

NATIONAL DEFENSE INDUSTRIAL ASSOCIATION

STRENGTH THROUGH INDUSTRY & TECHNOLOGY

UNDERSEA WARFARE DIVISION



A Message From The Naval Undersea Warfare Center

RDML PATRICK H. BRADY, USN, COMMANDER, NUWC & DON MCCORMICK, TECHNICAL DIRECTOR, NUWC

Concept Generation and Concept Development: Disciplines for Complex Decision Environments

The Liaison Message in the spring 2007 edition of the NDIA Undersea Warfare Division newsletter addressed the complexity of our operational environment and some of the challenges it imposes as we work to (out) pace potential threats. The fall 2008 conference theme follows that thread and affords us an opportunity to contemplate our approach to this demanding and ever-shifting operational landscape.

The drivers compelling the re-examination of what we should do and how we should do it are many and varied and most of them have been discussed at length. But it is worth reconsidering some of the more pressing issues extant in the increasingly complex USW environment. Dynamic and evolving undersea threats are a prime factor; whether they are ascribed to rogue or failing nations, potential superpowers, or transnational extremists, we constantly worry that emerging or unforeseen threats will render our technology and operational methods obsolete. That fear is partially grounded in the rapid advance and proliferation of sophisticated technology — some of which can be applied in disruptive and destructive ways and may be available in open commercial markets. We must also deal with the tension of competing timeframes of interest: we need to balance what the operational Fleet wants now with what may be required in the out years and prioritize our attention and resources accordingly. Another balancing act is

required in selecting, developing and deploying the right mix of off-board and platform-organic USW capabilities as we consider how our assets are going to be employed.

“...we constantly worry that emerging or unforeseen threats will render our technology and operational methods obsolete.”

Perhaps the greatest overall driver is the increasingly demanding set of resource challenges. Budget turmoil is a fact of life as the defense burden on the nation is continuously adjusted and pressures on discretionary accounts increase. Supplemental budgets and Congressional earmarks are under intense scrutiny. All of this may impose downward trends in USW investment that will demand greater efficiency and effectiveness in everything we do. Budgetary issues influence the Fleet as well. Fewer ships and smaller crews are being asked to do more with less, operational tempos are high, and multi-mission tasking is common. Finally, we need to be more responsive, agile and innovative to successfully cope with these and other converging factors. We all know that change does not come easily or quickly to many organizations; this inertia must be overcome if we are to deliver the capabilities needed within acceptable cost and schedule parameters.

The potential solution set to this broad set of challenges is unbounded and determining the optimal approach for finding the best answers requires considerable thought. It may not be coincidental that, as you are reading this, an interesting and relevant Navy initiative is underway: at the Chief of Naval Operations'



RDML PATRICK H. BRADY, USN,
COMMANDER, NUWC



DON MCCORMICK,
TECHNICAL DIRECTOR, NUWC

NUWC LETTER CONTINUED ON PAGE 9

INSIDE THIS ISSUE

- Division Chair's Update 2*
- Spring 2008 Awards 3*
- C4I/Combat Systems 4*
- Aviation USW Committee 5*
- Mine Warfare Committee 6*
- Undersea Vehicles Committee 7*
- USW Sensors Committee 8*
- Spring UWD Conference 10*

Division Chair's Update

BRUCE SPEAR, UNDERSEA WARFARE DIVISION CHAIRMAN

The Undersea Warfare Division (UWD) mission as stated in our charter under the National Defense Industrial Association is to promote the exchange between government and industry of technical information and expansion of research

and development in areas related to Undersea Warfare. The spring and fall conferences are our primary means to accomplish our mission. Attendees come to these conferences for a number of reasons: to learn about today's USW activities and issues from Navy leadership in the plenary sessions; learn the latest technical solutions in Undersea Warfare being pursued by government and industry by attending the technical sessions; and, I believe the most important benefit, to have one-on-one interactions between members of the Undersea Warfare community. In fact, we set aside extra time in our agenda so that this interaction can take place. While many think of this interchange as government-industry, I am amazed to see the significant government-government and industry-industry interaction; many folks exchanging ideas for the first time with their peers on topics in the same or related technology areas. I recommend that you take full advantage of this opportunity.

We also fulfill our mission by conducting a number of technical studies in support of Navy organizations. Each of our technical committees is either presently conducting a study or planning to conduct a study in the near future. Ongoing studies include:

C4I & Combat Systems Committee
Communications Management in Support of an Anti-Submarine Warfare Common Tactical Picture for the Director, ASW Cross-Function Board, OPNAV N87.

Undersea Sensors Committee
Distributed Netted Sensor Study for Director, Sea Shield Division, OPNAV N701.

Mine Warfare Committee
Maritime IED Study for NMAWC.

These studies are conducted at no cost to the government and provide a broad view of alternative solutions to operational needs. All interested UWD members (government

"We have a great opportunity to advance our Navy's undersea warfighting capabilities."

and industry) are encouraged to participate in our studies. Government leaders are invited to make use of our division member expertise to conduct studies that may be outside of the purview of specific government organizations or industry contractors.

The spring conference, April 28 – May 1, 2008 at the Admiral Kidd Conference Center, San Diego, Calif. was a great success with a record number of attendees. The adjacent location of the technical sessions allowed easy movement between sessions of interest. Holding the conference at the Naval Mine and ASW Warfare Command (NMAWC) provided us with a venue that is at the center of Undersea Warfare development in the Navy. We continue to receive excellent support from the commander NMAWC, RADM Drennan, and we thank him for that support. Wayne Jakubowski, our spring conference chair, organized a great conference and I thank him for his efforts.

Our Fall Conference is shaping up to be an outstanding event. Paul Normand, our fall conference chair, has put together a world-class plenary session including Navy USW leadership from Air, Surface and Sub-surface Operational and Acquisition Commands and I thank him for his efforts. I want to thank each of our plenary speakers for taking the time to be with us and provide their views on the state of Undersea Warfare in today's Navy. Our technical committee chairmen have organized five superb technical sessions covering Aviation USW, C4I & Combat Systems, Mine Warfare, Undersea Sensors, and Undersea Vehicles and I thank them for their efforts. I especially want to thank each of you who are making presentations at these sessions. Without your contributions we could not deliver a high-quality technical conference.



