



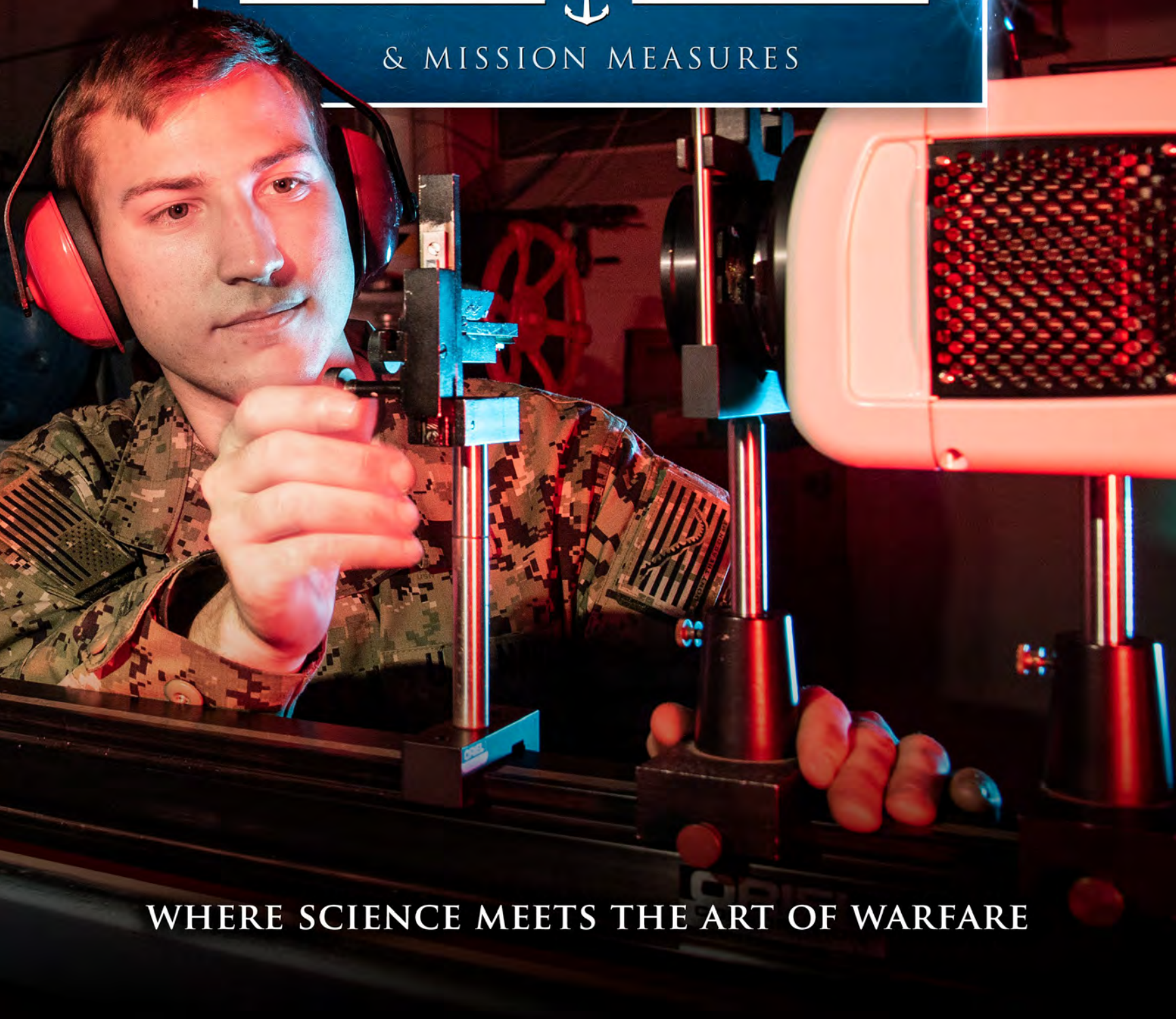
NAVAL POSTGRADUATE SCHOOL

2023

ANNUAL REPORT



& MISSION MEASURES



WHERE SCIENCE MEETS THE ART OF WARFARE

FOR DECISIVE ADVANTAGE



MISSION

Provide defense-focused graduate education, including classified studies and interdisciplinary research, to advance the operational effectiveness, technological leadership and warfighting advantage of the Naval service.

