



NAVAL POSTGRADUATE SCHOOL

IN REVIEW

M A G A Z I N E

OCTOBER 2010

Maintaining

THE EDGE

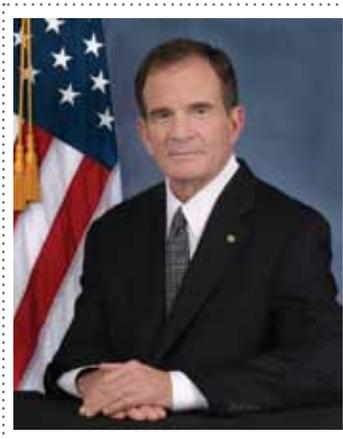
*NPS, Information Dominance,
and the New World*

INSIDE:

Seaweb Research Pioneers
Underwater Internet

.....
Space Systems Chair Supports
Navy's Effort in the Final Frontier

.....
Marine Explores Expeditionary
Energy for the Corps



Daniel T. Oliver
Vice Adm., United States Navy (Ret.)
President, Naval Postgraduate School

From national security studies to engineering, operations research to business, NPS has the intellectual and physical capital that allow our students to pursue and solve the same issues they experience first-hand in the fleet and field.

PRESIDENT'S MESSAGE

To educate at the master and doctoral levels, a university must mold a rigorous, forward-thinking effort of discovery into its intensive academic programs. The simple act of research is tightly intertwined with the educational enterprise, and is in fact, an inseparable component of an institution's identity.

Like those at any university, NPS students are encouraged – rather they are required – to challenge their preconceived notions, to ask critical, demanding questions that confront what they know and cross all disciplines. And they are provided with knowledge, support and resources to answer them.

But there is something quite unique about NPS and our engagement in research. The NPS student is a professional, mid-level, career-driven officer in the Armed Services, or a fast-track civilian in the DoD enterprise, and they bring with them both backgrounds and futures vastly different from the traditional graduate student. They are ones who have seen the fleet or battlefield and know first-hand what challenges face our national security. They have led men and women into the chaotic fray of operation, and they will return to lead once more. And they, more than anyone, understand the importance of providing viable solutions to challenges that face the warfighter.

Across campus, the diversity of programs and departments at our university ensures that every student will have the opportunity to discover those solutions. From national security studies to engineering, operations research to business, NPS has the intellectual and physical capital that allow our students to pursue and solve the same issues they experience first-hand in the fleet and field.

In this edition of *In Review*, you will learn about Marine Corps Capt. Brandon Newell, just one student in a class of many. He saw the loss in blood and treasure of delivering energy to front lines, and he committed himself to help solve that dilemma. His efforts in research led to establishment of the Marine Corps Expeditionary Energy Office, where he is now stationed, continuing to work on the very solutions he discovered here at NPS.

When the nation took bold steps to counter the threat of cybersecurity, and recognized that the power of information dominance was paramount, you will also read about the NPS students past and present and faculty who are leading national efforts in this critical domain. Truthfully, even before these issues reached the point of global exposure, NPS students and faculty were educating and researching in the fields of cyber and information defense.

As threats like these persist, as they undoubtedly will, NPS will remain unwavering in its commitment to finding ways to defend our nation. Like most graduate schools, NPS is committed to providing the most demanding, comprehensive curricula and advanced, relevant research. Unlike any graduate school, our results return to the fleet or field, command or lab as empowered leaders, ready to continue what they have already started.



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NAVAL POSTGRADUATE SCHOOL IN REVIEW MAGAZINE

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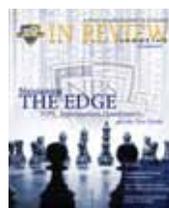
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ON THE COVER

The strategic advantage of Information Dominance is a well known and top national priority, and the Departments of Navy and Defense are showing it – look no further than the establishment of the U.S. Cyber Command, the integration of N2/N6, and the creation of the ID Corps for proof. NPS has and continues playing a significant role in supporting this priority, with graduates in leadership positions across the field, and the infrastructure and talent to educate the next round.

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Published by the Office of Institutional Advancement

For past issues, visit the Publications page at www.nps.edu. For subscription information or to submit your comments or suggestions on In Review magazine, contact dmkuska@nps.edu.

UNIVERSITY NEWS

Undersea Warfare Academic Group Re-established

During the Cold War era when the perceived threat of Soviet submarines loomed into the deep seas, NPS responded with the development of the first academic group on campus, the Undersea Warfare Academic Group (USWAG), along with the creation of a curriculum focused on an interdisciplinary approach to Undersea Warfare that would prepare naval officers for the challenges of the time. But the group downgraded to a committee in 2001 after it seemed the end of the Cold War also meant the end of sub-sea threats.

"We were best at [Undersea Warfare] in the world," explained Undersea Warfare Chair retired Rear Adm. Jerry Ellis. "[But] we have let a lot of our skills atrophy."

With the recent development of advanced submarine and sea mine technologies around the world, the Chief of Naval Operations and Secretary of the Navy have

begun to stress the importance of vigilance and training in the Undersea Warfare field. Again in response, NPS re-established the USWAG, allowing them once again the funding, staff and status needed to ensure students are receiving the most relevant undersea warfare education.

"Clearly having this kind of a group come together is one of the real strengths of the Naval Postgraduate School," noted Rick Williams, Mine Warfare and Expeditionary Warfare Chair, and also a retired Navy Admiral. "Only NPS can structure advanced educational programs for the officer corps of future generations that are based on world class academic rigor and are applied by our students to research that is relevant to current Navy needs and that addresses current Navy problems."

Head of Thai Ministry of Defence Inducted into Hall of Fame

The Naval Postgraduate School

welcomed General Apichart Penkitti, Permanent Secretary of Defence of the Thai Ministry of Defence, into the university's Hall of Fame, placing him in a distinguished group with 11 other NPS alumni whose photos line the wall in Herrmann Hall. The inductees, which include Chairman of the Joint Chiefs of Staff Adm. Mike Mullen, and former Marine Corps Commandant retired Gen. Michael Hagee, have all made significant contributions to the NPS community, the U.S. military, and the global defense structure.



General Apichart Penkitti

"General Penkitti's 38-year military career with the Royal Thai Armed Forces includes myriad noteworthy accomplishments," said NPS President Dan Oliver. "However, there is a common thread in all of them ... an unyielding dedication to the welfare and quality of life of the People of Thailand."

"General Penkitti is an ideal leader, and I believe his nation is very fortunate that he serves in his current position of Permanent Secretary of Defense," he continued.

Penkitti was selected for the honor based on his years of service as a military officer in Thailand, and his work as an advocate for military partnerships with the U.S. He received his degree in Mechanical Engineering in 1976 from NPS.

"I am profoundly honored and grateful for this privilege that has been bestowed upon me," said Penkitti. "It is a great pride for the Ministry of Defence of the Kingdom of Thailand as well as myself and my family."

NPS Grad, Sterrett CO Sees Familiar Face at SNA West

Cmdr. Darren McPherson ran into a familiar face while attending at the Surface Navy Association's West Coast Symposium in San Diego late August – his own! McPherson, who is now Commanding Officer of the USS Sterrett, was one of a handful of NPS grads spotlighted for the university's outreach efforts at the conference.

McPherson, a 1998 National Security Affairs graduate, was highlighted as an example of the value an NPS education can provide to a naval officer. "An NPS education provides effective joint community exposure and cross-cultural interaction in a beautiful setting," he said. "I highly recommend NPS to any career-minded officer."

NPS will continue its outreach efforts at several upcoming events through the next quarter, increasing awareness of the school, highlighting resident and distance learning programs, providing opportunities for professional networking, connecting with local alumni, and much more.

Scheduled stops include:

- ONR's Science and Technology Conference, Nov. 8-10 in Arlington, Va.
- IEEE Int'l Conference on Technologies for Homeland Security, Nov. 8-10 in Waltham, Mass.
- I/ITSEC Modeling, Simulation and Training Conference, Nov. 29-Dec. 2 in Orlando, Fla.
- Surface Navy Association National Symposium, Jan. 11-13, 2011 in Arlington, Va.
- Armed Forces Comm. and Electronics Assoc. West, Jan. 25-27, 2011 in San Diego, Calif.

If you're attending, stop by the NPS booth and learn more about today's Naval Postgraduate School.



UNIVERSITY NEWS

NPS Team Wins AIAA Rocket Launch Competition, Again



A team of students and faculty from NPS and Hartnell College participated in the second annual American Institute of Aeronautics and Astronautics (AIAA) Young Professional Rocket Launch Competition at Koehn Lake in the Mohave Desert. With successful launches in the two-day event, the team took top honors in the altitude prediction category for the second time in as many competitions.

“It was a great opportunity to apply what we have learned in the classroom to something real,” said Adam Yingling, a Ph.D. student in the Mechanical and Astronautical Engineering program and one of the co-captains of the team. “It was

exciting,” he added.

The section participated with three rockets in total, two 15-foot rockets from NPS named Castor and Pollux, and one 10-foot rocket from Hartnell College called Gemini.

In spite of the strong finish, the ultimate goal of the competition is experience – months of hard work and preparation for the team, culminating in a long trip to the desert on a Friday afternoon and two days of launching rockets. There’s a lot of application of meticulous calculations, some very technical aspects, but also a lot of elbow grease and waking up in the middle of the night with ideas, said Electrical Engineering student Lt. Cmdr. Tom Seigenthaler.

“They worked late at night; they basically lived here for several months,” added NPS Prof. Oleg Yakimenko. “These guys work on electronics, they work the mechanics and everything, but their major component is inspiration.”

FEW Presents NPS With 2010 Federal Agency Award

The Central Coast Chapter of Federally Employed Women (FEW) proudly presented NPS with FEW’s national 2010 Federal Agency Award, given to university President Dan Oliver by outgoing chapter President Eva Anderson during a ceremony on campus in late August.

The award had been presented to representatives of the FEW Central Coast Chapter during a ceremony at the FEW National Training Program in New Orleans in July where NPS was announced as the winner, sharing the distinction with the Department of Energy who tied with NPS for first place.

