Richard, USN</b> Commander, Submarine Forces Commander, Submarine Force Atlantic Commander, Allied Submarine Command	
9:15 – 9:45 am	<b>RDML Leonard “Butch” Dollaga, USN</b> Commander, Undersea Warfighting Development Center	
9:45 – 10:10 am	<b>NETWORKING BREAK</b> OUTSIDE PLAZA	



10:10 – 10:40 am	<b>Andrew Richardson</b> Deputy Commander, Office of Naval Intelligence
10:40 – 11:10 am	<b>RDML Michael Bernacchi, USN</b> Commander, Submarine Group TEN
11:10 – 11:40 am	<b>RDML David Goggins, USN</b> Program Executive Officer for Submarines, NAVSEA
11:40 – 11:55 am	<b>AWARDS CEREMONY</b> DEALEY CENTER AUDITORIUM  <b>Pierre Corriveau</b> Chair, Awards, Undersea Warfare Division, NDIA
11:55 am – 1:10 pm	<b>NETWORKING LUNCH</b> BASE GYMNASIUM
1:10 pm	<b>INTRODUCTION OF SPEAKERS</b> DEALEY CENTER AUDITORIUM  <b>Rob Dunn</b> Chair, Undersea Warfare Technology Fall Conference, NDIA
1:10 – 1:40 pm	<b>RADM David Hahn, USN</b> Chief of Naval Research and Director of Innovation, Technology Requirements and Test & Evaluation (OPNAV N94)
1:40 – 2:10 pm	<b>Dr. William Burnett</b> Deputy Commander and Technical Director, Commander Naval Meteorology and Oceanography Command/Task Group
2:10 – 2:40 pm	<b>CAPT Daniel Papp, USN</b> Program Manager, Air Anti-Submarine Warfare Systems Program (PMA-264)
2:40 – 3:00 pm	<b>NETWORKING BREAK</b> OUTSIDE PLAZA
3:00 – 3:30 pm	<b>Donald McCormack</b> Executive Director, Naval Surface and Undersea Warfare Centers
3:30 – 4:00 pm	<b>CAPT Peter Small, USN</b> Program Manager, Unmanned Maritime Systems (PMS-406)

4:00 – 4:30 pm	<b>CAPT Lincoln Reifsteck, USN</b> Commander, Submarine Development Squadron FIVE	
4:30 – 5:00 pm	<b>RADM Thomas Ishee, USN</b> Director, Undersea Warfare Division Office of the Chief of Naval Operations, N97	
5:00 pm	<b>CLOSING REMARKS</b> <b>Mike Cortese</b> Chair, Undersea Warfare Division, NDIA	
5:05 pm	<b>ADJOURN</b>	
6:00 – 7:00 pm	<b>NETWORKING RECEPTION (TICKET REQUIRED)</b> NORTH LAKE	Sponsored by <b>SILVUS</b> TECHNOLOGIES
7:00 – 9:30 pm	<b>NETWORKING DINNER (TICKET REQUIRED)</b> NORTH LAKE	Sponsored by <b>SILVUS</b> TECHNOLOGIES

WEDNESDAY, SEPTEMBER 18

7:00 am – 5:00 pm	<b>REGISTRATION</b> DEALEY CENTER AUDITORIUM	Sponsored by <b>Peraton™</b>
7:00 – 8:00 am	<b>NETWORKING CONTINENTAL BREAKFAST</b> OUTSIDE PLAZA	
8:00 am – 5:00 pm	<b>TECHNICAL SESSIONS</b> VARIOUS BASE LOCATIONS	
5:00 pm	<b>CONFERENCE ADJOURNS</b>	

NDIA has a policy of strict compliance with federal and state antitrust laws. The antitrust laws prohibit competitors from engaging in actions that could result in an unreasonable restraint of trade. Consequently, NDIA members must avoid discussing certain topics when they are together at formal association membership, board, committee, and other meetings and in informal contacts with other industry members: prices, fees, rates, profit margins, or other terms or conditions of sale (including allowances, credit terms, and warranties); allocation of markets or customers or division of territories; or refusals to deal with or boycotts of suppliers, customers or other third parties, or topics that may lead participants not to deal with a particular supplier, customer or third party.

TECHNICAL SESSIONS

WEDNESDAY, SEPTEMBER 18



	C4I Paul Rosbolt, Session Chair	Combat Systems Dr. Robert Zarnich, Session Chair	Mine Warfare Jon Tobias, Session Chair	Aviation USW Glen Sharpe, Session Chair	Undersea Sensors Mike Janik, Session Chair Joe Cuschieri, Session Co-Chair		Undersea Vehicles Tom Ruzic, Session Chair Chuck Fralick, Session Co-Chair
	Building 83, Room 317	Building 83, Room 318	Building 83, Room 319	Building 83, Room 327	Dealey Center Auditorium	Dealey Classroom	Bledsoe Hall
8:00 am	22575 Theater ASW Collaboration: Undersea Warfare Decision Support System (USW-DSS) Status and Plans for Implementing a Theater ASW Capability <b>Robert Schmidt</b> NAVSEA PEO IWS5E	22691 USW Futures Study <b>William Bundy</b> U.S. Naval War College		22711 Air ASW Systems (PMA-264) <b>CAPT Daniel Papp, USN</b> Air Anti-Submarine Warfare Systems Program (PMA-264)	22593 IWS5 Sensors Update <b>Peter Scala</b> PEO IWS5A	22621 Design, Construction, and Testing of Underwater Pentamode Metamaterials <b>Colby Cushing</b> Applied Research Laboratories at the University of Texas at Austin	22608 OPNAV N97's Undersea Constellation Warfare Area Strategy: Subsea and Seabed Warfare (SSW) <b>Daniel Stock</b> U.S. Navy OPNAV N97
8:30 am	22690 The Evolving Undersea Communications <b>CAPT Michael Boone, USN</b> PEO C4I/PMW 770	22678 Using Graphics Processing Units to Speed Up Sound Propagation Processing <b>Rachel Dendiu</b> Booz Allen Hamilton	22709 PMS 406 MCM Technical Portfolio and Investment Areas <b>George Saroch</b> Unmanned Maritime Systems Program Office (PEO USC, PMS 406)			22588 Exploiting ROV/AUV Underwater Imagery Using Real-Time Video Processing <b>Jack Wade</b> Zmicro, Inc.	22697 Undersea Weapons Programs and Plans <b>CAPT Steve Harrison, USN</b> PMS 404 (Undersea Weapons)
9:00 am		22573 IWS 5.0 Update <b>Lee Agin</b> PEO IWS 5.0	22664 NSWC Panama City Division NISE Program Supporting MIW <b>Dr. Kerry Commander</b> Naval Surface Warfare Center – Panama City Division	22590 Air ASW Integration for Theater USW: MPRF Collaborative Efforts with USW-DSS <b>Dr. Chidambar Ganesh</b> Naval Undersea Warfare Center Division Newport	22600 ANTX Demonstration of Autonomous Detection, Localization and Tracking of Submarines <b>David MacCulloch</b> L3Harris Technologies	22597 Lidar for USW Applications <b>Dr. Layne Churchill</b> Georgia Tech Research Institute	22458 Advanced Naval Technology Exercise (ANTX) – Prepare for Battle: Undersea Security 2019 (US-19) <b>Dr. Peter Hardro</b> Naval Undersea Warfare Center Division Newport
9:30 am	22659 Standardizing Undersea Communications: Thoughts and Ways Ahead <b>Dr. Ballard Blair</b> The MITRE Corporation	22630 IWS5 SQQ-89 Advanced Development Update <b>Stephen Lee</b> NAVSEA	22596 Multi-Sensor Automation Architecture for Autonomous Undersea Weapons Systems <b>Don Pace</b> Venator Solutions, LLC	22614 An App-based Approach to Summarizing MIL-STD-889 <b>Steven Policastro</b> U.S. Naval Research Laboratory	ONI-5 Potential Adversary Submarine Acoustic Signatures <b>ONI</b>	22592 Periodic Continuous Active Sidescan Sonar <b>Neil Judell</b> Optimal Systems Laboratory, Inc.	22681 UxS Cross-Domain Command, Control, & Communications (CDC3) Development & Experimentation Review <b>Scott Sideleau</b> Naval Undersea Warfare Center Division Newport
10 am	NETWORKING BREAK						
10:30 am	ONI-7 Emerging and Disruptive Technology with USW Applications <b>ONI</b>	22705 PMS425 and SWFTS Program Update <b>CAPT Gregory Zettler, USN</b> NAVSEA, PEO SUB	22710 Modular Undersea Effectors (MUSE) Program Update <b>John Dudinsky</b> Naval Surface Warfare Center – Panama City Division	22692 CASE FI: Measuring and Achieving High Fidelity in Simulation, An Important Component of Naval Systems-of-Systems to Attain Superior Training and Combat Readiness <b>Ben Boyle</b> Advanced Acoustic Concepts	22708 Incorporating Ocean Variability and Uncertainty into Metrics for Sonar Tactical Decision Aids <b>David Pistacchio</b> Naval Undersea Warfare Center Division Newport	22595 The Small Aperture Velocity Sensor (SAVS) – A Quantum Leap Forward in Undersea Platform Motion Sensing <b>Paul Wanis</b> Teledyne RD Instruments	22633 Hunter Program Update <b>Gregory Sutton</b> Defense Advanced Research Projects Agency