NAVAL
POSTGRADUATE
SCHOOL



APPLIED | CLASSIFIED | INNOVATIVE | INTERDISCIPLINARY | RESPONSIVE | SECURE

A Message from the President

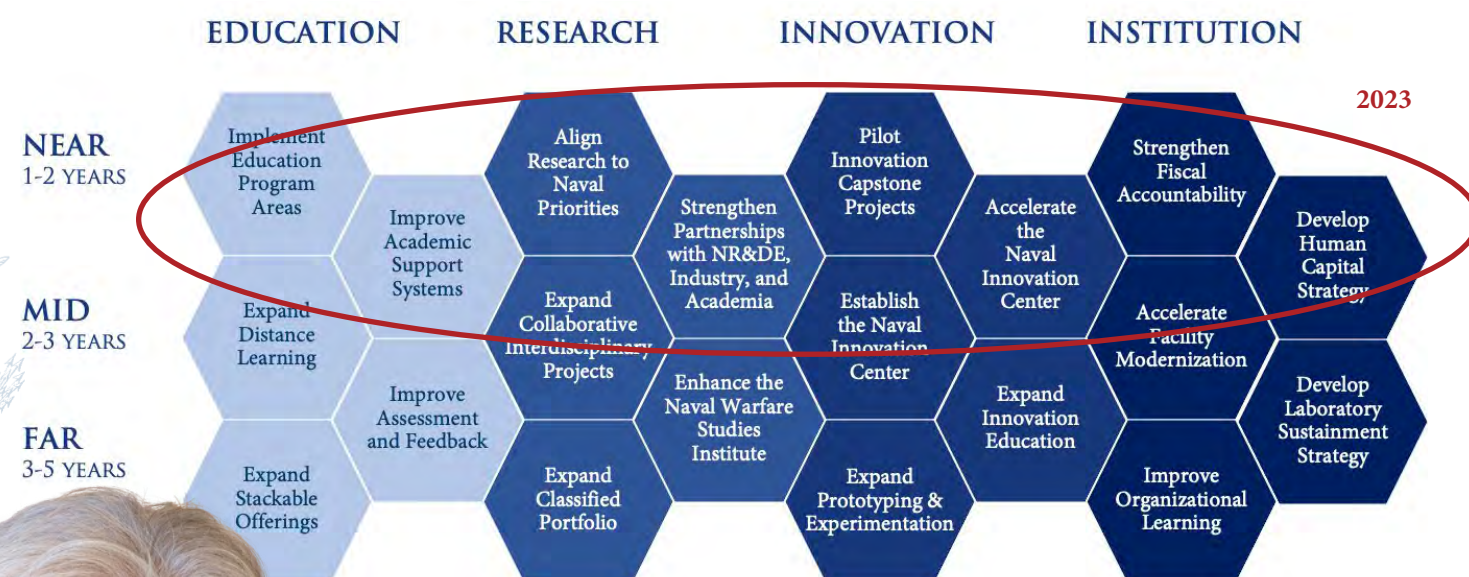
By Ann E. Rondeau, Vice Admiral, USN (Ret.)

In 2023, we set a new course for the Naval Postgraduate School (NPS). This was our first year operating under the *NPS Strategic Framework* — a five-year plan to strengthen our impact, comparative advantages, and value to naval warfighting.



The NPS Strategic Framework outlined four enduring priorities with five objectives each to achieve desired outcomes and the vision for NPS in support of the Secretary of the Navy's goals in the Naval Education Strategy. The approach also institutionalizes the Navy's "Get Real, Get Better" program in an annual cycle of targeted improvements, assessments, and progress reporting.

Last year we focused on the first set of enabling objectives in our four enduring priorities: Education, Research, Innovation, and Institution. This annual report offers highlights and updates of our efforts in addition to impactful achievements by our students and faculty. In 2024 we will build on this progress to take the next steps in our ongoing transformation.



We are changing our culture, our business processes, our organizational design and our value proposition to the Navy, the Marine Corps, and the Joint Force. This annual cycle of strategic execution and assessment is part of our "Get Real, Get Better" efforts, and at NPS, we are getting both Real and even Better each year. While we have much to be proud of, there is more to be done.