“What a tremendous honor to receive this award for the Naval Postgraduate School,”

said Oliver. “We have long maintained an affirmative stance on the advancement of women in government and military positions, and we are pleased to have earned this award by upholding our core values.”

Naval Support Activity Monterey Officially Established

The Naval Support Activity Monterey (NSAM) command was established during a ceremony, Sept. 30, replacing the former detachment created in 2003 to support Monterey’s military community.

“I am looking forward to serving with Team Monterey, to being part of the synergy between the base

and the tenants and the community here,” said Naval Support Activity Monterey Commanding Officer (CO), Navy Capt. Gerral David, who assumed command during the ceremony to become NSAM’s first CO. “I have one agenda and that is to make this place better.”

“The transition from a Naval Support Detachment to a Naval Support Activity is greater than just a simple name change. The new organization will streamline operations to better support NPS, the Naval Research Laboratory, Fleet Numerical, and more than 10 other commands located here in Monterey,” said guest speaker Rear Admiral William D. French, Commander, Navy Region Southwest.



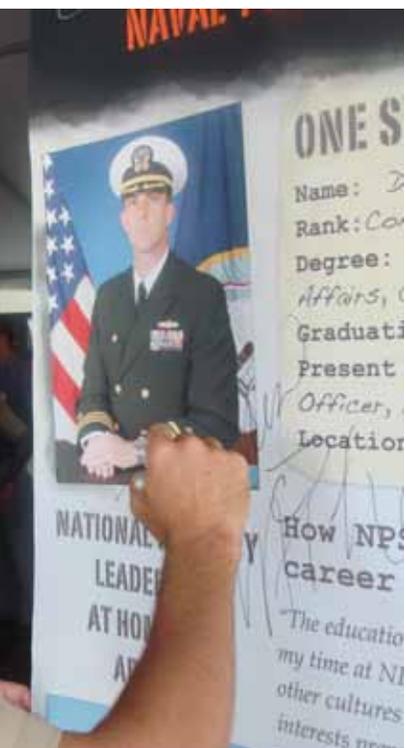
“Proud to Be NPS Alumni, and Proud to Serve!”

So wrote '07 National Security Affairs graduate Air Force Capt. Don “Shrek” Moss, second from left. Moss sent in this picture from his current post in the Middle East, where he met up with fellow NPS graduate Lt. Col. Kevin Kennelly, third from left, who is flying one of the Air Force’s newest and most technologically sophisticated aircraft, the MC-12.

The MC-12 is an advanced-sensor equipped aircraft used for intelligence, surveillance

and reconnaissance missions (ISR) and represents one of the newest in the Air Force’s fleet. “My perspective is that ... the MC-12 represents the most effective blending of human and technological resources in the ISR-sphere at this point,” wrote Moss.

Moss and Kennelly connected by random circumstance, and as fellow NPS grads, wanted to reconnect with their alma mater. It’s safe to say we’re proud of them as well!



FACULTY SHOWCASE

University Recognizes Newest Slate of Distinguished Faculty



Six members of the NPS faculty were recognized as Distinguished Professors during the summer quarter graduation ceremony in King Auditorium, Sept. 24.

"The title of Distinguished Professor is an honorary title conferred upon a small number of NPS faculty in recognition of the exceptional and sustained scholarly accomplishments that they have made, and continue to make," noted NPS Executive Vice President and Provost, Leonard Ferrari in

a memorandum announcing the recipients.

The six recipients of the prestigious honor, shown left to right, include Distinguished Professor Ching-Sang Chiu, Department of Oceanography; Distinguished Professor Herschel H. Loomis, Department of Electrical and Computer Engineering and Space Systems Academic Group; Distinguished Professor Patricia A. Jacobs, Department of Operations Research; Distinguished Professor

Kenneth J. Euske, Graduate School of Business and Public Policy; Distinguished Professor Jon T. Butler, Department of Electrical and Computer Engineering. Not shown is Distinguished Professor Young W. Kwon, Department of Mechanical and Aerospace Engineering, who was away on temporary duty.

Prof. Tapped as Top Adviser to Commander, Task Force Kandahar

Professor of National Security Affairs Thomas Johnson spent several weeks as the senior political aide and counterinsurgency adviser to Canadian Brig. Gen. Jonathan Vance, then Canadian commander of Task Force Kandahar – ground zero for the key campaign against the Taliban.

"General Vance contacted me shortly after he was selected by Ottawa in early June to return to Afghanistan as Commander of Canadian Forces ... and asked

if I would be willing to take on this assignment through the completion of his deployment," Johnson said before a week-long trip due to land him in Afghanistan, Aug. 10. "There's no question this is a critical time, and the Canadian effort is central to the success of U.S. and NATO efforts in the country.

Vance's tour has since completed, replaced by Brig. Gen. Dean Milner in September, but the critical efforts remain at the forefront of the nation's efforts to build security and stability prior to Canada's announced combat completion in July of 2011.

"Canada has announced it will withdraw its 2,700 troops next year, and it's very important to them that they be able to finish and leave behind major sustainable infrastructure programs," Johnson noted prior to his departure. "And because the Canadian withdrawal date coincides with the beginning of the U.S.' own announced

Two Prestigious Honors in Two Months for MAE Prof.

It has been a banner quarter for Professor Isaac "Mike" Ross of the Department of Mechanical and Aerospace Engineering (MAE) and Space Systems Academic Group.

In August, Ross along with Department of Applied Mathematics Professor Fariba Fahroo, were presented with the American Institute of Aeronautics and Astronautics (AIAA) Mechanics and Control of Flight (MCF) Award for their research in optimal control theory. The first NPS faculty to win the award, Ross and Fahroo spent many years working on a research project titled "Pseudospectral Optimal Control-Theory and Computation." The MCF award, presented jointly by

three AIAA committees, is the highest award given by the AIAA for the mechanics and control of flight.

"To NPS, this award is a national recognition of an outstanding partnership between an engineering scholar and an applied mathematician in developing the theory, computational algorithms and validation of certain novel maneuvering strategies for autonomous space systems," said Dr. S. S. Sritharan, Dean of the Graduate School of Engineering and Applied Sciences (GSEAS).

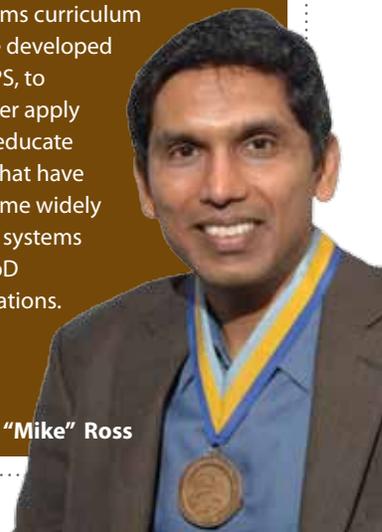
The following month, the American Astronautical Society (AAS) elected Ross as one of three Fellows for 2010. Established in 1954, AAS is the premier scientific and technical

organization dedicated to the advancement of space science and exploration. The selection as Fellow is one of the Society's top honors, recognizing those who have made significant scientific, engineering, academic and/or management contributions to astronautics and space.

"The AAS has been designating Fellows of the Society since its founding 56 years ago, and has elected only 436 distinguished men and women for this honor to date. Mike is the first ever NPS professor to receive this rare distinction ... NPS should be proud that Mike has been recognized as a trailblazer in astronautical engineering," wrote Fahroo in an announcement of the honor to their colleagues.

Ross and Fahroo have made tremendous contributions to optimal control theory, with their techniques now used in space control missions, air flight control and autonomous systems in various capacities. Ross has been actively advocating for an autonomous systems curriculum to be developed at NPS, to further apply and educate on what have become widely used systems in DoD operations.

Isaac "Mike" Ross



FACULTY SHOWCASE



drawdown, their exit plan can have a major impact on, and lessons for, the exit plan for the overall NATO coalition.”

Classroom Connections Examines Teaching and Learning at NPS

NPS has placed a high value on the integrity and excellence of its educational programs and their relevance to national security. But the university must also continually strive to improve instruction and assessment – refining outcomes for what students must know and how students and faculty alike can assess and validate learning.

The significance of interactions between professors and students at NPS is captured in a 15-minute video titled “Classroom Connections: Teaching at the Naval Postgraduate School.”

“Classroom Connections articulates a current snapshot of what it means to teach something well and to learn something well. The voices of faculty featured in this video are giving language to what excellence in teaching means,” noted Rodgers. “The video establishes context for excellence in teaching and learning – one of many standards that can be used to measure continuous improvement initiatives.”

The video serves as an informational presentation for new faculty about the diversity of classroom dynamics across departments and schools. “Teaching at the Naval Postgraduate School” – the first of the two-part volume is available for viewing on the NPS Video Portal. Recently completed, part two of the series titled “Students Perspectives,” should be available on the portal by the end of October.

International Team Studies the Impact of Pacific Typhoons

Researchers from governments, militaries, weather agencies and universities around the world

participated in an Office of Naval Research and Taiwan National Science Council sponsored research project focused on learning more about the Pacific Ocean’s response to typhoons.

The Impact of Typhoons on the Ocean in the Pacific, or ITOP study, is a collaborative, international effort headquartered at NPS where researchers continuously tracked storms over the summer.



Australian Meteorologist Gary Foley looks on at a live picture of Typhoon Fenapi as it develops momentum towards Taiwan in September, part of the international team of scientists at NPS supporting the ITOP study.

It was fast-paced work ... in order to get the most comprehensive data possible, researchers tracked developing storms daily for both intensity and path. When a storm reached typhoon strength, the team acted quickly, descending upon the weather system by sea and air to drop sensitive equipment and sensors on the ocean surface and below. At that point, they hoped the typhoon continued on the path they predicted, passing through the drop zone so the instrumentation can collect detailed data on both the weather system and the water below it.

Two major storms had been captured to date in detail as part of ITOP – one was Typhoon Fenapi, which was successfully tracked through the Pacific Ocean before impacting Taiwan in mid September.

