

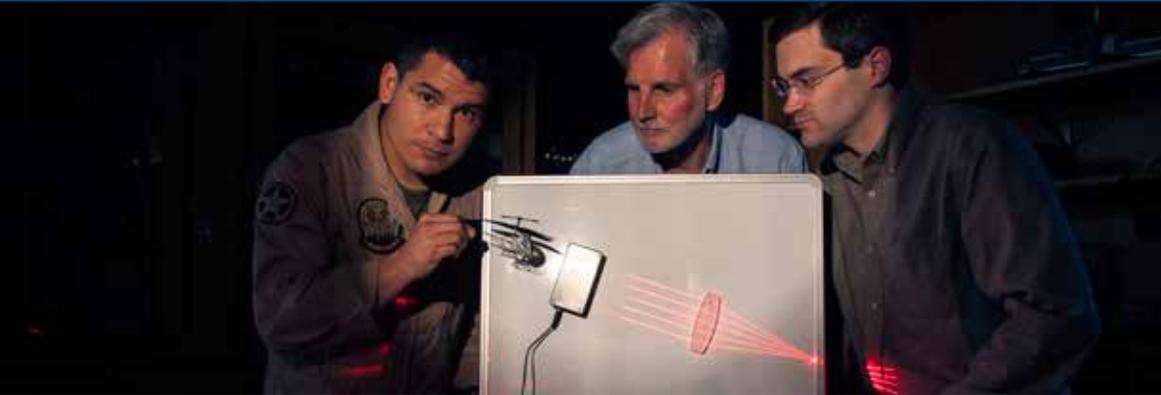


NAVAL POSTGRADUATE SCHOOL

UPDATE

NPS

JUNE 2013



U.S. Navy photo by Javier Chagoya

NPS' Long-Time Directed Energy Program Turns to Power Supply Systems

By Kenneth A. Stewart

Physicists at the Naval Postgraduate School are collaborating with researchers at the University of Texas to develop the power supply that will help make ship-born laser weapons a reality on U.S. naval vessels.

"We have worked with [the University of Texas] on these models in the past, we are adapting the old models to the new technology," said Distinguished Professor William B. Colson.

NPS Research Assistant Professor of Physics Keith Cohn insists that current technological advancements have created an opportunity for directed energy weapons. "The technology has reached a point that it matches the threat that we are trying to counter," said Cohn.

"Lasers are essentially electric weapons. As long as you have power to them, you have munitions." – Research Assistant Professor Keith Cohn

According to Colson and Cohn, directed energy weapons are ideal missile defense weapons and are applicable to a variety of threats to contemporary naval operations.

"The problem with shooting a bullet or a missile at a target is that by the time you have fired the munitions, the target is already half-way to the ship," said Cohn. "Lasers operate at essentially the speed of light, allowing operators to defeat threats at greater distances."

"Radar knows exactly where the target is, but if the enemy is being evasive, your bullet goes to the wrong target. The offense always has the disadvantage, except for when you are operating at the speed of light," added Colson.

Cohn notes that lasers are a cost-effective means of meeting mission requirements. "Lasers are essentially electric weapons. As long as you have power to them, you have munitions," said Cohn. "From a cost perspective, laser weapons are beginning to make more and more sense."

U.S. Marine Corps Capt. Miguel Alvarez, a helicopter pilot and NPS student, is working with Colson and Cohn on the tactics and engineering aspects of a helicopter-borne direct energy weapon.

"A laser is a very precise weapon ... as Marines, we often need to disable vehicles, particularly at checkpoints, a laser allows us to do that with much greater accuracy," said Alvarez.

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- p6** Ops Research Professor Reflects on Mars Mission-Planning Experience

A Message From ... Capt. Deidre McLay, USN

Acting Chief of Staff



I am very pleased to have been selected as Acting Chief of Staff here at the Naval Postgraduate School. I can tell already that it is a very busy job with a wonderful opportunity to help integrate and communicate the activities and requirements of a multitude of complex and diverse parts of the NPS team.

I am not new to NPS, as I have been here for a year as a Military Associate Professor in the Department of Operations Research. That experience plus the additional insights I am gaining as Acting Chief of Staff are letting me quickly follow behind the superb work done by Col. Zoë Hale, USAF.

