



U.S. Navy photo by MC3 Michael Ehrlich

Congressional Advisory Body Applauds NPS

By Dale M. Kuska

The National Research Council (NRC) completed a comprehensive review of specialized military graduate education in the Department of Defense, and the final report, released late June, has awarded high marks to NPS, noting its value to the nation is far greater than its costs.

“After an extensive study by the NRC, commencing with data calls and travel here to meet with us last Fall, we can take a great deal of pride in this strong, persuasive and influential recognition and appreciation of NPS, and its value to the Navy and DOD,” noted retired Vice Adm. Ronald A. Route, NPS President.

As the operating arm of the National Academies, the NRC is the federal government’s pre-eminent source for independent, expert advice in the sciences. The focal point of the comprehensive study aimed at graduate education in the STEM+M disciplines, or science, technology, engineering, mathematics and management.

“We can take a great deal of pride in this strong, persuasive and influential recognition and appreciation of NPS, and its value to the Navy and DOD.” - Vice Adm. (ret.) Ronald A. Route

The study was directed to the education and research programs provided by the DOD’s internal institutions, NPS and Ohio’s Air Force Institute of Technology, and how this education related to conventional civilian schools.

The results of the study were resoundingly clear.

“These schools (NPS and AFIT) offer valuable educational experiences typically not available at civilian institutions, which provide benefits that outweigh their costs. Notably, students attending AFIT and NPS possess the ability to readily conduct sensitive and classified research on campus alongside fellow students and faculty members,” the study said.

“Their programs focus on militarily relevant problems, some of which might not be welcome in civilian institutions (e.g., weapon system research). Their classroom environments allow for the free exchange of sensitive ideas,” the report continues. “Their geographical and cultural proximity to Service laboratories create significant leverage for limited DOD research funds. In addition, the students have the opportunity to interact inside and outside the classroom with a cohort that shares a common interest in military culture and problems.”



NAVAL POSTGRADUATE SCHOOL

UPDATE

NPS

p2 Long-Time Professor Champions Design Thinking

p3 NPS Foundation’s Legacy of Support

p6 Information Dominance Leader Recognized for Service

AUG 2014

Long-Time Professor Champions Design Thinking

By Kenneth A. Stewart



NPS Professor Nancy Roberts guides students through a design thinking workshop. Roberts would like to see NPS become the Navy's problem-solving center utilizing design thinking. (U.S. Navy photo by Javier Chagoya)

At a recent commencement address, NPS Professor John Arquilla discussed the “big, game-changing ideas” percolating at NPS, one of which he believes is design thinking.

“There is a lot of ferment about design thinking in the services ... At DA [the Department of Defense Analysis] we have made a major investment in design thinking because we think it is one of the next big things,” said Arquilla.

Professor Nancy Roberts, also with the DA Department, has championed design thinking at NPS.

Roberts is the co-founder and a former co-director of DA's Common Operational Research Environment (CORE) Lab, an innovative lab that has pioneered major breakthroughs in the areas of social network analysis and the disruption of dark networks. If she and Arquilla are correct, NPS may be part of yet another game-changing initiative.

“I am being an entrepreneur again and Dr. Arquilla has been instrumental to the effort and a great supporter,” said Roberts. “Our ultimate goal is to make NPS the military's creative problem-solving center using design thinking,” said Roberts.

Design thinking is a process of problem-solving that is distinguished from other problem-solving methodologies by focusing on the “human in the loop.”

“It relies on interdisciplinary expertise and encourages rapid, rough prototypes with end user feedback and involvement. The key is to

embed the problem in context and to understand how people who live with the problem experience it rather than rely on those far from the problem to define and solve it.

“We are helping people to empower themselves, to be entrepreneurial, creative, problem solvers ... It starts with teaching them how to frame problems, and then encourages them to be creative in generating their own solutions,” said Roberts.

Roberts has been working tirelessly to encourage design thinking labs at NPS and has pulled together four design spaces around campus with neither dedicated funds nor resources. She is also working with Stanford's Design School and with the Palo Alto, California based IDEO global design firm.

