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Assuring Undersea Dominance in an Era of Major Power Competition

UNDERSEA WARFARE DIVISION

DON MCCORMACK
EXECUTIVE DIRECTOR,
NAVAL SURFACE AND
UNDERSEA WARFARE
CENTERS

NAVSEA WARFARE CENTERS: DRAWING ON NON-TRADITIONAL AND FLEXIBLE SKILL SETS ON OUR PATH TO SUCCESS

A MESSAGE FROM THE NAVAL UNDERSEA WARFARE CENTER

Quantum dots, data analytics, social intelligence, ubiquitous sensing, the Internet of Things, quantum computing, entanglement, cognitive load management, space-based lasers, neuromorphic chips, selective genetic sequencing... if you haven't heard about these emerging technology areas, you should Google them, because they are the future. We need to think about these technologies today, including ways we can incorporate them and their implications for Navy undersea and surface warfare missions.

"We recognize that future success may well demand a different skill set, so we must build and shape a workforce that is flexible and possesses expertise not traditionally found at Navy laboratories."

At the Naval Sea Systems Command (NAVSEA) Warfare Centers, our workforce fuels innovation, supports current readiness, and preserves skills that may not exist elsewhere. Our scientists, engineers, and technicians offer technical advice and solutions across the entire full-spectrum life cycle of platforms and systems—from cradle to grave. Maintaining the strength of our people allows us to fulfill the primary role of the Warfare Centers, which is to help make naval programs successful by providing unbiased technical advice and solutions to our partners, namely the program executive offices (PEOs), the fleet, the Marine Corps, the Office of Naval Research (ONR), DoD, and the Defense Advanced Research Projects Agency (DARPA).

Determining the right mix of workforce skills is a challenge facing many government organizations, industry, and academia. Within the NAVSEA Warfare Centers, we must carefully consider the breadth and extent of the technical capabilities needed for today's Navy, tomorrow's Navy, and the Navy after next. Technical capabilities stewardship is a continuous process based on balancing investments and resources to maintain

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the skills and intellectual capital that exist nowhere else or that meet anticipated needs. It is also critical that we balance priorities and investments to sustain the capabilities needed for today with the development of future skills.

A number of global drivers inform the NAVSEA Warfare Centers' decisions about the best means to fulfill our responsibility for shepherding the Navy's technical capabilities in our surface and undersea mission areas. We work in alignment with higher-level DoD and Navy guidance, and actively seek ways to respond to the needs of maritime offset strategy. Chief among the drivers that help shape our responses are our customer and stakeholder requirements, which are firmly rooted in programs of record. We are committed to supporting the operational Navy by developing and maintaining the appropriate workforce to meet those requirements. At the same time that we are ready at a moment's notice to get the right people and the right technical services to the fleet, we recognize that future success may well demand a different skill set, so we must build and shape a workforce that is flexible and possesses expertise not traditionally found at Navy laboratories.

All of which brings us to a second driver, one that the Chief of Naval Operations (CNO) has also noted: the rapid pace of technology change. In today's highly globalized environment, the advent of disruptive new technologies could allow adversaries to acquire capabilities and leapfrog those of the United States' quickly and cheaply. Some of these technologies have been called out in the draft Department of the Navy (DoN) Research, Development, Test and Evaluation (RDT&E) 30 Year Strategic Plan, and include the fields of robotics, unmanned systems, miniaturization, big data, and additive manufacturing. ONR's Naval Science & Technology (S&T) Strategy highlighted nine complementary naval S&T focus areas, including autonomous engagement, electromagnetic maneuver, directed energy, and cyber – information dominance.

While we can't predict the exact set of future skills that our nation's naval forces will need, we can focus on strengthening our ability to adapt and building a workforce that is fully capable of responding as technology change escalates.

At the NAVSEA Warfare Centers, the workforce of the future must be technology integrators as well as developers. We will expect them, for example, to utilize a system-of-systems approach to drive rapid systems integration, apply platform considerations such as survivability and stealth, and work with an awareness of capacity. They will take commercial off-the-shelf technologies and apply them to the ever-changing demands of the fleet and be adept at combining technologies with operational concepts in novel and clever ways. We know that our workforce will draw on some more traditional skills to support Navy capabilities in missile defense; cyber; intelligence, surveillance, and reconnaissance; and precision navigation and timing. We can also anticipate the need to build skills in artificial intelligence, analytics, and man-machine interface in support of autonomous behaviors. Others, such as adeptness at virtual collaboration, will facilitate work on state-of-the-art simulations and networking capabilities for our customers, any time-anywhere while reducing cost, risk, and development time. Transdisciplinarity, or the ability to understand and engage in concepts across disciplines to transcend their traditional boundaries, will be a critical skill for our scientists and engineers, as well as for business support workers as we balance "better, faster, and cheaper" with a willingness to identify and assume smart risk.

Identifying future skills is just the beginning of building and shaping a workforce that will contribute to agile and successful NAVSEA Warfare Centers. Under the Personnel Demonstration Project -a pay-for-performance system specifically designed to attract, reward, and retain high-performing employees- the Warfare Centers possess unique authorities to shape their workforce with more flexibility than most government organizations. We have made significant inroads toward recruiting and hiring adaptable and skilled personnel. The 2016 National Defense Authorization Act, for example, increased our authority to directly hire scientists and engineers from 3% to 6%. We are also working to ensure that personnel already on board get training and experience in a variety of skills and in cross-disciplinary collaborative teams. But is it enough? It's time that we began to discuss possible changes that would enable us to better seek and secure "non-traditional skills." Ensuring that employees possess substantial depth and breadth of knowledge and experience within their discipline is also high on our list of priorities. We need to do this faster in support of the CNO's call for achieving high velocity learning at every level. This translates into accelerating learning for individuals, teams, and organizations and expanding the use

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of learning centered technologies, simulators, online gaming, and analytics. In the future, authorities in acquisition, hiring, and partnering may need to be expanded further to increase our ability to quickly respond to emerging threats in a rapidly changing environment.

The NAVSEA Warfare Centers have been actively engaged in strengthening a culture of continuous innovation and collaboration that strengthens the collective skills of our workforce, spread across ten sites. Some of our efforts include innovation cells, war gaming workshops, virtual worlds technologies, secure weapon and platform simulations, communities of practice for both technical and business areas, social networking and online collaborative tools, fleet exchanges, and many others. Not only do these initiatives help plant the seeds for ongoing innovation by spreading them across sites and fostering multi disciplinary teamwork, they also help focus our investments in a constrained fiscal environment.

To truly be successful, the depth and breadth of skills maintained across the NAVSEA Warfare Centers' workforce must be supported by a culture of collaboration, so that a technologist in discipline A would be expected to engage with a non-technologist or technologist in discipline B. Success in this area relies on an individual's ability to clearly communicate and collaborate across disciplines, organizations, and sometimes even nations, and may require non-traditional partnerships. Collaboration beyond the gates of the NAVSEA Warfare Centers is a key to our success. Encouraging a broad spectrum of contributors fosters more insights, which can lead to revolutionary new ideas, new services, and new products. Drawing on alternative partnerships will also help foster the depth and breadth of necessary skills. The ability to leverage technical hunter/broker efforts and develop technical partnerships, both domestically and globally, will be a critical enabler of diverse inputs in order to be truly effective, as is the ability to leverage commercial technology rapidly.