The exemplary leadership provided by Col. Hale over the past two years has been of great help to the institution to achieve its mission of graduate education and research while improving its business practices and support functions. Her tireless efforts and attention to detail are well known across campus, and I cannot thank her enough for her dedicated service to the institution.

NPS has changed a great deal since I was a student in 1990–1992, but the same love of learning and exploration of new ideas and new ways of addressing national interests remains. My time here set the stage for career success, and I drew on my positive experiences throughout the years following graduation.

As a Surface Warfare Officer, I proudly served as the commissioning Commanding Officer of the USS Farragut (DDG 99), leading the ship's first crew in preparation for fleet operations. These responsibilities posed myriad challenges, but I often referred back to my own advanced education and the subsequent critical decision making skills I received here at NPS in navigating these difficult waters.

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As I continue to learn about the duties and opportunities for teambuilding of the NPS Acting Chief of Staff job, I look forward to serving this fine university in a new capacity.

NPS' First Cyber Systems Graduates Honored for Thesis Research

By Kenneth A. Stewart

The Naval Postgraduate School has graduated its first cohort of students through the Master of Cyber Systems and Operations (CSO) degree program, and student-driven research is already showing promise, and producing results.

CSO student, Navy Lt. Billy Brinkmeyer's paper on Internet mapping won first runner-up honors before an international body of experts at the Active and Passive Measurement Conference, where leading Internet measurement researchers and top universities present the results of their research.

"The work that I focused on in my paper is primarily involved with Internet Protocol Version 6 (IPv6) router alias discovery. Essentially, I was trying to develop an accurate map of the IPv6 Internet," said Brinkmeyer.



Naval Postgraduate School cyber student, Navy Lt. Billy Brinkmeyer, left, and NPS Department of Computer Science Assistant Professor Rob Beverly, right, are pictured inside NPS' Hamming High Performance Computing Center. Brinkmeyer is one of several students from the university's first cohort of graduates from the Master of Cyber Systems and Operations program. (U.S. Navy photo by Javier Chagoya)

To accomplish Brinkmeyer's task, he developed what he calls the "Too Big Trick" program — an application designed to illuminate the various hubs, routers and pathways that collectively make up the IPv6 Internet.

"When you send an e-mail or visit a web page your data travels across the Internet through routers, it's like a freeway and the routers are the overpasses. We are trying to identify the freeways and determine how they connect to one another," said Brinkmeyer.

Brinkmeyer's work stems from a recent government mandated network upgrade that

requires networks to upgrade from IPv4 to IPv6, a mandate that changed the way network managers see the network.

Fellow CSO student, Navy Lt. Samuel Trassare's work is also showing promise. He submitted a paper, still under review, exploring a technique that obscures friendly networks thereby impeding adversarial network attackers.

"When an adversary comes probing for the topology of your network, he uses a program called Traceroute that reports every hop along the path to a destination of the adversary's choosing. I came up with a program that intercepts that probe and instead of returning a truthful route, the program sends back a false route of my own choosing in order to deceive the adversary," said Trassare.

"Sam Trassare's thesis is useful because it allows us to hide our network in such a way that the enemy is not able to identify weaknesses or single points of failure within our network," said NPS Cyber Academic Group Chair, Dr. Cynthia Irvine.

Trassare has gone on to work at the U.S. Cyber Command, commanded by another NPS alumnus, Army Gen. Keith B. Alexander.

"The CSO program is just what the Navy needs if the next big battle is going to take place in the cyber domain," said Trassare. "I am coming to Cyber Command to stand watch for them in their intelligence cell. I have a very strong technical background, but what I got out of the CSO program is insight into how to apply strategy and policy to the cyber domain."

Irvine stresses that projects like Brinkmeyer's and Trassare's are relevant to ongoing operations, and that they offer immediate value to Navy cyber operations.

"Their theses are applicable right now, their techniques and strategies can be put to use rather quickly," said Irvine.