“During Typhoon Fenapi we were able to take numerous oceanographic and atmospheric readings,” said Eric D’Asaro, ITOP’s lead scientist and a professor of oceanography and applied physics at the University of Washington. “We were also able to forecast the storm’s track within 10 nautical miles, 48 hours in advance.”

These techniques coupled with accurate forecasting allowed

researchers to collect data on the formation and strengthening of typhoons and to gather information on the properties of cold water troughs that follow in the wake of a storm.

“We’re taking a look at how long the water stays cool after a typhoon,” said D’Asaro. “Temperature in the water following a typhoon cools dramatically. This cooling has a tremendous effect on the acoustic properties. Studying this cooling will allow us to make better acoustic propagation predictions.”

“These storms dramatically alter the makeup of the ocean,” echoed Patrick Harr, an NPS professor of meteorology and scientist with the ITOP project. “This affects everything from acoustic propagation and tidal properties to currents and eddy fields.”

Studies conducted during ITOP also have a more direct impact on plans and relevancy to the Fleet.

“This partnership between us and ONR is strong and allows us to provide data to various Navy meteorological units. This data is for the fleet to use, and we are also looking at how well their models work,” said D’Asaro. “We would also like to see if we can improve on existing models.”

Business School Prof. Receives 2010 Richard W. Hamming Award

Associate Professor Rene Rendon of the Graduate School of Business and Public Policy has been named the 2010 Richard W. Hamming Teaching Award winner, announced by Executive Vice President and Provost Leonard Ferrari in September. Rendon was recognized for his exceptional teaching skills and commitment to interdisciplinary scholarship.

“He [Professor Rendon] has demonstrated outstanding teaching skills, displays an intense desire to further students’ learning via advisement, is superbly effective in interdisciplinary venues, and exhibits an extraordinary drive to extend students’ learning beyond NPS curricula,” said Ferrari.

The award, named for NPS professor emeritus Dr. Richard W. Hamming, highlights one faculty member annually that demonstrates commitment to interdisciplinary scholarship and exceptional teaching skills. As a mathematician, Hamming served on the Manhattan Project and worked for Bell Telephone Laboratories. Dr. Hamming taught at NPS as an Adjunct Professor from 1976 through 1997.

Rene Rendon





University Seaweb Team Pioneers the “Underwater Internet”

By Barbara Honegger

The Naval Postgraduate School stands on the cutting edge of what is in essence the underwater Internet, through-water acoustic communications technologies that enable a wide range of autonomous ocean sensors to operate as an underwater wireless wide-area network.

Through a decade of engineering experiments and sea trials in diverse maritime environments, NPS and its research partners have advanced what they have dubbed “Seaweb” to a point where it now routinely demonstrates capability for maritime surveillance, anti-submarine warfare (ASW), oceanographic sampling, instrument remote-control, underwater navigation, and submarine communications at speed and depth.

“Seaweb is a realization of FORCENet in the undersea battlespace,” said program Principal Investigator and NPS Physics Research Professor Joseph Rice.

The system uses through-water acoustic modems to interconnect a scalable quantity of underwater network nodes, linking them to a gateway node typically located at the sea surface. The gateway node is equipped with some form of radio modem permitting real-time digital communications between the underwater Seaweb domain and distant command centers.

“Seaweb is the product of interdisciplinary R&D [research and development] involving underwater acoustic propagation, sonar systems engineering, transducer design, digital communications, signal processing, computer networking and operations research,” explained Rice, an electrical engineer. “Our original goal was to create a network of distributed sensors for detecting quiet submerged submarines in littoral waters where traditional ASW surveillance is challenged by complex sound propagation and high noise. But as Seaweb technology developed, its broader overarching value became evident.”

For example, in a 2001 Fleet Battle Experiment, a U.S. fast-attack

submarine serving as a cooperative target for Seaweb ASW sensors was itself equipped as a Seaweb node. Thus instrumented, the submarine was able to access the deployed autonomous nodes as off-board sensors, and while transiting at speed and depth was also able to communicate through Seaweb with the command center and even with a collaborative maritime patrol aircraft.

“In effect, the Seaweb network served as a cellular communications and sensor infrastructure for the submarine,” Rice said.

According to Rice, a major advantage of an undersea wireless network is the flexibility it affords mission planners and theater commanders to appropriately match resources to the environment and mission at hand. For example, fixed sensor nodes can be combined with mobile Unmanned Underwater Vehicle (UUV) nodes, which has been demonstrated in a number of Seaweb experiments. “The UUV can serve the fixed nodes as their deployment platform, their gateway node, or as a mule for delivering and recovering large volumes of data,” Rice noted. “In turn, the fixed network can support UUV command, control, communications and navigation.”

A further example of heterogeneous Seaweb networks is the combination of surveillance sensor nodes with METOC sensor nodes to improve the performance and relevance of both. The wireless architecture means that ASW sensors can be sparsely distributed to cover a wide area or densely distributed to create a tripwire or to monitor a chokepoint. In a current international project, Seaweb is interconnecting undersea sensors from NATO nations as a single integrated network.

“In short, Seaweb integrates undersea warfare systems across missions, platforms, systems and nations,” Rice said.

Major attributes of Seaweb’s architecture are its low cost, its rapid

deployability from a variety of platforms, and its ability to autonomously self-configure into an optimal network. Through a build-test-build spiral engineering process and rigorous sea testing of diverse configurations of underwater sensors and Seaweb modems, the effort is honing the blueprint for an environmentally adaptive and energy efficient, expendable and cost-effective, bi-directional wide-area-coverage undersea communications infrastructure.

“Seaweb has now been exercised in over 50 sea trials,” Rice noted. “The system has proven to be effective in shallow waters such as the Intracoastal Waterway and in waters up to 300 meters deep off the coasts of Nova Scotia, San Diego, Long Island and Florida. It has been demonstrated in the Pacific and Atlantic Oceans, in the Mediterranean and Baltic Seas, in Norwegian fjords, and under the Arctic ice shelf.”

The experimental method involves stressing the network to the point of failure as a means of identifying and eliminating weaknesses. Recent multi-agency trials have engaged Seaweb at the front end of the “observe, orient, decide, act” loop, where the networked in situ sensors enhance the commander’s maritime domain awareness and complement remote sensing assets.

Last year, Rice and his students completed a two-part “Bayweb 2009” experiment using Seaweb’s undersea communications technologies in San Francisco Bay. The goals were to demonstrate the network architecture and test system performance, while measuring the strong currents around Angel Island using networked current sensors placed near the seabed and sharing these data with oceanographers.

“Due to the high levels of shipping and wind noise and flow noise from currents up to four knots, San Francisco Bay presented a challenging test environment and a learning opportunity for our students,” Rice said.

Some of Rice’s students are also working on a new “Deep Seaweb” project adapting the littoral Seaweb network to the deep ocean.

“It’s of utmost importance to the Navy to maintain submarine communications, but all existing communication methods are severely limited without compromising either speed or depth, or both,” said Operations Analysis student and submariner Lt. Andrew Hendricksen. “Once deployed, Deep Seaweb is the one option that allows stealthy, two-way submarine communications while maintaining both depth and speed. A number of sea trials have proven Seaweb works as a detection network, which can be expanded for two-way communications with undersea assets – submarines and UUVs – in the deep ocean. My thesis research is developing an algorithm that can show the best places to put it to get the coverage you want to achieve the purposes you want for sub detection, sub communications, tsunami warning, etc.”

Another student, Lt. Jeremy Biediger, is exploring the advantages of deploying Deep Seaweb hydrophones in deep ocean trenches to passively detect quiet diesel submarines, stealthy semi-submersibles carrying contraband and surface vessels.



Seaweb principal investigator Joseph Rice, third from right, and his student team gathered outside university’s Spanagel Hall, site of the new Undersea Warfare laboratory. Left to right: Singapore Navy Maj. Meng Chong Goh, Lt. Jeremy Biediger, Lt. Andrew Hendricksen, Research Professor of Physics Joseph Rice, Royal Thai Navy Lt. j.g. Pongsakorn Sommai and Ens. Bill Jenkins.

“The main advantages of deploying Deep Seaweb networked acoustic sensors along deep ocean trenches for barrier or tripwire coverage of submarines and of surface and semi-submersible vessels are reduced ambient noise and thus relatively high signal-to-noise ratio,” explained Biediger.

“It’s great working with Professor Rice because he’s a research professor who’s really involved with the ASW community and the system commands, so you get to meet and work with many of the top people in those communities,” Biediger added. “What I learned will be of great benefit to my future career as an engineering duty officer, especially on the acoustics side, as very few universities have acoustics programs and the Naval Postgraduate School is unique in acoustics with naval applications.”

“Future undersea sensor grids will enable navigation of submarines and autonomous underwater vehicles,” Rice added. “Seaweb technology could also support submarine communications, networked torpedo connectivity for ASW engagement from launch platforms at long standoff, communication among unmanned underwater vehicles in mine-countermeasure operations, and any undersea warfare system that requires data telemetry for command and control.

“A goal is for Seaweb technology to support the operational community,” Rice stressed. “In the shorter term, next year we’ll be testing against a cooperative diesel-electric submarine in the Mediterranean Sea in preparation for NOBLE MANTA 2012, the annual NATO antisubmarine warfare exercise.”

The NPS Seaweb program’s primary sponsor is the Office of Naval Research, with additional support from the Office of the Secretary of Defense.

NPS Seaweb research collaborators for 2010 include SPAWAR Systems Center Pacific; the University of Texas Applied Research Laboratories; the NATO Undersea Research Centre; Canada’s Defense Research and Development Center Atlantic; the Norwegian Defence Research Establishment; The Technical Cooperation Program (TTCP), a five-nation defense R&D collaboration involving Canada, Australia, New Zealand the United Kingdom, and the U.S.; and Teledyne Benthos, Inc.

“In effect, the Seaweb network served as a cellular communications and sensor infrastructure for the submarine ... [It] is a realization of FORCEnet in the undersea battlespace.”