We have a great opportunity to advance our Navy's undersea warfighting capabilities. Each of us can make a contribution through our efforts in our jobs and we can multiply our contributions through working together in the activities of the Undersea Warfare Division. The leadership of the UWD and I look forward to working with all the members of the Undersea Warfare community to ensure our Navy continues to be the premier undersea warfighting force in the world.

I close this article, my first, as the division chair, by acknowledging the contributions of our outgoing chair, Milo Hyde, who provided our division with two years of dedicated leadership. While most of us only see the chairman's activities during our spring and fall conferences, the chairman expends a significant amount of time and effort throughout the year to keep our division operating smoothly and productively. Thank you Milo!

Undersea Warfare Division Honors Awardees

BOB KITTREDGE, AWARDS CHAIRMAN



The NDIA Undersea Warfare Division was pleased to present four of its most prestigious awards during the Plenary Session of the Spring 2008 USW Conference in San Diego, Calif., on April 29, 2008.

The **Vice Admiral Charles B. Martell-David Bushnell Award** for exceptional contributions in the field of ASW and/or Undersea Warfare technology was presented to **Dr. Arthur B. Baggeroer**, Massachusetts Institute of Technology. In his forty-year career, Dr. Arthur Baggeroer has profoundly influenced this nation's capabilities in Undersea Warfare. Throughout his career he has continually pushed the state of the art in underwater acoustics and signal processing to enhance the performance capabilities of Navy sonar systems, active and passive, tactical and surveillance. His work covers a broad spectrum of topics such as robust adaptive beam forming, matched field processing, Arctic acoustics, acoustic communications, bottom geo-acoustics and geophysics, acoustic tomography and thermometry, coding and detection theory, and vector sensors. His most recent contributions include chairing a National Academy of Sciences study and report on Distributed Netted Systems, an area that is of great interest and importance to the Navy today. He's a prolific contributor to the USW technical knowledge base, having authored over 90 refereed journal articles, two books, three book chapters and 30 conference proceedings. His lifetime of accomplishments distinguishes him as one of the Undersea Warfare community's most valuable assets.



LEFT TO RIGHT: BRUCE SPEARS, DR. ARTHUR B. BAGGEROER AND MILO HYDE, UNDERSEA WARFARE FORMER DIVISION CHAIRMAN

The **Vice Admiral Charles E. Weakly Award** for meritorious service and/or noteworthy contributions to effective government/industry communications in the field of Undersea Warfare (USW) was presented to **VADM J. Guy Reynolds (USN, Ret)**, who unfortunately was unable to be in attendance to accept. His formal presentation will be conducted during the fall "Clambake." During a career spanning more than five decades, VADM J. Guy Reynolds has distinguished himself as a visionary leader and a consummate technical expert with a unique ability to forge cooperative working relationships across institutional bounds.

As an active duty officer, VADM Reynolds tirelessly championed Undersea Warfare technology from science and technology to research and development, production and in-service improvement, becoming the "father of ADCAP" and moving submarine combat systems into the digital age with BSY-1 and BSY-2. After retiring, VADM Reynolds continued to foster government-industry communications as president of the Naval Submarine League, and as a consultant to numerous companies involved in Undersea Warfare. In all endeavors, he possesses an unparalleled ability to communicate with personnel at all levels, from Admirals to Ensigns, and from CEOs to shipyard workers, which has helped ensure that the Navy acquires the most effective and efficient capabilities for today and tomorrow.

The **Captain George W. Ringenberg Award** is presented to recognize those who, through their service and leadership to the UW/D, have made noteworthy contributions to the organization.



THEODORE "TED" HACK, CAPT USN, RET

This year the award was presented to **CAPT Theodore "Ted" Hack (USN, Ret)** of General Dynamics. Ted chaired the Fall Joint Undersea Warfare Technology Conference, the premier NDIA event for eight years, from 1999 through 2006. Under Ted's stewardship, conference attendance increased and the quality of the speakers was uniformly superb. Through Ted's efforts, conference speakers were drawn not only from the leadership of the Navy and the full spectrum of the Undersea Warfare community, but also

included some nontraditional invited speakers for broader perspectives. He further strengthened a climate that allowed open and candid communication for the speakers, thereby increasing coordination and communication between the Navy and industry. His dedication, hard work, knowledge, skills and abilities provided the perception that the conferences are easy to organize and run. The success of the NDIA Fall Conference during this period reflects Ted's hard work and the respect he has earned in the community.

The **RADM Jack Jarabak/NDIA Award for Technical Excellence** in the area of Undersea Warfare by a student at the Naval Postgraduate School was announced for **LT Michael R. Dolbec**, USS Alexandria (SSN 757). LT Dolbec was unable to be in attendance due to Navy commitments. LT Dolbec graduated from the Naval Postgraduate School in March 2007, and was awarded a Master of Science degree in electrical engineering. He achieved an outstanding level of academic performance during the nine quarters of the Undersea Warfare (USW) Program. He was one of the first of the USW students to enter the Autonomous Systems track. A perfect trailblazer, he made suggestions that helped make the track even better for subsequent students. LT Dolbec's thesis, entitled "Velocity Estimation Using Forward Looking Sonar" is an outstanding research effort that contributes to the improvement of the guidance and control of Autonomous Underwater Vehicles (AUV), which are so critical to Undersea Warfare superiority. This method holds the promise for permitting smaller AUV's to navigate under the sea more accurately.

C4I/Combat Systems Technical Committee

MICHAEL A. TUCKER, CHAIRMAN
PAUL ROSBOLT, DEPUTY CHAIRMAN
CAPT CHARLES DAVIS, LIAISON



The committee is pleased to report an outstanding turnout of papers for the fall conference. We have a wide representation from government, labs, academia and industry.