FACULTY news & notes

Dr. Ray Buettner took over as CRUSER director, May 15. Professor of Practice retired Navy Capt. **Jeff Kline** passed the Consortium for Robotics and Unmanned Systems Education and Research (CRUSER) ceremonial pennant to Buettner in a ceremony at Root Hall. Kline has served as CRUSER director since its inception in 2011, and will continue to serve on CRUSER's advisory board.

Department of National Security Affairs, Assistant Professor **Donald Abenheim** was awarded the Rear Adm. John Jay Schieffelin Award for Teaching Excellence for the 2012 academic year. The Schieffelin Award is awarded to a faculty member for teaching excellence after the completion of an annual poll of students and alumni. Schieffelin Award committee members polled approximately 500 students and alumni before awarding Abenheim for his commitment to education.

Naval Postgraduate School Department of Defense Analysis Professor, **Anna Simons'** co-authored book, "The Sovereignty Solution" was recently included on the Air Force Chief of Staff's recommended reading list. The Sovereignty Solution was co-written with two of Simons' former students, U.S. Special Forces officers, Joe McGraw and Duane Lauchengco. The book was born of an academic experiment wherein Simons was asked to tackle a strategic policy question using ten NPS Department of Defense Analysis Students.

Faculty News and Notes provides a brief report on the activities of NPS' faculty and research. For more details on any of these reports, please contact the Public Affairs Office at pao@nps.edu.



NPS Research Assistant Professor of Operations Research, Dr. Emily Craparo. (U.S. Navy photo by Javier Chagoya)

Professor Reflects on Mars Mission-Planning Experience

By Amanda D. Stein

As a doctoral student at the Massachusetts Institute of Technology (MIT), NPS Research Assistant Professor, Dr. Emily Craparo was selected to take part in the Planetary Science Summer School (PSSS) at NASA's Jet Propulsion Laboratory (JPL).

Craparo was part of a team of 18 graduate and postdoctoral students that had the chance to work closely with NASA scientists and peers from across disciplines on the development of a Mars Lander Mission plan.

"[The Mars Geophysical Lander] is aimed at studying the Martian interior in search of past habitability and future exploration support," wrote Craparo's PSSS team in a follow-up report on their work. "During an intensive week in the summer of 2003, the PSSS team developed the Mars Geophysical Lander mission concept and gained valuable interdisciplinary skills in mission design."

The PSSS program, now in its 25th year, is aimed at exposing top young scholars to the kind of real-world work being done by NASA scientists daily at JPL and other research centers around the country. Craparo's PSSS group was invited to present its efforts given the similarities between their Mars Geophysical Lander (MGL) mission proposal and the existing NASA InSight [Interior Exploration using Seismic Investigations, Geodesy and Heat Transport] mission, slated for launch in 2016.

These similarities in intricate mission details, notes NASA InSight

Principal Investigator Dr. Bruce Banerdt, reflect how comprehensive the PSSS program is in giving students a true mission-planning experience.

"The unique strength of the PSSS is the way the students are integrated directly into the JPL mission development process, working with exactly the same engineers and processes that are used every other week of the year to develop mission ideas into implementable concepts, including InSight some years later," said Banerdt. "The eerie similarity of the 2003 mission concept to the current InSight mission demonstrates just how closely the PSSS simulates the actual planetary mission development process, giving students invaluable experience in turning science ideas into practical missions."

Craparo was responsible for overseeing the MGL attitude control system portion of the project, which utilized her academic background in aeronautics and astronautics from MIT. The experience of working in the interdisciplinary PSSS group was not unlike working in academia, she said, noting the value of hearing different perspectives on a single issue, and an associated balance in taking an idea from concept to reality.

As NASA's annual weeklong PSSS program marks its 25th anniversary, Craparo fondly recalls the opportunity to take part in the prestigious collaborative research program. The fact that the InSight mission so closely resembles the mission proposed by her group of students makes the summer of 2003 that much more memorable for the team.

Senior Pakistani Officer Earns Best Thesis Honors

Pakistani Air Force Air Commodore Shahid Latif Bajwa will graduate with outstanding thesis honors at NPS' upcoming Summer Graduation Ceremony, an honor bestowed upon less than 10 percent of the school's graduates and the first honor of its kind accorded to a senior Pakistani officer.