Research Professor Joseph Rice
NPS Dept. of Physics

University's Space Systems Chair Supports Naval Efforts in the Final Frontier

By Amanda D. Stein

While the Navy is our nation's seafaring service, it truly operates through every domain, be it sea or land ... or space. In fact, over the past few decades, the Navy has played a major role in the development and application of several space systems, providing naval and joint warfighters with a wide range of advanced capabilities in critical areas such as intel, communications and navigation. But perhaps one of the most critical components to the Navy's efforts in the final frontier is having the people who are educated in the development and operation of these advanced space systems, armed with the knowledge and expertise needed to use them.

"The Navy is hugely dependent on a variety of space systems including the Global Positioning System (GPS), the UHF Follow-On satellite communications system, ISR systems developed and operated by the National Reconnaissance Office (NRO) and many others," said Space Systems Academic Group (SSAG) Senior Lecturer and retired Navy Capt. Al Scott. "Consequently, it's important for the Navy to have people with expertise in the design, development, integration, test and operation of space systems and especially how to leverage those systems to support the warfighter."

That's where the Naval Postgraduate School (NPS) and its Space Systems Academic Group come in, providing the education and expertise to the men and women who will ensure the needs of the Navy are being met in a field traditionally maintained by the Air Force.

In 2008, NPS President Dan Oliver and then Program Executive Officer (PEO) for Space Systems, Rear Admiral Victor See, signed a Memorandum of Agreement for PEO Space Systems to sponsor a Space Systems Engineering and Acquisition Chair Professorship within the SSAG at NPS.

Scott, the current Chair, graduated from NPS in 1996 with Master of Science and Engineer's Degrees in Aeronautical and Astronautical Engineering. He spent much of his Naval career in various space systems engineering and acquisition positions, and brought a thorough understanding of the development and application of DoD and NRO space systems to the SSAG.

Students within the SSAG receive their Master of Science degree in Space Systems Operations (SSO), or Space Systems Engineering (SSE) and leave NPS to handle the space-related operational and technical needs of the DoD. Through the Chair Professorship sponsored by PEO Space, students take part in real, applicable research that often translates into



Retired Navy Captain Al Scott, right, discusses space systems technology with Space System Academic Group students Marine Corps Maj. Robert Brunkalla, left, and Cmdr. John Fernandez in the Naval Postgraduate School's Spacecraft Research Laboratory and Design Center. Scott serves as a senior lecturer and is the PEO Space Systems Chair Professor at NPS.

"The Navy is hugely dependent on a variety of space systems ... Consequently, it's important for the Navy to have people with expertise in the design, development, integration, test and operation of space systems and especially how to leverage those systems to support the warfighter."

Retired Navy Capt. Al Scott
NPS Chair Professor
Program Executive Office Space Systems



Cmdr. John Fernandez, a September graduate in Space System Operations, gives a presentation on the results of his research into the application of Lean Six Sigma efficiency practices in the satellite manufacturing industry.

assignments to one of PEO Space's programs, which has its headquarters in Chantilly, Va.

PEO Space is currently headed by Rear Admiral Liz Young, a graduate of NPS who received dual Master of Science Degrees in Physics and Space Systems Operations in 1990. She serves as the Program Executive Officer for Space Systems, as well as the Director of Systems Engineering at the National Reconnaissance Office.

Young's Executive Officer, Lt. Tom Parker, received his Master of Science Degree in Space Systems Engineering in 2007 from NPS. Parker noted that the space program at NPS prepares students in a unique way to meet the communications needs in the fleet.

"Space isn't something the Navy teaches you at your basic schools," explained Parker. "So if you are a surface warfare officer, traditionally you don't need to know anything about space other than that's where your communications come from. NPS teaches you the science and engineering behind all of that and how it's more complicated than just turning on a radio and all of a sudden you have communication."

The curricula for the SSO and SSE programs share several of the same classes in general space systems such as orbital mechanics, the space environment and satellite design. The degree-specific courses give students a hands-on technical education in engineering with a focus on building space systems to improve the Navy's space capabilities. The students within the SSAG use their research to support various Navy space programs that will ultimately enable the fleets to communicate efficiently.

Cmdr. John Fernandez, a Space Systems Operations student at NPS who graduated this past September and received the Admiral William Adger Moffett Space Systems Award, performed his thesis on ways to improve the production efficiency of satellites using Lean Six Sigma principles. He looked at ways to save money and time during production of different spacecraft to meet the needs of the Navy.

"My research is on the application of Lean Six Sigma manufacturing protocols in the satellite manufacturing industry," explained Fernandez. "The interest was piqued over a review of national systems programs that were funded on cost plus contracts where there appeared to be little motivation for controlling process variation. The Lean Six Sigma methodologies are all about doing something faster, better, with less waste and to customer specification."

Fernandez sees the value in saving the DoD time and money in working with contractors on the development and production of space systems. There is currently little done to regulate efficiency in time and

labor management for production within the DoD for space equipment, and Fernandez hopes that tightening budgets will wake people up to the need to set standards to ensure the best possible job is being done for the dollar.

"It seems kind of ironic to me that we spend so much money as a government on these national systems," said Fernandez, "and yet we don't demand that efficiencies be wrung out of every corner."

Eliminating waste, improving reliability, and monitoring production rates are just some of the areas of focus for Fernandez's research, but one of the key focuses is to have transparency in that data.

"It's really about an alignment of expectations," said Fernandez. "And it's something that every Navy space program can benefit from. If we don't put the effort forward to determine what we in the Navy want to get out of space, then we are going to be left last in line, and we will get the scraps."

Another SSAG student, Marine Corps Maj. Robert Brunkalla, used his thesis to investigate future space communications needs and how those needs can best be satisfied. Brunkalla, who graduated with his Master of Science Degree in Space Systems Operations in September, was selected for the Marine Corps Association Superior Service Award for Outstanding U.S. Marine Student. He has looked into what kinds of communications satellite capabilities will be required to meet the needs of the Navy as new challenges arise.

"My research is an analysis of potential replacements for the Mobile User Objective System satellite constellation. More generally, the Ultra High Frequency communications for the military into the future. You can't design and build a system overnight. The current system that is being launched by the end of next year is expected to have a 10-year lifecycle per spacecraft, meaning that by 2025, it's realistic to expect there will need to be a refresh. Now is the time to start to plan what we are going to do, and how we are going to do it."

The research being done by students within the SSAG not only benefits PEO Space Systems by offering fresh looks at complex issues, but also helps enhance the visibility of Navy space requirements and applications in a space acquisitions and operations community largely dominated by the Air Force. As technologies continue to evolve, the demand within the fleet to use space for intelligence, surveillance and reconnaissance, navigation, communications and other applications will continue to grow as well, offering even more opportunities for NPS students to take the lead in space systems research.

Maintaining THE EDGE

NPS, Information Dominance,
and the New World

By Amanda D. Stein



Clouds of smoke billowed from the beaches of Veracruz as hundreds of men faced the uncertainty of their fate. Outnumbered 300 to one and facing a long, difficult battle with the Aztecs, Spanish explorer Hernán Cortés ordered his men to burn their ships. Eliminating any chance they had of retreat, Cortés had left his crew with only two options – succeed or die.

The year was 1518, and the battle to secure the territories of what is now Mexico waged vehemently. With a courageous, resolute leader and almost certain death if they were defeated, Cortés' men accepted his challenge, and conquered the Aztecs against immeasurable odds.

Today, the U.S., if not the world, is facing a different kind of adversary – one that has no single identity and outnumbers us at equally staggering odds. It is the war over information and it requires bold leadership and an unwavering approach. The Chief of Naval Operations (CNO) has referenced Cortés' brave mentality, even echoed it in his battle to secure and obtain information – a field that has come to be known as Information Dominance.

Even before it became a key area of concern for the Department of Defense (DoD), NPS had faculty and students exploring the possibilities of using information as a weapon against potential adversaries. One such professor, Dr. John Arquilla of the Defense Analysis Department and Director of the Information Operations Center, coined the term Information Dominance in a 1994 article titled, "The Strategic Implications of Information Dominance." Arquilla brought that concept to NPS and has since become one of the country's leading experts on information-age warfare.

Arquilla imagined a chess board with one player able to see only his own pieces and moves, and his opponent able to see the entire board, including the pieces and moves of his competitor. For Arquilla, that concept clearly demonstrated that a really strong enemy could be defeated by an opponent, even one with fewer pieces, who had the information advantage. That is also a concept explored by students within the Defense Analysis Department, where they are exposed to courses on information operations, irregular warfare, culture, cyberspace conflict and intelligence.

"I think information technologies both empower our military and imperil it," explained Arquilla. "Many of the technical efficiencies that make us so dominant in battle have also made us very dependent upon their availability. And the disruption of these systems, many of them fully automated, could profoundly degrade our combat capabilities. In this respect, information technology is a double-edged sword and we have to proceed carefully. That said, despite the risks I think the benefits are quite great."

As technology has become more prevalent in our culture and our military, it has become even more critical that the systems upon which we rely are properly secured. The topic of information dominance has picked up momentum within the Department of Defense over the past few years, and has become a key area of focus for military leaders such as Vice Admiral David J. Dorsett, Deputy Chief of Naval Operations for

Vice Adm. David J. Dorsett outlines critical future investments in hardware to meet the growing challenges in Information Dominance. Dorsett addressed a large contingent of Information Dominance Corps students at NPS during a campus visit, August 23, stressing the U.S. military's and the Navy's commitment to maintaining an edge in Information Dominance.



Information Dominance and Director of Naval Intelligence. He and Chief of Naval Operations, Adm. Gary Roughead, have committed to making the Navy a strong leader in the ID field, which includes several different information communities.

"The CNO has directed that the Navy be the most prominent and dominant service in the areas of intelligence, cyber warfare, command and control, electronic warfare, battle management and knowledge of the maritime environment," said Dorsett. "This aspiration is only possible if we continue to break down barriers between fields, professions and skills ... and create a dramatically more competent and influential information-focused workforce for the future."

That desire to maintain the most capable ID forces has led to the establishment of the Information Dominance Corps (IDC) within the Navy. The IDC incorporates all of the ID relevant fields and serves to establish ID as a core warfighting capability within the service.