Roberts first introduced the design thinking process to NPS in her “Wicked Problems” class. She began to notice a change in her students as they used the process to explore a series of complex problems.

“People have to understand themselves and recognize that they can be creative problem solvers. Once they experience the design process, they get a sense of self-efficacy that gives them the confidence to innovate and get things done.

“It's about building up trust in themselves. All of the sudden they realize that they don't have to have permission to be innovative, or to try something new, they can just do it. There is a shift in identity that occurs when people go through this process,” said Roberts.

NPS' first course entirely dedicated to design thinking was introduced last summer.

“My students kept saying, ‘we want more’ but there was no more ... then Dr. Arquilla and I launched a year-long program with [Army Chief of Staff] Gen. Ray Odierno to apply design thinking to figure out what the Army should look like in 2020,” said Roberts.

“Today the Army is designed around a relatively small number of relatively big things, a couple dozen brigade combat teams. We thought it might be better to redesign the Army so that it was comprised of a large number of little things,” said Arquilla.

Arquilla also discussed similar efforts in the Navy and the Special Forces community to employ design thinking. He believes that current budgetary and manpower restraints make design thinking particularly relevant to the DOD, particularly in light of current manning and budgetary restraints.

“Dr. Roberts and others who are addressing this subject are performing an incredible service for the DOD. This can only be a good thing ... Design thinking will be a combat multiplier as we try to maintain our engagements around the world,” said Arquilla.

NPS Foundation's Legacy of Support

By Kenneth A. Stewart



NPS Foundation Executive Director retired Navy Capt. David Silkey and the Foundation staff are pictured at their offices on the NPS campus. (U.S. Navy photo by Javier Chagoya)

If you have received a student award or participated in the America's Heroes Charity Golf Tournament, chances are you have rubbed elbows with one of NPS' long-time supporters, the NPS Foundation.

As a private entity, the foundation is able to gather and solicit funds that directly support, among other things, its goal of promoting the development of military leaders at NPS. Executive Director retired Navy Capt. David Silkey leads the foundation. He came to NPS last year after retiring from the Navy where he last served as an air wing commander.

"Our vision is to work with NPS and support its strategic initiatives. We want to make a difference," said Silkey. "Our center of gravity is NPS' students, what they have accomplished in their careers past and what they will accomplish in their careers future."

NPS Provost Dr. Douglas Hensler is the university's designated liaison with the foundation.

"The foundation exists to support NPS. They support us by matching our priorities with its donor base, but we do not and should not solicit funds," said Hensler. "We merely communicate our priorities to the public and the foundation marries them to our many supporters who want to contribute to the institution."

Donations to the NPS Foundation support the institution by, amongst other things, purchasing computers and software, funding guest lectures and providing research support. Around campus, the foundation also supports many things that those unfamiliar with its work may take for granted.

The NPS Foundation supported the restoration of the Roman Plunge pool, decorates

the Quarterdeck during the holidays, and organizes events like the American Heroes Charity Golf Tournament and the Grand Winter Ball. Silkey notes the charity golf tournament, now in its 9th iteration, will raise in excess of \$4.2 million dollars for notable charities this year. It also brings major thinkers and policy makers, like former Vice President Dan Quayle and renowned economist Thomas Friedman, to the Monterey Peninsula.

Foundation donations also directly support student life and scholarly activities, such as student athletic and activity clubs, and the presentation of student awards for academic and thesis excellence.

But according to Silkey, the foundation's primary purpose is to provide a margin of excellence in academic research where appropriated funds fall short.

"If we look at the foundations that support school's like Stanford or Berkeley, they provide a margin of excellence that's critically important to their institutions," said Silkey.

He adds that some 90 percent of the money raised by the University of California, Berkeley comes from its foundation, and while there are many differences between a state school like Berkeley and a Navy graduate school like NPS, Silkey insists the NPS Foundation has the potential to make similar contributions to the university's legacy.

"Consider what NPS has been able to accomplish within its current budgetary constraints ... leading operations research, systems engineering, defense analysis, and CHDS [Center for Homeland Defense and Security] programs. Then, take a moment to consider what NPS could accomplish with the kind of private sector funding that institutions like Berkeley enjoy," said Silkey.