Through targeted collaboration, the NAVSEA Warfare Centers seek to enhance the ability to swiftly incorporate diverse inputs and respond to rapidly changing, potentially disruptive external drivers. As an organization, we encourage a culture —from leadership down to the entry level positions— that is more comfortable with risk where it makes sense, including risk taken early in the development phase. We are deepening our perspectives into the nature of the fleet's issues to better enable the development of innovative solutions and rapid prototypes to test and demonstrate their utility. We are broadening senior leader engagement with the fleet, establishing a Fleet Engagement Community of Practice to identify and translate key fleet issues into actionable initiatives, increasing rotational assignments at fleet sites and development commands, and actively seeking additional durable partnership with shipyards.

The Navy's technological superiority is not something that was gained instantaneously, so sustaining it will take a steady and concerted effort. We are on the right path to harness the brightest minds through innovative, novel, and constructive partnerships. More remains to be done as we seek opportunities that are new and non-traditional, to place the NAVSEA Warfare Centers in the best possible position to generate the cutting edge technologies that will sustain our Navy's capabilities well into the future.

NMAWC COMPLEX
NAVAL BASE PT. LOMA

DIVISION CHAIR'S MESSAGE

PAUL NORMAND, CHAIRMAN
UNDERSEA WARFARE DIVISION

On behalf of the entire management team of the National Defense Industrial Association Undersea Warfare Division, welcome to our Spring Conference. Wayne Jakubowski, conference chairman, and Greg Vaughn, conference co-chair have again assembled an outstanding group of speakers to address the issues that we face assuring access and maneuver to the global commons. Our technical committees continue to engage the Navy customer base to provide the most useful information exchanges possible to support our efforts to provide the United States Navy the best warfighting capability possible.

Over the last year we revised our division charter. The revised charter has been approved and is available on our division website http://www.ndia.org/Divisions/Divisions/UnderseaWarfare/Pages/default.aspx. We owe a debt of gratitude to Greg Bauer and Milo Hyde for their efforts to support the revision to our charter that articulates our way of doing business in the Undersea Warfare Division.

Biennially, we develop a report that we provide to the Navy's Undersea Warfare leadership. The most recent report addresses topics that are of concern to this enterprise: the need to leverage industry to get solutions to the warfighter faster, the concern of an increasing gap in USW professions, the need for business case for IR&D investments, enhanced government-industry engagements. We provide our recommendations to the Navy on a way forward. Again, this report is posted on our NDIA UWD website.

The President's Budget for fiscal year 2017 is again very favorable for Undersea Warfare capabilities that our Nation and our Navy require to preserve undersea dominance and to outpace the threat. The challenge that our Department of Defense faces is the Budget Control Act (also known as Sequestration) I encourage you and your companies to engage your members of Congress and let them know from your perspective, the impacts of the Budget Control Act.

"The challenge that our Department of Defense faces is the Budget Control Act (also known as Sequestration). I encourage you and your companies to engage your members of Congress and let them know from your perspective, the impacts of the Budget Control Act."

At this conference we are recognizing two stalwarts in their support of Undersea Warfare. RADM (Ret) Jerry Ellis will receive the VADM Charles E. Weakley award recognizing his contribution to the Government, Industry and Academia in support of the Undersea Warfare for more than 50 years. The Captain George W. Ringenberg will be presented to CAPT (Ret) Bruce Roulstone for his outstanding contributions to the Undersea Warfare Division. We have been blessed to have Bruce as our NDIA corporate mentor for the last 16 years. He has been the oil that has kept this machine operating so well.

On behalf of the Executive Board and the Advisory Council, thank you for your continued support of the National Defense Industrial Association and the Undersea Warfare Division. We hope you enjoy the Spring Conference and look forward to seeing you at the Fall Conference in Connecticut.

ADMIRAL KIDD CONFERENCE CENTER
NAVAL BASE PT. LOMA

FALL 2015 NDIA UNDERSEA WARFARE AWARDS

DAVID MEDEIROS, CHAIRMAN
AWARDS COMMITTEE

The NDIA Undersea Warfare Division (UWD) Bronze Award is issued to recognize outstanding individual achievements in either Science or Engineering in the field of Undersea Warfare and is awarded to key individuals in the principal Navy and University Laboratories engaged in Undersea Warfare related activities. By recognizing these individual achievements, the UWD seeks to: reward achievement in the field of Undersea Warfare; inspire accomplishment by other workers in the field; and increase public awareness of the field and its importance to Defense preparedness. The NDIA UWD was pleased to present Bronze Medal Awards to the following five individuals during the Plenary Session of the fall 2015 USW Conference in Groton, CT.

DR. HARRY SIMPSON
NAVAL RESEARCH LABORATORY (NRL), ACOUSTICS DIVISION

Dr. Simpson, a research physicist at NRL, leads a group of scientists and engineers in the conduct of basic and applied research in applying the physics of target scattering mechanisms into active sonars, in creating innovative measuring techniques, and in autonomy for autonomous underwater vehicles (AUVs). Dr. Simpson's scientific research and technical developments in these areas have enabled a new paradigm for finding sea mines and difficult undersea targets that are based on their structural acoustic response. In particular, Dr. Simpson developed new laboratory and at-sea measurement techniques that have enabled the low frequency, broadband sonar measurement techniques for AUVs that are the cornerstone of the Knifefish system in acquisition at PMS 406.

MR. CHRIS EGAN
NAVAL UNDERSEA WARFARE CENTER, DIVISION NEWPORT

A recognized subject matter expert in unmanned systems, Mr. Egan has provided sustained exceptional service as a leader in the area of Unmanned Maritime Systems (UMS). As Division Newport's Customer Advocate, he provides technical expertise and leadership to the NAVSEA Warfare Centers, sponsors, and stakeholders with seamless coordination to gain and secure support for unmanned system technologies for the U.S. Navy. Mr. Egan is a scientist, engineer, innovator, and visionary who has earned the trust and respect of government, fleet, academia, and industry colleagues, and senior leadership at the highest levels of the U.S. Navy.

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MR. PAT KELLEY
NAVAL UNDERSEA WARFARE CENTER, DIVISION NEWPORT

Throughout his 26-year federal career, Mr. Kelley has made numerous important technical contributions to the U.S. Navy's Submarine Force combat system – in the areas of research, prototyping, field testing, and delivery. Most recently, he led the near term SSBN Tactical Control upgrade project for PMS 425, and as a result of his technical leadership, the AN/BYG-1 contact management, command displays, and the mission planning application were successfully integrated to operate on a single TI-14 server and interfaced to the legacy CCS Mk 2 Block 1C combat system. This product was delivered to the Trident Training Facility 11 months after project initiation and will be delivered to all available SSBNs.

MR. CIRO MINOPOLI
NAVAL SURFACE WARFARE CENTER, CARDEROCK DIVISION

Mr. Minopoli's contributions in the area of underwater electromagnetic signature control and technology development have directly contributed to the underwater electromagnetic signature superiority of operational U.S. submarines and the future Fleet. He has significantly advanced submarine stealth technology, transforming the underwater electromagnetic signature field into a fully operational program of modeling, measurement, and design resulting in the successful implementation of signature reduction technologies that provide the U.S. submarine fleet with advanced needed operational capabilities in the face of ever more capable threat detection capabilities.

MR. ROBERT MIYAMOTO
APPLIED PHYSICS LABORATORY

Mr. Miyamoto's contributions in the data-driven analyses and environmental-adaptive algorithm development for acoustic systems have resulted in improved performance prediction, mission planning and performance of undersea acoustic detection systems. In particular, his efforts to incorporate more accurate environmental information and models towards improving system performance, tactics, and mission planning for multi-static acoustic systems have resulted in new capabilities for undersea warfare. Mr. Miyamoto is continuing these efforts across a broad array of R&D activities related to the use of unmanned undersea vehicles, new undersea warfare technologies, and the Arctic Ocean environment.