	<b>C4I</b> Paul Rosbolt, Session Chair	<b>Combat Systems</b> Dr. Robert Zarnich Session Chair	<b>Mine Warfare</b> Jon Tobias, Session Chair	<b>Aviation USW</b> Glen Sharpe, Session Chair	<b>Undersea Sensors</b> Mike Janik, Session Chair Joe Cuschieri, Session Co-Chair	<b>Undersea Vehicles</b> Chuck Fralick, Session Co-Chair	<b>Undersea Vehicles</b> Tom Ruzic, Session Chair
	Building 83, Room 317	Building 83, Room 318	Building 83, Room 319	Building 83, Room 327	Dealey Center Auditorium	Dealey Classroom	Bledsoe Hall
11:00 am	<b>22606</b> Use of a Data Shuttle as a Communications Circuit for Unmanned Undersea Vehicle (UUV) Data Exfiltration <b>William Craig</b> Naval Undersea Warfare Center Division Newport	<b>22705</b> PMS425 and SWFTS Program Update <b>CAPT Gregory Zettler, USN</b> NAVSEA, PEO SUB	<b>22623</b> Near-Surface Maritime Architecture for Modular UnderSea Effector (MUSE) <b>Andy Coon</b> Systems & Technology Research	<b>22605</b> Low-Cost Advanced Processor <b>Jon Dionne</b> RDA, Inc.	<b>ONI-4</b> Potential Adversary Sonar Developments <b>ONI</b>	<b>22683</b> Overview of the Holistic Approach to Submarine Li-ion Embarkation and Introduction to New Initiatives <b>Dr. Joseph Fontaine</b> Naval Undersea Warfare Center Division Newport	<b>22635</b> A New Generation of Propulsion and Control Effectors for Submarines <b>Todd Sedler</b> Huntington Ingalls Industries
11:30 am	<b>22617</b> Cross-Domain Mission Planning and Unmanned Vehicle Command and Control (C2) <b>Mark Casolara</b> General Dynamics Mission Systems <b>Jackson Lyons</b> General Dynamics Mission Systems	<b>22628</b> Future State for the SWFTS Enterprise: Go Faster, Safely <b>Christopher DeAngelis</b> Naval Undersea Warfare Center Division Newport	<b>22613</b> Mine Warfare and Unmanned Related Research at the Naval Postgraduate School <b>RDML Richard Williams III, USN (Ret)</b> Naval Postgraduate School	<b>ONI-2</b> Potential Adversary Submarine Construction #2 <b>ONI</b>	<b>22695</b> Development of a Deep Depth Capable, Low Frequency, Broadband Source – Progress Status <b>Jason Osborn</b> BAE Systems		<b>22673</b> GhostSwimmer: System of Systems Advancement by Combining Next Generation Sensing Modalities and Non-Conventional UUVs <b>David Shane</b> Boston Engineering
12 pm	<div> <div>NETWORKING LUNCH</div> <div>NETWORKING LUNCH</div> </div>						
	<b>Warfighter Performance</b> John Linderman, Session Chair	<b>Combat Systems</b> Dr. Robert Zarnich Session Chair	<b>Mine Warfare</b> Jon Tobias, Session Chair	<b>Aviation USW</b> Glen Sharpe, Session Chair	<b>Undersea Sensors</b> Mike Janik, Session Chair Joe Cuschieri, Session Co-Chair	<b>Undersea Vehicles</b> Chuck Fralick, Session Co-Chair	<b>Undersea Vehicles</b> Tom Ruzic, Session Chair
	Building 83, Room 317	Building 83, Room 318	Building 83, Room 319	Building 83, Room 327	Dealey Center Auditorium	Dealey Classroom	Bledsoe Hall
1:00 pm	<b>22604</b> Ensuring Optimal Submariner Readiness by Identifying Attributes Critical to Submariner Success <b>Dr. Dominica Hernandez</b> Leidos, Inc. <b>Dr. Andrea Bizarro</b> Leidos, Inc.	<b>22668</b> vTwin <b>Edgardo Ramos</b> Naval Undersea Warfare Center Division Newport	<b>22670</b> Operational Concepts Supporting Navy Advances in Mine Countermeasures <b>Angela Thayer</b> Raytheon Company	<b>ONI-6</b> Potential Adversary Submarine Operations #1 <b>ONI</b>	<b>22612</b> Development of Leveraged Low Frequency Underwater Transducers <b>Adam Blanchard</b> Image Acoustics, Inc.	<b>22632</b> In-Water Fuel Cell Power System Development <b>Robert Sievers</b> Teledyne Energy Systems, Inc.	<b>22569</b> Undersea Vehicle Design for Submarine Host Platforms <b>Jack Chapman</b> General Dynamics Electric Boat
1:30 pm	<b>22607</b> Future Tools for Tracking Performance Changes Due to Fatigue in Submarine Environments <b>Dr. Jeffrey Bolkhovsky</b> Naval Submarine Medical Research Laboratory	<b>22671</b> Software Defined Combat Systems <b>Paul Czetwertynski</b> Cisco Systems, Inc. <b>Kelly Jones</b> Cisco Systems, Inc.	<b>22572</b> Hidden Sources of Underwater Electromagnetic Signatures <b>Dr. John Holmes</b> Naval Surface Warfare Center – Carderock Division	<b>22626</b> DICASS System Performance Results <b>Jonathan Stone</b> RDA, Inc.	<b>22682</b> On-Going Efforts in Acoustic Transduction at USSI <b>Dr. James McConnell</b> Ultra Electronics – USSI	<b>22627</b> Aluminum-Seawater Power Module: Safe, Extended Duration Power for Fixed Installations and Vehicles <b>Donald Aubrecht</b> L3Harris Open Water Power	<b>22610</b> Autonomized Riptide UUVs <b>Ronald Carvalho, Jr.</b> BAE Systems FAST Labs
2:00 pm	<b>22579</b> The Human Part of the Human-Submarine System: A Research Update from the Naval Submarine Medical Research Laboratory <b>Dr. Benton Lawson</b> Naval Submarine Medical Research Laboratory	<b>22672</b> The Virtual Undersea Battlespace <b>Michael Pelczarski</b> Naval Undersea Warfare Center Division Newport	<b>22706</b> Advances in Unmanned Underwater and Surface Vehicles <b>Matthew Clements</b> Peraton	<b>ONI-9</b> Potential Adversary Offensive ASW <b>ONI</b>	<b>22640</b> High Power, Low Frequency Textured PMN Based Projector <b>Stephen Dynan</b> QorTek, Inc.	<b>22616</b> Understanding Dielectrics: Impacts and Understanding of Novel Paradigm Supercapacitors <b>LT Alexander Roman, USN</b> Naval Postgraduate School	<b>22622</b> “Beehive” Flexible Payloads on Small UUVs with Swarming Behavior <b>Joel Parry</b> The Charles Stark Draper Laboratory, Inc.
2:30 pm	<b>22598</b> Resiliency, Readiness, and Innovation During the Dip <b>LCDR Noah McBurnett, USN</b> U.S. Naval War College	<b>22602</b> Undersea Superiority for Offensive Anti-Surface Warfare (OASuW) – A System of Systems Approach <b>Christian Sprinkle</b> Raytheon Company	<b>22696</b> Optimizing Area Coverage Rate with Side Scan Sonars <b>Dr. Gordon Clark</b> General Dynamics Mission Systems	<b>ONI-10</b> Threat Support to Acquisition <b>ONI</b>	<b>22680</b> Current State of Textured Piezoelectrics at L3Harris <b>Dr. Lindsay Fuoco</b> L3Harris Technologies		<b>22675</b> Evolution of Fiber Optic Micro-Cable Design to Support Advanced Undersea Payloads <b>Donna Kocak</b> L3Harris Technologies

	Warfighter Performance John Linderman, Session Chair	Combat Systems Dr. Robert Zarnich, Session Chair	Mine Warfare Jon Tobias, Session Chair	Aviation USW Glen Sharpe, Session Chair	Undersea Sensors Mike Janik, Session Chair Joe Cuschieri, Session Co-Chair	Undersea Vehicles Tom Ruzic, Session Chair	Undersea Vehicles Tom Ruzic, Session Chair
	Dealey Classroom	Building 83, Room 318	Building 83, Room 319	Building 83, Room 327	Dealey Center Auditorium	Building 83, Room 317	Bledsoe Hall
3 pm	NETWORKING BREAK				NETWORKING BREAK		
3:30 pm	22694 CASE FI: Measuring and Achieving High Fidelity in Simulation, an Important Component of Naval Systems-of-Systems to Attain Superior Training and Combat Readiness <b>Ben Boyle</b> Advanced Acoustic Concepts	22584 Optimal Life of Need Buy Policies for Strategic DMSMS Management <b>James Starling</b> University of Washington	ONI-3 Threats to Industry <b>ONI</b>		22500 Potential Problems and Some Solutions for Navigation in GPS/GPS Degraded/ GPS Denied Situations <b>John Hamilton</b> Naval Surface Warfare Center - Crane Division <b>Mark Chapman</b> Collins Aerospace		22603 Own the Land and Sea Domain: Surveillance, Mapping and Operations from the Sea, Across the Surf Zone and Onto Craft Landing Zone Using Amphibious Crawlers <b>Thomas Matozel</b> Control Instruments, Inc. (C2i)
4:00 pm	22601 Improve Warfighter Performance via AR <b>Maj Gen Brent Baker, USAF (Ret)</b> PTC <b>Sean Wade</b> PTC	22578 Balancing Performance, Scheduling, and Cost for Rapid Prototyping, Experimentation, and Demonstration Programs Using Modeling and Simulation <b>Ron Vancourt</b> Systecon North America	ONI-8 Shifting to Intelligence Support as a Service <b>ONI</b>		22594 Estimation of Clock Errors in Underwater Acoustic Instruments <b>Dr. Ilya Udovydchenkov</b> The MITRE Corporation		22611 Platform Health for Robust Autonomous Systems <b>Eric Homan</b> Pennsylvania State University Applied Research Laboratory
4:30 pm	22599 Over Water Surveillance and Scoring (OWSS) Emerging Technologies: Swarm <b>Josue DeJesus</b> 96 Test Wing <b>Brooke Ezell</b> 96 Test Wing						ONI-1 Potential Adversary Submarine Construction #1 <b>ONI</b>
5 pm	CONFERENCE ADJOURNS				CONFERENCE ADJOURNS		

# BUS SCHEDULE

Due to heightened security measures, it is in your best interest to take the shuttle buses provided. The use of POV is strongly discouraged and may result in entry delays and the risk of not being allowed access.

TUESDAY, SEPTEMBER 17

6:30 – 9:00 am

Buses will shuttle (as filled) from the hotels (Mystic Marriott, Hilton Garden Inn, and Hampton Inn) to the Dealey Center Auditorium.

10:00 am – 4:00 pm

Bus departs the Dealey Center Auditorium for the Hotels (Mystic Marriott, Hilton Garden Inn, and Hampton Inn) every hour.

Bus departs Dealey Center Auditorium at:  
10 am | 11 am | 12 pm | 1 pm | 2 pm | 3 pm | 4 pm

4:45 – 5:45 pm

Buses will shuttle in a loop from the Dealey Center Auditorium to the hotels (Mystic Marriott, Hilton Garden Inn, and Hampton Inn).

5:45 – 7:00 pm

Buses will shuttle in a loop from the hotels (Mystic Marriott, Hilton Garden Inn, and Hampton Inn) to the Clambake.

8:00 – 9:30 pm

Buses will shuttle from the Clambake to the hotels (Mystic Marriott, Hilton Garden Inn, and Hampton Inn). Drop-offs only.

WEDNESDAY, SEPTEMBER 18

6:30 – 9:00 am

Buses will shuttle from the hotels (Mystic Marriott, Hilton Garden Inn, and Hampton Inn) to the Dealey Center Auditorium.