FACULTY news & notes

National Research Council postdoctoral researchers with NPS' Department of Mathematics Dr. Simone Marras and Dr. Andreas Mueller were recently featured on the cover of the National Academies' publication, "The Postdoc" for their research into the Non-Hydrostatic Unified Model of the Atmosphere.

Energy Academic Group (EAG) Faculty Associate Thomas Hazard was presented with the Navy's Meritorious Civilian Service Award by EAG Chair and NPS Department of Operations Research Professor Dr. Daniel Nussbaum upon his retirement from civil service. Hazard was honored with the recognition for his "visionary leadership" through more than 16 years of service.

GSBPP Assistant Professor Dr. Michael Dixon was Awarded the Journal of Operations Management's 2013 Jack Meredith Best Paper Award for his work, "Sequence Effects in Service Bundles: Implications for Service Design and Scheduling." Dixon's paper was based on his doctoral dissertation at Cornell University. Dixon is also a two-time recipient of the Louis D. Liskin Award for Teaching Excellence.

NPS Department of Meteorology Professor Qing Wang recently welcomed a multidisciplinary group of scientists to NPS to kick off a research initiative dubbed Coupled Air-Sea Process and EM Refraction (CASPER).

The multiyear initiative will combine modeling and experimentation efforts on both the East and West coasts in an attempt to answer a wide swathe of questions related to, amongst other things, the meteorological processes that occur between and within boundary layers.

Have a story to share? Public Affairs is constantly seeking interesting news and stories for Update NPS. Send your tips to pao@nps.edu.



Former NPS Chair of Systemic Strategy and Complexity Capt. Wayne Porter and Former Salinas Mayor Dennis Donahue are pictured in one of the many fields that support Salinas' billion-dollar agriculture industry. (U.S. Navy photo by Javier Chagoza)

Navy Strategist Supports Local Community Planning

By Kenneth A. Stewart

U.S. Navy Capt. Wayne Porter twice served as Adm. Mike Mullen's "deep thinker" in strategic systems. Until recently, he served as the NPS Chair of Systemic Strategy and Complexity, where in addition to his professional duties, he worked across the region with local mayors, academics and industry leaders to develop a series of computer models designed to support the development of a high-tech, agriculture focused, industrial cluster in the nearby Salinas Valley.

Porter's 25-year models are not quite predictive, but he insists that by modeling investment and research, gang membership and prevention programs, education for technology employment, water management and the attractiveness of the Salinas Valley, city planners and others can make informed decisions that will lead to greater prosperity throughout the area.

While originally intended to address the Salinas Valley, Porter's systems approach to modeling quickly caught the attention of U.S. Pacific Command (PACOM) planners. NPS Professor and Systems Engineering Chair Cliff Whitcomb has been applying ideas originally espoused by Porter, to models that he hopes will aid PACOM planners as they explore the future of U.S. - China relations.

"Capt. Porter's work looking at the city of Salinas inspired the Joint Staff (J8) to fund our systems approach to understanding what influences the dynamics between the U.S. and China. [The models offer] a simulation based on how people think. When they put it together and demonstrated the relationships between variables, the joint staff

realized that they could apply it to PACOM's decision making process.

"The J8 funded project is part of a strategic multilayer assessment bringing people from around the world together to model U.S.- China relationship dynamics over the next 5-25 years," said Whitcomb.

The models were born out of a meeting between Porter and former Salinas Mayor Dennis Donahue who asked Porter to apply his modeling and strategic planning directly to the Salinas Valley.

"What I think Wayne has brilliantly done is to create models that demonstrate how our [regional challenges] work together," said Donahue. "One of the things that you learn, if you're as attentive as a mayor, is that you're always going to have challenges, and the best way to deal with the negative is to accentuate the positive.

"When you are dealing with situations like youth violence, economic expansion, creating prosperity ... It's the anecdote over time that is important. Wayne's modeling expresses that beautifully. I was really drawn to what Wayne was doing and I think he found Salinas to be a great laboratory," explained Donahue.