One aspect of the IDC, intelligence, has long been understood to be a critical area of opportunity over adversaries. NPS' Intelligence Chair and Director of the Information Dominance Center of Excellence, retired Rear Adm. Andy Singer, noted that ID comes down to gathering information and using that information in a way that gives us an advantage over our adversaries. In that role, the Intel community is critical to maintaining dominance in the information realm.

"All the communities in the IDC are hunters and deliverers of intelligence," explained Singer. "While Naval intelligence focuses on delivering knowledge of the enemy, it takes the communities' collective work to make that knowledge as complete as possible and from it find the opportunities to anticipate, know, predict and change the adversary's desired effects. NPS is giving Navy intelligence professionals the technical

Continued on page 14

NPS is giving Navy intelligence professionals the technical and regional expertise needed to master information advantages for our nation. In today's Navy, intelligence is the key to knowing first and therefore acting first and best.

Rear Adm. Andy Singer (retired)
NPS Intelligence Chair Professor
Director of the Information Dominance Center of Excellence



Part of his visit as September graduation speaker, Army Gen. Keith Alexander, far right, takes the opportunity to meet with a select group of NPS' Information Dominance Corps students about their roles in executing DoD's mission. Alexander serves as the current Director of the National Security Agency/Chief, Central Security Service and is head of the newly established U.S. Cyber Command.

and regional expertise needed to master information advantages for our nation. In today's Navy, intelligence is the key to knowing first and therefore acting first and best."

While gathering information is critical, protecting it is equally important and the U.S. has stepped up in response to a threat that hasn't always been as prevalent. In May 2009, President Barack Obama issued a press release on the importance of remaining diligent in cyber defense. He noted that the threat to our digital infrastructure would undoubtedly affect daily life in the U.S. as a nation so connected through networks.

"From now on, our digital infrastructure, the networks and computers we depend on every day, will be treated as they should be; as a strategic national asset," said Obama. "Protecting this infrastructure will be a national security priority. We will ensure that these networks are secure, trustworthy and resilient. We will deter, prevent, detect and defend against attacks and recover quickly from any disruption or damage."

Secretary of Defense Robert Gates has vowed to establish a strong force to respond to cyber security threats, one of the growing concerns within the ID communities. On May 21, Gates activated the United States Cyber Command (CYBERCOM) to be headed by NPS alumnus and current Director of the National Security Agency, Army General Keith B. Alexander. CYBERCOM supports the joint services in cyber defense, and is tasked with all aspects of protecting the DoD networks from potential threats.

"In the Information Age, we are only as strong as our information infrastructure and those who protect it. That protection may come from the physical or cyber domain, though cyber investments are always less expensive," explained Navy Cmdr. Sean Heritage, IDC Officer and Current Commanding Officer of the Navy Information Operations Command Pensacola. "From an organizational standpoint, the stand-up of CYBERCOM is extremely significant. Within the Navy, the re-establishment of [Fleet Cyber Command], the realignment of [Navy Cyber Forces] functions, as well as the birth of the Information Dominance

Corps are more than symbolic gestures."

Alexander's vision for the new command is one that is dedicated to ensuring that sensitive information is secure, and that the military is properly prepared to respond to threats against government networks, or networks that, if compromised, would threaten our national security. He adds that doing so in the most open manner possible is a high priority.

"I think that perhaps the most important problem facing CYBERCOM will come out of concern over what the military and the intelligence community is doing in the networks," explained Alexander. "The solution to that is transparency. Transparency with the American people, with Congress, and with the Administration so everyone knows exactly what we are doing and how we are doing it. Future commanders and directors have to have both the technical capability and the ability to communicate those issues so that people understand and have trust and confidence that we are doing that mission correctly."

Because cybersecurity is a fairly new concern, there is little known about what would constitute a 'cyber war'. One of the critical realities that come with cybersecurity is how extensively the cyber domain and the physical world intersect, and what the consequences can be to our homeland security if the DoD was ill-prepared for an attack. Hospital records, bank accounts, air traffic control, power grids, and even life-saving electrical equipment are all operated using systems that can become vulnerable to attack if not developed with the proper security measures. Compromising these technologies could mean serious consequences in terms of personal safety, economics, and the ability to respond to an attack.

"The problem is that if somebody gets into your network, you don't know who they are," explained Distinguished Professor of Defense Analysis, Dorothy Denning, one of the nation's foremost experts on information security. "You have to be concerned with everybody. You don't know their motivation or what data they are after. You don't know what kind of malicious code they may leave behind that can cause problems later. So you have to take every attack seriously"

Faced with thousands of attacks each day, the DoD has an enormous task on their hands in trying to secure and protect those networks. The kinds of threats facing the cyber domain are vastly different from the

"The CNO has directed that the Navy be the most prominent and dominant service in the areas of intelligence, cyber warfare, command and control, electronic warfare, battle management and knowledge of the maritime environment. This aspiration is only possible if we continue to break down barriers between fields, professions and skills ... and create a dramatically more competent and influential information-focused workforce for the future."

Vice Adm. David J. Dorsett
Deputy Chief of Naval Operations for Information Dominance
and Chief of Naval Intelligence

traditional acts of war, leaving conventional warfighters unfamiliar with the kinds of technology being used to defend. To mitigate those threats and create a strong ID force, NPS strives to create the kinds of academic programs that could help military officers and DoD civilians understand and develop ways to respond to attacks. One such program, the Center for Information Systems Security Studies and Research (CISR), focuses on meeting the Information Assurance (IA) needs of the warfighter by providing a comprehensive network defense based curriculum.

“Adversaries currently have an asymmetric advantage: they do not have to work very hard to succeed, yet defense is very hard,” said Computer Science Professor and CISR Director, Cynthia Irvine. “Our biggest challenge is to find ways to make the work factor for an attack by sophisticated adversaries much larger, thus tipping the scales in favor of the defender through robust, resilient systems built on a solid foundation and that can support dynamic defense. There is a great deal of work ahead. Fortunately, NPS personnel have a deep understanding of cyber security, some acquired over many decades, and can creatively address today’s challenges.”

CISR is just one of many ID relevant programs offered to both U.S. military and international military students at NPS. Because the Internet has become such a global institution, and adversaries can attack the DoD network from almost anywhere in the world, NPS programs offer the training and understanding for our global partners to help in the information and cyber defense efforts. Threats most often come not from state governments looking to incite an act of war, but from individual radical groups or ‘patriotic hackers’ looking to gather sensitive information or disrupt system operations.

“I think there are two parts to engaging global partners,” said Alexander. “We will have to come up with a way of establishing rules of the road for operating in cyber space. What constitutes an act of war? What are the red lines that each country has? What is normal behavior? All of those will have to be addressed. Along with that will have to be a whole new theory on deterrence and how to deter in cyber space. We will have to develop all



Cmdr. Will Taff, a student and member NPS’ Cyber Defense Exercise (CDX) team monitors the network during CDX 2010, a National Security Agency sponsored exercise conducted annually throughout military educational installations to raise cybersecurity awareness. NPS teams have traditionally finished at or near the top of the ID relevant competition.

of that over time.”

As the tactics and capabilities of potential adversaries evolve beyond the traditional battlefield, the U.S. military remains vigilant in maintaining an information edge. While Cortés chose to burn the ships behind him to force a course of action, today it’s NPS’ education, training and awareness in the ID fields that will drive that vigilance. The struggle for Information Dominance will be an ongoing one, with enemies and strategies constantly changing. The one certainty is that there will be no turning back for the U.S.’ commitment to maintaining dominance in the information domain.



Retired Rear Adm. Andy Singer speaks with student Lt. Beth Jasper outside Root Hall on the NPS campus. Recognizing that intelligence is a critical area of opportunity over adversaries and to maintaining dominance in the information realm, Singer guides intel educational efforts as NPS’ Adm. Bobby Inman Intelligence Chair, as well as Director of the Information Dominance Center of Excellence.

Electrical Engineering Student Explores Expeditionary Energy for the Marine Corps



Soldiers assigned to the 2nd Battalion, 321st Field Artillery Regiment, 4th Brigade, 82nd Airborne Division, remove a broken generator from Objective Prius in the Bala Murghab district of Afghanistan. Fuel-driven generators are commonplace in support posts and all across the front lines, and represent just a small piece of the energy needs that carry with them a heavy cost, in both lives and dollars, to keep operational.

By Amanda D. Stein

For Marine Corps Capt. Brandon Newell, the issue of alternative energy has long been one of concern. Even before the Department of Defense (DoD) recently began to prioritize alternative energy and energy conservation, Newell began searching for a scarce network of experts with similar concerns. When he started out in 1996 as an Electrical Engineering student pursuing his bachelor's degree at Louisiana State University, Newell was disappointed at the availability of curriculum relevant to solar engineering, something he became interested in as far back as childhood.

Upon arriving at NPS to pursue his Master's in Electrical Engineering in 2008, Newell decided to go in a direction that was seemingly uncharted territory within the military at that time. He focused his thesis on alternative energy and meeting the demand for the warfighter overseas.

The HOMER Micropower Optimization software, a tool Newell researched extensively for his thesis, provides optimal power solutions based on set data input by the user on conditions and determining factors in a given area. Because the military operates in different conditions around the world, Newell was interested in capabilities that could identify the most efficient alternative energies to get the job done in each kind of environment.

It is critical that the DoD establish alternatives to costly fuel for many

reasons. The physical dangers to the troops and convoys transporting fuel in combat zones is one area of particular importance. Reducing the amount of consumable resources being used, and relying more on natural alternatives such as wind and solar energy would ease the transportation burden, and also keep the troops from spending more time than necessary in harm's way.

Newell sought out an internship with the National Renewable Energy Lab and worked as their first ever active duty military intern. His six-week internship opened many doors for him, including one that would take him to the Marine Corps Energy Summit, where top Marine leaders met to outline the goals for the future.

Newell noted that the incredible strides made in energy awareness within the DoD really began to take shape at the Summit when Marine Corps. Commandant Gen. James T. Conway expressed that expeditionary energy was a new area of focus for the Marine Corps. Conway assembled a team called the Marine Energy Assessment Team (MEAT), with the purpose of visiting the Marine Area of Responsibility in Helmand Province, Afghanistan to investigate the fuel, water and electricity usage. Newell was a member of that team, and spent three weeks last September doing just that.