10:00 am – 4:00 pm

Bus departs the Dealey Center Auditorium for the hotels (Mystic Marriott, Hilton Garden Inn, and Hampton Inn) every hour.

Bus departs Dealey Center Auditorium at:  
10 am | 11 am | 12 pm | 1 pm | 2 pm | 3 pm | 4 pm

5:00 – 6:30 pm

Buses will shuttle from the Dealey Center Auditorium to the hotels (Mystic Marriott, Hilton Garden Inn, and Hampton Inn). Drop-offs only.



AVIATION USW

AIR ASW INTEGRATION FOR THEATER USW: MPRF COLLABORATIVE EFFORTS WITH USW-DSS

Ganesh, C. • Burkley, F. • Huang, D.  
22590  
A key component of USW DSS B3 Fleet Capability Release 1 (FCR1) will be integration of Air ASW capabilities provided by the Maritime Patrol and Reconnaissance Force (MPRF) for the Theater. In collaboration with the MPRF operational and acquisition community, the USW-DSS team has developed a 3-phase approach for providing a holistic solution to P-8A Poseidon aircraft (P8) integration with the TUSW Operations Center (TUSWOC). This briefing will summarize the approach, present recent results, and discuss the way-ahead.

Low-Cost Advanced Processor

Dionne, J.  
22605  
LCAP is RDA's Low-Cost Advanced Processor, a roll-on / roll-off Air Anti-Submarine Warfare Acoustic Testbed.

An App-based Approach to Summarizing MIL-STD-889

PolICASTRO, S. • Anderson, R. • Hangarter, C.  
22614  
Discussion on the approach taken to develop a desktop app that provides

a shortcut to accessing a lot of the important information contained in MIL-STD-889.

DICASS System Performance Results

Stone, J. • Buratti, R. • Russo, D.  
22626  
Research showing improvements to the signal excess for DICASS detection. Data collected in Atlantic Ocean.

CASE FI: Measuring and Achieving High Fidelity in Simulation, an Important Component of Naval Systems-of-Systems to Attain Superior Training and Combat Readiness

Boyle, B. • Lyons, R. • Root, C. • Tufts, S.  
22692  
Providing the U.S. Navy platforms with a "Nearly Realistic" acoustic training capability for the first time. Fidelity, a subjective indicator, is difficult to measure. The CASE FI program has defined a process to measure fidelity and created software that challenges an operator to distinguish between real world and simulated data at the tactical displays.

Air ASW Systems (PMA-264)

Papp, D.  
22711

C4I

Theater ASW Collaboration: Undersea Warfare Decision Support System (USW-DSS) Status and Plans for Implementing a Theater ASW Capability

Schmidt, R.  
22575  
USW-DSS is the Navy's Anti-Submarine Warfare Command and Control (ASW C2) Program of Record (POR) system developed by Program Executive Office, Integrated Warfare Systems (PEO-IWS5) under the sponsorship of OPNAV N2/N6.

Use of a Data Shuttle as a Communications Circuit for Unmanned Undersea Vehicle (UUV) Data Exfiltration

Craig, W.  
22606  
This presentation provides a means for assigning a "data rate" to the use of a data shuttle and outlines the potential military utility of using a data shuttle for data exfiltration in support of UUV missions. A notional search mission is used as a baseline for estimating the conditions for which a data shuttle would be useful, and general equations are identified for estimating potential impacts on mission timeline.

Cross-Domain Mission Planning and Unmanned Vehicle Command and Control (C2)

Casolar, M. • Lyons, J.  
22617

General Dynamics Mission Systems is building upon its 2018 Advanced Naval Technology Exercise (ANTX) capabilities to demonstrate a Cross-Domain Mission Planning and Unmanned Vehicle (UxV) Command and Control (C2) architecture. The architecture supports Artificial Intelligence (AI) enhanced Anti-Submarine Warfare (ASW) and Seabed Warfare planning, in-situ assessment and execution of maritime operations, connecting assets from the sea floor to the surface, and provides Virtual Reality 3D viewing of all activity.

Standardizing Undersea Communications: Thoughts and Ways Ahead

Blair, B.  
22659  
Undersea communications are vital for future development of undersea technology. This talk presents several ideas to ensure that undersea communications continues to advance to keep pace with future Navy requirements.

The Evolving Undersea Communications

Starr, B. • Stang, A.  
22690  
The Undersea Communication and Integration Program office works to acquire and integrate advanced capabilities to revolutionize digital and information warfare. This presentation discusses current afloat (outboard & inboard) programs and future connectivity concepts designed to maintain a competitive advantage in the undersea maritime domain.

COMBAT SYSTEMS

IWS 5.0 Update

Agin, L.  
22573  
High level summary of latest developments in IWS 5.0 programs.

Balancing Performance, Scheduling, and Cost for Rapid Prototyping, Experimentation, and Demonstration Programs Using Modeling and Simulation

Vancourt, R. • Woulfe, J.  
22578  
Given the rapid technological advances realized in the defense industry, asymmetric threats present new challenges to the US Navy. DE, a rapid prototyping, experimentation and demonstration (RPED) initiative seeks to develop and deliver advanced laser capabilities to the fleet to mitigate the newly discovered capability gaps.

Optimal Life of Need Buy Policies for Strategic DMSMS Management

Starling, J. • Choe, Y. • Mastrangelo, C.  
22584  
Diminishing Manufacturing Sources and Material Shortages (DMSMS) issues can cause excessive costs in the procurement and sustainment lifecycles of military platforms if not addressed. This research compares two methods to

calculate strategic DMSMS management strategies that minimize lifecycle using multiple technology refresh policies over the lifetime of a platform utilizing life of need buy options.

Undersea Superiority for Offensive Anti-Surface Warfare (OASuW) – A System of Systems Approach

Sprinkle, C. • Chen, M. • Wu, H.  
22602  
We propose applying a system of systems approach that would expand our Undersea Superiority for Offensive Anti-Surface Warfare (OASuW) and, importantly, enable our Submarine Force to engage adversaries from sanctuary. Our concept effectively employs Human-Machine Teaming with sensors and communication systems organic to the Undersea Forces, as well as those that are on scene from other domains, if available.

Future State for the SWFTS Enterprise: Go Faster, Safely

DeAngelis, C. • Moniz, D.  
22628  
In concert with our mandate to "Go Faster, Safely" in order to preserve undersea superiority, this brief presents the tenets and design goals, along with the technical and business objectives driving the system of systems future state for the SWFTS Enterprise.

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**IWS5 SQQ-89 Advanced Development Update**

**Lee, S. • Leanna, A. • Miller, M. • Valdez, T.**  
22630

Mr. Lee will provide an update on Advanced Capability Build (ACB) efforts for the SQQ-89A(V)15 Surface ASW Combat System.

**vTwin**

**Ramos, E. • Moniz, D. • Roman, W. • Sideleau, S.**  
22668

vTwin - Combat System Virtualization in a 4U space.

**Software Defined Combat Systems**

**Czetwertynski, P. • Jones, K. • Beel, J.**  
22671

This presentation will discuss how COTS software defined networking and cloud capabilities can be used to deliver software defined combat systems and flexible mission add-on sleeves that support adaptive force packages. Additionally, this presentation will address how these systems greatly enhance cyber security and resilience of Navy platforms.

**The Virtual Undersea Battlespace**

**Pelczarski, M.**  
22672

**MINE WARFARE**

**Hidden Sources of Underwater Electromagnetic Signatures**

**Holmes, J.**  
22572

Conventional sources of submarine & surface ship underwater electromagnetic (UEM) signatures in the ultra-low and extremely low frequency bands have been studied for many years and are well characterized. This presentation will discuss lesser known UEM sources and their signatures that have been previously obscured.

**Multi-Sensor Automation Architecture for Autonomous Undersea Weapons Systems**

**Pace, D. • Brouillard, R. • Cook, R. • Eldredge, W. • Sternlicht, D.**  
22596

Advanced mining systems may require adaptable, autonomous sensor and field level processing. An architecture for an autonomous multi-sensor field is presented, with initial results showing achievable fusion performance over the field. Fusion performance is then used to assess field level design trades on sensor configurations, performance, and communications bandwidth.

**Mine Warfare and Unmanned related research at the Naval Postgraduate School**

**Williams, R.**  
22613  
This presentation will discuss Mine Warfare and Unmanned related research at the Naval Postgraduate School (NPS). A review of NPS programs that can provide support for Mine Warfare related research will also be discussed.

The Virtual Undersea Battlespace is an LVC M&S-enabled collaborative environment to serve a variety of roles and stakeholders and facilitate the development of future warfighting system-of systems constructs.

**Using Graphics Processing Units to Speed Up Sound Propagation Processing**

**Dendiu, R. • Byrnes, I.**  
22678

SUBPAC has funded research in FY19 to determine whether offloading certain computations in the Common Acoustic Simulation (CASS) sound propagation model could speed performance. An affirmative finding shows that GPU’s hold promise for the future of tactical decision aids tied to the submarine control systems.

**USW Futures Study**

**Bundy, W. • Choinski, T. • Kona, C. • Moyer, S.**  
22691

In late 2016, a study was commenced to assess USW futures. The intent was to initially assess mid-term capability development. That vision of the future was extended to 2050 where driving forces and trends will shape the future.

**PMS425 and SWFTS Program Update**

**Zettler, G.**  
22705

**Near-Surface Maritime Architecture for Modular UnderSea Effector (MUSE)**

**Coon, A. • Hall, R.**  
22623

STR is conducting R&D into how best to leverage a distributed acoustic sensing network for detecting, fusing, and tracking ships. We are collecting data and developing processing to shape the design and architecture.

**NSWC Panama City Division NISE Program Supporting MIW Commander, K.**

22664  
This brief will provide an overview of accomplishments in FY19 and FY20 plans specific to mine warfare using Naval Innovative Science and Engineering (NISE) funding at NSWC PC and from other Naval Research and Development Establishment (NR&DE) partners.

**Operational Concepts Supporting Navy Advances in Mine Countermeasures**

**Thayer, A. • Chapman, D. • Short, J. • Wood, T.**  
22670

The objective of this paper is to explore options within CONOPS for new MCM capabilities with the goal of maximizing the Area Clearance Rate Sustained (ACRS) Measure of Effectiveness (MOE) given a constant Risk to First Transistor MOE. The exploration of CONOP options leads to various technical approaches to satisfy the MCM objective.