The presentations offer a mix of program status, test results and technology that will provide insight and stimulate the exchange of information.

I am both saddened and excited to announce that Paul Rosbolt (Raytheon) will be assuming committee chair on the conclusion of this fall conference. I am saddened because I have thoroughly enjoyed my four-year tenure as committee chair and have had the opportunity and pleasure of meeting so many professionals dedicated to the ASW challenge and the defense of our great nation. As such, I plan to remain fully engaged in NDIA. I am excited because Paul Rosbolt has assumed chair for the committee. As many of you know, Paul has been involved in this committee for many years and was committee liaison while serving as PEO-IWS5. I am also pleased to announce that Bob Zarnich (Metron) will be taking over as deputy chair. Bob has also been involved with the committee for many years and we look forward to the added leadership he brings.

"The CFT found it (ASW CTP Study) to be both relevant and timely."

The committee has been quite busy with two very interesting projects. First, as many of you are aware, we have been conducting a study concerning the ASW Common Tactical Picture (CTP). The study focuses on existing technologies and capabilities that could be brought together to support the formation of the CTP. A brief on Communications Management in support of an ASW CTP has been prepared, vetted through the NDIA executive board

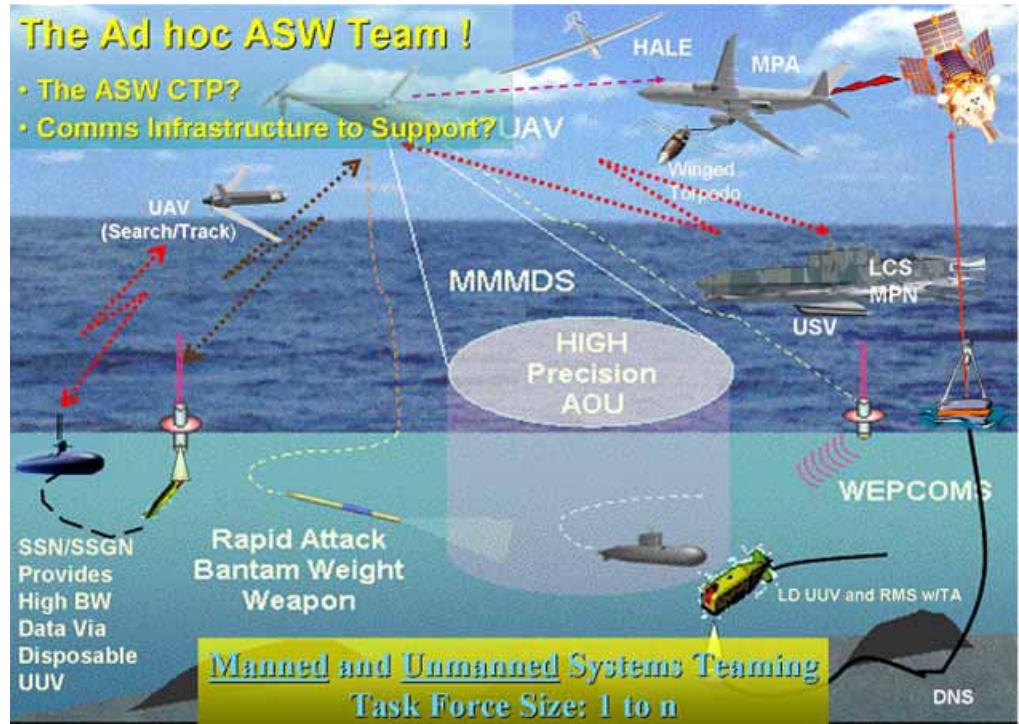


FIGURE 1: COMMUNICATIONS TO SUPPORT THE ASW TEAM.

and is currently being briefed to USN. On August 11th, it was briefed to the ASW cross-functional team (ASW CFT). The CFT found it to be both relevant and timely. They recommended that it be briefed to OPNAV N6 for their consideration in architecture development. The brief will be presented by Don Randle (Boeing) during the C4I & Combat System Technical Breakout Session. Figure 1, Communications to Support the ASW Team, provides a visual on the problem space that the study and associated brief addresses. The committee intends to continue to monitor technologies and capabilities that support the ASW CTP and to provide periodic reports.

The second project involves a review of the Combat Systems Architecture Description Document (ADD). As CAPT Charles Davis (PEO IWS5) announced at the spring conference, PEO IWS has drafted a combat systems architecture description document (ADD) to describe the objective combat systems architecture for current and future surface ship combat systems. As part of the review process,

CAPT Davis asked the Combat Systems and C4I committee to conduct a quick look review of the ADD. Specifically, the committee will identify issues with implementation of the architecture in Undersea Warfare systems, and provide recommendations to resolve the issues.

The study was kicked off in July, when a group of 15 committee members met at the Raytheon facility in Crystal City to identify issues. This was followed up by another meeting in early August to generate recommendations. As this goes to press, the team is smoothing out the recommendations, and will provide a brief to CAPT Davis during the fall conference.

A committee meeting will be held on Sept. 8th at the Mystic Marriott at 1:30 p.m. The agenda includes current activities.

Aviation Undersea Warfare Committee

DAVE NELSON, CHAIRMAN
 MAX NORGART, DEPUTY CHAIRMAN
 CAPT LARRY PUGH, LIAISON



At last check, Aviation USW programs appear to be doing well in the FY-09 budget cycle on the Hill. It is also our sense that the POM-10 build is going to be rather robust for airborne USW as well in terms of ensuring the readiness of the P-3C, bringing the P-8A on-line and making the Broad Area Maritime Surveillance a program of record. Other maturing focus areas having an affect on airborne USW are Maritime Domain Awareness and Intelligence,

Reconnaissance, Surveillance and Targeting (IRS&T). Although not pure USW both concepts continue to shape the requirement and budget for airborne capability. The CNO has pointed out that the "kill end" is important but the Navy needs to start making sure it makes investments in the intelligence side and command and control side of the equation.

"As the CNO stated in a recent interview, 'While the Navy has purchased good ASW systems...it still comes down to the need to practice with all those systems.'"