NPS has a great legacy of achievement and impact, but we cannot rest on our laurels. For 2024, we will stay on course with some additional focus on: investing in our people, executing mission in a resource-constrained environment, and being responsive to requirements while preparing for future modernization resourcing.

The world is increasingly dynamic, and the pace of change is accelerating. Accordingly, NPS must be equally dynamic and constantly changing to be the catalyst for cognitive readiness and technological leadership our Naval forces need.

In abiding service,

Ann E. Rondeau

Ann E. Rondeau

A Message from the Provost

By Dr. Scott Gartner

2023 was an inflection point in the transformation of NPS. It was a year of refocusing our graduate programs to support the priorities and objectives established in the NPS Strategic Framework. In particular, my academic leadership team of Vice Provosts and department Chairs sought to align and integrate nine warfighter development Program Areas core to all NPS education, research and innovation activities. This work will continue.



In Education: NPS is a naval command with a graduate university mission, and we are committed to staying at the cutting-edge of education and pedagogy. NPS is evolving degree programs by introducing more stackable certificates and by improving access through our new portal, NPS Online. For instance, the Master's of Applied Computing can now be earned by military or defense civilians through a combination of certificates in Artificial Intelligence, Cybersecurity, Data Science, or Robotics. NPS is demand driven. We are working to educate warriors where they are, and when they need it, by expanding online and short course offerings to include in-person courses direct to the fleet at the new NPS-Hawaii campus in Pearl Harbor.

In Research: NPS became a full member of the Naval Research and Development Establishment (NR&DE) and we are working to increase our collaboration with warfare centers and industry to help focus, enhance and accelerate capability solutions. Larger interdisciplinary projects can more effectively leverage NPS attributes and our partner ecosystem for greater impact. To enable this work, we are fostering collaborations with key industries aligned to support outcomes in 14 defense critical technology areas. Together, these efforts are laying the groundwork for the Secretary of the Navy's vision for a purposefully designed facility to house the Naval Innovation Center at NPS.

In Innovation: Education and Research are two sides of the same Innovation coin at NPS. As a graduate-level institution, learning is combined with operational experience, expertise, and experimentation to solve complex defense problems. Through initiatives like the Naval Innovation Exchange (NIX) Teams we are fostering an interdisciplinary environment conducive to hands-on innovation with industry partners greatly enhancing the education experience and NPS research impact. The NIX is part of the Naval Innovation Center operating concept at NPS — a collaborative approach to accelerate development of defense technology applications and the talent needed to employ it.

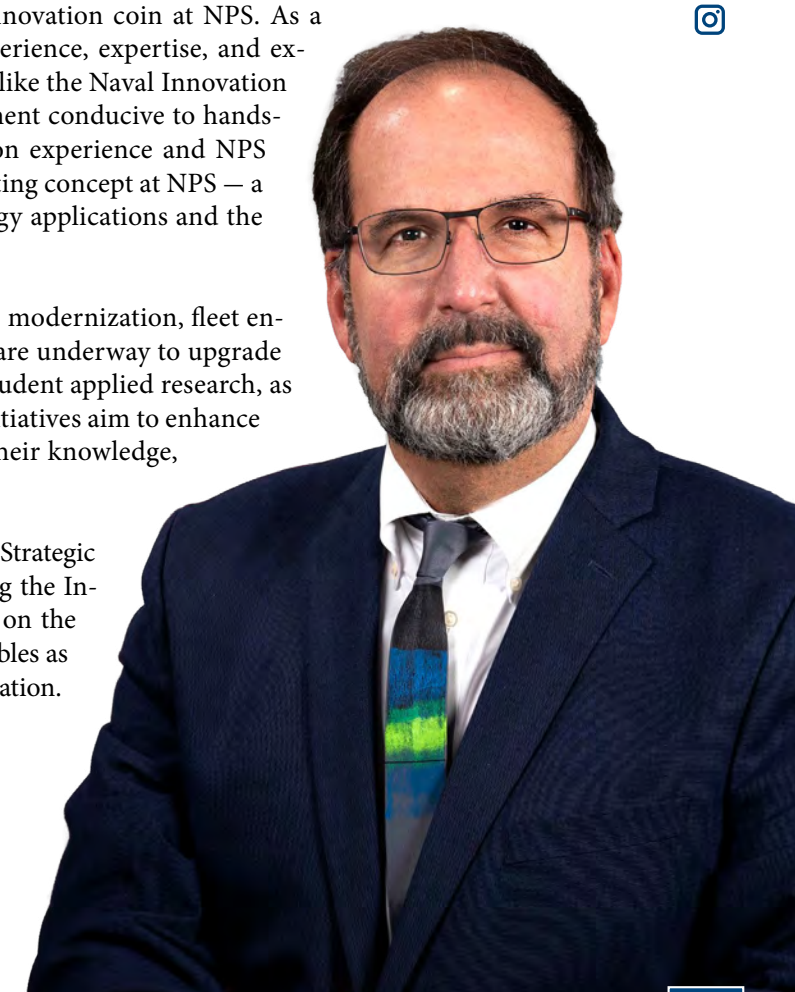
Underpinning these efforts are investments in our **Institution:** campus modernization, fleet engagement and academic leadership initiatives. Comprehensive efforts are underway to upgrade all buildings, and increasing involvement with the fleet will enhance student applied research, as well as grow faculty involvement and depth in classified work. These initiatives aim to enhance NPS effectiveness, relevancy, and faculty development by expanding their knowledge, and addressing critical naval and national defense issues.