**Optimizing Area Coverage Rate with Side Scan Sonars**

**Clark, G.**  
22696

This presentation examines the concepts of area coverage rate (ACR) and sustained area coverage rate (ACR-S) in the context of expeditionary mine countermeasures (MCM), or other expeditionary ocean bottom survey capabilities using unmanned underwater vehicles (UUVs). Some of the technical topics to be addressed include optimizing vehicle speed vs endurance and distance traveled, and optimizing area covered per unit time for side scan and synthetic aperture type sonars. The analysis to be presented highlights overall sustained area coverage rates and explores the impact of UUV speed and endurance on both instantaneous and sustained area coverage rate.

**Advances in Unmanned Underwater and Surface Vehicles**

**Clements, M.**  
22706

This brief will discuss developmental unmanned underwater and surface

**UNDERSEA SENSORS**

**Potential Problems and Some Solutions for Navigation in GPS/ GPS Degraded/GPS Denied Situations**

**Hamilton, J. • Chapman, M.**  
22500

Problems and some solutions to GPS/GPS degraded/GPS denied navigation.

**Periodic Continuous Active Sidescan Sonar**

**Judell, N.**  
22592

A pair of periodic, continuous sidescan sonars were constructed. Simultaneous monostatic and bistatic operation was tested. Results of testing of proof-of-concept system presented.

**IWS5 Sensors Update**

**Scala, P.**  
22593

Mr. Scala will provide an update for the advanced sensor related development efforts contribution to robust ASW systems.

**Estimation of Clock Errors in Underwater Acoustic Instruments**

**Udovydchenkov, I. • Blair, B. • Egnor, D. • Stephen, R.**  
22594

A method to estimate clock performance on underwater instruments during a particular experimental event of interest has been developed. The method improves the accuracy of the acoustic receivers and the data fidelity during post-processing.

**The Small Aperture Velocity Sensor (SAVS) – A Quantum Leap Forward in Undersea Platform Motion Sensing**

**Wanis, P. • Brumley, B. • Taudien, J.**  
22595

vehicle technologies in the mine warfare mission area.

**PMS 406 MCM Technical Portfolio and Investment Areas**

**Saroch, G.**  
22709  
This presentation will discuss the Navy’s Unmanned Maritime Systems Program Office’s mine countermeasures.

**Modular Undersea Effectors (MUSE) Program Update**

**Dudinsky, J.**  
22710  
The Modular Undersea Effectors (MUSE) program, a 5-year ONR investigative look at core thrusts and capabilities for next generation mining, seeks to understand the role of unmanned systems (both supporting and supported) in distributed sensing, communications, and minefield effects. This talk shall highlight critical in-water tests conducted in 2018, as well as subcomponent technology integration underway for final performance assessment in FY20.

A new Small Aperture Velocity Sensor (SAVS) has been developed which performs acoustic velocity tracking of a vessel versus the sea bed. The SAVS uses new velocity measurement techniques to deliver a four-fold increase in achievable tracking altitude, for a given transducer size, versus existing technology. We present the theory behind the SAVS and field-testing results validating the performance of the technology.

**Lidar for USW Applications**

**Churchill, L. • Brown, E. • Carr, D. • Haran, T.**  
22597

GTRI will provide an overview of their high-performance bathymetric lidar system and present initial results from its deployment in the Trident Warrior 2019 at-sea experiment.

**ANTX Demonstration of Autonomous Detection, Localization and Tracking of Submarines**

**MacCulloch, D. • Jones, S.**  
22600

The “Bloodhound” ASW demonstrator system developed by L3 Harris Technologies (L3Harris) consists of an unmanned surface vehicle (USV) teamed with an unmanned underwater vehicle (UUV), to increase search and track coverage without increasing fleet operator workload. Advances of near-peer undersea threat capabilities and limited surveillance assets demand autonomous systems with proven capabilities of vehicles and payloads. The USV is equipped with a convergence-zone (CZ) dipping sonar capable of autonomous swarm and leapfrog operation to track, trail, and influence threat submarine behavior. The UUV is SIGINT-enabled and detects events within a harbor or other known threat submarine operating area, triggering the USV dipping sonar mission.



**Development of Leveraged Low Frequency Underwater Transducers**

**Blanchard, A. • Butler, J. • Fratantonio, F.**

22612

Image Acoustics, Inc. has devoted significant effort in undersea sensor research to develop newer structural leveraged designs that improve upon the older flextensional types. Since these transducers are multi-dimensional, finite element modeling was chosen as the main tool, which also provided good predictions of the measured results.

**Design, Construction, and Testing of Underwater Pentamode Metamaterials**

**Cushing, C. • Haberman, M. • Su, X. • Wilson, P.**

22621

Additively manufactured underwater metamaterials allow for manipulating sound in ways that cannot be found in nature. Specifically, a subset called pentamode materials have been experimentally proven to yield focusing effects and also directionally dependent sound speeds.

**High Power, Low Frequency Textured PMN Based Projector**

**Dynan, S. • Rorick, T. • Tuncdemir, S. • Zook, J.**

22640

QorTek is teamed with Ultra-USSI to develop a high power, low frequency textured PMN-PT based ceramic transducer for next generation undersea projectors and sensors. These research results were obtained under a Phase I SBIR funded by NAVAIR and demonstrate the increased acoustic performance possible using a textured ceramic material over the traditional PZT ceramic material in a cymbal-based transducer design. This work is on-going and currently funded by NAVAIR under a Phase I Option/II effort.

**UNDERSEA VEHICLES**

**Aluminum-Seawater Power Module: Safe, Extended Duration Power for Fixed Installations and Vehicles**

**Doherty, R. • Aubrecht, D. • Porter, D.**

22627

L3Harris Open Water Power’s Aluminum-Water Power Module provides 3-10 times the endurance for UUV’s and undersea deployed sensors in an inherently safe and pressure tolerant design.

**Advanced Naval Technology Exercise (ANTX) – Prepare for Battle: Undersea Security 2019 (US-19)**

**Hardro, P. • Konrath, L. • Schumacher, C.**

22458

The Advanced Naval Technology Exercise (ANTX) 2019 is a collaborative event taking place at the Naval Undersea Warfare Center’s Narragansett Bay Test Facility in Newport, RI, in collaboration with the Southeastern New England Defense Industry Alliance and partnership with the Commander, Naval Meteorology and Oceanography Command (CNMOC) in Stennis, Mississippi. ANTX demonstrates the future of Navy technologies in action today by providing a low-risk environment in which scientists and engineers may evaluate their technological innovations at the research and development level before their technologies become militarized and integrated at the operational level.

**Current State of Textured Piezoelectrics at L3HARRIS**

**Fuoco, L.**

22680

Textured materials are the next generation of piezoelectric materials, which exhibit extraordinary piezoelectric responses and can be produced at a much higher yield, with greater compositional uniformity and at a more cost-effective price point when compared to current commercially produced single crystal piezoelectric. An update will be given on the production scale-up of textured piezoelectric materials at L3Harris Technologies and the upcoming availability of commercialized textured products.

**On-Going Efforts in Acoustic Transduction at USSI**

**McConnell, J. • Chase, E. • Crandall, J. • Rorick, T.**

22682

Status updates are provided for various projects involving advanced acoustic transducers for underwater applications.

**Development of a Deep Depth Capable, Low Frequency, Broadband Source – Progress Status**

**Osborn, J. • DeAngelis, M.**

22695

The Positioning System for Deep Ocean Navigation (POSYDON) program aims to develop an undersea system that provides omnipresent, robust positioning across ocean basins. By ranging to a small number of long-range acoustic sources, an undersea platform would be able to obtain continuous, accurate positioning without surfacing for a GPS fix. Phase I of the program focuses on accurately modeling the signal propagation channel, and Phase II focuses on developing the signal waveform. Presentation will highlight source technologies developed under this program along with recent test results.

**Undersea Vehicle Design for Submarine Host Platforms**

**Chapman, J. • Cheung, V. • Kombo, L.**

22569

Results from at-sea tests are presented for unmanned undersea vehicle (UUV) configurations to improve interoperability with manned submarines. These configurations are aimed at overcoming challenging launch and recovery issues as well as augmenting UUV maneuverability, stealth, range and endurance when operating from a submarine host platform in the theater of operations.

**Exploiting ROV/AUV Underwater Imagery Using Real-Time Video Processing**

**Wade, J.**

22588

ROVs are collecting huge amounts of video imagery. In fact, video imagery is currently being collected at a faster rate and in greater volumes that can be fully exploited, especially with regard to real-time processing. Consequently, there is a need for tools that enable enhanced video imagery, AI-assisted image recognition, and search and retrieval capabilities that will allow undersea mission operators to work far more effectively and derive greater benefit from the growing volume of undersea ISR video.

**Own the Land and Sea Domain: Surveillance, Mapping and Operations from the Sea, Across the Surf Zone and Onto Craft Landing Zone Using Amphibious Crawlers**

**Matozel, T. • Mangolds, A.**

22603

Amphibious crawlers are a class of AUV that is coming into its own. While challenges remain, crawlers offer many advantages that compliments conventional mid-column, surface and overhead solutions. They enable sensors to get closer-in, stay longer, and provide more precision and accuracy than comparable methods.

**OPNAV N97’s Undersea Constellation Warfare Area Strategy: Subsea and Seabed Warfare (SSW)**

**Stock, D.**

22608

DUSC - N97’s first SSW initiative - is our plan to aggressively establish sustainable US dominance throughout the water column and across domains from the undersea.

**Autonomized Riptide UUVs**

**Carvalho, R. • Filiberti, J.**

22610

A fully autonomous Riptide UUV with modular communications and sensor payloads was prototyped for The Advanced Naval Technology Exercise (ANTX). Results from the August 2019 demonstration will be shared, pending appropriate approvals.

**Platform Health for Robust Autonomous Systems**

**Homan, E. • Sustersic, J.**

22611

We trained a neural network to predict UUV control failure by learning how a UUV performs under normal operating conditions. This design generalizes well to other UUVs, requires no additional hardware, and has been tested on an IVER-3 to detect rudder failure and net entanglements.

**Understanding Dielectrics: Impacts and Understanding of Novel Paradigm Supercapacitors**

**Roman, A. • Phillips, J.**

22616

A summary of findings from research into Novel Paradigm (NP) Supercapacitors. The ultimate goal is to replace batteries in many applications with a rapid charge capacitor of higher energy and power density.

**“Beehive” Flexible Payloads on Small UUVs with Swarming Behavior**

**Parry, J. • DiBiaso, D. • Foley, J. • Plummer, J.**

22622

“Beehive” is an ANTX2019 demonstration focusing on four items that are enablers of future UUV operational concepts: payload flexibility on low cost platforms, magnetometry based target detection with onboard real time processing, swarming behaviors, and operator friendly high level mission specification that creates activities that are then carried out by onboard autonomous controllers on each vehicle.