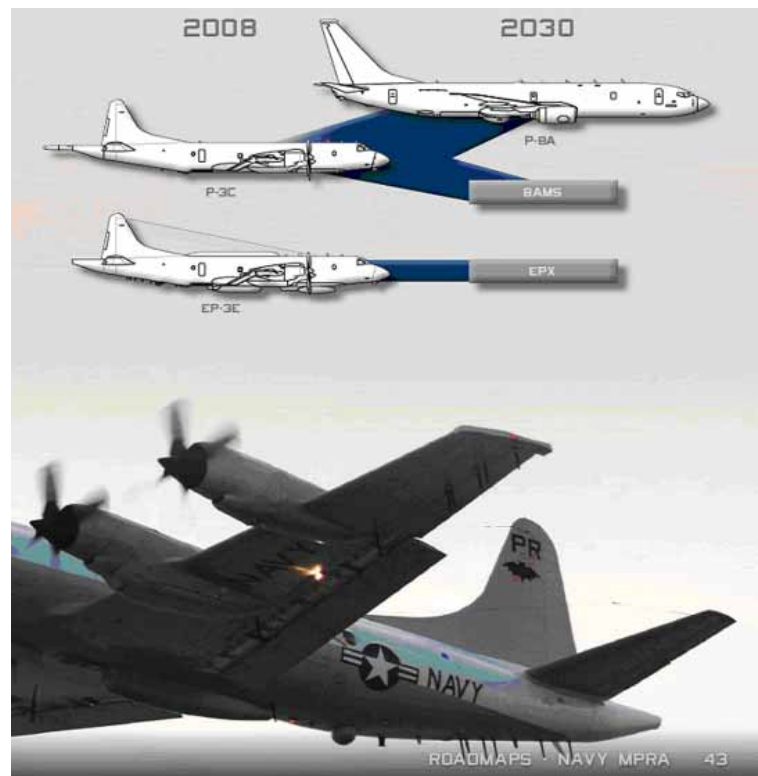
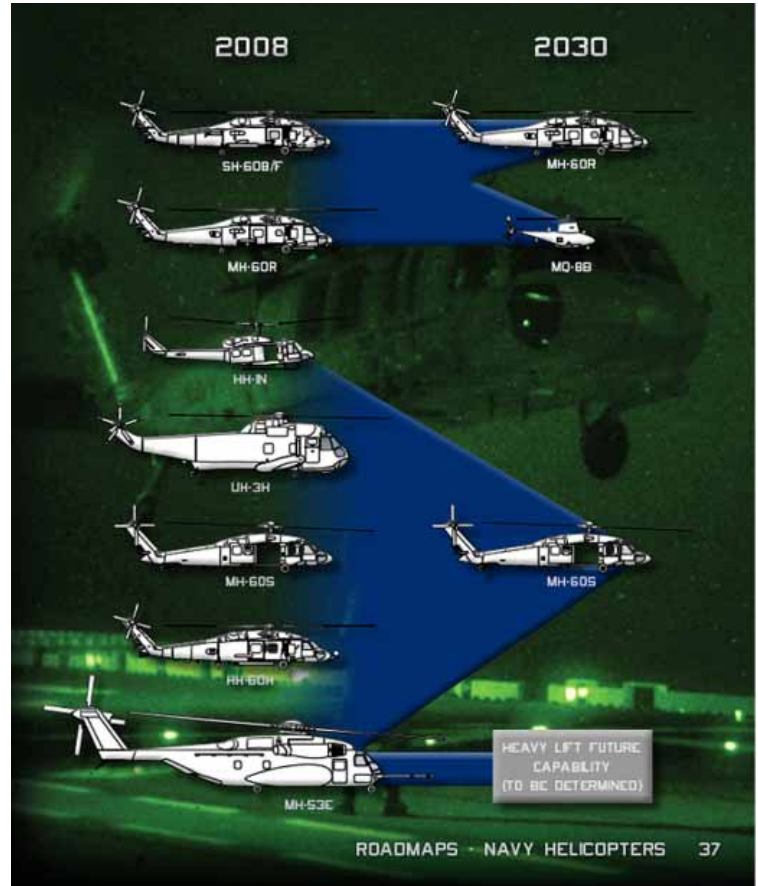
In addition, concerns are being raised about potential lack of hard core USW training and the ability to maintain warfighting proficiency with the airborne USW communities spending most of their time operating over land. Are the mission systems being developed agile enough to make up for a lack of "hands-on" sub time? As the CNO stated in a recent interview, "While the Navy has purchased good ASW systems in the form of more advanced sonars, airplanes, sonobouys and weapons, it still comes down to the need to practice with all those systems."

One of the key transformations taking place in airborne systems is working from "high" altitudes for the fixed-wing platforms. It is our sense that some of the issues that the Maritime Patrol and Reconnaissance community is studying are sensor placement accuracy, integration, high altitude atmospheric, high altitude weapons release and maneuvering, RFI mitigation and GPS jamming. Sustained/sophisticated Fleet training is also noted as a challenge. In addition, false contact resolution, persistent tracking/persistent kill chain from high altitude, and not increasing crew work load with additional systems are some of the issues that are being worked.

The legal issues surrounding active sonar training continue to work their way through the courts. In the long term, these court excursions will have a profound affect on the way combat aircrews are trained and systems are built. The future of successful airborne USW depends on having both acoustic and non-acoustic wartime skill levels available on a sustained basis. This is an area where perhaps the committee could add some value in helping the Navy determine if the appropriate requirement and acquisition programs are in place to ensure that the art form of USW warfare is maintained in an environment where most of the operational time is spent over land.

Airborne USW remains a critical part of the overall core competency for the Navy. The committee's work/review of emerging technical USW systems can provide a supportive review for our Navy partners from an industry perspective.

Once again, the Aviation USW technical session has an excellent mix of platform and sensors program status overviews along with both acoustic and non-acoustic sensor technology presentations. We look forward to your participation.



