

2021 UNDERSEA WARFARE VIRTUAL CONFERENCE



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On-Demand gives you access to the technical presentations and handouts from the 2021 Undersea Warfare Virtual Conference to view at your own convenience. Accessing these presentations from the virtual conference allows you to gain valuable insights from the undersea warfare community.

AVIATION USW

HyDrone Multi-Domain (Marine, Ground, Air) Vehicle

Scott Kempshall

President and Chief Executive Officer
HyALTA Aeronautics, Inc.

HyDrone TM is the world's only fully multimodal UAS using a single drive system to operate as a Quad VTOL aircraft, as an airplane for high speed transit, as a land vehicle, and as an underwater vehicle. This simple, scalable and safe design uses a shrouded propulsor to provide efficient airborne performance, act as a wheel in ground or amphibious modes and as a shrouded propeller in the water. This range of operating modes allows for very high speed transit as an airplane, without the need for airport infrastructure, as well as the ability to perform the "last quarter mile" of delivery operations as a land vehicle. No other UAS can provide the range of operations for package/cargo delivery, sensor deployment, observation and reconnaissance, or emergency humanitarian response as HyDrone TM.

Distributed ASW: Sonobuoy Mission Capability on MQ-8 Fire Scout

Gary Morgan

Senior Technical Consultant
Ultra Maritime, Sonobuoy Systems

Ultra and Northrop Grumman have been jointly developing a pod-launch and processing capability for G-sized sonobuoys for the MQ-8C

Fire Scout RWUAV. The system was demonstrated off the Southern California coast in October 2020. This presentation will include an overview of the development effort and summary of the demonstration event, including a conceptual video of the fielded capability.

Low-Cost Persistent Environmental Measurement System

Dr. Fritz Stahr

Vice President and Chief Technology Officer
MRV Systems, LLC

MRV Systems is developing the ALAMO-2™, an ocean profiling float that measures temperature, salinity, pressure, ambient acoustic noise, and diffuse optical attenuation from the surface to 1500 feet deep many times a day. Designed to be deployed from various aircraft in a standard Sonobuoy Launch Canister, it transmits data ashore by Iridium satellite over periods of weeks to months. High-resolution data of ocean conditions in multiple domains at once (density, sound, light) provides critical input to the Navy's ocean models, tactical decision aids, and general ASW battle-space preparation. Funded by a NAVAIR SBIR program, the ALAMO-2™ is a low-cost, persistent environmental measurement system designed for the ASW warfighter.

MinAu – Collaborative Autonomy for Navy UxV Swarms

Dr. Neil Dhingra

Business and Program Leader

Orbit Logic, Inc.

Orbit Logic's Data Architecture Enabling Robust Cooperative Autonomy with Minimal Information Exchange (MinAu) solution is onboard software that benefits unmanned underwater vehicle (UUV) missions involving many assets cooperating to achieve a widespread set of mission objectives in a large area with very limited (and highly variable) opportunity to intercommunicate and exchange information. MinAu has been deployed and tested on relevant UUV platforms and shown utility toward to a widespread set of missions, such as hull and port inspections, mine countermeasures, marine husbandry (cleaning to improve vessel fuel economy), seabed survey, mapping, search, repair, recovery. MinAu supports homogeneous and heterogeneous systems of assets, including different classes of underwater robots with varying installed capabilities and performance, and surface-going marine vehicles which in addition to hosting sensors might also provide communication relay support and resource resupply roles.

DEVSECOPS and Observability: The Future of Cybersecurity in the Navy Underwater Systems Arena

Jim Pietrocini

Vice President, Space Superiority and Missile Defense Group
Centauri

Purpose? To enhance the undersea community's cybersecurity posture with a better understanding of DEVSECOPS and the concept of continuous monitoring. The recent SolarWinds incident will have an impact on Navy C4I systems.

Theme? This research will impact how the undersea community develops and fields future C4I related systems/applications.

Design/Methodology/Approach? The value of "observability" is the ability for a real-time view of systems and applications. This continuous monitoring piece of DEVSECOPS allows the government to have real metrics to determine their investment value. The architecture also connects the development environment (i.e., the contractor, navy lab, acquisition community) with the end-user (fleet asset).

Findings? True logs and metrics are combined to determine the proper "observability" of a system or specific architecture.

Practical Applications? These efforts should focus on a few critical systems or applications currently operational in the fleet today.

Original Value? What unique findings will be conveyed through the research? Today's current cybersecurity processes center around static testing based on a specific scheduled Red Team penetration test or an organized system scan that is a subset of a Risk Management Framework (RMF) process. An approved certification or accreditation of a system or application is approved based on the cybersecurity condition. This process can be in the past (some beyond 3-6 months). Software development and delivery is an ever-changing world. Writing code was once an art form all its own, where you could write and deploy machine code with freedom of purpose and no concern for things like connecting to other computers. But as the world and the variety of systems that software supports became more complex, so

did the ecosystem support software development. The advancement in how teams create software, where it runs, what it affects, and how to secure those systems has accelerated Ops and Sec's need to address the underlying systems' evolving complexities. The Navy is moving towards DEVSECOPS.