**In-Water Fuel Cell Power System Development**

**Sievers, R. • Leanna, A. • Miller, M. • Valdez, T.**

22632

Air Independent fuel cells along with reactant storage and feed systems have been developed for undersea applications, both sea floor and UUV. This is an update on design studies, development and testing in 2018-19.

**Hunter Program Update**

**Sutton, G. • Ashton, D.**

22633

DARPA will update progress on the Hunter program.

**A New Generation of Propulsion and Control Effectors for Submarines**

**Sedler, T. • Harrison, S. • Sargent, A.**

22635

Newport New Shipbuilding is developing new technologies for SSNX. It has designed and is building an autonomous undersea vehicle to test these technologies. The presentation will explain the technologies to be tested as well as the unique aspects of the vehicle’s design.

**GhostSwimmer: System of Systems Advancement by Combining Next Generation Sensing Modalities and Non-Conventional UUVs**

**Shane, D.**

22673

GhostSwimmer is a unique platform that provides capability and value in areas of increasing importance and challenge, specifically system of system operations and sensor-vehicle capabilities. We will provide an update on the GhostSwimmer AUV technology and its recent developments towards obstacle detection and avoidance as well as general sensing considerations.

**Evolution of Fiber Optic Micro-Cable Design to Support Advanced Undersea Payloads**

**Kocak, D. • Bilos, C.**

22675

This research presents the latest innovations in small-scale fiber optic cable design to support advanced undersea payloads. Recent cable performance accomplishments of high strength-to-size ratio and low loss under pressure help mitigate risks in an operational environment. These properties support many advanced payloads for both manned and unmanned undersea vehicles.

**UxS Cross-Domain Command, Control, & Communications (CDC3) Development & Experimentation Review**

**Sideleau, S. • Ferro, M. • Gagner, C.**

22681

A review of three (3) 2019 demonstrations at the University of Hawaii Applied Research Lab test site in Kaneohe Bay, the NUWC Advanced Naval Technology Exercise, and the NATO Recognized Environmental Picture (Maritime Unmanned Systems) exercise where open standards have been applied across distributed teams and their robots to enable effective, man-in-the-loop C3 of multiple, heterogeneous unmanned systems.

Overview of the Holistic Approach to Submarine Li-ion Embarkation and Introduction to New Initiatives

Fontaine, J. • Davey, R. • Jeffrey, D. • Smith, W.

22683

Overview of the Holistic approach being implemented for the submarine embarkation of Li-ion powered systems.

WARFIGHTER PERFORMANCE

The Human Part of the Human-Submarine System: A Research Update from the Naval Submarine Medical Research Laboratory

Lawson, B. • Brill, J.

22579

The Naval Submarine Medical Research Laboratory (NSMRL) is the only DoD laboratory dedicated to research in both Submarine and Diving Medicine. NSMRL is proud of its long tradition of ensuring peak health and performance among our nation's undersea warfighters. This presentation highlights the recent activities of NSMRL, emphasizing those that are most relevant to this symposium's emphasis on technological solutions.

Resiliency, Readiness, and Innovation During the Dip

McBurnett, N.

22598

Resiliency, Readiness, and Innovation during the Dip, leveraging a manpower surplus to ensure the critical component of US undersea dominance thrives, the submarine crews.

Over Water Surveillance and Scoring (OWSS) Emerging Technologies: Swarm

Lucas, J. • DeJesus, J. • Ezell, B. • Stilwell, K.

22599

The Over Water Surveillance and Scoring (OWSS) system provides an unmanned, mobile, versatile/configurable, persistent, cost-effective, and rapidly deployable test and training capability to collect BLOS precision end-game impact scoring metrics that help determine the required decision quality weapons effectiveness data.

Improve Warfighter Performance via AR

Boulton, I.

22601

Use of Augmented reality to train front line and maintain equipment.

Undersea Weapons Programs and Plans

Harrison, S.

22697

There are several new and upcoming undersea weapon programs. In addition to a significant amount of heavyweight and lightweight torpedo production and sustainment, there are new software and hardware projects starting and on the horizon. CAPT Harrison will lay out industry opportunities and how industry can help the Navy.

Ensuring Optimal Submariner Readiness by Identifying Attributes Critical to Submariner Success

Hernandez, D. • Bizarro, A. • Handy, J. • Peltier, C.

22604

This project contributes to ongoing efforts at the Naval Submarine Medical Research Laboratory to optimize the existing psychological screening test (known as SUBSCREEN). The existing assessment focuses on screening prospective Submariners for symptoms of psychopathology and traits unsuitable for submarine service.

Future Tools for Tracking Performance Changes Due to Fatigue in Submarine Environments

Bolkhovsky, J. • Bonacci, L. • Daley, M. • Gever, D.

22607

The Naval Submarine Medical Research Laboratory is currently examining how to track performance decrements due to fatigue on submarines using non-invasive, non-disruptive physiological monitoring. Our aim is to use this information in the design of systems that provide feedback to watch schedulers and Independent Duty Corpsman.

CASE FI: Measuring and Achieving High Fidelity in Simulation, an Important Component of Naval Systems-of-Systems to Attain Superior Training and Combat Readiness

Boyle, B. • Lyons, R. • Root, C. • Tufts, S.

22694

Providing the U.S. Navy platforms with a "Nearly Realistic" acoustic training capability for the first time. Fidelity, a subjective indicator, is difficult to measure. The CASE FI program has defined a process to measure fidelity, creating software that challenges an operator to distinguish between real world and simulated data at the tactical displays.

Incorporating Ocean Variability and Uncertainty into Metrics for Sonar Tactical Decision Aids

Pistacchio, D.

22708

BIOGRAPHIES



RDML MICHAEL BERNACCHI, USN

Commander  
Submarine Group TEN

Rear Admiral Michael Bernacchi is a native of Pleasant Ridge, Michigan, and a

graduate of the University of Detroit with a BS in Biology and an MEng from the University of Michigan in Nuclear Engineering and another MEng in Industrial Engineering.

His operational tours include service aboard both attack and ballistic-missile submarines, including USS James Madison (SSBN 627), USS Albuquerque (SSN 706), and USS Santa Fe (SSN 763). He commanded

USS Alexandria (SSN 757) and was commodore of Submarine Squadron Four in Groton, Connecticut.

Ashore, Bernacchi held a variety of positions: executive assistant to the Vice Chief of Naval Operations; executive assistant to the Chief of Naval Personnel; chief of staff for Submarine Group Two; deputy nuclear community program manager; special assistant to Naval Reactors for Office Matters; and cruise-missile planner for theater operations at United States Strategic Command.

His previous flag assignments include commander, Naval Service Training Command, where he was privileged to serve with a staff that was recognized with a Navy Unit Commendation. At the time, only five such commendations had been previously awarded to shore commands in the last 30 years.

Bernacchi's personal awards include the Legion of Merit (seven awards), Defense Meritorious Service Medal, and various personal, unit and service awards. He was recognized by the Naval League of the United States in 2007 with the John Paul Jones Award for inspirational leadership.

ANNUAL SYMPOSIUM  
& INDUSTRY UPDATE

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6-7 November 2019

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### DR. WILLIAM BURNETT

*Deputy Commander and Technical Director*  
 Commander Naval Meteorology and Oceanography Command/Task Group

Dr. William Burnett is the Technical Director to the Commander, Naval Meteorology

and Oceanography Command/Task Group 80.7. In this role, he provides technical responsibility and oversight for a fleet of six survey ships, 2,000 civilian and military personnel, and a budget of over \$300 million. Burnett also serves as a Computational Technology Area Leader in Climate, Weather and Ocean for the Department of Defense's High Performance Computing Modernization Office.

Prior to being promoted to the Senior Executive Service in January 2012, Burnett worked at the National Data Buoy Center,

recognized as a world leader in providing operational, real-time marine observations by being named the world's first Regional Marine Instrumentation Center. He also served on the International Tsunami Commission and as the U.S. National Representative to the World Meteorological Organization's and Intergovernmental Oceanographic Commission's Data Buoy Cooperation Panel.

Before joining the National Weather Service in 2004, Burnett was the Plans and Programs Division Head at the Naval Meteorology and Oceanography Command. In 1992, he joined the staff of the Naval European Meteorology and Oceanography Center in Rota, Spain, and served as the Oceanographic Services

Officer where he developed a new data exchange system that provided products and observations to the Fleet during Operation Provide Promise/Deny Flight. Burnett joined the Naval Oceanographic Office in 1988 as a meteorologist at the Operational Oceanography Center. Burnett began his career in 1985 as a physical science aide and storm chaser with the Storm Electricity Group at the National Severe Storms Laboratory in Norman, Oklahoma.

He received a BS in Meteorology from the University of Oklahoma in 1988 and then an MS and doctoral degrees in Marine Science from the University of Southern Mississippi.



### ADM JAMES CALDWELL, JR., USN

*Director*  
 Naval Nuclear Propulsion Program

Admiral James Caldwell received his commission while graduating

with distinction from the United States Naval Academy in 1981 with a BS in Marine Engineering. He also holds an MS in Operations Research from the Naval Postgraduate School.

Caldwell commanded USS Jacksonville (SSN 699) homeported in Norfolk, Virginia; Submarine Development Squadron (DEVRON) 12 in New London, Connecticut; Submarine Group 9 in Bangor, Washington; and the Submarine Force, U.S. Pacific Fleet, Hawaii. His sea tours include service in both the Atlantic and Pacific Fleets. His

operational assignments include duty as a division officer on USS Boston (SSN 703), engineering officer on USS Alabama (SSBN 731) (GOLD), and executive officer on USS Buffalo (SSN 715).

Ashore, Caldwell served on the Pacific Fleet Nuclear Propulsion Examining Board and later as Undersea Warfare (USW) Requirements officer on the staff of Commander in Chief, U.S. Pacific Fleet. He also served as senior member of the Naval Submarine Force's Tactical Readiness Evaluation Team; on the Joint Staff as deputy director for Politico-Military Affairs for Europe, the North Atlantic Treaty Organization, Russia and Africa; and deputy commander for U.S. Strategic Command's

Joint Functional Component Command for Global Strike in Omaha, Nebraska and as Naval Inspector General, Washington Navy Yard, DC. His most recent tour was on the (Office of Naval Operations) OPNAV Staff as the Director, Navy Staff.

He assumed his duties as the Director, Naval Nuclear Propulsion Program, in August 2015.

Caldwell's awards include the Distinguished Service Medal, Defense Superior Service Medal, Legion of Merit, Meritorious Service Medal, Navy Commendation Medal, Navy and Marine Corps Achievement Medal, and the Naval Submarine League's Charles A. Lockwood Award for Submarine Professional Excellence.