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The NDIA UWD is honored to recognize these significant contributions to the Undersea Warfare community through our awards program.

Congratulations to the Awardees!

NDIA UWD 2016 ACADEMIC SPEAKER AWARD

DR. JAMES KISENWETHER, CHAIRMAN
ACADEMIC FELLOWSHIP COMMITTEE

The NDIA Undersea Warfare Division (UWD) established the Academic Fellowship Program in 1990 to provide financial aid to Ph.D. candidates at universities closely associated with the Navy's undersea warfare community. The objective is to encourage outstanding science and engineering students specializing in fields pertinent to undersea warfare to attend our conferences. The students present their research initiatives during an appropriate technical session and get a perspective on Navy USW programs and initiatives. We have three academic presentations scheduled for the Spring 2016 conference. Congratulations to the Awardees!

ANTHONY BONOMO

Mr. Anthony Bonomo from The ARL, University of Texas will be discussing aspects of detecting unexploded ordnances with the title, "On the use of fluid sediment models for target strength predictions from objects buried in sandy sediments".

WILLIAM WASCOM

Mr. William Wascom and Mr. Victor Valerio from The Naval Postgraduate School (NPS) Distance Learning Program will be discussing aspects of LCS platform designs with the title, "Evaluation of Littoral Combat Ships for open-ocean anti-submarine warfare".

BELLAMARIE LUDWIG

Ms. Bellamarie Ludwig from The ARL, Penn State University will be discussing aspects of fuel feeding technologies with the title, "Surface treatment of aluminum powders that enable long duration underwater power".

VICTOR VALERIO

The Executive Board appreciates your efforts in welcoming these students, whom potentially will be our future colleagues. We welcome nominees for the 2016 Fall Conference from NPS and the Navy's University Affiliated Research Centers.

UNDERSEA COMMAND, CONTROL, COMMUNICATIONS AND COMBAT SYSTEMS COMMITTEE

PAUL ROSBOLT, CHAIRMAN
DR. BOB ZARNICH, DEPUTY CHAIRMAN
CAPT STEVE HARRISON, USN (PEO IWS 5), NAVY LIAISON

Greetings, All! I'm looking forward to a great conference in San Diego! At the time of this writing, the call for abstracts has just gone out, so I can't describe the sessions, but I'm sure they will be great! Our big committee news is that John Linderman has taken on the role of Warfighter Performance session chair. John has a terrific background in ASW and in warfighter performance, both as a U.S. Navy Acoustic Intelligence specialist (ACINT Rider) and as a principal staff member at Johns Hopkins University Applied Physics Lab. Welcome aboard, John!

And now a word from our sponsor, Captain Steve Harrison, Major Program Manager for Undersea Systems, PEO IWS 5.

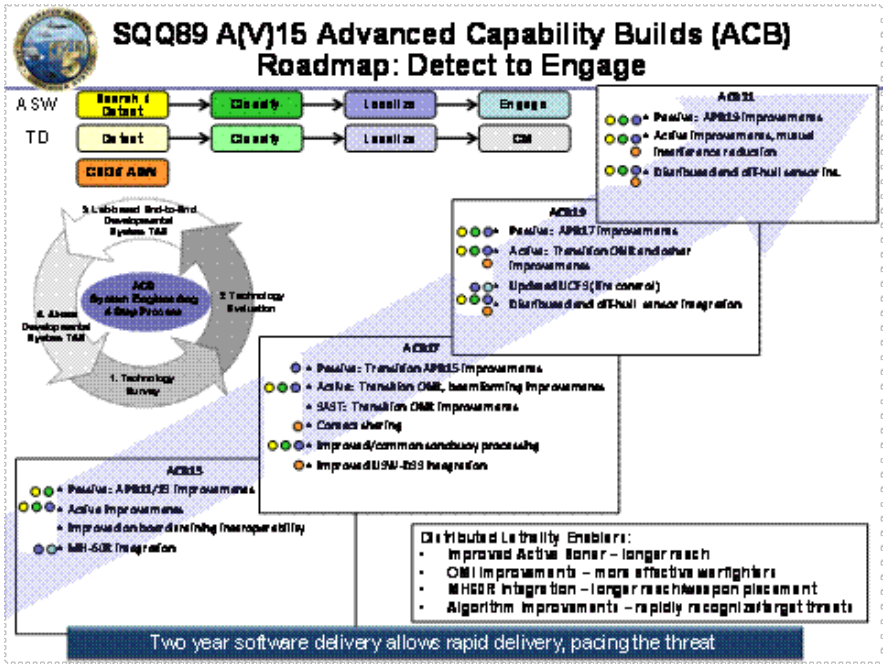
CAPT STEVE HARRISON, USN (PEO IWS 5)

"IWS 5 strives to provide game-changing ASW capability to the Fleet across a large spectrum, including submarine combat systems, surface ASW combat systems, surveillance sonar systems, CVN Tactical Operations Center, and ASW Command and Control. Consistent with messages from our leadership, our cornerstones are rapid delivery, innovation, and bringing the warfighters into the development process to give them what they really need.

"Sonar commonality continues to be a theme for IWS 5, with significant improvements in each AxB build leveraged from existing capabilities."

In order to deliver a system that capitalizes on the skills of our Sailors, our goal is to involve the warfighter throughout the entire development process, starting with our design thinking TANG (Tactical Advancements for the Next Generation) events. TANG is an innovation process first introduced in 2011 by IWS 5, in partnership with JHU/APL, to make sonar and combat systems more intuitive. After the success of the first event, there have been eight more TANG events. TANG events have brought together junior officers and operators, leaders from the commercial sector (e.g. Microsoft), key decision makers, and leading design thinking innovation firms, for three days of brainstorming and inexpensive prototyping. Participant ideas in imaging, sonar and tactical control from the first TANG workshop have been fielded in the 2013 (APB13) submarine tactical software update. After seeing the success of TANG for IWS 5 systems, there has been significant interest across the Navy in how TANG can help bring innovation into other programs. The last TANG event, held in Dec 2015, focused on Theater ASW and how the watchfloor and supporting systems could be improved.

Sonar commonality continues to be a theme for IWS 5, with significant improvements in each AxB build leveraged from existing capabilities. Our goal is to have a "conveyor belt" of capabilities, which will allow us to move new capabilities