Finally, assessment plays a critical role in the implementation of our Strategic Framework and Get Real, Get Better improvement efforts. By enhancing the Institutional Research arm of the Provost Office, we are increasing focus on the impact and outcomes of our education, research and innovation deliverables as vital feedback to the NPS strategic planning cycle and ongoing transformation.

We will accelerate this essential work in 2024.

Scott Gartner

Dr. Scott Gartner



The Naval Postgraduate School

Our History is Distinguishing and Distinguished

Ordered by President Theodore Roosevelt, the record-setting world cruise of the Great White Fleet (1907-1909) was a powerful show of American strength and U.S. foreign policy. Sixteen of the latest U.S. Navy’s battleships provided the strongest evidence yet that science and engineering prowess were of critical importance to U.S. seapower.

To further sharpen our Naval technologica, Secretary of the Navy George von L. Meyer signed General Order No. 27 that same year, establishing a graduate-level school of marine engineering at the U.S. Naval Academy in Annapolis, Maryland, which would later become the Naval Postgraduate School (NPS). In 1912, Meyer broadened NPS’ role in officer graduate studies by directing that ordnance and gunnery electrical engineering, radio telegraphy, naval construction and civil engineering be added to the curriculum, laying the foundation for NPS to become an innovation hub where officers apply the tools of graduate academic rigor to developing solutions to operational problems.

During World War II, Fleet Adm. Ernest King, Chief of Naval Operations and Commander-In-Chief of both the Atlantic and Pacific fleets, established a commission to review the role of graduate education in the Navy. By the end of the war, it was apparent that the facilities of NPS at the Naval Academy were insufficient for the Navy’s future needs.

“To my horror — I learned that on ‘D’ Day — it was planned to close down the Naval War College and the Naval Postgraduate School in order to provide officers for an expanding Fleet — as was done on ‘D’ Day for World War I,” said Fleet Adm. Chester Nimitz, reflecting on the war plans he received as his first act as Chief of Bureau of Navigation. “I immediately cancelled those plans and prepared for expanded classes at both...”

Nimitz and King, along with SECNAV James Forrestal, had a vision for the future of Naval graduate education and are considered the architects of today’s NPS. In early 1944, more than a year before the first peace accord of World War II was signed, King’s actions set the stage for landmark legislation in the 79th and 80th Congresses that transformed NPS.

Public Law 250 of December 1945 authorized the Postgraduate School to confer advanced degrees “in engineering and related fields” and NPS became a graduate Naval university with expanded research facilities. This led to the purchase of the world-famous 627-acre Hotel Del Monte in Monterey, California, previously home to a Navy flight school established in February 1943 (called the Del Monte Pre-Flight School, it graduated nearly 5,000 aviation cadets in 11 months before it was decommissioned in January 1944).

NPS moved to Monterey in 1951, and the coast-to-coast move involved 500 students, about 100 faculty and staff, and thousands of pounds of books and research equipment. Rear Adm. Ernest Edward Herrmann supervised the move that pumped new vitality into the Navy’s efforts to advance naval science and technology.