Whether or not the coordinated efforts of the many players invested in the Salinas Valley's long-term growth will be successful or not remains to be seen, but Porter's confidence is infectious and the opportunities that he describes are at their worst inspiring.

New FEW Officers Elected

The Monterey Chapter of Federally Employed Women (FEW) recently held its annual leadership election and NPS employees were well represented.

Breonna Tiffany was elected to her second term as FEW president and Sara Stolt was elected to serve as vice president. Also elected were NPS employees: Recording Secretary Tyronica Jones, Corresponding Secretary Bandomina Lopez, and Treasurer Jaye Panza.

FEW Monterey has recently established community outreach as its flagship principle.

"We do a lot of lunch-and-learn and speaker events; focusing on a variety of topics like heart health or disability awareness," said Tiffany. "We also do a lot with Relay For Life and the battered women's shelter in Marina. We also donate to homeless shelters."

FEW has also organized adopt-a-family programs where they collected donations for participating families during the winter holidays.

FEW Monterey hopes to make a bigger impact on the local community by increasing its membership and fundraising opportunities.

NPS History Permanently on Display in New Historic Center

By Dale M. Kuska

Visitors to the NPS campus can often be seen touring the institution's well-known administration building, Herrmann Hall, admiring its distinctive architecture and compelling craftsmanship and public art. And thanks to the efforts of NPS Dudley Knox Library Special Collections Manager John Sanders, the university's dynamic history and that of the former Hotel Del Monte it resides in, will now permanently be on display for all in the new NPS Welcome and Historic Center.

"NPS and Hotel Del Monte have a remarkable and rich history. Their shared legacy and heritage have had a global impact in areas as diverse as sports, recreation, tourism, transportation, art, historic preservation, mathematics, science, engineering, and military and political affairs. This is a compelling story with a global impact and these examples from the past offer a guide star for the present and the future," said Sanders.

Closing the STEM Gender Gap

By MC2 Danica M. Sirmans

NPS STEM – or Science, Technology, Engineering and Mathematics – Internship Coordinator Alison Kerr recently hosted the annual "Ph.D.s and Polka Dots" luncheon at the Roman Plunge Reflecting Pool.

Kerr welcomed a contingent of female high school and college summer interns to meet with NPS faculty Drs. Eva Regnier and Deborah Goshorn for a networking and mentorship opportunity designed to encourage the students' pursuit of STEM careers.



NPS STEM Internship Coordinator Alison Kerr, left, hosts the annual "Ph.D.s and Polka Dots" luncheon at the Roman Plunge Reflecting Pool. (U.S. Navy photo by MC2 Danica M. Sirmans)

The notion for a "welcome center" of sorts had been around for several years.

In fact, during fiscal year 2011, the Advanced Education Review Board at the approval of then Chief of Naval Operations Adm. Gary Roughead, earmarked funding for several special projects including a number of improvements to Herrmann Hall, with a welcome center among them.

"The NPS Welcome and Historic Center, construction was originally part of the FY11 Herrmann Hall first floor renovation project," noted NPS Director of Facilities, retired Air Force Col. Pete Boerlage. "However, the center was never completed due to changes in leadership."

Believing in the importance of history, and the lessons that can be learned from it, Sanders made the center's completion a top priority.

"The importance of role models cannot be stressed enough for young people pursuing STEM professions, particularly for those that don't see themselves mirrored in the general STEM workforce," said Kerr.

Regnier, an Associate Professor in the Defense Resources Management Institute, agreed and advised the group to have the confidence to tell their own stories.

"Everyone makes mistakes but stick to the technical fields and work hard.

"You'll have more options later. Tell your story as if you had every intention to do exactly what you did because in a way you had to go through those things to get where you are," said Regnier.

The female students in attendance are part of a larger group of 84 total students interning at NPS over the summer.

Students participating in the eight-week internships are assigned research projects focused on areas such as computer security, space systems, renewable energy, humanitarian assistance and disaster response (HADR), and the modeling of virtual environments.

CAMPUS news & notes

Sponsored Programs Financial Specialist Michele Merenbloom was recently presented with a 10-Year Service Pin by School of International Graduate Studies Dean Jim Wirtz.