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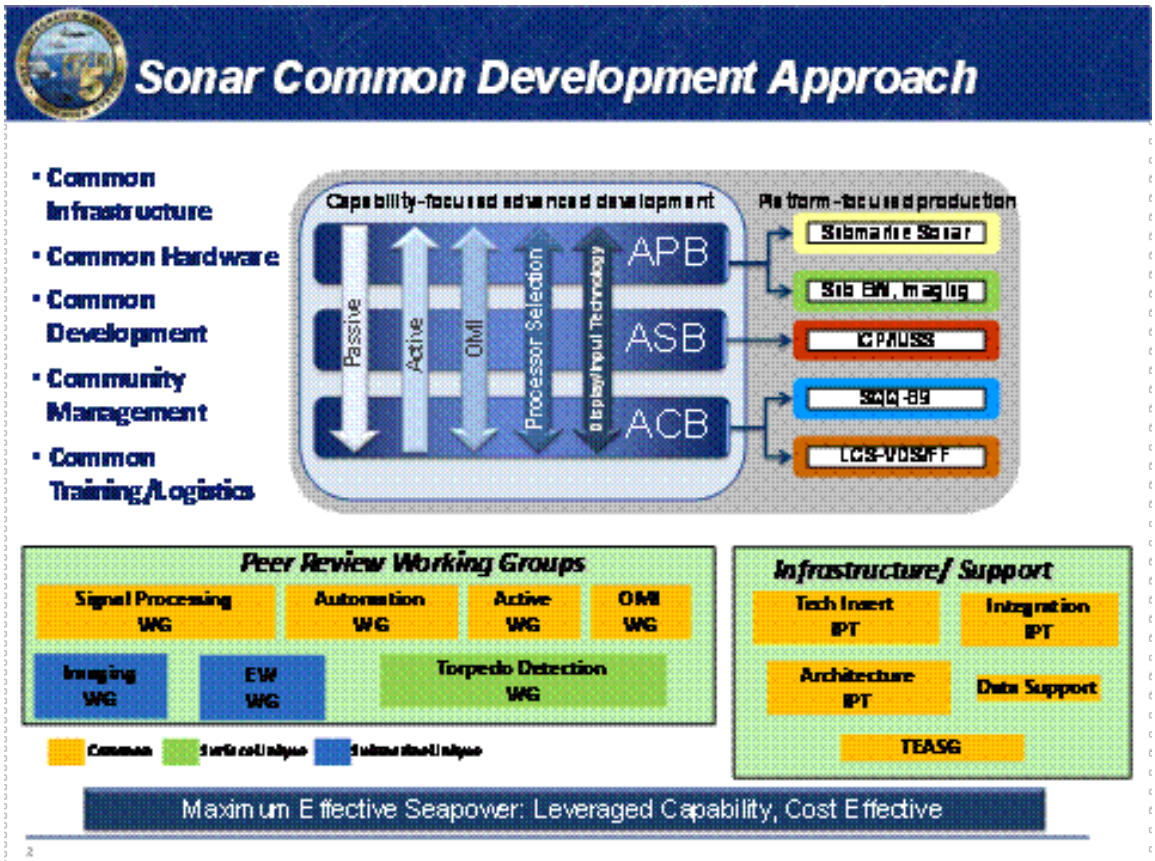
between APB (Advanced Processing Build) for submarines, ACB (Advanced Capability Build) for surface ships, and ASB (Advanced Surveillance Build) for surveillance platforms as they are developed.

The ASW capabilities of our Cruisers and Destroyers has dramatically improved with the continued fielding of AN/SQQ-89A(V)15. There have been 31 installations of the AN/SQQ-89A(V)15 ASW combat system, which has made the surface Navy a major contributor in the ASW fight. The Continuous Active Sonar (CAS) function of the ACB-11 build will be another significant improvement in ASW capability and is being tested at sea to support employment guidance and CONOPS development.

In Command and Control, AN/UYQ-100 Undersea Warfare Decision Support System (USW-DSS) Build 2 Release 3 is being fielded on Western Pacific deployers to ensure all deployed ships are fully integrated with the Strike Group for a common ASW Common Tactical Picture and search planning tool. USW-DSS also has tremendous potential as a Theater ASW tool and Build 3 development of the system begins in FY17 to provide improvements that will help both Strike Group and Theater commanders.

CV-TSC (Aircraft Carrier Tactical Support Center) Build 7 has now been installed on all CVNs except NIMITZ and LINCOLN, which have installations ongoing. CV-TSC is the first system that brings the MH-60R sensors and capabilities directly to the Strike Group ASW Commander. The capabilities of CV-TSC are also being delivered to the LCS ASW Mission Package and will be delivered as an element of the Aegis Combat System ACB-16.

I look forward to continue working with warfighters, industry, University Affiliated Research Centers, Navy Warfare Centers, and the entire ASW community to ensure that IWS 5 delivers tip-of-the-spear ASW systems."



UNDERSEA MINE WARFARE COMMMITTEE

ERIC HOLMES, CHAIRMAN
BARRY BAKOS, DEPUTY CHAIRMAN
RICH KIMMEL, SMWDC, NAVY LIAISON

What is the state of Mine Warfare (MIW) today in the US Navy? Our front line assets (MH-53E Sea Dragon helicopters and Avenger class Mine Countermeasures (MCM) ships) are nearing the end of their service lives and are being extended as the replacement systems, primarily Littoral Combat Ship (LCS) based, are slow to be introduced into the Fleet. The MIW fleet and OPNAV vision has been fairly consistent;

- Reduce MCM timelines for Combatant Commanders
- Reduce risk from sea mines to allow Joint Force mission execution
- Integrate new and evolving technologies into the LCS to fill capability gaps
- Speed of the kill chain for all MCM Systems
- Low cost, innovative, expedient/COTS Solutions

Despite this vision, the development of the organic (LCS-based) systems has been fraught with difficulties, including several program stops and re-starts. The phasing out of the MH-53E helicopter in favor of the MH-60S in search of a common more affordable airframe, failed to consider the need for a heavy-duty mine sweeping capability. This was a decision driven not by technical and operational reasons considerations, but by cost. The developing MCM systems have also had performance and reliability issues, Initial Operational Test and Evaluation (IOT&E) delays and both system and operator issues leading to less than required Area Clearance Rate Sustained (ACRS).

The Rapid Airborne Mine Clearance Systems (RAMICS), Expendable Mine Neutralization System (EMNS), AQS-20A (for the MH-60), Organic Airborne Influence Sweep System (OASIS), have all been canceled. Starts and stops with re-baselines between the MH-53E and MH-60S, along with re-baselines between the DDG 51 and LCS platforms, have all contributed to delays in improving MIW readiness. The Remote Minehunting System (RMS) and the Airborne Mine Neutralization Systems (AMNS) have had their share of development problems and are not yet at Initial Operating Capability (IOC). "The RMS program has recently been cancelled." To achieve detection requirements, the Airborne Laser Mine Detection Systems (ALMDS) tactics require multiple passes to minimize the number of false classifications, thereby reducing the area coverage rate.

There are MIW successes such the Underwater MCM (UMCM) systems, with the MK 18 Mod 2 Kingfish Unmanned Underwater Vehicle (UUV) systems and the Coastal Battlefield Reconnaissance and Analysis (COBRA) system. COBRA, operating from the MQ-8B Fire Scout, is outperforming all of these other LCS-based systems.

"The evaluation of capabilities, capacities and requirements asks for an assessment of the dedicated MCM forces and those capabilities in ships, aircraft and submarines not yet dedicated to MCM, opening up the aperture to ensure our MCM needs are met."

In the interim to fill the operational gaps, the Fleet is relying on at least Urgent Operational Needs Statement (UONS) programs; Mine Hunting USV (MHU) towing an AQS-24A and Seafox mine neutralizers both from MCM ships and MH-53E, as well as a "Fast Lane" program for the MK 18 Mod 2 Kingfish systems. These UONS and Fast Lane programs provide capability, but they are not a primary means that we should use to provide our sailors with the sustainable tools that they need.

The Congressional Research Service (CRS) recently published a report (5 January 2016) addressing the "Navy LCS/Frigate Program: Background and Issues for Congress" that provides significant details regarding problems with the MIW Mission Package (MP). Though the report's focus is on the LCS program, the MIW MP being integral to LCS success, its status is prominently addressed. This is recommended reading for all in the MIW community.

Congress has indicated their desire to reinstate the annual MCM certification requirements, called out for in H.R. 1375 as the MCM Master Plan. This master plan would include an evaluation of the capabilities, capacities, requirements and readiness levels for the Navy's defensive MCM, an evaluation of the ability of commanders to exercise command and control of MCM forces, an assessment of technologies and their transition paths, a fiscal plan to support the master plan, and a plan for MCM asset inspection and verification of both material readiness and force training levels. Also included would be the recommendations from SECNAV regarding MCM force structure and ensuring the operational effectiveness of surface MCM forces through 2025. Specifically called out is the inclusion of the LCS MCM mission package increment one performance against the IOT&E criteria.