In a 1959 commencement address at NPS to mark its 50th anniversary, then-Chief of Naval Operations Adm. Arleigh Burke, a 1930 NPS alumnus, attributed several important naval advances to the Navy’s long-term commitment to postgraduate education. “Rapid technological advance...did not come by accident, nor did it come overnight. It has been the result of educating carefully selected officers in each succeeding generation of officers,” he said.

“The naval leaders of 50 years ago showed great perspective and foresight in seeing the need for advanced technical and scientific knowledge among naval officers. They recognized that ships and naval weapons were becoming more complex, that their proper employment at sea would require officers who were familiar not only with the age-old profession of the sea, but who could understand and could use effectively the complex weapons of the years to come.” ■



Since Moving to Monterey...

- 1950s**
 - **1951:** Rear Adm. Ernest Herrmann officially moves NPS to Monterey, California, from Annapolis, Maryland.
 - **1952:** Classes begin at NPS with keynote speeches from Secretary of the Navy Dan Kimball and Fleet Adm. Chester Nimitz.
 - **1955:** Adm. Arleigh Burke becomes Chief of Naval Operations, the first NPS alumnus to achieve this post.
 - **1956:** The first woman officer student arrives at NPS.
 - **1958:** Seymour Cray installs the CDC 1064 computer, serial #1, at NPS.
 - **1959:** The Office of Naval Research established a funded research program for NPS and sponsors its first projects.
- 1960s**
 - **1960:** Lt. Wayne E. Meyer graduates from NPS; he would go on to pioneer the AEGIS combat system.
 - **1964:** The Aeronautics Department opens the Turbopropulsion Laboratory near the Monterey Airport.
 - **1965:** The Defense Resources Management Institute (DRMI) is established and remains to this day offering short courses for officers of all services and around the world.
- 1970s**
 - **1974:** Dr. Gary Kildall builds Control Program/Microcomputer, the first standard operating system for microcomputers. His system allows a student to read and write from a disk. It will sell more than 250 million copies.
 - **1978:** NPS student Lt. Cmdr. Marton Dundics’ research expedites the incorporation of microcomputer units in modern ship propulsion control systems.
- 1980s**
 - **1982:** Adm. James Watkins becomes the second NPS alumnus to hold the post of Chief of Naval Operations from 1982-86. His maritime strategy will help bring an end to the Cold War.
 - **1987:** The Center for Autonomous Vehicle Research is established to advance pioneering research and Naval applications.
- 1990s**
 - **1991:** NPS student Lt. Cmdr. John Hearing’s classified thesis becomes Challenge Athena, a secure communications network that also enables the first two-way imaging communications to aircraft carriers.
 - **1996:** NPS alumna Patricia Tracey becomes the first woman promoted to the rank of vice admiral.
 - **1998:** Vice President Al Gore convenes the National Ocean Conference at King Hall during the international Year of the Ocean.
- 2000s**
 - **2004:** NPS information technology experts already in Thailand rush to support Asian tsunami relief efforts by setting up wireless network communications.
 - **2007:** Adm. Michael Mullen is nominated as the Chairman of the Joint Chiefs of Staff, becoming the first NPS alumnus to achieve this position.
- 2010s**
 - **2011:** Operation Neptune Spear neutralizes Osama Bin Laden. Adm. William McRaven used what he learned at NPS in the planning and execution of the mission. His NPS thesis would later be published as a book: “*Spec Ops: Case Studies in Special Operations Warfare*.”
 - **2019:** After 10 years of development by NPS faculty and students, NPSAT-1 was launched aboard a SpaceX rocket to investigate space weather and the flight demonstration of space technologies.
- 2020s**
 - **2021:** NPS student Lt. Cmdr. Austin West wins national recognition for technical achievement in adaptive optics targeting developed for the shipboard High Energy Laser Weapons System (HELWS).



EDUCATION



“Our mission demands leaders who possess the highest intellectual and warfighting capabilities in order to confront the many dangers of a complex world.”

Naval Education Strategy



June 2023: Spring Quarter graduation in King Hall with guest speaker Gary Wipfler, former Vice President and Treasurer for Apple Inc.

In Education... NPS in-resident curricula are being consolidated and binned into nine core program areas, allowing easier understanding and communication of NPS’ unique defense-focused education. The consolidated curricula have been fully integrated into the Navy’s education planning and quota system (the Strategic Education and Academic [SEA] Plan). The nine program areas foster alignment and focus on the core value of NPS, which is to meet the naval-unique needs of the Department of the Navy in graduate education.