Much of Bajwa's thesis, "U.S. Security Cooperation with India and Pakistan: A Comparative Study," details the history of U.S. Pakistani relations over the last 60 years.



"The U.S. and Pakistani relationship is like a marriage, it has its up and its down but 'divorce' is not the answer. There is no doubt that it is in both of our nations' interests to pursue cooperation that is in our mutual benefit," said Bajwa.

Bajwa will soon return to Pakistan where he hopes to incorporate the lessons he learned at NPS. "When I go back to Pakistan, the knowledge that I gained here will be very useful, I will be able to share a different perspective... What I have learned here will be put to good use," said Bajwa.

Distinguished NPS Professor Discusses the Ethics of Cyber Warfare

By Kenneth A. Stewart

The United Nations Charter prohibits the use of force by one state against another. But in the cyber world, where are the borders and what constitutes force? NPS Department of Defense Analysis Distinguished Professor Dorothy Denning is an icon in the field of information security, but has spent the last several years adding the ethics of cyber warfare to her fields of exploration.

Denning teaches a class titled, "Conflict in Cyber Space" that attempts to address the legal and ethical issues associated with cyber warfare.

"We focus on the law of armed conflict as well as issues related to censorship, privacy and surveillance ... It is a required course in the CSO program," said Denning.

Denning helps her students to navigate the murky waters of cyber ethics, where battlefields may consist of layers of code rather than the mountains, seas and planes that have historically defined combat areas of operations.

Despite the legal ambiguity of some ques-

tions, Denning makes a seemingly powerful case for both the legality and the moral imperative to seek cyber approaches to conventional warfare objectives.

"If you can achieve the same effects with a cyber weapon versus a kinetic weapon, often that option is ethically preferable ... If an operation is morally justifiable, than a cyber route is likely preferable, because it causes less harm," said Denning.



Distinguished Professor Dorothy Denning

Denning insists that cyber attacks are not as new as they may appear; pointing out that cyber operations have been used in the past in conjunction with kinetic operations.

The U.S. military and both its allies and foes have made tremendous human and economic capital investments into the burgeoning arena of cyber defense. What will come of these investments remains to be seen, but their ethics and conformity with international law is already an area of particular emphasis within the cyber operations community at NPS.

NPS Workshop Helps Senior Leaders Apply Innovation Across the Service

By MC3 Danica Sirmans

The Naval Postgraduate School's Center for Executive Education (CEE) provided a four-day course to flag officers and Department of the Navy civilian senior executives, May 6-9, entitled "Leading Innovation." The course is designed to provide Navy leaders with the skills and mindset necessary to encourage innovation as it relates to organizational success in the Navy.

Leading Innovation Program Manager Dr. Neal Thornberry developed the course five years ago and brought it to NPS in 2011. "The course started out as a bi-annual event but due to increase of demand we bumped it up to three-times a year."

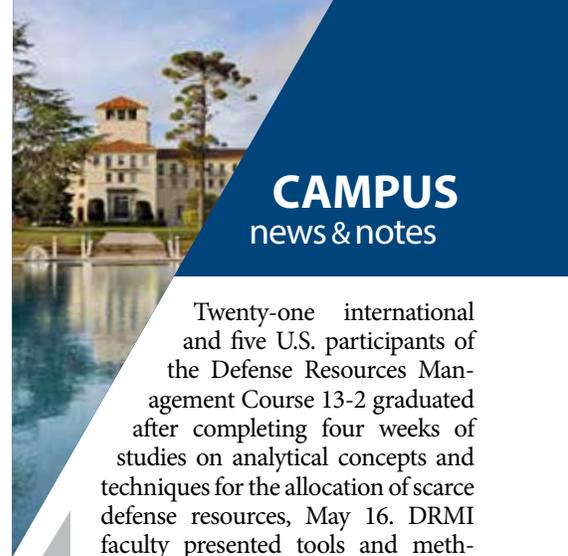
Initially the course was met with some push-back, Thornberry said. "There was a time in the beginning that there was a lot of cyni-

cism about business classes because these are warfighters. I think we've gone way beyond that now."

But Thornberry notes that CEE's Leading Innovation workshop is charged with not only giving leaders the tools it takes to be innovative, the course was created to inspire.