Mine Warfare Committee

ERIC HOLMES, CHAIRMAN
BILL KEY, DEPUTY CHAIRMAN
GARY HUMES, LIASON



During the week of last Fall's Clambake Conference, the initial MIW Mission Package (MP), destined for the Littoral Combat Ship (LCS), was delivered in a ceremony at the Naval Surface Warfare Center

(NSWC) Panama City. As we approach this year's conference, the LCS-1, USS Freedom, has recently completed its builder's sea trials on the waters of Lake Michigan. LCS-1 operations have been outstanding, meeting performance objectives and demonstrating impressive capabilities (e.g. speed in excess of 40 kts). As this article goes to press the ship is preparing for the Navy's own acceptance trials of LCS-1 on the Great Lakes with further testing on the Atlantic later this year. Some of the MIW Mission Package systems are set for delivery to LCS-1 for late 2008.

The organic MIW capability that the LCS will provide was a passion of Jim Thomsen, who led us through the thrust towards organic MIW as well as modernization of the M-class ships. As PEO LMW, PEO LMW Executive Director, and in various capacities at NSWC Panama City, Jim has been instrumental in the positive accomplishments of the MIW community. We wish him well in his new job as the principal civilian Deputy Assistant Secretary of the Navy. Jim has already indicated that even in his new position, he "will always keep an eye lasered on mine warfare."



LCS-1, USS FREEDOM, ON BUILDER'S SEA TRIALS.

The AN/WLD-1 Remote Minehunting System (RMS), with the AN/AQS-20A minehunting sensor, has completed TECHEVAL and will enter OPEVAL some time after Sept. 1. The RMS has had significant operational time on the USS Bainbridge, including time in the Mediterranean. Bainbridge was also the host platform for the recent AN/WLD-1 TECHEVAL. The ship's

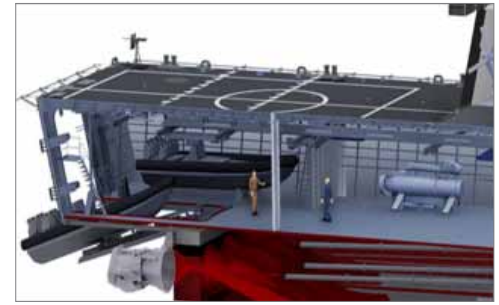
Commanding Officer (CO) extolled the capabilities of this readily available (on demand) minehunting capability for his destroyer, publishing his position in the June issue of *USNI Proceedings*. From the Bainbridge CO, "Imagine an organic system that could be launched and recovered in a relatively short time, a system that could operate over the horizon independent of other mission areas and obviate the need for fly-away teams, special mission modules, or force protection." After identifying that system as the RMS, he continues, "The destroyer-mounted RMS (DDG-RMS) offers a tremendous niche capability for independently deployed ships or units and fills the mine countermeasures gaps in the U.S. Navy's strike group forces."

"LCS-1, USS Freedom, has recently completed its builder's sea trials... operations have been outstanding."

Clearly the value of organic mine warfare has been acknowledged by the Fleet. Though not destined for the DDGs, the first RMS delivery to the LCS-1 is planned to take place later this year. The organic systems are maturing and will be delivered as part of the MIW MP for the LCS. Systems include the Coastal Battlefield Mine Reconnaissance System (COBRA), Airborne Laser Mine Detecting System, (ALMDS), Unmanned Surface Sweep System, and the AN/ASQ-235 Airborne Mine Neutralization System (AMNS). They will be briefed at the fall conference.

An area of mine warfare that traditionally does not see much attention is minefield breaching. The U.S. Navy has recently awarded Boeing Company a \$153M contract to develop the Assault Breaching System (ABS) Countermine System (CMS). The CMS capability will provide the Navy with the ability to project power and successfully complete a Ship-to-Objective Maneuver (STOM). The CMS warhead uses the combat-proven Joint Direct Attack Munition guidance set to accurately position the weapon above the mines. The warhead is designed to dispense its payload of more than 4,000 neutralizer "darts" at a predetermined altitude, clearing the way for safe beach landings. And in the spirit of true jointness, U.S. Air Force strategic bombers will be used as the CMS delivery platform to clear assault lanes while Navy tactical fighters perform localized mine neutralization.

With CMS, MIW continues to be a transition partner of choice with the Office of Naval



LCS BRINGS EXPANDED ORGANIC CAPABILITY TO THE FLEET THROUGH THE USE OF UNMANNED VEHICLES.

Research as the technology for CMS was developed in conjunction with the ONR Mine Obstacle Defeat System program. ONR and the Naval Research Laboratory (NRL) are also critical to the transition of the Low Frequency Broadband (LFBB) technology that is planned for transition by PMS 403 into the Surface

Mine Countermeasures (SMCM) UUV program, focusing on detection of buried, proud and volume mines in high clutter environments.

RADM Frank Drennan, Commander Naval Mine and Anti-submarine Warfare Command (NMAWC), expressed interest in Offensive and Defensive Mining at our spring conference. From the Admiral's presentation at the spring conference there were three issues which he is interested in how we the community is addressing. These issues are the principal to deterring our tactical application of sea mining. They include "too hard to clear ...," "too indiscriminate ..." and "international law considerations." These areas will be a principal focus area of the MIW technical presentations at the Clambake in an effort to address the Admiral's concern that we "Need technical options that will overcome our self-deterrence."

The mining capability in the U.S. Navy, both defensive and offensive, has received little attention over the past 5-10 years. Mining, although tactically very effective, carries an international stigma related to indiscriminate application of force. Consequently, the U.S. has been reluctant to continue to maintain an effective mining capability, either offensive or defensive, in spite of significant successes experienced in the past as a result of offensive mining (e.g., the mining of Haiphong Harbor in 1972 brought the North Vietnamese back to the negotiating table and facilitated the ending of the Vietnam war). The fall conference will focus on addressing these issues, both domestic

Undersea Vehicles Committee

RICH TALIPSKY, CHAIRMAN
TOM SHERMAN, DEPUTY CHAIRMAN



Across the vehicle spectrum, innovative technologies and collaboration of commercial and Government programs continue to expand. Moves toward standardization, the incorporation of commercial-off-the-shelf (COTS) products

and streamlining of processes combine to make vehicle systems more and more capable and cost effective. The use of unmanned systems is becoming increasingly, perhaps critically, important, to our fleet's ability to perform their missions in today's operational environment.