NPS says farewell to Human Resources Specialist Sandra Williamson. Williamson will be leaving NPS after four years of dedicated service due to a promotion. She was promoted to a position with the Program Management Office, Strategic Systems Programs Flight Systems.

The Graduate School of Business and Public Policy recently completed beta testing of its Advanced Comptroller Course (ACC). This latest professional development course is geared toward senior, active duty Navy (O4 - O6) and civilian (GS13 - GS15) personnel and will consist of 60 hours of study.

The ACC is part of the Department of Defense's congressionally mandated Financial Management Certification program.

The Naval War College Monterey recently honored its top students for the third quarter of Academic Year 2014. Honored with "highest distinction" were Marine Corps Capt. Michael Eady, Navy Lts. Daniel Krause and Thomas Park, Army Maj. Thomas Lainis, and Brian Lampert and Marine Corps Capt. Michael Wright, all of which finished in the top five percent of their class.

THIS MONTH ON

INSIDE NPS

- Showcase of the Center for Civil-Military Relations
 - Introduction to NPS' vibrant STEM program
 - Highlights from a recent student deployment in support of "cold-formed steel" project
- "INSIDE NPS" AIRS MONTHLY ON DOD NEWS

Information Dominance Leader Recognized for Service

By Javier Chagoya



Operational and Information Sciences Military Associate Dean Army Col. Nelson Emmons presents a memento to departing IDCFE Director Navy Capt. Tim Unrein. (U.S. Navy photo by Javier Chagoya)

Information Dominance Center for Excellence (IDCFE) Director Navy Capt. Tim Unrein was recently recognized during a military faculty luncheon in the Del Monte Room.

NPS President retired Vice Adm. Ronald A. Route honored Unrein with the Meritorious Service Medal (MSM) during the gathering and thanked him for his many contributions to NPS as IDCFE director.

Unrein's MSM citation noted his many contributions to NPS and the Department of Defense as IDCFE Director from July 2011 to August 2014, which he summed up in a few words.

"I think the main thing I've been able to do is to get NPS faculty and students better attuned to what Information Dominance Warfare (IDW) means.

As director, Unrein led IDCFE efforts to promote education and professional development for the U.S. Navy Information Dominance Corps (IDC) and assisted with Navy IDC education requirements and research coordination efforts.

Unrein also helped NPS students and faculty to fully engage with other Navy, Joint, and Department of Defense commands and organizations on IDW challenges and Decision Superiority.

"To have spent five-and-a-half years of my career here was an incredible gift," said Unrein.

After saying farewell to NPS, Unrein will report to Commander, Submarine Force Atlantic in Norfolk, Virginia.

"I've worked hard to infuse NPS education and research with ongoing challenges in the IDW business, such as cloud computing, big data science, electromagnetic maneuver warfare and cyber operations," said Unrein.

Unrein, who himself graduated from NPS with a Master of Science in Applied Physics in 1997, is known for his dedication to the professional development of officers in the IDW program and has been an integral, long-term member of the NPS community.

Unrein served as IDCFE director during a critical time within the field - a time when NPS has been asked to respond to IDW challenges by senior Navy and civilian leaders who are seeking officers capable of leading the fight in the headline grabbing and internationally relevant Information Dominance challenges facing the DOD and the nation.

Focus On ... Elise Magsarili

A Monthly Look at Names and Faces on Campus

Elise Magsarili has recently joined the NPS staff as our new Human Resources Specialist in charge of employee and labor relations.

She brings a wealth of experience with her from her previous assignment at Hanscom Air Force Base, Massachusetts.

"I had exposure to all aspects in human resources at Hanscom including work in the areas of employee and labor management and classification. I also

spent two years in civilian recruitment," said Magsarili.

Some of Magsarili's specific responsibilities include internal oversight and coordination in matters related to conduct, performance, grievances, leave administration, recognition and dispute resolutions.

Externally, Magsarili works to establish and maintain relationships with labor groups by negotiating and administering labor agreements, while providing

guidance and consultation to management.