Upon returning from the MEAT trip, Newell and his team briefed the Commandant on their findings. In response to a need for continued focus on deployable resources, Conway created the Marine Expeditionary Energy Office, which is where Newell is now stationed following his graduation from NPS in September. The office is responsible for establishing ways to meet the energy needs of the troops in the most efficient manner possible.

“The Marines are trying to undergo a cultural shift in how we view energy. One way to do that is by creating metrics that truly evaluate the power demand impact of new technologies being introduced into the Corps,” explained Newell. “So if you have programs that are power intensive, we didn’t have a way to properly evaluate whether it was worth the cost. The other part of that shift is in behavior. It’s about making deployed Marines aware that energy is a costly commodity in blood and treasure – whether it’s the amount of air conditioning we use or just our everyday habits. So we are trying to make behavioral changes in addition to equipment changes.”

Those changes have finally begun to catch on across the services, and Newell sees only more promising things on the horizon. Most recently a powerful partnership was formed to ensure the most energy-conscious minds in the government are working together towards a common goal.

On July 27 at the White House Forum on Energy Security, it was announced that the Department of Defense and the Department of Energy (DoE) would be signing a Memorandum of Understanding (MOU) in support of a joint mission to secure the safety of troops overseas, and to continue to explore efficient use of resources throughout the services, including the use of renewable energy, alternative fuels, water efficiency and deployable power supplies, to name a few.

“It is not enough for the Marine Corps to purchase alternative energy systems such as solar panels and wind turbines,” noted Newell in his thesis project. “The Marine Corps must provide commanders with the tools necessary to maximize the potential of these resources. If alternative power sources are used incorrectly or inefficiently – such as by employing them in locations where the solar and/or wind resources are poor – Marines will lose confidence in the capability of these power sources and will return to the fossil fuel-driven generators because of their consistent production.”

The MOU was signed by the U.S. Deputy Secretary of Energy, Daniel Poneman and U.S. Deputy Secretary of Defense, William Lynn. It combines the DoE’s commitment to developing energy technologies with the DoD’s

need to maintain safe and reliable methods for delivering resources to the troops in theater.

“The Department of Energy and the Department of Defense’s shared vision of a safe, secure energy future has provided us with a strong foundation to work together on energy issues,” said Poneman. “Working together, we can speed the transition to a clean energy economy, while helping protect our troops. Building a new energy future is the right thing to do to strengthen our national security, to promote economic prosperity, and to improve our environment. It is also the right thing to do for our men and women in uniform.”

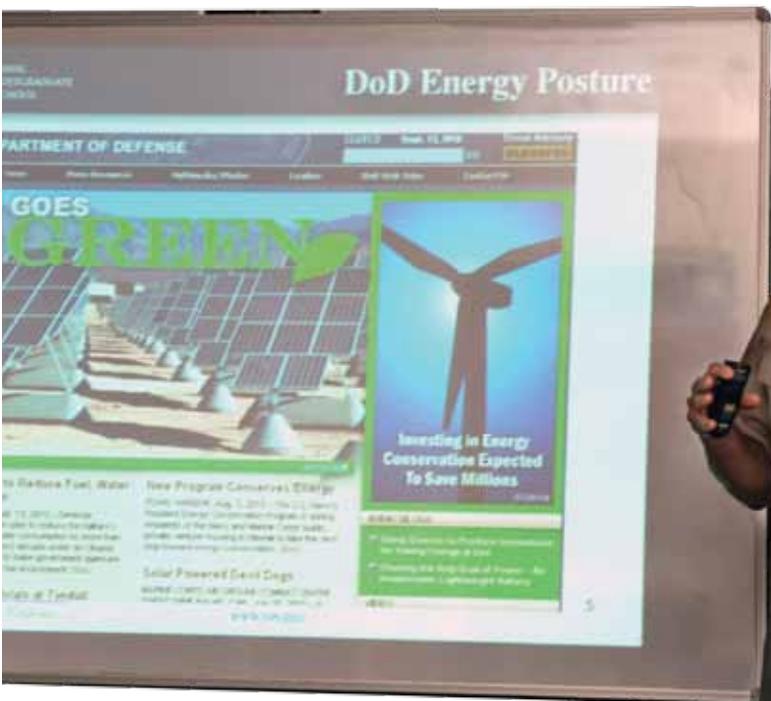
For Newell, the MOU symbolizes more than just the partnership. It represents all of the progress being made in establishing safer, more reliable resources for the troops.

“The DoE has the resident knowledge,” explained Newell. “My internship and my networking have really given me a greater understanding that these issues are not new. While they are new talking points, there are people who have been working in these arenas for a long time. And it’s those experts that we need to rely heavily upon. We don’t want to reinvent the wheel, so that relationship with the DoE is critical.”

Newell’s understanding of the expeditionary energy needs of the services will be invaluable as he leaves NPS and takes his education to the Marine Corps Expeditionary Energy Office at the Pentagon. As his career progresses and his persistence grows, there is no question that Newell will continue to help lay the foundation for safer, more efficient resources throughout the military.

“It is not enough for the Marine Corps to purchase alternative energy systems such as solar panels and wind turbines. The Marine Corps must provide commanders with the tools necessary to maximize the potential of these resources. If alternative power sources are used incorrectly or inefficiently, Marines will lose confidence in the capability of these power sources and will return to the fossil fuel-driven generators because of their consistent production.”

Marine Corps Capt. Brandon Newell
Electrical Engineering, 2010



Electrical Engineering student Marine Corps Capt. Brandon Newell speaks about expeditionary energy during a lecture hosted by NPS’ Cebrowski Institute. Through research for his thesis, Newell became an expert on alternative energies, such as utilizing solar and wind for power. His work as a member of the Afghanistan Marine Energy Assessment Team led to the establishment of the Marine Corps Expeditionary Energy Office, where Newell reported for duty following graduation in September.

Admiral Mike Mullen Headlines Summer Quarter's Lecture Series

Staff Report

The Summer quarter proved to be an exciting one for students attending the Secretary of the Navy Guest Lecture Series' (SGL) in August and September. Headlining speaker Admiral Mike Mullen, Chairman of the Joint Chiefs of Staff, returned to NPS almost exactly one year after being inducted into the NPS Hall of Fame, giving him an opportunity to directly address NPS students, staff and faculty. Mullen, the 17th CJCS and a 1985 Operations Research graduate, was accompanied on the SGL roster by three other distinguished guests who shared compelling insights on everything from the dangers of a cyber attack to the inspirational story of saving the USS Samuel B. Roberts.

The quarter's SGL Series began with a motivational presentation by retired Navy Capt. Paul Rinn, first Commanding Officer of the guided missile frigate Roberts. While on escort duty in the Persian Gulf in 1988, the Roberts struck a mine suffering heavy damage.

Described as the largest explosion of his naval career, Rinn recalled the shock of having to immediately recover from such a crippling blow. "I was standing on the starboard bridge wing 140 feet from the explosion, and it broke my left foot," Rinn said. "We didn't know it at the time but we had a 20-foot wide hole on the side of the ship"

Rinn explained that what followed was nearly two days of heroism by a relatively inexperienced crew, two thirds of which were on their first sea tour. Severe flooding was contained, power was restored to the lifeless vessel, and fires were extinguished largely through what Rinn described as ordinary individuals accomplishing extraordinary feats.

"Ordinary individuals can accomplish extraordinary feats if they are well-trained and led as well as given a sense of focus and purpose," Rinn said. "That was the whole premise behind Samuel B. Roberts, that was the whole thing we were trying to do – make your people believe that they can do better than they ever thought they could do and then execute that."

Several times during the ordeal, Rinn was asked if he wanted to abandon ship, and he refused repeatedly. Later, when asked why he wouldn't he said,

You should take time to interact not just with members of your community, not just with members of your service, not just with members of the United States military and not just with the military ... When I think about our military today, as I do our country, we have moved well beyond any single military or any single country doing it alone. We've got to have partners in the future.

Adm. Mike Mullen
Chairman of the Joint Chiefs of Staff
Operations Research, 1985

Chairman of the Joint Chiefs of Staff, Adm. Mike Mullen, addresses a packed house of Naval Postgraduate School students, staff and faculty as part of NPS' SGL Series in King Auditorium. "You are the future. It's why I come here," he said. "It's why I invest in education. And I sat right there in these seats when I was here. And I had no clue, in retrospect, where I would be and what I would be doing ... I've been very fortunate."



"Commanding Officers are not given ships in the United States Navy to surrender them or give them up, we're there to fight for them!"

Rinn's heroism and commitment to keeping his crew safe offered a shining example of the kind of leadership qualities NPS students can strive for in their own careers.

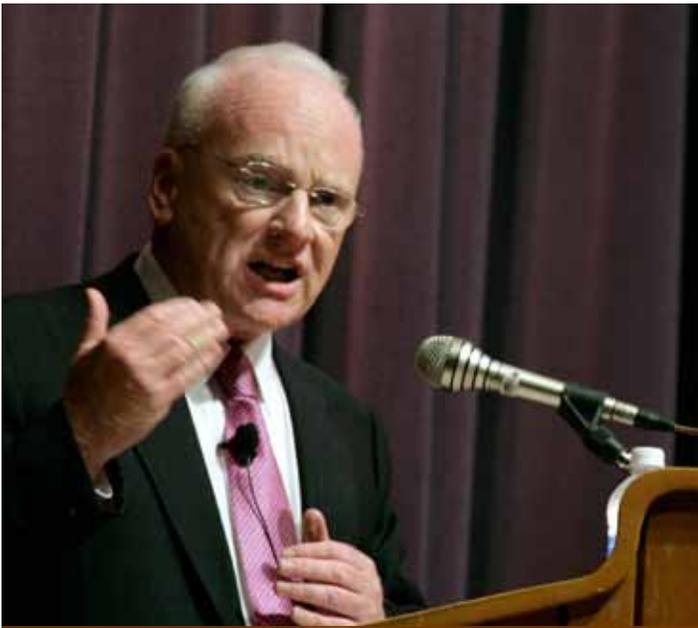
The following week, Admiral Mullen, yet another exemplary leader, spoke to the NPS community about family values and the importance of creating support for service members' families.