AUV FEST 2008 shows that "Partnership Runs Deep"

AUV FEST 2008 conducted this summer in Narragansett Bay in Rhode Island showcased over thirteen unique Autonomous Undersea Vehicles (AUVs) with a theme called "Partnership Runs Deep". A distinctive aspect of the FEST was the sharing of the Office of Naval Research Technologies with the National Oceanographic and Atmospheric Administration to explore marine archeology. The FEST utilized an integrated display center where data was centrally managed by over forty analysts. Four wrecks in the bay were surveyed using both Navy and commercial technology. Although the technologies were used to survey wrecks, some from the Revolutionary War, also demonstrated were several Navy mine countermeasure mission objectives including search and mapping capabilities, mine hunting, mine neutralization and hull inspection.



THE SAS-12 SIDESCAN SONAR PRODUCED THIS IMAGE OF A SHIPWRECK. NOTE THE VISIBLE LINES IN THE SAND LEFT BY THE BUOY CHAIN. IMAGE COURTESY OF AUVFEST 2008.

The Advanced Seal Delivery System (ASDS) achieves increased mission capability

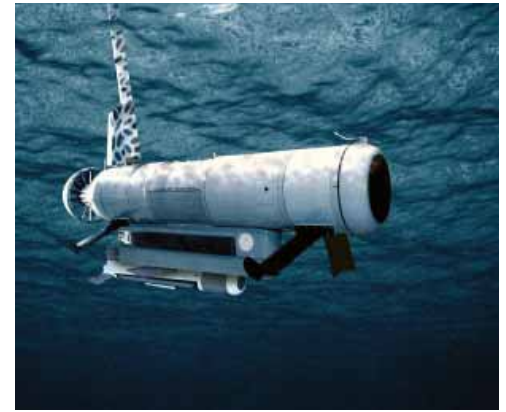
In March 2008, during the USS Michigan's (SSGN 727) post-conversion follow-on test and evaluation (FOT&E) the ship conducted the first ever SSGN operation of the ASDS. The ability of the ASDS to be hosted on the SSGN was enabled by a set of "universal pylons", originally developed for the Los Angeles and Virginia Class Submarines and designed and manufactured by Northrop-Grumman. The universal pylons will greatly increase the options for deployment of the ASDS capability in theater.

Joint NUWC/Raytheon effort simplifies torpedo hardware change processes

A collaborative value stream analysis lean effort between the Naval Undersea Warfare Center, Division Newport (NUWC DIVNPT) and Raytheon resulted in a common champion process that will result in dramatic overall changes in the torpedo hardware change process and increased flow and cost reductions and efficiency gains for FY08 and FY09. A future goal will be to require contractors supporting the torpedo hardware change process to utilize the CMPPro tool to evaluate the processes and provide usage statistics for later analysis of the value improvements. This initiative supports NUWC commander RDML Brady's challenge to mitigate industrial barriers to allow partnerships with small businesses in support of torpedo system acquisition strategies.

RMS comes of age as a multi-mission platform

The Remote Minehunting System (RMS) (AN/WLD-I) is nearly ready to be deployed on U.S. Navy destroyers and as a mission package aboard the Navy's new Littoral Combat Ship (LCS). Beyond its minehunting capability, the vehicle is being positioned as an unmanned multi-mission undersea vehicle system. Lockheed Martin has begun to examine the multi-mission capabilities of the Remote Minehunting Vehicle (RMV). This endeavors to leverage existing investments to save development costs. Leveraging the RMV's modular payload capability, the U.S. Navy can deliver high endurance, persistent undersea warfare surveillance. An anti-submarine warfare (ASW) variant would tow wideband active source and passive receiver to provide uninterrupted bi-static surveillance, detection and tracking of quiet diesel electric submarines in the littoral waters. This versatility to perform multiple



AN/WLD-I SYSTEM: THE REMOTE MULTI-MISSION VEHICLE

missions will transform RMV into a "Remote Multi-Mission Vehicle". The flexibility in being able to operate without a host combatant ship can have particular benefit, for example, when a requirement arises for a multi-mission unmanned system to perform coastal defense, or intelligence, surveillance, reconnaissance (ISR), to support a force that does not have the surface combatant infrastructure used in the baseline AN/WLD-I system.

Unmanned Maritime Systems (UMS) technology insertion

The Navy is considering an update to the Unmanned Undersea Vehicles (UUV) master plan. In support of this, the program manager for Unmanned Maritime Vehicle Systems, CAPT Paul Siegrist, has asked NDIA to examine whether there are significant advances in the "state of the practice" in UUV technology areas since the last master plan update in 2004.

Specifically, the areas of vehicle autonomy, high bandwidth communication, electromagnetic sensors, open architecture, and hull materials might be leverage points for providing capability to the fleet in a spiral development manner. Spiral development programs rely on the insertion of proven technology from commercial-off-the-shelf (COTS) sources and new emerging technologies as soon as they are ready.

The Navy desires to define technology advances in the past several years that support a plan to incrementally enhance existing systems to meet the demands of the Fleet in the quickest and most cost-effective manner.

The NDIA USW Division Vehicle Committee is working with CAPT Siegrist to define a study that will help identify those technologies and focus the study topic. Those interested in participating should e-mail Rich Talipsky: rtalipsky@seacorp.com with suggestions and interest in participating. Participation by industry will greatly benefit the advancement and interoperability of UMS.