The evaluation of capabilities, capacities and requirements asks for an assessment of the dedicated MCM forces and those capabilities in ships, aircraft and submarines not yet dedicated to MCM, opening up the aperture to ensure our MCM needs are met. Are our dedicated forces sufficient and what can we do to supplement and replace them once retired?

In addition to problems with bringing the developmental systems to the Fleet; there has been a shift in focus from the Persian Gulf to the Western Pacific. These are significantly different missions

UNDERSEA MINE WARFARE COMMITTEE

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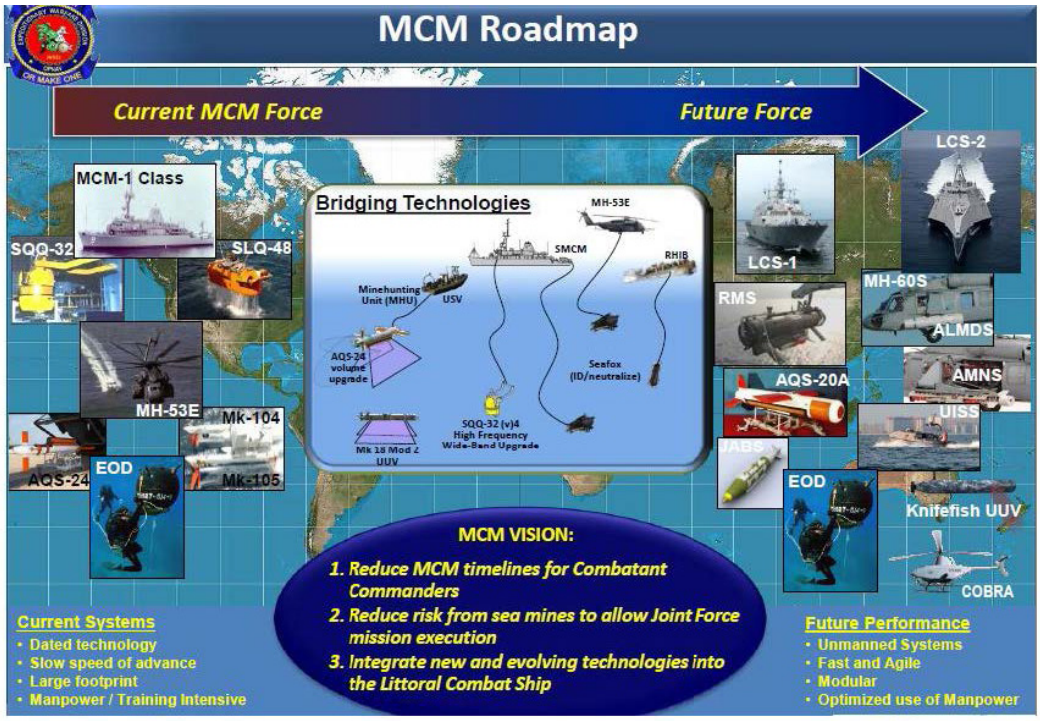
and environments, both from the geographic dispersion and an operating environment perspective. The US Navy needs to pursue the appropriate MCM systems to support the WestPac Area of Responsibility (AOR). The Naval Surface and Mine Warfighting Development Center (SMWDC) is responsible for the improvement in MIW warfighting effectiveness including tactics and training, including this WestPac thrust, and different systems/technologies than we are pursuing now may be required.

The US Navy MCM vision (and MIW, when one includes mining) is missing. Scott Truver has written about the lack of support for MIW in his Naval War College Review Spring 2015 article "Wanted: U.S. Navy Mine Warfare Champion." A champion, or set of champions, is needed. However beyond this champion, US Navy MIW also needs a vision, something similar to what the Congress is outlining in their version of an MCM Master Plan. From an Industry perspective, this vision is critical to help define company strategies, including investment for MIW systems.

OPNAV N952 has stated that the future of MIW is "Fewer Systems, Greater Capability". Fewer systems are in part budget driven, on the other hand, greater capability is technology driven. We need to ensure we invest in the right technologies and the transitioning of those technologies. The MIW Science and Technology (S&T) enterprise, as evidenced by the Office of Naval Research (ONR) Unmanned Maritime Systems Technology (UMST) Program Review held in early February, is developing innovative technologies and concepts clearly focused on improving MCM capabilities. We need to ensure that there is the budget and leadership necessary to transition these technologies into Program of Records (PORs). And how will the new OPNAV N99 organization, Unmanned Warfare Systems, play in the rapid transition of MCM technologies, given that the future MCM systems will heavily rely on unmanned vehicles?

The Single Sortie Detect to Engage (SS-DTE) Future Naval Capability (FNC) appears to be a step in the right direction. SS-DTE, consists of Unmanned Underwater Vehicles (UUV) for mine search, reacquisition and identification, associated automated deploy and retrieval with battery charging and data transfer on an Unmanned Surface Vessel (USV), processing automation including Automated Target Recognition (ATR) and mine neutralization using advanced technologies surpassing the capabilities of existing neutralization systems. SS-DTE is entering a key demonstration year in 2016 with an exit demonstration planned for 2017. The transition path appears to distribute those technologies among separate programs rather than proceed forth with an actual SS-DTE system (which would represent one of the systems with greater capability).

In summary, US Navy MCM systems under development are experiencing performance problems that are delaying their introduction to the Fleet. The transition to more capable systems leveraging advanced technologies is paramount; the key MIW stakeholders, Government, Industry, and Academia need to collaborate to make this happen. An MIW vision from US Navy leadership, a deficiency recognized by Congress, would help define the near and long term future on our MIW forces.



UNDERSEA WARFARE VEHICLES COMMITTEE

TOM RUZIC, CHAIRMAN
CHUCK FRALICK, DEPUTY CHAIRMAN
MIKE GRANT, NUWC DIVISION NEWPORT, NAVY LIASON

Advantages of CRADAs for Rapid & Collaborative Technology Development

By Stephen Plunkett, Naval Undersea Warfare Center Division Newport

Cooperative Research and Development Agreements (CRADA) have enabled technology development for the Navy and Industry through mutually beneficial collaborations. CRADAs can provide the Navy with the opportunity for joint technology development with industry and provide insight into advances in commercial off the shelf technologies that can be adapted for naval applications. The collaboration can help the Navy obtain a technical solution or a higher Technology Readiness Level for a challenging problem at a much faster rate than if the Navy were to attempt the development on their own. Industry benefits by obtaining insight into the Navy's approach to rapid prototyping and Navy developed technologies.

Several measures are put in place in the signed CRADA to protect the contractor's intellectual property and any intellectual property used as part of the CRADA. Collaborators may provide personnel, services, facilities and equipment. NUWC or the Navy cannot send funds to industry as part of the CRADA but in some cases the Navy can receive funding. An example would be funding to support testing at a unique Navy test facility.

One example of a CRADA enabling technology development is the agreement in place between the Naval Undersea Warfare Center (NUWC) and Channel Technologies Group, LLC (CTG). Ceramic and transducer design experience gained through a variety of medical and undersea applications at CTG is being applied to a set of challenging undersea vehicle sensor system R&D objectives. The CRADA enables CTG's transducer and production experience to be combined with NUWC's experience in advanced signal processing and sensor design. Initial testing of prototypes completed to date has demonstrated desired sensor performance at NUWC's Acoustic Tank Facility (ATF).