"We've been a Navy family for over 40 years and the family support has always been critical in military service. And I have seen it grow to a level that is unprecedented since these wars started. And it's actually very simple for me [to say that] we would be unable to carry on our mission without the incredible support that we have had from our families," noted Mullen. "I believe the family readiness issue is directly tied to our military readiness not just now but in our future in ways that we really haven't thought through in the past. So we are focused on that, investing in that, making sure that our families are every bit as ready to handle the challenges of our missions as our military members."

Mullen also touched on the importance of valuing the diversity of NPS' student population, and of creating global partnerships to face the security challenges of the future.

"You should take time to interact not just with members of your community, not just with members of your service, not just with members of the United States military and not just with the military," Mullen explained, stressing that establishing relationships with other militaries around the world, and working together on common issues, is critical.

"When I think about our military today, as I do our country, we have moved well beyond any single military or any single country doing it



The Honorable Richard Clarke – former National Coordinator and Special Assistant on Counterterrorism, Security, Global Affairs and Cyber Warfare to three presidents – called for a new national cyber defense policy to reduce the likelihood of a Cyber 9/11, during his SGL at the Naval Postgraduate School, Aug. 17.

alone,” said Mullen. “We’ve got to have partners in the future. As I look at the war in Afghanistan right now, the 46 countries who have military personnel supporting the efforts in Afghanistan ... that’s a huge statement of support – not just military support but political support, and proper prioritization of the dangers that exist in that part of the world.”

A week later, the Honorable Richard Clarke called for a new national cyber defense policy to reduce the likelihood of a Cyber 9/11 during a special lecture, Aug. 17. Clarke, a White House adviser for a near unprecedented 11 straight years, discussed what he calls the next major threat to national security.

“When historians look back at this period, what are they going to say were the really important changes that were going on?” he asked rhetorically in opening. “I think they’re going to say that this was a time when a new form of warfare – cyber warfare – came into its own.

“Because our critical infrastructure so heavily depends on computer networks and because of the open nature of our society, we’re highly

vulnerable to cyber attack while also being relatively weak in cyber defense,” he added.

“This is such an important topic, and students here are such a key group – the future of the career military – to engage in this critical national policy debate on cyber defense,” said National Security Affairs student and Foreign Area Officer Marine Corps Capt. Anna Noyne at the reception following the afternoon’s second presentation. “So it’s fantastic that Mr. Clarke is doing this here NPS. He can pick and choose where he goes, and it shows how important it is that the military be aware of this. He was right before [in warning of the danger of a terrorist attack before 9/11] when he said it could happen here, and we didn’t pay attention. We have to pay attention now. This time, we have to take his warning seriously, and we have to act on it.”

National Institute of Standards and Technology Senior Computer Scientist and Information Security Researcher Dr. Ron Ross wrapped up the SGL series for the quarter with a message of caution that echoed Clarke’s. Ross, an NPS alumnus, spoke about the issue of cyber security and the inevitable threats that the DoD will continue to face. Ross touched on the importance of having collaboration by all of the services, and even those outside of the services working together towards securing our nation’s networks.

“It is so critically important today to every one of us, whether in the warfighter side, the intelligence community, the civil part of government or the private sector,” said Ross. “Cybersecurity is one of these things that cuts across disciplines. Information technology is at the heart of everything that we do. Computer systems are fueling our ability to achieve mission success. And in order for us to be successful and carry out those missions, the technology that we deploy today must be dependable. And in order for that technology to be dependable, we have to make sure that it is properly secure.”

As the threats continue to grow, and the adversaries’ tactics continue to evolve, there will always be a need for qualified men and women to serve in defending our critical information systems. Ross explained that the enemy is determined and can operate from anywhere in the world, and that requires the DoD to remain vigilant in cyber defense. From amateur hackers working out of their basement to terrorists with a specific target in mind, there is a continuous cyber threat. The important part, Ross noted, is being able to continue carrying out a mission, even when under attack, a message that fittingly ended the series that began with Rinn demonstrating the same idea.

“The threat is always out there. The adversaries never rest,” said Ross. “Therefore we have to make sure that we keep on going every step of the way just like we are.”



Chairman of the Joint Chiefs of Staff, Adm. Mike Mullen, takes the opportunity to personally meet hundreds of Naval Postgraduate School students, including Indian Navy Cmdr. Deetak Boyini, after addressing NPS students, staff and faculty as part of NPS’ Secretary of the Navy Guest Lecture Series in King Auditorium. Mullen emphasized the importance of maintaining the health of our forces at home and overseas, and using prioritization in strategic planning.

NSA Director and First Commander, U.S. Cyber Command, Keynotes Summer Graduation

By Barbara Honegger

Three hundred and eight U.S. and international students tossed their mortar boards at the Naval Postgraduate School's Summer 2010 graduation ceremonies Sept. 24 following a rousing keynote address by NPS Distinguished Alumnus Army Gen. Keith B. Alexander. Alexander is Director of the National Security Agency/Chief, Central Security Service; and the first Commander of the U.S. Cyber Command.

President Dan Oliver kicked off the ceremony by introducing Alexander, who holds dual Master of Science degrees from NPS in Physics and Systems Technology/Electronic Warfare.

"This graduating class represents our best leaders and our brightest minds," Alexander told the assembled graduates. "We know this when we look at the list of alumni of this institution that includes the Chairman of the Joint Chiefs of Staff Admiral Mike Mullen, heads of state such as King Abdullah of Jordan, Secretaries of the Army and Air Force, the Commandant of the Marine Corps, and foreign defense secretaries. You are in that class of people – the visionaries we seek to be the front line leaders.

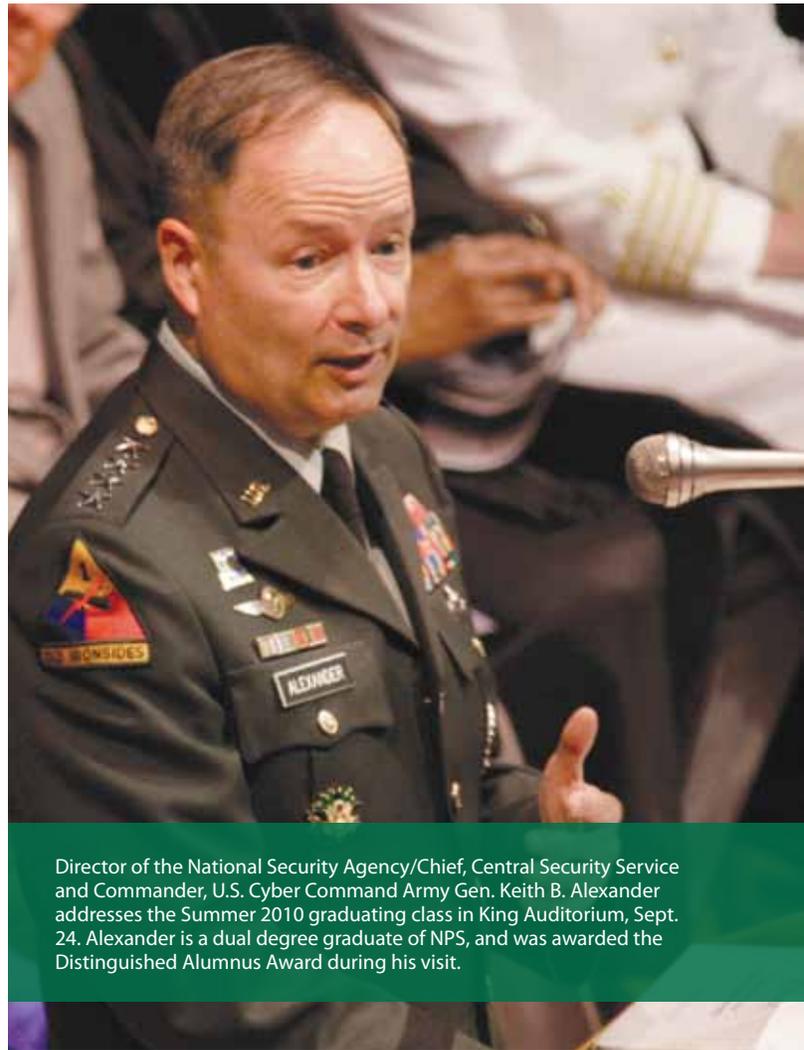
"Many of you are graduating with advanced technical degrees, and technologists have always driven the evolution of warfare and been leaders in shaping the way we fight," Alexander said. "Today as before, technologists are on the front lines, and technically adept and trained people are the key to our success in cyberspace. In the 20th century, being a 'superpower' was defined by the ability to build and test nuclear weapons," Alexander noted. "In the new 21st century, as more and more of our nation's treasure is stored in cyberspace, real power lies in the ability to protect and defend cyberspace. You can't be a superpower unless you can effectively defend your networks against all adversaries."

Alexander emphasized that "technical competence will be as fundamental for our future military leaders as traditional military strategic and tactical skills" and challenged the graduates to do four things to ensure success: "Whatever you do, do it with passion. Embrace your vision and take educated, professional gambles routinely and often. And while you're gambling intelligently, live on the edge – the cutting edge – anticipating and even developing the 'next big thing.' Those who have lived on the cutting edge have changed the course of warfare – and our history."

At the ceremony, Executive Vice President and Provost Leonard A. Ferrari announced the promotion of five outstanding faculty to the prestigious rank of Distinguished Professor: IEEE Fellow and Electrical and Computer Engineering (ECE) Prof. Jon Butler; ECE and Space Systems Prof. Hershel Loomis; Oceanography Prof. Ching-Sang Chiu; Graduate School of Business and Public Policy Prof. Kenneth Euske; and Operations Research Prof. Patricia Jacobs.