Undersea Warfare Sensors Committee

JOSE RIO, CHAIRMAN
JUERGEN KEIL, DEPUTY CHAIRMAN
CAPT RICK NICKLAS, LIAISON



Our theme for this conference is, "Undersea Warfare: Solutions for a Complex Environment." This complexity manifests itself in many ways: the littoral high traffic environment, the management and projec-

tion of the battle force, the proliferation of SSKs, the multifarious character of the threats, the asymmetry associated with the threats and the problem of anticipating the nature of the threats. We must adapt not only to the bewildering variety but also the imperative of doing so expeditiously. The technical sessions that have been assembled from our treasure of industry, government laboratories, and academia address undersea warfare by applying creative and effective solutions as will be demonstrated by our program of presentations.

Among the solutions we have the foundational open architecture computing for future warfare systems that are coordinated across the enterprise. These address decision support, ASW systems engineering and advanced development programs. To realize the objective improvements, there have been initiatives such as the Advanced Processor Build that have successfully transitioned innovations in a very short time. Initiatives such as the Distributed Netted System have been studied by the ASW community and a long overdue thrust for surface ship improvement has been launched. The AN/SQQ-89 A(V) 15 is the newest version of the AN/SQQ-89(V) and it includes a new Multi Function Towed Array (MFTA) with an Acoustic Intercept (ACI) sensor. The active processing capabilities have been expanded and multi-static operation is included.

There has been new emphasis on fleet support and technology transition and this has great relevance in view of the contemporary threats. This has been complemented with increased experimentation to validate the enhancements needed to guarantee unchallenged superiority, and this in turn has been driven by clear mission redefinition with the corresponding CONOPS.

Given the volatile geopolitical environment rapid insertion is essential but must be done without losing sight of the concomitant economic constraints. The A-RCI business



THE IMPORTANCE OF ASW

model fills this need nicely. Among the new sensors we have the TB-33, the TB-34, and the LCCA. The TB-34 has a bandwidth improvement and tow depth reduction opening new possibilities for shallow water deployment. It also is synchronized so that it can be used to advantage with other arrays to perform, for example, cross array ranging. The LCCA has been installed and tested on the USS *Cheyenne* (SSN 773) and it provides a significant tactical value and considerable improvement in situational awareness.

"Given the volatile geopolitical environment rapid insertion is essential but must be done without losing sight of the concomitant economic constraints."

There has been renewed effort to coordinate all sensing systems; RADAR, SONAR, video from Unmanned Aerial Systems (UAS), navigation systems, and optimized use of team trainers in conjunction with real platforms. Interoperability is being tested with unmanned systems in complex warfighting environments. ONR is pushing the envelope with its work on Persistent Littoral Undersea Surveillance (PLUS), exploiting low cost unmanned vehicles to provide wide area long term surveillance without risking high-value capital platforms. These systems employ sophisticated sensing technologies to detect and track the quiet SSK threat. Vertical and horizontally directive sensors designed for distributed sensing applications and that can operate autonomously or collaboratively are gaining currency for use in barrier and wide-area littoral surveillance.

Thrusts into high technology are achieving very high precision navigation using the Atom Interferometer (AI). This development opens the door for ultimate advancement in a number of diverse areas such as tracking and highly covert active SONAR. Single Crystal technology supports broadband operation in low frequency active SONAR. Acoustic vector sensor arrays provide greater freedom to extract information required for high performance in the difficult shallow water environment. Collaboration between the Light Weight Wide Aperture Array (LWWAA) and the new bow sensor the Large Aperture Bow (LAB) array gains the ultimate in tactical awareness in the complex shallow water ambient.

The preceding has been but a very brief preview of the content of our technical sessions on USW sensors and the direction of the community. We anticipate that they will provide a stimulus within the community to further contributions to our pool of solutions.

I want to extend my thanks to Juergen Keil our USW Undersea Sensors Committee deputy chairman for providing invaluable assistance in organizing our agenda this fall. I also want to thank Kim Williams and CAPT Bruce Roulstone USN (Ret) who as always provided excellent support. I also want to thank CAPT Rick Nicklas, our USW sensors liaison, for his contribution to our technical agenda.

Concept Generation and Concept Development: Disciplines for Complex Decision Environments

CONTINUED FROM PAGE 1

direction, the role of Concept Generation and Concept Development (CG&CD) is being reinvigorated to better provide Navy and joint leadership with more comprehensive understanding of the potential solution “trade space” and elicit informed decisions on warfare capability development and investment vectors. Specifically, Admiral Roughead has tapped the Navy Warfare Development Command as his Executive Agent for CG&CD to ensure concept formulation and concept development disciplines lead to timely implementation of needed Fleet and joint forces capabilities. The Fleet Forces Command and the Naval War College will be supporting the initial implementation of this reinvigorated process. At NUWC we’ve taken note of this and are exploring how CG&CD tenets might be adopted to make us and other members of the provider enterprise more effective USW capability providers.

Historically, the fields of concept generation and concept development within our community have predominantly revolved around platform and technology focused ideas, with most exploration at the tactical level. Concept exploration and development processes included cost, feasibility, and design studies; military mission analysis; and studies to determine optimum applications for specific technologies. We’re anticipating that the resurgent approach to CG&CD disciplines will result in processes that offer distinct advantages over the historical methodology. This new perspective will allow the Navy to be driven by its best operational ideas, along with their respective underpinnings. CG&CD should be thought of as two distinct phases. Concept generation (formulation)

and provide some indication of its efficacy and feasibility within the timeframe of interest—thereby giving first-order understanding of the potential the concept holds. Concept development involves gathering and organizing compelling evidence that the concept is feasible (and will improve warfighting ability) and finalizing a concept “intellectual prototype” package—not a physical prototype. Effective concept development will supply convincing evidence that the concept will, in fact, improve warfighting ability—and to what degree—and will identify the critical knowledge areas of interest that will enable formulation of a sound experimentation strategy.