The rate of technical progress in this partnership is being accelerated by CTG's investment of Internal Research and Development (IRAD) towards the partnership. CTG's IRAD funds are being used to adapt ceramic fabrication techniques designed for other commercial purposes and to prototype sub-scale sensor systems. The prototype sub-scale sensor systems will be tested at NUWC's ATF and will be analyzed and compared to a set of previously identified sensor parameters and objectives.

With the increasing focus on rapid technology transfer to the Fleet, CRADAs offer the Navy an opportunity to assess the potential of new or existing commercial technologies in a collaborative manner with industry. The CTG example is just one of many successful partnerships that have been executed under a CRADA agreement. Recent partnerships have resulted in new commercial products being introduced by industry while providing new undersea capabilities for the Navy and NUWC.

"With the increasing focus on rapid technology transfer to the Fleet, CRADAs offer the Navy an opportunity to assess the potential of new or existing commercial technologies in a collaborative manner with industry."

Prototype Sensor Development

UNDERSEA AVIATION COMMITTEE

GLEN SHARPE, CHAIRMAN
MATT HILL, DEPUTY CHAIRMAN
CAPT MATT TOBLER, USN (NAVAIR PMA-264), NAVY LIAISON

We look forward to an exceptional conference and technical session where the diversity of the Aviation ASW community continues to grow in support of the ASW mission. Numerous advancements are on the horizon from sensor improvements, signal processing, and new platform concepts joining the ASW domain. Collaboration between industry, academia and Navy counterparts needs to continue. Below are a few public release data points on succeeding Aviation programs:

Commander Patrol and Reconnaissance Group Pacific "Checking in on station"

By Rear Admiral Kyle Cozad, Commander, Patrol and Reconnaissance Group

Rear Admiral Kyle Cozad
Commander, Patrol and Reconnaissance Group

Maritime Patrol and Reconnaissance Warriors Past and Present,

Happy New Year! For this first edition of Checking on Station of 2016, I am pleased to report that the Maritime Patrol and Reconnaissance Force (MPRF) is "Kilo Alpha" and on course for its ongoing transformation. Navigated by a very able TRIAD team of OPNAV Requirements Officers, NAVAIR Acquisition Professionals, and MPRF fleet leadership, every piece of our Family of Systems -- consisting of P-8A Posedon, MQ-4C Triton, and TacMobile --is on track to eventually supplant our legacy platforms. The eye watering capabilities in Anti-Submarine Warfare (ASW), Intelligence, Surveillance and Reconnaissance (ISR), and Anti-Surface Warfare (ASuW) that these platforms will bring to our squadrons are truly transformational and require a fresh approach to employment as we succeed in our mission of ASW first, ISR always, and ASuW when called upon.

With 39 of 109 jets having delivered to the fleet on or ahead of schedule, and more showing up monthly, we will wrap-up the east coast P-8A Transition with VP-26's safe-for-flight certification in April. At that point we will take about a six month pause to allow MILCON to catch up in Whidbey Island and grow our Poseidon inventory before beginning our first west coast squadron transition next Fall. This will also mark the beginning of homeport changes from MCAS Kaneohe Bay to Whidbey Island, where each Hawaii squadron, beginning with VP-4, will return from their next deployment to Whidbey Island and begin their transition to P-8A. With continued strong support from Navy, OSD, and congressional leadership we are programmed to stay on course and complete transition with 12 active duty squadrons of seven aircraft each, plus the Fleet Replacement Squadron (FRS), as planned in FY20.

That is certainly not to imply that we will be completely out of the P-3 business anytime soon. Far from it, as we will continue to fly P-3s with our reserve squadrons and VPU-2, and EP-3s with VQ-1, for a bit longer as we await arrival of P-8A Increment 3, Triton Mulit-INT, and the Advanced Airborne Sensor (AAS). These upgrades will serve to bridge the final gap between legacy and new platforms and increase key operational capabilities. We also enjoy robust international partnerships that will see our allies continue to operate very capable P-3 Orions around the globe for years to come. Today's Lockheed P-3C Orion has more than kept pace with a host of actual and potential adversaries and is still highly regarded as one of the most capable Maritime Patrol and Reconnaissance Aircraft (MPRA) ever built. In addition to the United States Navy, 14 allied countries currently fly some variation the P-3. These countries include Japan (78), Canada (21), Australia (18), South Korea (17), Taiwan (12), Brail (12), Germany (8), Norway (6), Greece (6), New Zealand (6), Chile (6), Argentina (6), Pakistan (6), and Portugal (5). And while each country's exported P-3 may have its own unique capabilities, they all share a common core and are extremely well suited for the mission for which they were designed. Even as the US Navy divests itself of this venerable workhorse, some of our friends are investing in new P-3 technologies.

Germany has developed a mission system and acoustic refresh plan and is intending to fly their fleet of P-3C aircraft through 2035. They are currently re-winging their eight aircraft over an eight year period. Another close ally, Greece, has recently committed significant resources to reactivate their P-3B fleet. This effort includes re-winging and acoustic and non-acoustic systems modernization through 2022 and they will likely be flying their maritime patrol assets for years to come. Probably the most ambitious P-3 program to date, the Taiwan Air Force (TAF) and Taiwan Navy (TN) have recently joined the International MPRA forces, operating re-worked P-3C aircraft based on a Service Life Extension featuring new wings and empennage installations and state-of-the-art mission systems. Initial stand up is almost complete as the majority of their twelve P-3C aircraft have been delivered.

While it is clear that there is still an important mission and

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UNDERSEA WARFARE AVIATION COMMITTEE

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place in the world for the P-3 to operate, no less than a dozen countries have expressed some level of interest in the P-8A Poseidon. Of particular note, the U.S. Navy is actively strengthening existing bonds with Australia through a PMA-290 managed P-8A Cooperative Program, which has proven to be of tremendous benefit to both nations. Participation as a cooperative partner means Australia has been fully integrated into the U.S. Navy requirements, development, procurement, logistics support, training, future capability development, and operational fleet introduction activities and processes. It is vitally important to the partnership that Australia participates fully in upgrades and modifications such as Increment 3, as configuration commonality is a key tenet to maintaining affordability and cooperative value for both partners over the life of the program.

The Australia Department of Defence (ADOD) officially entered into a Memorandum of Understanding (MOU) for P-8A Spiral 1 (Increment 2) Development with the U.S. DoD in April 2009. Current USN Increment 2 scope includes Multi-static Active Coherent Anti- Submarine Warfare (ASW) search and Automated Identification System integration, Tactical Operations Center upgrades, High Altitude ASW Sensors and Weapon integration, and acoustics refresh.

As a continuation of the successful international collaboration between the U.S. and Australia, the U.S. DoD and the Australian DOD signed the Production, Sustainment and Follow-on Development (PSFD) MOU March 2012. The PSFD MOU is currently a 10-year term umbrella agreement that will allow the RAAF to cooperate in the procurement of P-8A aircraft, Training Systems, and TacMobile, with Increment 2 capability. Australia initiated procurement for eight P-8 aircraft in 2014 (with a possibility of procuring up to 12 aircraft), with initial delivery scheduled for early FY17. The Australian Aircrew Training Systems and Maintenance Training Systems contracts have been awarded with all training systems' deliveries scheduled to begin August 2017. To support initial Australian P-8A training, seven aircrew and three maintenance instructors under the Personnel Exchange Program (PEP) arrived in NAS Jacksonville December 2014 and June 2015 respectively. The first three Australian transition training students of approximately 250 planned among three pipelines of aircrew, maintenance, and Tactical Operations Center (TOC), commenced training October 2015 and will continue over the next three years to mid- 2018. The USN and RAAF have been successful at creating new, innovative and precedence-setting policy and processes in areas such as Communications Security (COMSEC), global supply chain, financing, training, and co-sharing of IT systems, with continued pursuit of program enhancements in areas such as foreign disclosure, future capability development, and Export Control Reform. But it is not just P-8 and TacMobile that has captured the attention of our allies. MQ-4C Triton, which completed its initial Operational Assessment last month, is also being looked at as a potent addition to a number of MPRA stables. Australia has recently expressed interest and views Triton in much the same way as the U.S. Navy to provide a persistent maritime ISR asset that augments and multiplies its manned P-8A platforms.