### RDML LEONARD "BUTCH" DOLLAGA, USN

*Commander*  
 Undersea Warfighting Development Center

Rear Admiral Leonard Dollaga is a native of Vallejo, California, and a 1990 graduate

of the U.S. Naval Academy with a BS in Mechanical Engineering. He holds an MEng in Management from The George Washington University in Washington, DC.

His sea tours include division officer assignments aboard USS Los Angeles (SSN 688); engineer officer aboard USS Rhode Island (SSBN 740)(B); and executive officer aboard USS Cheyenne (SSN 773). He commanded USS Charlotte (SSN 766)

in Pearl Harbor, Hawaii, and also served as commodore of Submarine Development Squadron 12, Groton, Connecticut.

His staff assignments include admissions officer at the U.S. Naval Academy; technical assistant to the Director of Naval Nuclear Propulsion; nuclear officer program manager and the submarine officer community manager on the staff of the Deputy Chief of Naval Operations (Manpower, Personnel, Training, and Education); Commander, Submarine Force, U.S. Pacific Fleet prospective commanding officer instructor (Submarine Command Course); chief, program and budget branch on the

Joint Staff (J8) Directorate (Program and Budget Analysis Division); and director, Congressional Liaison Appropriations Matters Office (FMBE) on the staff of the Assistant Secretary of the Navy (FM&C).

He has completed three overseas deployments in Indo-Pacific Command and five strategic deterrent patrols in the Atlantic.

Dollaga assumed his current duties as commander, Undersea Warfighting Development Center in May 2018.

The units he served with collectively earned four unit awards, five Battle "E"s, and U.S. Pacific Fleet's Arleigh Burke Fleet Trophy.



### RDML DAVID GOGGINS, USN

*Program Executive Officer for Submarines*  
 NAVSEA

Rear Admiral David Goggins is a native of Los Angeles. He attended the

University of California, Berkeley, and graduated in 1989 with a BS in Nuclear Engineering and Material Science Engineering. His graduate education includes an MS in Operations Research from the Naval Postgraduate School, and an MS in Mechanical Engineering from the Massachusetts Institute of Technology.

Goggins's career in the Navy began as a submariner aboard USS Tecumseh (SSBN 628) where he served as an electrical officer, reactor controls assistant, and assistant operations officer. He was then selected for lateral transfer to the Engineering Duty Officer Community and reported to the Supervisor of Shipbuilding, Conversion and Repair (SUPSHIP) in Groton, Connecticut. At this command, he was the lead ship coordinator for PCU Connecticut (SSN 22) from initial hull erect to the initial stages of Post-Shakedown Availability planning.

Subsequent shore duty tours included serving as assistant repair officer at Naval Submarine Support Facility in New London, Connecticut; Seawolf class project officer and program manager's representative at SUPSHIP Groton; SSGN conversion project officer and program manager's representative at SUPSHIP Groton; Virginia class assistant program manager for new construction within PEO Submarines; and a staff assignment within the Office of Chief of Naval Operations, Undersea Warfare Division (N97).

Goggins also served as an individual augmentee participating in Operation Iraqi Freedom. While in Iraq, he supported the military's counter-IED effort and was responsible for fielding over 3,000 mission critical systems to counter the rapidly evolving IED threat.

Goggins served as major program manager of the Virginia Class Program and the Columbia Class Program. Under his leadership and guidance, the Virginia Program delivered three submarines to

the fleet, started the initial design work on the Virginia Payload Module and Acoustic Superiority, and won both the DoD Value Engineering Award and the David A. Packard Award for acquisition excellence. With Goggins as the Columbia program manager, the program completed milestone B, awarded the Detail Design and Construction Readiness Contract, and started prototyping efforts.

Goggins became program executive officer for submarines in August 2018.

His awards include the Legion of Merit (two awards), the Meritorious Service Medal (two awards), the Navy Commendation Medal (two awards), and the Navy Achievement Medal (two awards).

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## RADM DAVID HAHN, USN

*Chief of Naval Research & Director of Innovation, Technology Requirements and Test & Evaluation*  
OPNAV N94

A native of Tampa, Florida, Rear Admiral David Hahn graduated from the U.S.

Naval Academy with distinction in 1985, earning a BS in Mechanical Engineering. Additionally, he holds an MBA from George Mason University and has completed the Massachusetts Institute of Technology Seminar XXI program in International Security Affairs.

Prior to command, he served at sea aboard USS Casimir Pulaski (SSBN 633), USS William H. Bates (SSN 680) and USS Springfield (SSN 761), deploying to the North Atlantic and Western Pacific, as well as conducting several strategic deterrent patrols.

Ashore, he served as flag lieutenant to superintendent, U.S. Naval Academy; squadron engineer, Submarine Development Squadron (SUBDEVRON) 12; action officer, Joint Staff in the Command, Control, Communications and Computers (C4) Directorate; and legislative fellow on the staff of U.S. Senator John Warner.

Hahn commanded the USS Pittsburgh (SSN 720) from September 2003 to January 2007. In command, he deployed to the Caribbean Sea and Pacific Ocean and conducted an Engineered Overhaul in Portsmouth, New Hampshire.

Since becoming an acquisition professional in 2007, he has served as Joint Test and Evaluation test director and program manager, Advanced Submarine Research

and Development and served as major program manager, Submarine Combat and Weapon Control Systems program.

Hahn's first flag assignment was as the senior technical advisor to the deputy chief of Naval Operations for Information Warfare/ director of Naval Intelligence (OPNAV N2/ N6).In November of 2016, he became the 26th chief of Naval Research with concurrent flag responsibilities as director, Innovation Technology Requirements and Test & Evaluation (OPNAV N94).

Hahn has been awarded the Defense Superior Service Medal, Legion of Merit, Defense Meritorious Service Medal, the Meritorious Service Medal (three awards), the Navy and Marine Corps Commendation Medal (four awards), the Navy and Marine Corps Achievement Medal, and various campaign and unit awards.



## RADM THOMAS ISHEE, USN

*Director*

Undersea Warfare Division Office of the Chief of Naval Operations, N97

Rear Admiral Thomas Ishee is a native of Danielsville, Georgia, and a 1987 graduate

of the University of Georgia, where he majored in mathematics and computer science. He was commissioned in 1988 after attending Officer Candidate School in Newport, Rhode Island, and earned an MS in Electrical Engineering from the University of Texas at Austin and an MA in Security Studies from the Air War College.

His sea tours included assignments onboard submarines USS Narwhal (SSN 671), USS Sea Devil (SSN 664); engineer officer onboard USS Tunny (SSN 682); and executive officer onboard USS La Jolla (SSN 701).

He commanded USS Key West (SSN 722). While in command, the crew was awarded the Navy Unit Commendation, the U.S. Pacific Fleet Arleigh Burke Trophy and Battle

Efficiency Award. He also commanded Submarine Squadron 11, where he ensured the readiness of six fast attack submarines and oversaw the operations of three torpedo retrievers, a floating drydock and the Navy's submarine rescue systems.

His tours ashore included assistant professor of Naval Science at the University of Texas at Austin; engineer and executive officer of Moored Training Ship MTS 626; executive assistant to the deputy commander, U.S. Pacific Fleet; director of intelligence and special operations for Commander, Submarine Force U.S. Pacific Fleet; director of operations for Commander, Submarine Group 7 and Task Force 54/74; senior advisor to the Secretary of Defense for U.S. Pacific Command Plans; executive assistant to the Chief of Naval Operations; deputy commander, Joint Functional Component Command-Global Strike; director of

operations, U.S. Naval Forces Europe-Africa; deputy commander, U.S. 6th Fleet; and commander, Submarine Group 8.

Ishee is currently serving as the director, Undersea Warfare Division, Office of the Chief of Naval Operations (N97), Washington, DC.

His personal decorations include the Defense Superior Service Medal, Legion of Merit, Meritorious Service Medal, Navy Commendation Medal, and the Navy Achievement Medal.

He has been privileged to serve on commands that have been awarded the Presidential Unit Citation, Joint Meritorious Unit Award, Navy Unit Commendation, Meritorious Unit Commendation, and the Battle Efficiency "E" awards.



## DONALD MCCORMACK

*Executive Director*

Naval Surface and Undersea Warfare Centers

Donald McCormack, a member of the Senior Executive Service since September

2001, is the Executive Director (ED) for Naval Surface Warfare Center (NSWC) and Naval Undersea Warfare Center (NUWC), both Echelon III commands within Naval Sea Systems Command. In this position, McCormack is responsible for leading more than 23,000 civilian scientists, engineers, technicians, and support personnel within ten divisions located across the country to perform research, development, test, and evaluation for the future Navy, and to provide in-service engineering and logistics support for the operating fleet.

Prior to being named ED in March 2014, McCormack had been Technical Director (TD) for NUWC since November 2004 and

performed additional duties as Acting TD for NSWC since April 2012. From 2003 to 2004, McCormack was Director for Undersea Warfare Command and Control (USW CC) Systems Product Area, serving as the Naval Sea Systems Command (NAVSEA) focal point, leader, and advocate for all USW CC Systems. From 2002 to 2003, McCormack was ED of NUWC Newport Division. Before that, McCormack was Director for Weapon Systems.

McCormack has received many awards for outstanding performance, including the Distinguished Executive Presidential Rank Award in 2016 and 2010, and the Meritorious Presidential Rank Award in 2005. In 1998, he received a Meritorious Civilian Service Award for technical excellence while assigned to the NAVSEA Submarine Technology Office. In 2001, he received his

second Meritorious Civilian Service Award for management excellence while serving as the acting Deputy Program Manager at PMS404. Mr. McCormack was the recipient of the Department of the Navy Superior Civilian Service Award in 2008. That same year, he received the Society of Women Engineers' Rodney D. Chipp Memorial Award and the Rhode Island Federal Executive Council's Bud Gifford Leadership Award. In 2012, he received the University of Massachusetts Dartmouth Alumni Association Achievement Award.

McCormack earned his BS in Electrical Engineering from the University of Massachusetts Dartmouth in 1985.



## CAPT DANIEL PAPP, USN

*Program Manager*

Air Anti-Submarine Warfare Systems Program (PMA-264)

Captain Daniel Papp is a Chicago native who graduated from Northern Illinois

University with a BS in Technology. Upon serving two years of enlisted Naval service, he received his commission via the Officer Candidate School and was designated a Naval Flight Officer (NFO) in 1998.