Even though new CG&CD policy and processes are still being codified, there are a few efforts underway to use the high-level precepts already defined. The CNO’s Strategic Studies Group (SSG) employs a tried and proven Concept Generation (CG) practice within their overall Innovation Process. The SSG CG practice may serve as a useful baseline from which other Navy activities in this discipline could be expanded. Another recent example is a working group addressing concepts for non-traditional ASW capability. Although its proceedings aren’t appropriate for this forum, the methodology used in this initiative underscores how conceptualization, research, collaboration, and feasibility assessments performed early in deliberations proved very beneficial for addressing a complex topic and yielding an experimentation approach. One reason the disciplines of CG&CD are being reemphasized is that the Navy must move forward with its best ideas, and CG&CD can facilitate that with

compelling knowledge and evidence. CG&CD’s focus on intellectual activity permits its use for broader and higher levels of application, particularly at the operational warfare level.

The reinvigoration of CG&CD within the Navy should precipitate future directions and investments that are based upon best ideas and sound operational concepts. It could inhibit the occasional tendency to develop technological point solutions in search of a problem and foster more rigorous feasibility assessment early in the process. Thus, concepts would flow from an operational perspective, and would include supporting elements (e.g. platforms and technologies). CG&CD could therefore



activities include conceiving and characterizing the idea, focusing first on the operational warfare level; performing initial feasibility estimates; and determining what potential the candidate concept holds for improving warfighting ability. Effective concept generation/formulation will not only fully describe the operational warfare concept, but will also identify its critical underpinnings (such as technologies or concepts of operations)

be useful as an on-ramp, if you will, to the bridge between the technical communities and the warfighter and we at NUWC will be assessing how we can adopt its precepts. We need to work together—from preparing the seeds of ideas and informing the solution space of what is possible, to supporting the maturation and evaluation of concepts to meet the diverse challenges our warfighters face, both now and in the future.

Mine Warfare Committee

CONTINUED FROM PAGE 6

and international, which have continued to cause the reluctance of naval leaders to fully embrace the operational application of mining.

The MIW committee continues to work on the Underwater Improvised Explosive Device (UIED) Study being performed for NMAWC. The current study effort is comprised of four working groups: One – Strategy, Policy and Agency Context; Two – Threat and Domestic UIED Requirements; Three – current Capabilities and Gaps; and Four – Alternative Counter UIED Concepts.

These working groups are comprised of volunteers from the MIW committee

membership and represent a broad spectrum of experience, both on the government side and the industry side. The ultimate goal of the UIED Study, as it has become known, is to provide a series of options, both conventional and unconventional, for clearance of U.S. ports and harbors from UIEDs. The Study is chaired by Scott Truver; executive advisor National Security Programs at Gryphon Technologies, who is well known to the underwater warfare community having published numerous articles on the impact of UIEDs on the U.S. in prestigious professional journals, such as the USNI Proceedings. The final report is scheduled for completion by March 2009.

For the third consecutive year, the Mine Warfare committee will be holding a full set of technical briefs at the Clambake. In addition to the technical sessions, a committee meeting will be held during the Thursday working lunch and committee meeting. All are welcome to the committee meeting to dialogue with fellow members of the community and further discuss the UIED Study. Finally, I want to thank those in the community who have supported us with your abstracts and your conference participation. You have allowed us to have full technical sessions at both the fall and spring conferences.

Fall Undersea Warfare Division Conference: Sept. 8-11, 2008

PAUL NORMAND, CHAIRMAN

Today, more and more countries see the submarine as a strategic asset. The ability of these evolving countries to get a submarine underway and have it operate submerged increases the complexity of the challenges we face. In the recently approved New National Defense Strategy, Secretary of Defense Robert M. Gates says that even winning the conflicts in Iraq and Afghanistan will not end the "Long War" against violent extremism and that the fight against al-Qaeda and other terrorists should be the nation's top military priority over coming decades. We cannot ignore the fact that third world nations and non-state entities may in the future attempt to influence world order through exploitation of the world's oceans.

Our NDIA Undersea Warfare Division goal with this year's fall conference is to continue to build on the Navy's achievements. Our theme for the fall conference is: Undersea Warfare: Solutions for a Complex Environment. This year's plenary session includes: the Director, Naval Reactors, Commander Submarine Forces, Director Navy Intelligence, Commander Navy Mine and ASW Command, Commander Naval Sea Systems Command, leadership from our Program Executive Offices, Submarine Research and Development and Naval Undersea Warfare Center, the Oceanographer and Navigator of the Navy, the Director Submarine Division CNO N-87, Director Warfare Integration and the Commander of Center for Counter Terrorism Operations.

The Honorable Mike Vickers, Assistant Secretary of Defense for Special Operations, Low Intensity Conflict and Interdependent Capabilities, will deliver the conference keynote address.

We look forward to understanding the challenges that our Navy faces in the undersea domain and identifying how the Navy and industry team can bring solutions to continue the United States dominance of the undersea environment.

¹ *Washington Post*, 31 July 2008, *Gates Sees Terrorism Remaining Enemy No. 1*

"The ability of these evolving countries to get a submarine underway and have it operate submerged increases the complexity of the challenges we face."



NAVAL SUBMARINE BASE NEW LONDON, GROTON CT – SUBMARINE CAPITOL OF THE WORLD

Raytheon Integrated Defense Systems

Printing and publication costs of the NDIA Undersea Warfare Division Newsletter have been paid for by Raytheon Integrated Defense Systems.

Copyright © 2008 Raytheon Company. All rights reserved. Cleared for public release. Printed in the U.S.A. 4238096

NDIA HEADQUARTERS

Director, Operations
CAPT Bruce Roulstone, USN (Ret)
broulstone@ndia.org
Meeting planners
Kim Williams (kwilliams@ndia.org)
Angie DeKleine (adekleine@ndia.org)
Tel: 703.247.2599

Please notify Kim or Angie of address changes.

NDIA UWD NEWSLETTER

Published periodically to communicate activities and plans. For inputs or suggestions contact:
CAPT Tom Dion, USN (Ret), editor
Raytheon Integrated Defense Systems
thomas_c_dion@raytheon.com
Tel: 401.842.5597
Raytheon Advanced Media
Pam Reynolds, Art Director/Sr. Graphic Designer
pam_reynolds@raytheon.com