"While I am getting my bearing and learning the position, I will see if there is any need for change or opportunity for growth," said Magsarili. "I hope to see and meet the needs of the installation."

Magsarili earned her bachelor's degree in Business Administration from Northeastern University in Boston, but calls her new job a return to home.



Human Resource Specialist Elise Magsarili

"I am originally from the L.A. area," said Magsarili. "California is home, this is the job I have been hoping to find while continuing my career progression."

Any Day at NPS ...



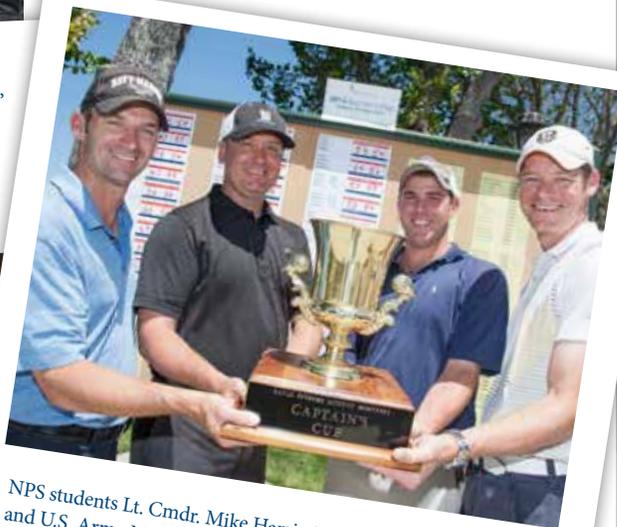
Pasig City Command Communication and Control Center (EC3) Director Ritche Van C. Angeles guides Hastily Formed Network Center Director Brian Steckler on a tour of the EC3 center located within Metro-Manila, Philippines, June 24. (U.S. Navy photo by MC2 Shawn J. Stewart)

Information Technology and Communications Services (ITACS) Executive Director Joe LoPiccolo presents Caryl Rojas, alongside her husband David, with the Meritorious Civilian Service Award. Rojas retired after 30 years of service to NPS and the Department of Defense. The award is the third highest honor offered to civilian employees within the federal government. (U.S. Navy photo by MC2 Danica M. Sirmans)



NPS Center for Executive Education (CEE) Leading Innovation Program Manager Neal Thornberry leads a group of participants through one of many brainstorming exercises during the Leading Innovation Energy Application Focus (LIEAF) Workshop. The workshop provided 17 senior officers and executive service officials with real-world tools for inspiring innovation across their organizations. (U.S. Navy photo by Javier Chagoya)

NPS' top-performing Sailors of the Spring 2014 Quarter are pictured in front of Herrmann Hall, July 17. Pictured from left to right, Yeoman 1st Class Lemarkus Thompson, Yeoman 3rd Class Jerrica Davis and Electronics Technician 2nd Class Richard Reardon. (U.S. Navy photo by MC2 Chablis J. Torrence)



NPS students Lt. Cmdr. Mike Harris, Lt. Rich Jordan, Lt. Eric Stinson and U.S. Army Maj. Derek Raymond, from left to right, show off the 2014 Naval Support Activity Monterey Captain's Cup trophy in front of the match scoreboard at the Monterey Pines Golf Course, July 25. The victorious team won with a gross score of 55 on the competitive course. (U.S. Navy photo by Javier Chagoya)

STUDENT voice

By U.S. Marine Corps Capt. Alex Beachy, President's Student Council, Chair



I would like to take a moment to introduce my fellow council members and myself. I was recently elected President's Student Council Chair along with Vice Chair Lt. Adam Farber and Secretary Lt. Gabe Urquidez.

We are here to facilitate relationships between the student body and NPS' administration and staff. Our goal is to make life for our fellow students more productive and enjoyable.

To that end, we plan to increase our presence across campus and the local community through community outreach, philanthropy, and most importantly, through you the student body.

With your assistance, there are several important areas that we would like to address throughout campus.

We would like to improve the fluidity of the check-in and check-out process, giving students more time to settle and adjust to life on campus and to prepare for their follow-on assignments.