Operationally, he served in Patrol Squadron FORTY (VP-40) at Naval Air Station (NAS) Whidbey Island, WA, from 1998 to 2002. After his first sea tour, he served with the P-3C Fleet Replacement Squadron as the Weapons and Tactics Unit Intelligence, Surveillance, and Reconnaissance Subject (ISR) Matter Expert, AGM-84H (Standoff Land Attack Missile Expanded Response) Fleet Introduction Team Lead, and was named an Air Combat Training Continuum Level V Orion Weapons and Tactics Instructor.

In 2004, he reported to USS DWIGHT D. EISENHOWER as a Catapult and Arresting Gear Officer and V-3 Division Officer. In

2005, he was the Patrol Squadron (VP) Shore Detailer at Naval Personnel Command. During this tour, he deployed as an Individual Augmentee and flew as an Airborne ISR Systems Officer for a Joint Special Operations Taskforce.

After reporting to the U.S. Air Force Air Command and Staff College in 2007, he received an MS in Military Operations and completed Joint Professional Military Education Phase I. In 2008, he reported to Special Projects Patrol Squadron TWO (VPU-2) as the Tactics Officer, Training Officer, Operations Officer and Detachment Officer-in-Charge. Additionally, he served as an Instructor Sensor Coordinator and Mission Commander.

In 2010, he reported to Naval Air Systems Command (NAVAIR), the Naval Aviation Training Systems Program Office (PMA-205), as the P-8A Poseidon Assistant Program Manager (Training Systems) before successfully standing up the P-8A Integrated Training Center at NAS Jacksonville, FL.

In 2012, he departed NAVAIR for transition training in the P-8A Poseidon and, in 2014, assumed command of Patrol Squadron SIXTEEN (VP-16).

Following his command tour, he returned to NAVAIR to the Maritime Patrol and Reconnaissance Aircraft Program Office (PMA-290) as the P-8A Current Development and Modification Team Lead.In 2016, he reported to the Persistent Maritime Unmanned Aircraft Systems Program Office (PMA-262) as the MQ-4C Triton Integrated Product Team Lead.

CAPT Papp reported to Air ASW Systems Program Office (PMA-264) as the Program Manager in 2019.

He holds Level III Acquisition Certification in Program Management. His awards include Bronze Star, Meritorious Service Medal (2), Air Medal (10 Strike/Flight), Navy Commendation Medal (4), Joint Service Achievement Medal, and other Unit Awards.





CAPT LINCOLN REIFSTECK, USN

Commander  
Submarine Development Squadron FIVE

Captain Lincoln Reifsteck is a native of Fairfield, California. He earned a BS in Political Science from the U.S. Naval Academy in 1995 and an MBA from The George Washington University in 2002.

Captain Reifsteck currently serves as the Commander of Submarine Development Squadron FIVE. His previous sea tours were as a Division Officer on USS ALASKA (SSBN 732)(BLUE), Navigator and Operations Officer

on USS CHARLOTTE (SSN 766), Executive Officer on USS COLUMBUS (SSN 762), and Commanding Officer of USS HAMPTON (SSN 767). His experiences at sea include strategic deterrent patrols, Pacific and Arctic deployments, and transits across the Equator and International Date Line, through the Panama Canal, and under the North Pole.

Shore assignments were as Strategic Weapons Training Project Officer for Strategic Systems Programs (Washington, DC), Tactical Readiness Evaluator and Assistant

Force Navigator for Submarine Force, U.S. Pacific Fleet (Pearl Harbor, Hawaii), Submarine Assignments Branch Head and Executive Officer Detailer for Navy Personnel Command (Millington, TN), Deputy Chief of Staff for Operations for Submarine Group SEVEN (Yokosuka, Japan), and Nuclear Operations Division Chief for the Joint Staff (Washington, DC).



VADM CHARLES "CHAS" RICHARD, USN

Commander  
Submarine Forces; Submarine Force Atlantic; Allied Submarine Command

Vice Admiral Charles Richard is a native of Decatur, Alabama, and a 1982 graduate with honors from the University of Alabama. He has earned master's degrees with honors from the Catholic University of America and the Naval War College.

His operational assignments include command of USS Parche (SSN 683) as well as Submarine NR-1, then the U.S. Navy's only nuclear-powered, deep-submergence submarine. He also served aboard USS Portsmouth (SSN 707), USS Asheville (SSN 758) and USS Scranton (SSN 756).

Richard's staff assignments include service as the executive assistant and naval aide to the Under Secretary of the Navy;

chief of staff, Submarine Force Atlantic; and command of Submarine Squadron (SUBRON) 17 in Bangor, Washington. Other staff assignments include director of resources, Under Secretary of Defense (Policy); squadron engineer of SUBRON-8 and duty on the Deputy Chief of Naval Operations (Submarine Warfare) staff. He has also served as a member of Chief of Naval Operations' Strategic Studies Group XXVIII, studying the integration of unmanned systems into naval force structure.

Flag officer assignments include command of Submarine Group 10 in Kings Bay, Georgia; director of Undersea Warfare (OPNAV N97), Pentagon, and deputy commander, Joint Functional Component Command for Global Strike at U.S. Strategic Command.

Richard previously served as the deputy commander, U.S. Strategic Command.

He assumed his current duties in August 2018. As commander, Submarine Forces, he is the undersea domain lead responsible for the submarine force's strategic vision. As commander, Submarine Force Atlantic, he commands all Atlantic-based U.S. submarines, their crews, and supporting shore activities. These responsibilities also include duties as commander, Task Force (CTF) 144, CTF 84; commander, Anti-Submarine Warfare (ASW) Forces Western Atlantic; and CTF 46. As commander, Allied Submarine Command, Richard provides advice to the North Atlantic Treaty Organization Strategic Commanders on submarine-related issues.



ANDREW RICHARDSON

Deputy Commander  
Office of Naval Intelligence

Andrew Richardson was appointed to the position of Deputy Commander, Office of Naval Intelligence, and to the Defense Intelligence Senior Executive Service, in 2018. Immediately prior to assuming his current position, Richardson served on a joint duty assignment, beginning in 2015, as the Assistant Deputy Director of Naval Intelligence, N2N6I, and the Assistant Director of the Naval Intelligence Activity.

From 2006 to 2018, Richardson was an employee of the Office of the Director of National Intelligence (ODNI) and was appointed to the Senior National Intelligence Service (SNIS) in 2008. From 2011 to 2015,

he was Deputy Director of the Office of Legislative Affairs. Richardson also served as Director of Policy and Programs for the Associate Director of National Intelligence for Human Capital. Prior to his appointment to the SNIS, Richardson served as a senior human capital policy advisor for almost two years.

Prior to joining the ODNI staff, Richardson worked for over 11 years in the U.S. Congress. From 1999 to 2006, he worked for Senator George Voinovich on a subcommittee of the Senate Committee on Homeland Security and Governmental Affairs. In 2001, he became the staff director of the subcommittee, serving as Senator Voinovich's principal advisor and

representative on committee issues. Prior to his Senate employment, Richardson worked for over four years in the U.S. House of Representatives.

Richardson received a commission as a reserve intelligence officer in the U.S. Navy in 2000 and remains active in the reserves. Currently a Commander, in 2010 he was mobilized to active duty and served in Basra, Iraq, in support of special operations forces and the U.S. Army.

Richardson holds an MS in Strategic Intelligence from the National Defense Intelligence College (now National Intelligence University), Washington, DC, and a BA in History from Connecticut College, New London, Connecticut.



CAPT PETER SMALL, USN

Program Manager  
Unmanned Maritime Systems (PMS-406)

Captain Pete Small was commissioned in 1995 from the NROTC at the University of Virginia where he earned a BS in Mechanical Engineering. He has also earned an MS in Operations Research in 2002 from Columbia University, an MS in Mechanical Engineering, and a Naval Engineer Degree in 2005 from the Massachusetts Institute of Technology. He is a licensed Professional Engineer in the Commonwealth of Virginia.

Upon completion of Navy nuclear propulsion training in 1996, Captain Small reported to USS L. MENDEL RIVERS (SSN 686) where he conducted dry-deck shelter operations on two deployments to the Mediterranean Sea and Arabian Gulf. He then served as Assistant Professor of Naval Science at the State University of New York (SUNY) Maritime College and Fordham University NROTC. In 2005, Captain Small reported to the Supervisor of Shipbuilding Newport News,

Virginia, where he was the Assistant Project Officer for VIRGINIA Class submarine new construction and two LOS ANGELES Class submarine repair availabilities and completed an Individual Augmentation deployment to HQUSEUCOM in Stuttgart, Germany. From 2008 to 2010, he served as Deputy Ship Design Manager and Aft Project Officer in the OHIO Replacement submarine program office (PMS397.)

In 2010, Captain Small was appointed Associate Professor of the Practice in the Mechanical Engineering Department at the Massachusetts Institute of Technology and served as the Academic Officer of the graduate Naval Construction and Engineering (Course 2N) curriculum. From 2012 to 2015, he served as the PMS450 Program Manager's Representative for VIRGINIA Class submarine construction at Supervisor of Shipbuilding Groton, Connecticut, and delivered USS NORTH DAKOTA (SSN784) to the Navy. From 2015 to 2017, he served

as the Assistant Program Manager for Acquisition in the Advanced Undersea Systems Program Office (PMS394) and successfully attained Milestone C and Initial Operational Capability for a Major Defense Acquisition Program. In May of 2017, he reported as the Construction Manager for the COLUMBIA Class Submarine Program Office (PMS397.) In June of 2018, he relieved as Major Program Manager of the Unmanned Maritime Systems Program Office (PMS 406) in PEO Unmanned and Small Combatants. He continues to teach Submarine Concept Design in the MIT Professional Summer program.

Captain Small's personal decorations include the Legion of Merit, Meritorious Service Medal (three awards), Joint Service Commendation Medal, Navy Commendation Medal (four awards), and the Navy and Marine Corps Achievement Medal (four awards.)