The introduction of Blackpearl.us and the Project Overmatch Software Armory leads the Navy's attempt to develop systems faster and remain competitive with our adversaries. There is also an attempt to keep pace with commercial best practices when hiring and retaining top software development talent. Agile development or DevSecOps has slightly different concerns and priorities, but the goals and methods are symbiotic and supportive. Developers are concerned with ensuring workflows are optimized for speed, measuring progress, and keeping backlog under control, and maintaining quality and compliance standards throughout the Dev cycle. Ops teams care about ensuring that architecture and infrastructure requirements are clearly defined and validated to ensure availability, optimal performance, and scalability. Security and compliance teams care about providing data leakage is limited and that the organization's security and compliance posture is strong throughout the dev/test lifecycle.

DevSecOps is both a mentality and a workflow that provides the following:

- Automated build, test, scan, and deployment processes
- Reduced "drift" between implementations by standardizing configurations.
- Reduced attack surface using pre-hardened components.
- Full observability across the entire stack, including infrastructure, applications, and access
- Improved resilience with the ability for loosely coupled components to fail gracefully or be replaced easily

A DevSecOps approach requires more coordination and up-front agreement across each of the teams. The dependencies and goals to be achieved at each sprint result in a robust code that adheres to: Continuous integration, continuous delivery/deployment (CI/CD): Building blocks with hardened containers, automated build, and testing. Infrastructure as Code (IaC): System and network automation and orchestration with security controls, zero-trust, and chaos engineering principles built-in. Ruggedness: Security that is built-in at the initial stages rather than being an afterthought. Continuous monitoring: The ability to monitor and measure all aspects of the infrastructure and workloads running there; used for security, auditing, compliance, and performance. Finding all relevant information is the very first step in any program and software development project and often the deciding factor between success and failure for that operation. Fast search over all data sources is the key to making critical business decisions, identifying performance issues, and detecting internal or external threats.?

The recent SolarWinds incident exposes the lack of "observability" in a program or systems network, system logs, and applications. It is one thing to collect logs-records and never have the resources to analyze real-time issues or problems. Combining logs, metrics, and application performance monitoring will become particularly important as the DEVSECOPS side car function.

UNDERSEA SENSORS

A Novel Fiber Optic Telemetry System Can Be Integrated into Towed Sonar and Other Sensor Arrays

Dr. David Sharman

Chief Executive Officer

Kingfisher Business Solutions, LLC

A novel optical telemetry system has been experimentally integrated into a towed sonar array using traditional sensors. The system harnesses the benefits of an optical network reducing signal noise. Replacing copper wire in a traditional array reduces weight and drives down cost. The optical telemetry system has the potential to be integrated into network system of systems similar to the Undersea Constellation and POSYDON.

Small USV ASW TTX

Brian Gregg

Engineer

U.S. Navy Federal NAVSEA

Conducted Wargame/TTX Wargame 1 at the Lockheed Martin Lighthouse Facility in Suffolk, Virginia from 15-17 Dec 2020. The TTX series in Fall 2020/Winter 2021 is intended to evaluate the potential for small USV Platforms to provide a disruptive technology solution in the Great Power Competition. The purpose of these TTXs is to inform Warfare Center investment/procurement decisions and reduce the time required to deliver emerging technologies to the fleet. The Capability to Fleet initiative is sponsored by the office of Director Surface Warfare (HQ DSW). The proponent for the Small USV TTX Series is Fleet Forces Command (FFC). The Operational Proponent is U.S. PACFLT. TTX 1, 15-17 Dec was directed at evaluated USVs in the ASW Mission Set specifically. The event included evaluation of the existing Navy USV Programs of record including the GARC very small USV produced by Maritime Applied Physics and the CUSV produced by Textron. The TTX also included examination of the Mobile Hybrid Sensor Package developed by NUWC Keyport, and the GTS TRAPS Variable Towed Active/Passive Array. The event generated a range of useful insights captured in an AAR available at higher classification. The next event will be TTX 19-21 Jan focused on the Surface Warfare Mission Set at the LM Lighthouse. The event supported FFC Distributed Mission Ops analysis. The games are designed as computer assisted games and use the simulation Command PE (Matrix Games) to automatically adjudicate outcomes at real-time/faster than real-time. Players experience a perceived view of enemy forces and have to make decisions dynamically and interactively under realistic time constraints. This simulation has proven highly effective at supporting tactical level naval wargames.