NPS Online Portal: NPS Extended Campus (NEC) was established by re-aligning portions of other units and consolidating management of distance learning for consistency and efficiency. The Extended Campus is focused on expanding the reach and impact of NPS education through new teaching

modalities aligned to SECNAV’s Naval Education Strategy. NEC provides support for program communications and messaging to potential students, video, instructional design, graphics support, and other enabling services, and manages the NPS Online distance learning (DL) portal at: online.nps.edu.

Naval Aviation Support: NPS rapidly stood up a distance learning program for over 100 ensigns that were facing long delays entering flight school. NPS Academic Affairs and several departments coordinated to place all students into two graduate stackable certificates, one in Ops Analysis and one in a STEM field. This was an enormous effort across the institution that helped fill a critical need for Naval Aviation and demonstrated NPS’ ability to scale hybrid and DL coursework while maintaining academic rigor.

NPS Hawaii: This new branch campus became operational, with several short courses and DL certificates delivered to U.S. Pacific Fleet and related commands. A dedicated classroom was established on Oahu with full support from Adm. Samuel Paparo, Commander of the Pacific Fleet. The NPS Extended Campus is planning expanded offerings in areas of space, cyber, ops analysis, and strategy in Hawaii in the coming year.

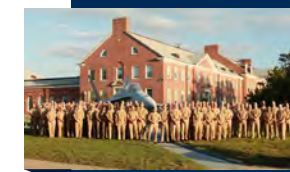
Distance Learning: NPS’ distance learning programs have been added to the Strategic Education and Academic Plan (SEA Plan) with a notation for historical enrollments; this is the first step in giving official visibility of DL and non-traditional offerings to the Navy and allowing greater flexibility for community managers to direct students to NPS Online who are not available for in-resident programs due to constrained career pipelines. ■



TAKE A DEEPER DIVE



Chief of Naval Research Honors NPS Fall Quarter Graduates



NPS Stackable Graduate Certificates Give Student Naval Aviators A Head Start



Naval Postgraduate School Expands Educational Reach with New Hawaii Campus



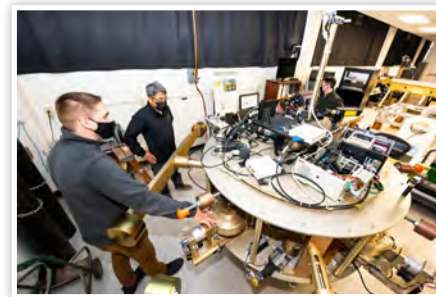
Marine Corps Ph.D. Graduate Explores Uncertainty in Machine Learning



Champion for Student Success, Interdisciplinary Research Earns NPS Hamming Award



RESEARCH



"If you go to any one of the departments here at NPS, in any field of study, the faculty is world-class, and we are very, very fortunate to have them personally instruct us — which is not the model everywhere else."

**Rear Adm. Kurt J. Rothenhaus
Ph.D., Chief of Naval Research**



Student applied research in energy security supports the Secretary of the Navy's Climate Action 2023 strategy.

In Research... NPS established the Office of Research & Innovation (OR&I) to promote and advance the role of research in the graduate education mission, while fostering development of innovative results for transition. OR&I is improving its tracking of reimbursable research according to Naval priorities through updates to the NPS proposal software package. It is also more effective at capturing information on projects with operational impacts and ensuring effective communication of those successes through its website, collaboration with the NPS Naval Warfare Studies Institute (NWSI), newsletters, and NPS Public Affairs.

NR&DE Membership: NPS is now firmly established as a member of the Naval Research & Development Establishment (NR&DE). The Deputy Assistant Secretary of the Navy for Research, Development, Testing and Evaluation (DASN/RDT&E) oversees the NR&DE, and has welcomed expanded engagements with NPS. The operationally experienced student body at NPS offers informed insight to the DON research community and NPS was asked to routinely present its portfolio of activities at NR&DE leaders. In addition, the Chief of Naval Research (CNR), an NPS alumnus, requested NPS direct input into the SECNAV's new S&T Strategy. This recognition will help NPS receive greater visibility as an asset to the Navy, a valuable partner to other NR&DE organizations, and an attractive place for sponsored research to be conducted.