"We want them to not just launch the ship and say, 'Go innovate!' We want them to build value for it, and make sure that they give feedback to people who are involved on it, to show them it's important," he added. "It's not easy in a lot of organizations to say 'Go innovate,' because it's easy to kill new ideas. It takes very attentive leaders who are passionate about it. It's not enough to be strategic ... You have to have some tactics on how to get those ideas on the table and then lead them into happening."

CAMPUS news & notes



Twenty-one international and five U.S. participants of the Defense Resources Management Course 13-2 graduated after completing four weeks of studies on analytical concepts and techniques for the allocation of scarce defense resources, May 16. DRMI faculty presented tools and methods that provided participants the analytical basis for cost effectiveness analysis and discussion of defense management in the international economy. The participants successfully completed application exercises and case studies that culminated in a capstone resource allocation exercise.

The Morale, Welfare and Recreation program established a relay team to participate in this year's Relay for Life, May 4. Team captain, Lindsay Carver and Marine Corps Capt. Joshua Lum banded together to create a fundraising team that they named, "Keep Calm and Fight On." The team worked to raise funds for the American Cancer Society by asking for donations and selling baked goods at the relay.

Workers from the Navy's Southwest Region Morale Welfare and Recreation (MWR) Projects have begun preparing 1,800 square feet of former library space to build a Starbucks Coffee house. The MWR project team is currently cutting through eight inch thick cement flooring and rebar. The NPS Starbucks plans to open by mid-summer.

THIS MONTH ON INSIDE NPS

- VIP Interview with Vice Chief of Naval Operations Admiral Mark E. Ferguson
- Overview of Research and Experimentation for Local and International Emergency and First Responders at Camp Roberts with Directors, Dr. Ray Buettner and Randel Zeller and FEMA's Desiree Matel-Anderson.
- Overview of Aerial Swarm UAVs Research with Associate Professor Kevin Jones.
- Overview of Robots in the Roses with former CRUSER Director retired Navy Capt. Jeff Kline, CRUSER Director of Research and Education Dr. Timothy Chung and U.S. Coast Guard Lt. J.B. Zorn

"INSIDE NPS" AIRS WEEKLY ON THE PENTAGON CHANNEL

Defense Analysis Professor Explores Ethics of Unmanned Systems in New Book

By Amanda D. Stein

With so many lingering questions surrounding the ethics of drone warfare, NPS Department of Defense Analysis Assistant Professor and ethicist Dr. Bradley Strawser, saw an opportunity to further the conversation. His new book, "Killing by Remote Control: The Ethics of an Unmanned Military," addresses the many dimensions of unmanned systems, and the role they play in military operations.

A compilation of the works of 10 contributing experts in their fields, the book looks at such topics as just war theory, martial virtues, the morality of lethal autonomy, and the use of unmanned systems in humanitarian operations.

"I brought together a mix of philosophers, political scientists and legal scholars to address moral questions about drones that have been out in the national discussion for a long time, but nobody has ever sat down and done an intense analytic dissection of the issues," explained Strawser.

"I'm excited and proud of it because it really pushes the debate on drones forward," he continued. "Most of the books out there on drones are either specifically about the law, or they engage questions on specifically-U.S. policy. This book is not that. It is really asking the deeper moral questions behind this form of warfare in general."



Dr. Bradley Strawser, an Assistant Professor with the NPS Department of Defense Analysis, is pictured with his new book, "Killing by Remote Control: The Ethics of an Unmanned Military." The book is a compilation of the works of 10 contributing experts in their respective fields that addresses the many dimensions of unmanned systems, and the role they play in military operations. (U.S. Navy photo by Javier Chagoya)

Among those questions is that of the idea of bravery and courage for warfighters who may not actually be in harm's way. Remotely piloting vehicles removes the risk of physical harm, but it also creates an asymmetry in warfare that raises questions of the moral implications. They are easy enough topics to discuss abstractly, but the reality of the issues surrounding unmanned systems are very real and of serious concern to ethicists like Strawser. The DOD agrees and has begun in recent years to emphasize the moral and ethical considerations of warfare.