We would also like to increase incentives to inspire people to participate in their council. The council is the voice of the student body, but our combined voices will always speak louder than the council's voice alone. We need your help to ensure that every voice is heard and that your council is able to represent your interests to the president and the administration.

We want you to know that we are here and that we work for you.

<http://intranet/psc/index.html>

Have a story to share? Public Affairs is constantly seeking interesting news and stories for Update NPS. Send your tips to pao@nps.edu.

On Campus this Month



Aug 11-17

Joint Interagency Field Experiment (JIFX)
<http://my.nps.edu/web/fx/home>

Aug 15

MWR Date Night
POC: Lindsay Carver
(831) 656-7955



Aug 12

America's Heroes Charity Golf Tournament
POC: NPS Foundation Office
(831) 656-2339

Aug 22

Movies on the Lawn
POC: Lindsay Carver
(831) 656-7955

Aug 13

Secretary of the Navy Guest Lecture
Lt. Gen. (ret.) David K. Heebner, U.S. Army
POC: Lt. Matthew Colpitts
(831) 656-2228



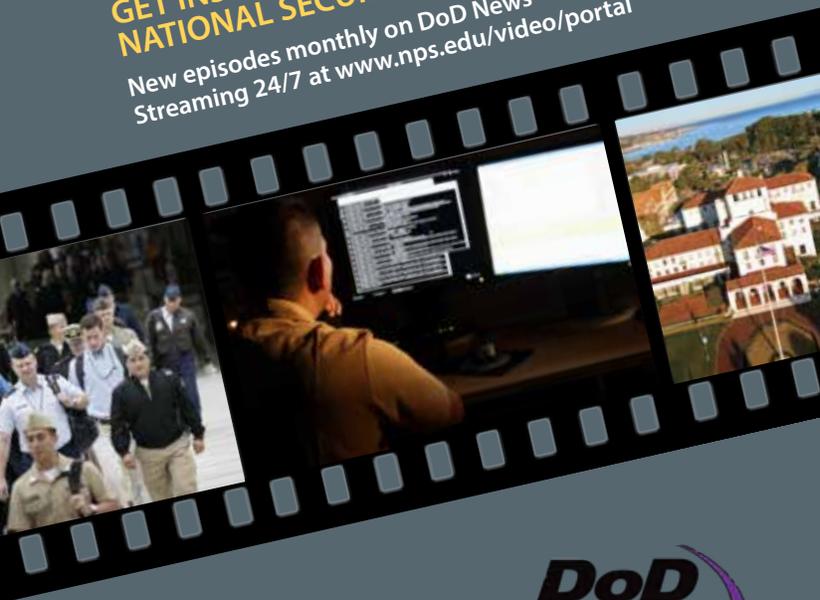
Aug 22

Defense Energy Speakers Seminar
Guest Lecturer
U.S. Army Col. Paul Roege
POC: Dr. Daniel Nussbaum
(831) 656-2387

Inside NPS

GET INSIDE AMERICA'S PREMIER
NATIONAL SECURITY RESEARCH UNIVERSITY

New episodes monthly on DoD News
Streaming 24/7 at www.nps.edu/video/portal



Historical Highlights



Fifty years ago, NPS' annual report listed among its six primary future objectives, "the increase in utilization and

diversity of the computer facility in academic programs." NPS owned and operated four computers at the time – a CDC 1604, an IBM 1401 and two CDC 160s. Of NPS' 1,612 enrolled students, 77 percent used the computer facility and NPS projected that percentage to increase to 90 percent by the end of 1965. FORTRAN 60 and an NPS program called SCRAP were the main computer programming languages. The Navy's recently-established Fleet Numerical Weather Facility (FNWF) was located on the main NPS campus and its high speed data links to Pearl Harbor, Guam and Norfolk enabled raw observations and output of finished numerical products to move at a rate of 4,000 words per minute. FNWF – now the Fleet Numerical Meteorology & Oceanography Center – also conducted its first high speed tests with communication satellites in 1964 for which data rates averaged just above 3,000 words per minute.

Historical Highlights are provided by the Dudley Knox Library.