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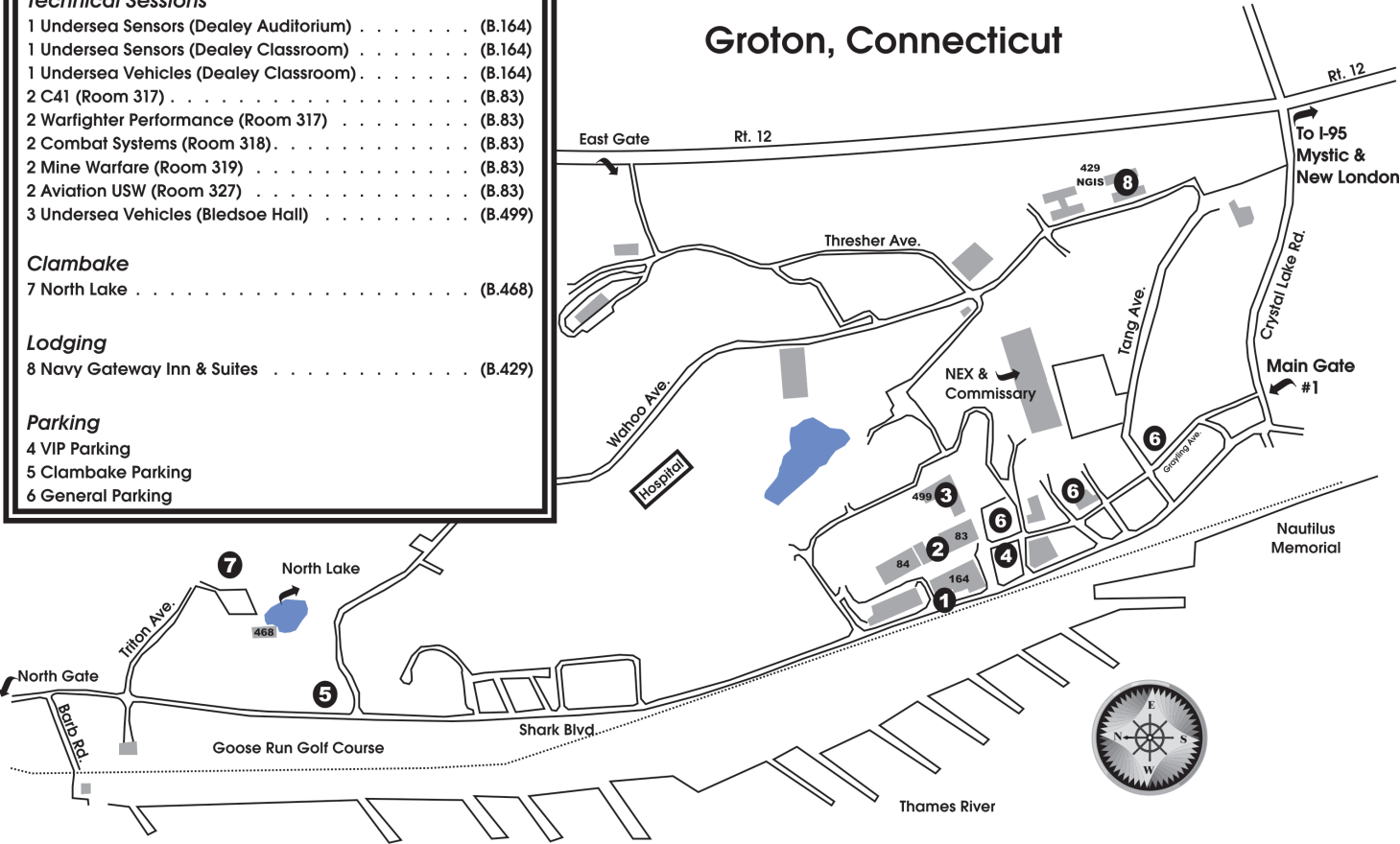




# VENUE MAP

SPEAKING SITES	
<b>Plenary Session</b>	
1 Dealey Center Auditorium . . . . .	(B.164)
(no general parking available)	
<b>Technical Sessions</b>	
1 Undersea Sensors (Dealey Auditorium) . . . . .	(B.164)
1 Undersea Sensors (Dealey Classroom) . . . . .	(B.164)
1 Undersea Vehicles (Dealey Classroom) . . . . .	(B.164)
2 C41 (Room 317) . . . . .	(B.83)
2 Warfighter Performance (Room 317) . . . . .	(B.83)
2 Combat Systems (Room 318) . . . . .	(B.83)
2 Mine Warfare (Room 319) . . . . .	(B.83)
2 Aviation USW (Room 327) . . . . .	(B.83)
3 Undersea Vehicles (Bledsoe Hall) . . . . .	(B.499)
<b>Clambake</b>	
7 North Lake . . . . .	(B.468)
<b>Lodging</b>	
8 Navy Gateway Inn & Suites . . . . .	(B.429)
<b>Parking</b>	
4 VIP Parking	
5 Clambake Parking	
6 General Parking	

## Naval Submarine Base New London Groton, Connecticut



# SPONSOR DESCRIPTIONS



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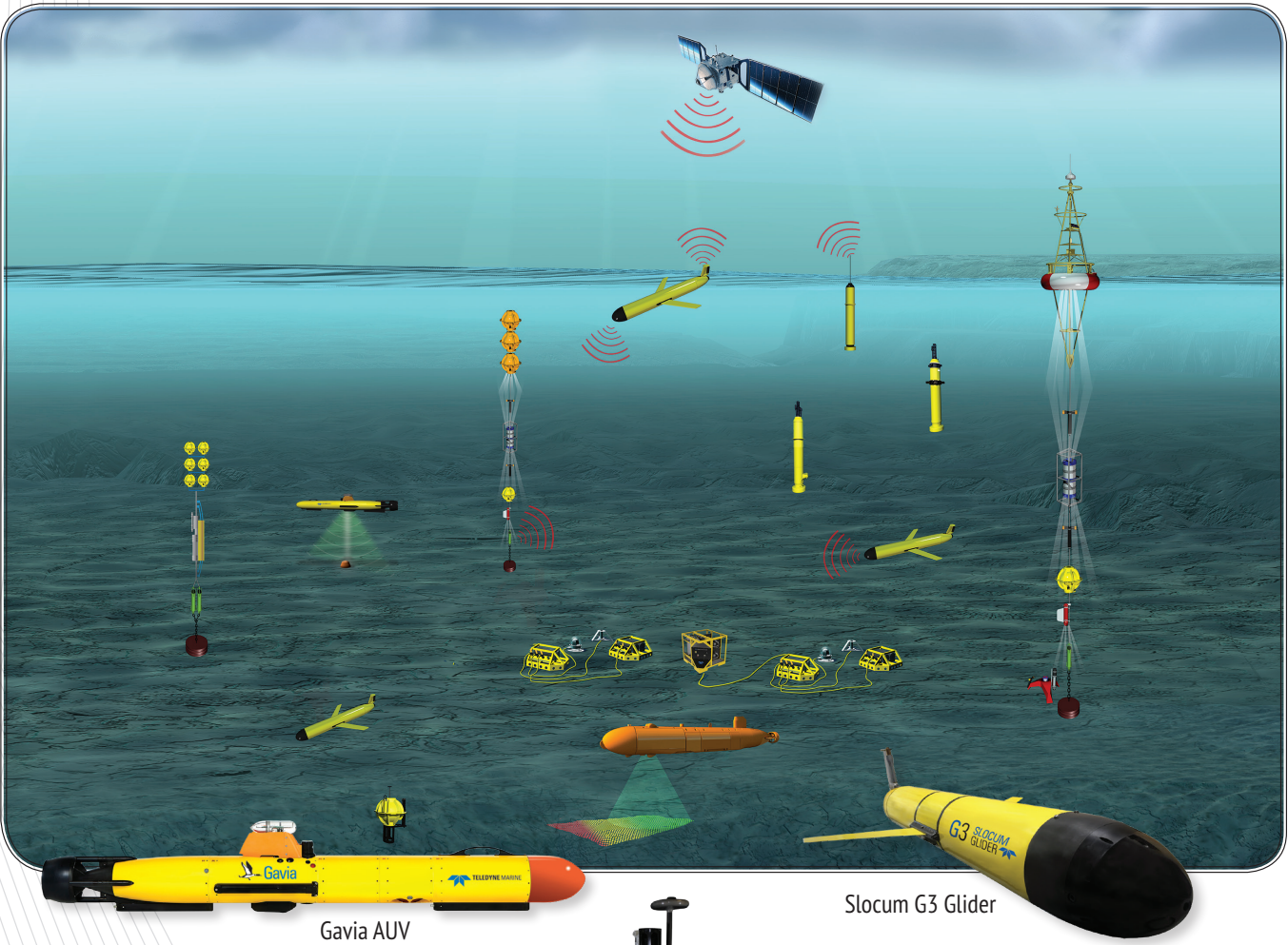
In 2004, Silvus was founded with a mission of applying the benefits of MIMO technology at the tactical edge. Silvus assembled a team of scientists and engineers to pursue US Government-funded R&D opportunities that address challenges such as multipath, Non-Line-of-Sight (NLOS) propagation, interference, mobility and spectrum congestion. As of today, Silvus has executed on over \$65M in contracts.

In 2011, Silvus leveraged this expertise to develop a commercial MANET product line, known as the StreamCaster family. Ever since, Silvus has demonstrated an aggressive product development cycle; continually improving the size, weight, power, and cost – while simultaneously introducing next-generation features and capabilities.

Today, Silvus continues to innovate, with an ever-growing lineup of R&D contracts, COTS products, and happy customers. Experience gained through our early research efforts made possible the first generation of StreamCaster radios, and new concepts currently incubating in our R&D labs will pave the way for tomorrow's product breakthroughs.



# Battlespace Preparation *Know What's Below*



- Persistent Water Column Infrastructure**
- Acoustic and Ocean Sensors
  - LF Acoustic Sources
  - Data Exfil via Acoustic & RF
  - Long Loitering Platforms
  - GPS Denied Acoustic Positioning
  - Seabed Power

- Autonomous Monitoring for USW and Seabed Warfare**
- Sound Speed Profiles
  - Noise Monitoring
  - Current Profiles
  - Seabed Mapping
  - Change Detection
  - Object Identification

**Find Out More:**  
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EM APEX





A large, white, cylindrical minehunter with four red fins is shown underwater, viewed from below. A thin cable extends from the surface down to the minehunter. The water is deep blue, and sunlight filters down from the surface, creating a bright, hazy area at the top. The minehunter is positioned in the lower half of the frame, angled slightly towards the left. The overall scene conveys a sense of advanced technology operating in a deep-sea environment.

AQS-24

**THE VALUE OF  
GAINING NEXT-GEN  
CAPABILITY WITHOUT  
WAITING A GENERATION.**

In mine hunting, every moment matters.

Only Northrop Grumman's AQS-24 family of sensors are currently available for deployment, with thousands of proven operational hours under the U.S. Navy.

Sporting next-generation sensor technology, high speed and modular adaptability in hardware and software, the AQS-24 is the most capable and affordable mine hunting system fielded today. *That's why we're a leader in advanced undersea technology.*

**THE VALUE OF PERFORMANCE.**

***NORTHROP GRUMMAN***

[northropgrumman.com/minehunter](http://northropgrumman.com/minehunter)

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