Interdisciplinary Research: NPS is increasing the level of interdisciplinary work through internal program incentivization. Through the Naval Research Program (NRP) and research centers like CRUSER and CAMRE, teams of activity are being encouraged, which will create greater community awareness across campus and improve the quality of products through diversity of experience and thought. Examples of such efforts include, but are not limited to, the Naval Innovation Exchange (NIX) teams and the Interdisciplinary Transition Teams (ITT), which have led to

student-developed technology to support Over the Horizon (OTH) Command and Control (C2) through an industry CRADA partnership.

Naval Warfare Studies Institute (NWSI): The alignment of activities and mutual support between OR&I and NWSI continues to improve. The FY23 Naval Research Program (NRP) execution was an intentionally deliberate effort to prioritize selected projects that align with the NPS mission. The products of the NWSI Warfare Innovation Continuum (WIC) Workshop are being used to provide a framework for future NPS research and providing external organizations with new concepts to explore. And the promotion of NPS research activities through a coordinated synchronization of the various NPS Warfare Chairs is helping the fleet and Fleet Marine Forces better understand the capabilities that NPS has to offer. This is especially true as NPS prioritizes efforts in support of activities in the U.S. Indo-Pacific Command area.

STEM Historically Black Colleges and Universities and Minority-serving Institutions (HBCU/MI) Program: The Diversity STEM Scholarship for Service program at NPS successfully launched its pilot with Naval Information Warfare Systems Command (NAVWAR). This OUSD/R&E funded program brings recent graduates of HBCUs to NPS for 18 months to learn alongside our warrior-scholars in uniform, followed by 6 months at a NAVWAR Warfare Center lab to complete their thesis research in an area of relevance to the command. With oversight provided by the DoN HBCU/MI office, completion of the program is followed by a 3-year commitment to work at the Warfare Center. ■



TAKE A DEEPER DIVE



NPS Team Makes Key Breakthrough on Path to Electric Aircraft Propulsion



NPS Advances Energy Resilience, Sustainability Through Microgrid Research



NPS Research on Coast Guard Icebreaker to Enhance Arctic Readiness



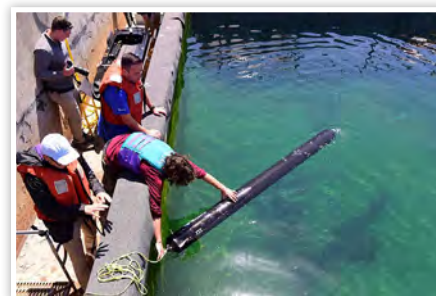
NPS Professor's DURIP Award Will Take Quantum Research to New Heights



NPS Student, Faculty Research Helps Develop Climate-Ready Force through Infrastructure Resilience