"There is a Tennyson line that says, 'Their not to question why, Theirs but to do and die,'" Strawser explained. "That old mindset is going away and people are saying 'no, military officers do need to be thinking about the morality of the wars in which they fight and the ethics and right and wrong of the military's actions.'"

Beyond the conversations in his ethics class, Strawser is pleased by the traction the topic has gained globally. The issues surrounding drone warfare have been so prominent and dynamic that he and the other contributors had to evolve their content as the issue progressed. He sees this as a good sign that defense leaders and scholars are ready to begin delving into these issues.

Focus On ... Supporting Space Systems

A Monthly Look at Names and Faces on Campus

"It isn't rocket science, but really it is," said Administrative Support Assistant Heidi Nalwasky with the Space Systems Academic Group (SSAG). Nalwasky is the brains behind all the "non-rocket science" things that happen at SSAG.

"I don't just do the administrative things like time-keeping and hiring," said Nalwasky. "I'm really a part of what goes on. Together with Dr. Newman, we've come up with a better way to manage all the different kinds of funding we receive."

Nalwasky joined NPS in March 2010. She began working for SSAG Chairman Dr. Rudy Panholzer in 1986. She is in charge of organizing; ordering and making sure that funding is available for the rare and expensive items needed by SSAG members.

Nalwasky is also an integral part of "Space for Space," a rare jewel of collections featuring SSAG student work and pieces gathered from past NASA missions to space.

"Rudy includes me in everything, I'm like his Radar O'Reilly," quipped Nalwasky. "I've sat through some extremely interesting presentations on research that's far beyond my understanding, but I like to be able to know what [Panholzer] wants before he asks."

As the sole assistant for Space Systems, Nalwasky is an integral part of the many projects and functions that occur within her department.

"I think the best thing about



SSAG Administrative Support Assistant Heidi Nalwasky

Space Systems is that the professors believe that everything should be hands-on, so the students actually get to work with and create things that can or will go out in space," said Nalwasky. "I've got to make sure everything gets out on time and if it's not going to, I go door to door making sure it gets where it needs to be."

Any Day at NPS ...



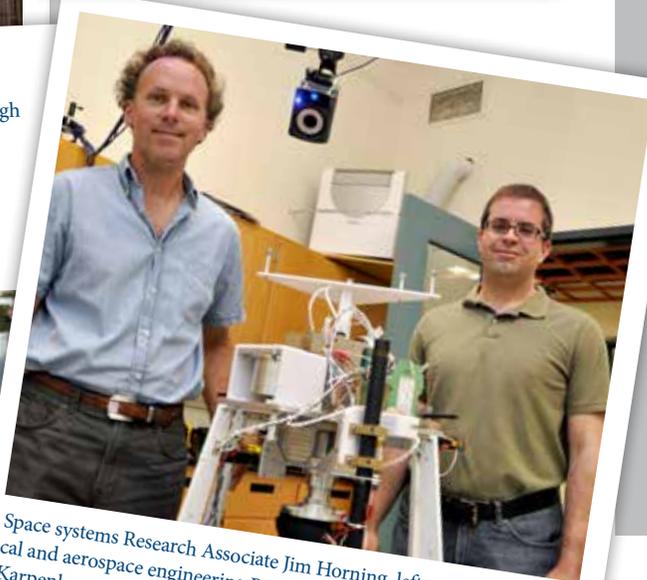
Navy Reserve Capt. David Harach hand-launches a Unicorn unmanned aerial vehicle during the Research and Experimentation for Local and International Emergency and First Responders (RELIEF) field-training exercise in Camp Roberts, Calif., May 8. RELIEF is an NPS-led, field-training exercise focused on humanitarian assistance and disaster response missions. (U.S. Navy photo by MC3 Shawn J. Stewart)

NPS Students discuss rule of law after a National Park Service tour of Alcatraz Island, May 24. Students with the Global Public Policy Academic Group visited Alcatraz to demonstrate the affect of government and military run detention facilities on civilian populations. (U.S. Navy Photo by MC2 Chablis J. Torrence)



Department of Defense Analysis Senior Lecturer retired U.S. Air Force Col. Brian Greenshields accepts a papyrus hieroglyphic translation chart from members of the Egyptian Police and Customs Ministry during NPS' Border Security and Terrorism Seminar at the Monterey Hyatt hotel, May 13. The four-day seminar covered a diverse series of counter-terrorism and security related topics. (U.S. Navy photo by MC3 Shawn Stewart)