Sharing the honors of cutting the ceremonial class cake at the post-ceremony reception with Oliver, Alexander and Ferrari was the Summer 2010 class outstanding student, Monterey Council of the Navy League Award winner, naval information warfare officer Lt. Peter M. B. Harley.

"For anyone thinking about coming to NPS, I'd say 'Do it, absolutely



Director of the National Security Agency/Chief, Central Security Service and Commander, U.S. Cyber Command Army Gen. Keith B. Alexander addresses the Summer 2010 graduating class in King Auditorium, Sept. 24. Alexander is a dual degree graduate of NPS, and was awarded the Distinguished Alumnus Award during his visit.

– in a heartbeat," said Harley, who briefed Gen. Alexander in the afternoon on promoting NPS as a Center for Cyber Excellence. "The Naval Postgraduate School is a fantastic experience. In addition to world-class faculty providing a world-class education, a unique aspect of the NPS experience is the opportunity to collaborate with research sponsors to solve real-world military challenges that can have a significant impact on current operations. The knowledge I've gained during my time here is directly applicable to my follow-on assignment, and I look forward to making a positive impact at the Navy Information Operations Command."

Harley also received the Space and Naval Warfare Systems Command Award in Electronic Systems Engineering. His thesis topic was "Performance Evaluation of Delay-Tolerant Wireless Ad-Hoc Network Utilizing Remote Access to the MeshTest Wireless Testbed."

Also headlining the reception were presentations of two Distinguished Alumnus Awards by Alumni Relations Director Kari Miglaw, to Gen. Alexander and to Rear Adm. Jan Tighe, Alexander's former executive assistant and current Deputy Director of Operations for the U.S. Cyber Command.

"I knew General Alexander was going to be recognized as a Distinguished Alumnus, but this came as a complete surprise," Tighe said. "I'm very honored and proud to be an NPS alum. It's a wonderful institution whose faculty and staff are top notch."

Select students and faculty were recognized for outstanding achievement in academics, instruction, research and community service at a pre-graduation awards ceremony, Sept. 14.

Associate Professor of the Graduate School of Business and Public

This graduating class represents our best leaders and our brightest minds. We know this when we look at the list of alumni of this institution ... You are in that class of people – the visionaries we seek to be the front line leaders.

Army General Keith B. Alexander
 Director, National Security Agency/Chief, Central Security Service
 Commander, U.S. Cyber Command

Policy Renee Rendon received the prestigious Richard W. Hamming Teaching Award; School of International Graduate Studies Senior Lecturer and NPS Defense Systems Analysis alumnus retired Lt. Col. Steve Hurst of the Defense Resources Management Institute was awarded the Lieutenant Commander David L. Williams Outstanding Professor Award; and Mark Rhoades, Timothy Anderson and Brigitte Kwinn received the Wayne E. Meyer Award for Teaching Excellence in Systems Engineering (Distance Learning).

“I’m deeply honored to be selected for the Hamming Award for Teaching,” said Rendon, who served for over 20 years as an acquisition contracting officer for the Air Force before coming to NPS. “This is indeed a special award for me, because it reflects Dr. Richard Hamming’s teaching values, which I also share. One of those values is a passion for our students and their learning. Student mastery of the course material in the classroom is important, but what is also important and valuable is the knowledge

gained outside the classroom – through thesis research and independent studies.”

In addition to Lt. Harley, some of the notable student awardees were Turkish Air Force 1st Lt. Fevzi Kaya, who received both the NPS Outstanding Academic Achievement Award for International Students and the Kiwanis Club Outstanding International Student Award. Systems Engineering Analysis student Lt. Matt Martin received the Commander Helicopter Maritime Strike Wing U.S. Pacific Fleet 2009 Pilot of the Year Award; and Electrical Engineering student and Marine Corps Capt. Brandon Newell received the Cebrowski Institute Award for Innovation as well as a copy of Institute Director Prof. Peter Denning’s new book on the core principles and practices of successful innovators.

One of the university’s many graduates whose education was delivered via technology vice the classroom noted that the quality and relevance of the degree remains in tact in spite of the distance between teacher and student. “The Naval Postgraduate School has a lot of prestigious professors who really care a lot about our education,” distance learning Systems Engineering graduate software engineer Anthony Nguyen said, “Whether you’re a resident student or distance learning, the faculty go out of their way to give you full access.”

Of the 308 graduates, 123 came from the Navy, 38 Marine Corps, 22 Air Force, 10 Army, one each from the Naval Reserves and Coast Guard. The class also included 90 U.S. Department of Defense students and 23 international students from allied and coalition countries. Degrees awarded were eight Ph.D.s, 209 Masters of Science, 59 Masters of Arts, 40 Executive Masters of Business Administration, three Masters of Business Administration, two Mechanical Engineer, and 13 dual degrees. Seventy-six students were unable to attend due to operational commitments and were awarded their diplomas in absentia. Sixty-eight graduates also received Joint Professional Military Education (JPME) certification from the Naval War College.



NPS faculty Fred Drake and Dorothy Denning watch as the procession of Summer 2010 graduates march past the graduation platform party in Spanagel Hall, Sept. 24.

President's Committee on the Future, Full Steam Ahead



Charged by NPS President Dan Oliver with looking “beyond the boundaries of the present into the possibilities of the future,” on Wednesday, August 11, NPS hosted the inaugural meeting of the Committee on the Future. Over the next year, the committee will examine trends across the higher education landscape and the Departments of Defense and Navy, and provide guidance on how NPS can fully realize its potential moving into the future.

By Joan Ackerman

As the world continues to change rapidly, higher education institutions must expand the frontiers of knowledge creation and scientific inquiry, something NPS President Dan Oliver says is paramount to the university's future.

“There is no parallel to NPS in any of the other armed services; therefore, the school's imminent relevance must remain a top priority,” noted Oliver. “While our current strategic plan governs our near future, we must understand what lies beyond, knowledge absolutely critical in determining our direction.”

To meet this end, he commissioned a year-long group called the Committee on the Future and charged them with looking “beyond the boundaries of the present into the possibilities of the future.” Chaired by retired Rear Adm. Jerry Ellis, the committee will examine some of the trends across the higher education, and Departments of Navy and Defense landscapes to provide guidance on how NPS can fully realize its potential as a central resource to its students, sponsors, and the nation.

“NPS must predict and enable the future in the most efficient and productive way, with a keen emphasis toward the academic excellence and relevance of NPS' future degree programs,” said Ellis. From academic resources crucial to national security to technology development, multidisciplinary synergies to supported research, alternate resourcing to setting priorities — all topics will be studied by the committee.

The group will be seeking broad input and consultation in their efforts to get the most comprehensive information possible ... the campus community, NPS sponsors, leaders from various federal agencies, higher education and global partners will be all be invited to join in discussions that will help set the scene for creating the committee's final report in August 2011, which will be used to develop the school's next strategic plan.

On August 11, the committee held its first meeting. Joining Oliver, Executive Vice President and Provost Leonard Ferrari and Ellis were NPS representatives Doug Moses, Christine Haska, Karl van Bibber, Colleen

Nickles, Frank Giraldo, and Maj. Kris Zhea, Chair of the NPS Student Council.

In addition were Michael Bayer, President/CEO, Dumbarton Strategies and member of the NPS Board of Advisors; Mark Breckenridge, Deputy Director, Defense Manpower Data Center; Sunder Ramaswamy, President, Monterey Institute of International Studies; retired Navy Capt. James Durham, Vice President and Director, Undersea Systems and Technology Systems Planning and Analysis, Inc.; retired Naval officer James M. McGarrah, Director, Information Technology and Telecommunications Laboratory at Georgia Tech Research Institute; Mark Gorenflo, SES Principal Deputy and Senior Director for Future Capabilities for the Deputy Under Secretary of the Navy for Plans, Policy, Oversight and Integration Office, SECNAV; and retired Navy Capt. Karl M. Hasslinger, Director, Washington Operations, General Dynamics Electric Boat.

“I could not have been more pleased with the accomplishments and progress of the first meeting of the Committee on the Future. We have a clear understanding of what is to be done and why. We know the areas we wish to explore, to gather data, and to make observations and recommendations,” Ellis explained. “However, what really impressed me about the first meeting was the caliber of the members of the committee. They are an outstanding group of distinguished leaders in their own careers who are definitely energized to support NPS and the goals of the committee. I am absolutely convinced that this committee has the abilities and the motivation to produce a superb and beneficial report. I look forward to working with them.”

Michael Bayer noted that he is “pleased to serve on this outstanding committee, and to begin to consider the opportunities NPS faces as it continues to serve the national agenda. The challenges we face, including the national debt, global conditions, national security and the role of higher education will foster innovative approaches as the members begin their work to prepare NPS for its future in the global theater.”

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Simply the Best

On October 6, Naval Postgraduate School University Librarian Eleanor Uhlinger was presented the Federal Librarian of the Year Award, an honor bestowed upon only one out of a pool of thousands of federal librarians from facilities across the world.

As University Librarian, Uhlinger is the chief administrative officer and director of the Dudley Knox Library on the NPS campus. She is responsible for aligning library services with NPS' mission and vision in all aspects, including facilities, resources and technology.

"There are more than 2,000 federal libraries around the globe and many more librarians working in those libraries," said Uhlinger. "This honor was made possible because of the collaborative and hard-working staff of the Dudley Knox Library coupled with incredible support from NPS and senior Navy leadership."

The awardee is selected by the Federal Library and Information Center Committee, an organization created to foster excellence in federal library and information services through interagency cooperation as well as providing guidance and direction for the Federal Library and Information Network (FEDLINK).

Uhlinger was selected by the committee for her innovative leadership and professionalism in providing information services to the NPS community, something she says validates the efforts of her and her staff.

"The award verifies that we are on the correct path providing friendly, patron-focused service and high quality collections that support the instructional and research needs of NPS faculty, students and staff," she added.

As part of this distinguished honor, Uhlinger was presented with the award during a ceremony at the Library of Congress in Washington, D.C., with NPS President Dan Oliver and alumnus Vice Adm. Mark Ferguson, Chief of Naval Personnel, in attendance. Her name will also be added to a plaque in the Library of Congress' FLICC offices.