"Today's Lockheed P-3C Orion has more than kept pace with a host of actual and potential adversaries and is still highly regarded as one of the most capable Maritime Patrol and Reconnaissance Aircraft (MPRA) ever built."

Furthermore, the United Kingdom recently demonstrated its intent to recapitalize its MPRA fleet. The UK has been without a long range MPRA asset since they cancelled their MRA4 Nimrod program in 2010. While details are being worked, the UK Prime Minister has announced the decision to procure nine P-8As to be stationed at RAF Lossiemouth with first aircraft delivery desired in April 2019. The second and third aircraft are desired in 2020 and the remaining six aircraft in 2021. We are currently evaluating requirements and capacity at VP-30 to meet the UK's training needs and support their proposed plan.

So, it is clear that 2016 is off to a tremendous start and I am confident that this will be a good year for the MPRF and United States Navy. It is very fitting that this year's theme for the Maritime Patrol Association's (MPA) Symposium in Jacksonville, 13-15 April, is Honor the Past, Forge the Future. As it has in all previous years, this year's reunion is shaping up to be a great one and I invite you to visit MPA's website for details: (www.maritimepatrolassociation.org). Hope to see you there! Until then, continue to Fly, Fight, and Lead.

With Great Respect,

Kyle Cozad
Rear Admiral
Commander Patrol and Reconnaissance Group and Patrol and Reconnaissance Group Pacific

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UNDERSEA WARFARE AVIATION COMMITTEE

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Navy makes big order of anti-submarine warfare (ASW) sonobuoys to help aircraft find enemy subs

By John Keller, Editor, Military & Aerospace Electronics

PATUXENT RIVER NAS, Md., 29 Oct. 2015. U.S. Navy anti-submarine warfare (ASW) experts are replenishing their supplies of air-launched sonobuoys with a variety of capabilities ranging from taking the temperature of ocean layers at different depths, to detonating submerged explosive charges.

Officials of the Naval Air Systems Command at Patuxent River Naval Air Station, Md., announced a $178.6 million contract Monday to ERAPSCO Inc. in Columbia City, Ind., for as many as 136,500 AN/SSQ series sonobuoys for anti-submarine warfare (ASW).

Sonobuoys enable Navy ASW forces to detect, track, and pinpoint potentially hostile submarines operating in the open ocean and in coastal areas that could be threats to Navy carrier battle groups or other forces. Information from these systems can help enable precision attacks with air-launched torpedoes.

Monday's order consists of as many as 6,000 AN/SSQ-36 sonobuoys; 95,000 AN/SSQ-53 sonobuoys; 15,500 AN/SSQ-62 sonobuoys; 10,000 AN/SSQ-101 sonobuoys; and 10,000 AN/SSQ-125 sonobuoys.

Aircraft can drop a pattern of sonobuoys, which relay information back to the aircraft by radio link, to determine the exact locations of enemy submarines.

The AN/SSQ series of sonobuoys consists of the SSQ-36 bathythermograph (BT); SSQ-53 passive directional low frequency analyze and record (DIFAR); SSQ-62 directional command active sonobuoy system (DICASS); SSQ-101 air deployed active receiver (ADAR); SSQ-110 multi-static non-coherent source; and SSQ-125 multi-static coherent source.

The AN/SSQ-36B provides vertical temperature profiles of the ocean layer for ASW and research, and used widely in ASW operations to evaluate local effects of seawater temperature on sonar propagation and acoustic range prediction.

The AN/SSQ-53F uses four hydrophones -- each one a multichannel directional piezoelectric ceramic transducer -- that operate at depths of 90, 200, 400, and 1,000 feet to listen for potentially hostile submerged enemy submarines. Aircraft can drop a pattern of sonobuoys, which relay information back to the aircraft by radio link, to determine the exact locations of enemy submarines.

The SSQ-53F has three sensors: a constant shallow omni (CSO), an advanced DIFAR sensor, and a calibrated wideband omni. The buoy digitally conditions and amplifies the acoustics and provides directional data that helps establish azimuthal bearing to the submarines being tracked.

"Sonobuoys enable Navy ASW forces to detect, track, and pinpoint potentially hostile submarines operating in the open ocean and in coastal areas that could be threats to Navy carrier battle groups or other forces."

The AN/SSQ-62E DICASS sonobuoy is for detecting and localizing submarines in preparation for attack. It can provide range and bearing to the target to fix position, and can support any of the four acoustic frequencies as selected via the Electronic Function Select.

The AN/SSQ-101 ADAR sonobuoy provides a commandable passive search capability, and functions as the receiver in a multistatic active receiver system. The device uses a pentagon-shaped horizontally oriented pattern of hydrophones to detect and beamform underwater sound waves.

The AN/SSQ-125 sonobuoy is a source in a multistatic field, and can generate a variety of waveforms, and is designed to work with the AN/SSQ-53F, AN/SSQ-77C, and AN/SSQ-101 (ADAR) sonobuoys.

The AN/SSQ-125's RF channel can be programmed to any of the standard sonobuoy operating channels. At any time after deployment, the AN/SSQ-125 can be commanded to change its operating parameters or depth (deeper only), generate a ping, or scuttle.

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US Military's New Swarm of Mini-Drones

Defense News

WASHINGTON — US military scientists have invented a miniature drone that fits in the palm of a hand, ready to be dropped from the sky like a mobile phone with wings.
The "micro air vehicle" is named after the insect that inspired its invention, the Cicada, which spends years underground before appearing in great swarms, reproducing and then dropping to the ground dead.

"The idea was why can't we make UAVs (unmanned aerial vehicles) that have the same sort of profile," Aaron Kahn of the Naval Research Laboratory told AFP.

"We will put so many out there, it will be impossible for the enemy to pick them all up."

The "Cicada," short for Covert Autonomous Disposable Aircraft, was designed to be smaller, cheaper and simpler than any other robotic aircraft — but still be able to carry out a mission in a remote battlefield.

The prototype cost just a thousand dollars, and the cost could come down to as little as $250 apiece, said Kahn, a flight controls engineer at the naval lab.

With no motor and only about 10 parts, the Cicada resembles a paper airplane with a circuit board.

It is designed to glide to programmed GPS coordinates after being dropped from an aircraft, a balloon or a larger drone, researchers said.

In a test about three years ago in Yuma, Arizona, Cicada drones were released from 57,600 feet (17,500 meters). The little drone flew — or fell — 11 miles, landing within 15 feet of its target.

The Cicada drone can fly at about 46 miles (74 kilometers) per hour and are virtually silent, with no engine or propulsion system.

"It looks like a bird flying down," said Daniel Edwards, an aerospace engineer at the Naval Research Laboratory. But, he said, "it's very difficult to see."

Robotic Carrier Pigeons

In the flight test, the Cicada had sensors that could send back weather readings for temperature, air pressure and humidity.