Undersea Distributed Acoustic Sensor (DAS) Systems for Protection of Expeditionary Advanced Base Operations

Chelsea Meggitt

Managing Director and Senior Strategic Planner

Sound & Sea Systems, LLC

Expeditionary Advanced Base Operations (EABO) is a major Navy/ Marine Corps initiative focused on China and the Indo-Pacific area of operations that envisions placement of relatively small Marine Corps units, armed with long-range strike and other weapons, at forward locations. These expeditionary outposts are likely nearshore and are potentially vulnerable to waterborne attacks by units in small boats, by swimmers or divers or by forces inserted from amphibious vessels offshore. This paper describes an expedient, rapidly-deployable undersea sensor system that can detect and classify these types of threats as part of an overall force protection paradigm for EABO.

Bayesian Inversion Method for Determining Seafloor Sediment and Bathymetric Properties from Simulated Transmission Loss Data

James Albritton

Graduate Student

Applied Research Laboratories, University of Texas, Austin

The study focuses on how recent inversion techniques can be used to reinforce and improve understanding of the seafloor's composition and structure by obtaining sediment bulk parameters and bathymetric parameters through inexpensive in situ acoustic data. Parallel tempering is one such technique that has helped overcome some of the pitfalls inversion techniques often face when applied to underwater sound propagation problems. By combining it with Bayesian inversion, our work seeks to determine the viability of inverting for not only the composition of the seafloor, but also its structure in areas where sediment ripples are likely to form.

Deep Learning for Clutter Reduction in Multistatic Active Sonar Systems

Bradley Riddle

Principal Investigator

Signal Systems Corporation

Signal Systems Corporation is developing breakthrough performance improvements for multistatic processing in its Phase II SBIR "Deep Learning for Clutter Reduction in Multistatic Active Sonar Systems". New capabilities aim to reduce training requirements, better integrate with advanced data fusion products and enable new multistatic active sonar platforms.

UNDERSEA VEHICLES

Presenting the Hyper-Sub Multi-Purpose Subsea Utility Vehicle (MSV)

Alasdair Murrie

Consultant, Business & Product Development, and
Manufacturers Representative
Hyper-Sub Platform Technologies, Inc.

The Hyper-Sub Multi-Purpose Subsea utility Vehicle (MSV) is a multi-passenger, multi payload speedboat capable of traveling at speeds of up to 30Kts and with a potential range of 500 miles.

When required, and with the flick of a few switches, using onboard ballast tanks, MSV can then dive to 500ft or operate in waters as shallow as 15ft, traveling submerged for more than 300 miles on a single mission.

The capabilities of the Hyper-Sub MSV make it a perfect solution for multiple government and military operations, particularly littoral operations.

Sea Water Inflated – Launch and Recovery System (SWI-LARS)

Mitchell Loyd

Mechanical Engineer
Phoenix International Holdings, Inc.

The Sea Water Inflated Launch and Recovery System (SWI-LARS) is an innovative solution for a Department of the Navy (DON) requested inflatable system to ease the current operations involved with launching and recovering UUVs. SWI-LARS utilizes soft inflatable structures with a compact and predictable deflated shape to extend and retract the UUV through a Virginia-Class submarine torpedo tube. This effort is currently in Round 3 of a direct to Phase 2 SBIR. Current focus of the system is performing 1000 operational cycles and preparing for torpedo tube integration

Submarine Escape and Rescue Program

CAPT Jonathan Kim, USN

PMS 390

The U.S. Navy's submarine escape and rescue program supports U.S. and foreign submarine services, providing needed capability to rescue sailors in the event of a distressed submarine (DISSUB).

The U.S. Navy operates the Submarine Rescue Diving and Recompression System (SRDRS) and the Submarine Rescue Chamber Fly-away System (SRCFS) for deep and shallow water rescue. In order to maintain and increase the overall capabilities of the USN Submarine Escape and Rescue Program, PMS 391 continues to actively pursuing technology improvements to address capability gaps, enhance survivability challenges of DISSUB sailors before and after rescue, improve operational proficiencies, maintain efficiency, and increase international engagements.

Getting Started with the Unmanned Maritime Autonomy Architecture (UMAA): The Software Architecture of Undersea Autonomous Vehicles

John Breitenbach

Regional FAE Manager
Real-Time Innovations, Inc.

The Unmanned Maritime Autonomy Architecture promotes the development of common, modular, and scalable software for Unmanned Maritime Vehicles. In this session we'll explore how the modular services provided by UMAA connect together to enable humans in, on, and out of the loop. Learn about Data Distribution Service (DDS), the connectivity framework that links UMAA services together and provides a data-centric view of the unmanned system. Finally, we'll see how DDS tools can help visualize and capture the behavior of your unmanned systems.

WARFIGHTER PERFORMANCE

Navigating Uncharted Waters: Developing and Deploying Software on Submarines in a DevSecOps Age

LT Bridger Smith, USN

Naval Postgraduate School

The research conducted covers the potential uses for submarine digital twins with specific focus on furthering the effort for more efficient maintenance planning. The case study also explores the possibility of rapidly deploying cloud based, containerized, continuous authority to operate software onto submarines to append additional methods to the submarine software playbook.