U.S. Marine Corps Capt. Dan Beck plays basketball with students from Central Coast High School as part of the Motivating Others Through Outreach (MOTO) program. Developed by Marine Corps students studying at the Naval Postgraduate School, MOTO is a Marine-led, student-mentoring program focused on contributing positively to the lives of local youth. (U.S. Navy photo by MC1 Grant P. Ammon)



Space systems Research Associate Jim Horning, left, and mechanical and aerospace engineering Research Assistant Professor Mark Karpenko, right, pose for a photo after conducting a demonstration in support of the NPS Spacecraft Architecture and Technology Satellite project at the Non-Linear Control Lab, May 3. (U.S. Navy photo by MC3 Shawn Stewart)

STUDENT voice

By Lt. Kris Yost, Chairman
President's Student Council

Over the past few months I have received numerous questions, comments, and concerns about the reputation of the degree we receive at NPS and how it will translate to the private sector. Most of the inquiries were born out of a reaction to reading the IG report last year, but some concerns were present prior to that. I would like to use this time to address these concerns.

During my time as chairman, I have had the opportunity to attend several meetings with the Institutional Advancement team, Dean and Deputy Dean of Students, and the Board of Advisors, and I can tell you that the NPS leadership has done, and is continuing to do a tremendous job of promoting NPS within the U.S. Department of Defense and the civilian sector.

Their efforts will continue, but some of the responsibility in promoting this institution lies with us, the student body. NPS can advertise and promote, but the best way to continue to improve the reputation of the university is by us going back to our military services and continuing to excel in our career fields. No poster, commercial, or video promoting NPS will ever do a better of job promoting the Naval Postgraduate School.

Lt. Kris Yost is the Chairman of the President's Student Council. Visit the PSC on the intranet at <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

June 5

Defense Energy Seminar
Deep Ocean
Methane Hydrates
POC Gian Duri
(831) 656-3102



June 13

Naval War College Graduation Ceremony
Barbara McNitt Ballroom
POC Rose Drake, (831) 656-2118

June 11

Dr. Jim Riker, Air Force Research Laboratory
Presenter at the Adaptive Optics Workshop
POC Jackie Rosenkranz, (831) 656-2329

June 21

Spring Quarter Graduation Ceremony
Commencement Speaker,
Gen. Keith Alexander, USA
POC Student Services, (831) 656-3816



June 11

Spring Quarter
Awards Ceremony
POC Student Services
(831) 656-3816



(U.S. Navy photo by Javier Chagoya)

June 24–26

Rear Adm. David Titley (Ret.)
NOAA Deputy Under Secretary
for Operations
Climate Change Lecture
POC Todd Harris, (831) 656-2072



INSIDE NPS

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NATIONAL SECURITY RESEARCH UNIVERSITY

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Streaming 24/7 at www.nps.edu/video/portal



Historical Highlights

On June 15, 1967, NPS broke ground for the construction of a new building to be named in honor of three generations of U.S. Naval Academy graduates: Rear Adm. Royal R. Ingersoll (1868), Adm. Royal E. Ingersoll (1905) and Lt. Royal R. Ingersoll, II (1934). The Ingersoll family made numerous contributions to the Navy including paying the ultimate sacrifice.



Rear Adm. R.R. Ingersoll was Chief of Staff of the Atlantic Fleet during the first part of the Great White Fleet's world cruise as well as the author of several books on naval ordnance. Adm. R.E. Ingersoll ended his distinguished career as Commander in Chief, U.S. Atlantic Fleet, Deputy Commander in Chief, U.S. Fleet and Deputy Chief of Naval Operations during and after World War II. Lt. Royal R. Ingersoll, II sadly died from a "friendly fire" incident in June 1942 during the Battle of Midway.

NPS' Ingersoll Hall is now home to GSBPP, CEE, and ITACS. Two destroyers (DD-652 & DD-990) were also named in honor of the contributions and sacrifices of these three distinguished naval officers.

Historical Highlights are provided by the Dudley Knox Library.