But researchers said the mini-drones could be used for a myriad of missions, and outfitted with a range of light-weight sensors, including microphones.

"They are robotic carrier pigeons. You tell them where to go, and they will go there," Edwards said.

One possible scenario could be using the drones to monitor traffic on a remote road behind enemy lines.

"You equip these with a microphone or a seismic detector, drop them on that road, and it will tell you 'I heard a truck or a car travel along that road.' You know how fast and which direction they're traveling," Kahn said.

The micro-planes could be outfitted with magnetic sensors to pick up enemy submarines, or to eavesdrop on troops or operatives.

For the moment, equipping it with a video feed poses a technical challenge, because extracting the video requires too much bandwidth, researchers said.

Although the drones have yet to be deployed, the first use may come outside the battlefield, for weather forecasters.

Meteorologists trying to predict tornadoes have to rely on temperature readings from the ground. But the Cicada drone offers the prospect of numerous temperature readings from the air, providing enough data to build a truly three-dimensional model for forecasting tornadoes.

And despite their toy-like appearance, the Cicada drones are surprisingly robust, Edwards said.

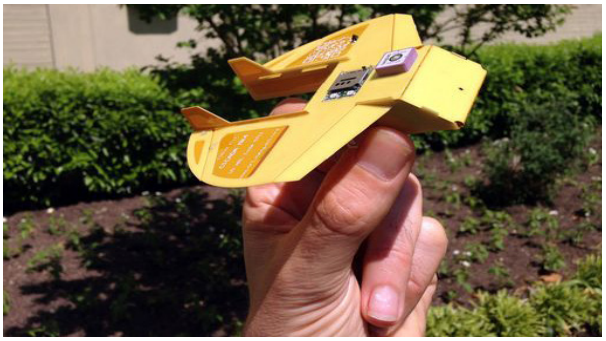
"You can thrown them out of a Cessna or a C-130," he said.

"They've flown through trees. They've hit asphalt runways. They have tumbled in gravel. They've had sand in them. The only thing that we found that killed them was desert shrubbery," he said.

Edwards had the Cicadas on display at the Pentagon's "lab day" this week, as part of a bid by US defense officials to promote technological innovation.

Academics and just about every branch of government have expressed an interest in the Cicada program, including some intelligence agencies.

"Everyone is interested. Everyone," Edwards said.



The "Cicada," short for Covert Autonomous Disposable Aircraft, was designed to be smaller, cheaper and simpler than any other robotic aircraft.

UNDERSEA SENSOR SYSTEMS COMMITTEE

MICHAEL JANIK, CHAIRMAN
JOE CUSCHIERI, DEPUTY CHAIRMAN
MR. PETER SCALA, PEO IWS 5, NAVY LIAISON

I would like to begin this article by acknowledging the contribution of the former USW Sensor Committee Chairman - Mr. Jose Rio. Jose has served as chairman for as long as I can remember. He always did a superb job organizing the program, working all the logistics, and keeping the sessions on track. It is only now that I am realizing the contribution he made, in time and effort, to ensure that things ran smoothly. We will miss him and wish him the best.

The Sensors Committee Spring session addresses sensor needs for fixed surveillance systems, distributed netted sensors as well as sensors on submarines, surface ships and unmanned vehicles. This year's theme "Assuring Undersea Dominance in an Era of Major Power Competition" emphasizes the need for new sensor and signal processing capability. These sensors will be necessary to maintain tactical and strategic awareness in the evolving maritime undersea battle space. During this session we will receive a brief from our Navy liaison Mr. Pete Scala, Director of IWS 5A Advanced Development. Mr. Scala will discuss the new AxB process, APB-15 sensor algorithms and the Large Vertical Array 2 initial test results; as well as providing updates on the Conformal Bow Array and Wide Aperture Array (WAA). Captain Andy Wilde, Program Manager on PMS485 Maritime Surveillance Systems, will address the Integrated Undersea Surveillance Systems (IUSS) sustainment and modernization needs required to meet emerging threats and achieve the desired undersea dominance vision in this new era. In addition, we will hear from ONR on affordable, scalable Hull Array Panels that can provide new or expanded sonar capability for surface ships. ONR will also discuss innovative ideas and concepts that enable rapid completion of the "detect to engage" kill chain.

These presentations are just a sample of the exciting session we have planned. NDIA is a team effort. Forums such as the USW Division of NDIA bring together intellectual resources, i.e. the Uniformed Services, Navy Labs, Academia, and Industry. We all work together to share information, collaborate, and coordinate our investment resources so that we can provide the best systems to the warfighter. The presenters are key to the information transfer and I want to thank them for their effort. I want to thank Joe Cuschieri, the Deputy Chairman, for helping organize the agenda. We are both new and have worked together to coordinate the session. I also want to thank Tiffany Wilson for providing very significant support. Putting USW Sensors Session together would be impossible without her. Finally, I'd like to express our sincere appreciation to Pete Scala from the IWS 5 PEO who is the Navy Liaison for our USW Sensors committee. Pete has a wealth of pertinent experience and is a strong asset to the team.

SPRING 2016 UNDERSEA WARFARE DIVISION CONFERENCE

APRIL 11-13, 2016

WAYNE JAKUBOWSKI, CHAIRMAN
SPRING CONFERENCE

This year's conference Theme, "Assuring Undersea Dominance in an Era of Major Power Competition" clearly highlights the emergence of new challenges, new thinking, and the need for updated strategies to leverage new and existing technology in innovative ways. Another set of exceptonal speakers will provide their perspectives and help develop a clearer picture of the undersea enterprise, its gaps, and its emerging requirements. Again hosted by the Admiral Kidd Conference Center, the 2016 Spring NDIA Undersea Warfare Conference will provide the backdrop for the critical conversations needing to take place. In an election year, where the potential exists for waiting and assessing versus engaging and deciding, this conference will clearly stress the importance of continued action and forward progress. Our six technical tracks consisting of Aviation USW, C4I, Combat Systems/Warfighter Performance, Mine Warfare, Undersea Sensors, and Undersea Warfare Vehicles provide the opportunity to engage with the technology developers and Navy program managers and help shape their vision and solution portfolio. Special attention has been taken this year to adjust schedules so that program overviews are staggered or provided in more than one time slot.

"In an election year, where the potential exists for waiting and assessing versus engaging and deciding, this conference will clearly stress the importance of continued action and forward progress."

As in the previous two years, the Holiday Inn will serve as our headquarters and registration reception area. Buses will support both the Holiday Inn and Liberty Station hotels for transportation to and from the conference. Tuesday evening will include a networking dinner at the Conference Center. Thank you for your continued support to this conference. Its networking value is only enabled by the tremendous participation of industry, universities, active duty commands, and the Naval System Centers and Warfare Laboratories. We have reviewed comments from last year's conference as well as the Fall conference in Groton and continue to make changes that we believe continue to improve the conference value to all participants. Thank you for joining us this year and we are looking forward to providing you with the information and networking opportunities that are required to keep our community informed and effective.

NDIA HEADQUARTERS
Assistant Vice President, Operations
CAPT Bruce Roulstone, USN (Ret)
broulstone@ndia.org
Tel: 703.247.2574

Meeting Planner
Tiffany Wilson (twilson@ndia.org) 703.247.9467

Please notify Tiffany of address changes.

NDIA UWD NEWSLETTER
Published periodically to communicate activities and plans. For inputs or suggestions contact:

Laurie Carter, Editor
Rite-Solutions, Inc.
lcarter@rite-solutions.com
Tel: 703.517.9904

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