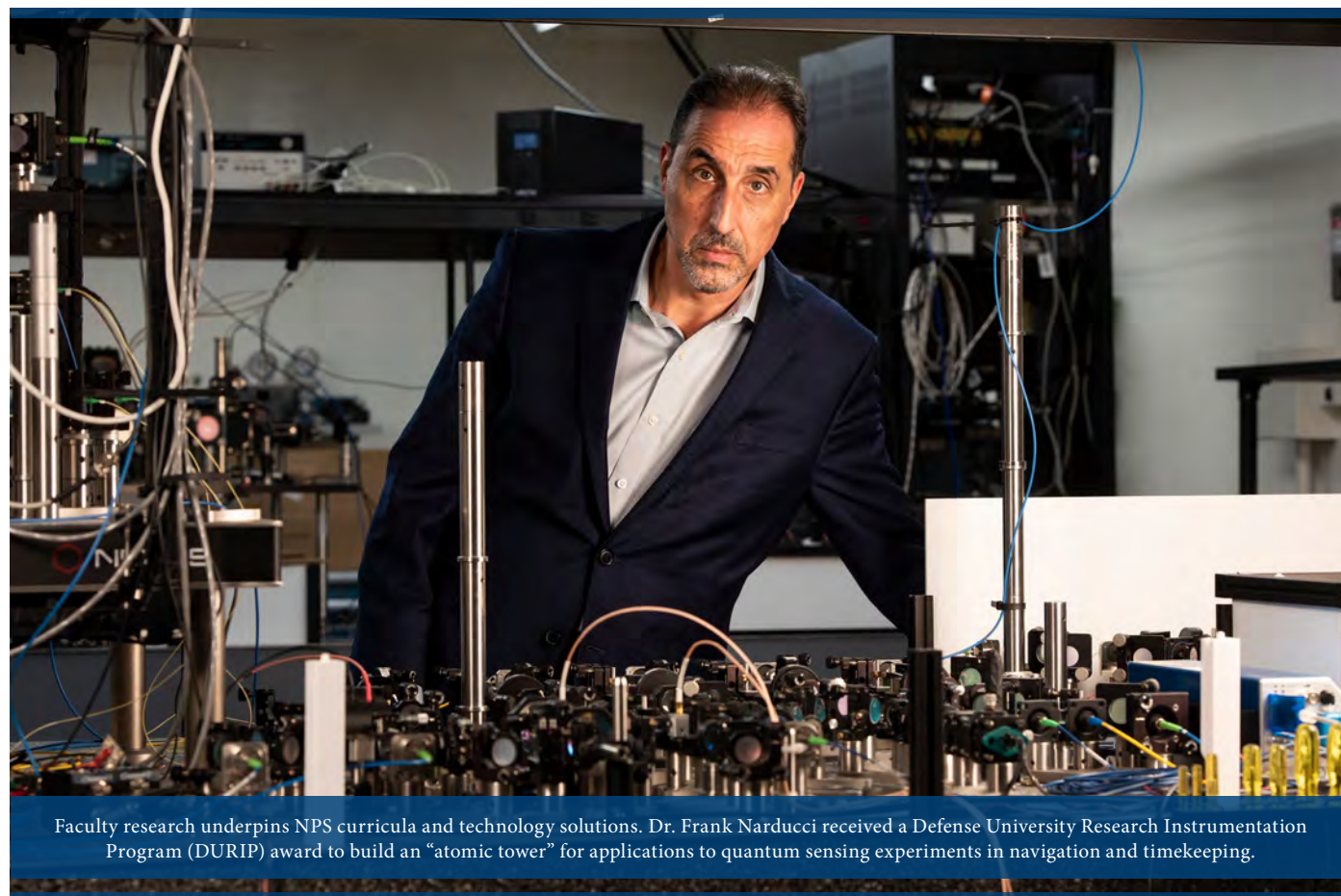


INNOVATION



“We are supporting the construction of a purposefully-designed facility to house the NIC at the Naval Postgraduate School, providing a space for collaboration, defense-focused experimentation, and demonstration of operational use cases to ensure the right technology is evolving.”

The Honorable Carlos Del Toro
Secretary of the Navy



Faculty research underpins NPS curricula and technology solutions. Dr. Frank Narducci received a Defense University Research Instrumentation Program (DURIP) award to build an “atomic tower” for applications to quantum sensing experiments in navigation and timekeeping.

In Innovation... The NPS Strategic Framework formally established the Innovation pillar to “lead Naval innovation via a collaborative ecosystem connecting warrior-scholars with academia and industry.” NPS hired Kaitie Penry from the National Security Innovation Network to be the Director of Research Innovation, leading development of processes to leverage NPS as an intellectual hub for defense innovation development and adoption for Naval forces. The innovation process at NPS seeks to *identify* innovation strengths and *diversify* and *deepen* innovation opportunities for our warrior-scholars, the Department of the Navy, and the nation.

WIC Kicks Off NPS Innovation: In order to *identify* innovation strengths, NPS continues to leverage the Warfare Innovation Continuum (WIC) and Workshop, led by the Naval Warfare Studies Institute (NWSI). This program collaborates with the Office of Research and Innovation (OR&I), and these entities worked together to leverage the best interdisciplinary research ideas for implementable solutions to key operational problems. This year’s theme is **Integrated Naval Campaigning**. Students have the opportunity to work alongside faculty, decision makers from the fleet and force, and many of NPS’ 40+ CRA-DA partners to identify creative solutions that feed into Naval Innovation Exchange (NIX) teams and generate prototypes.

NIX and ITTs: Established in 2023 to *diversify* and *deepen* innovation opportunities, NPS implemented two key programs—the NIX and the Interdisciplinary Transition Teams (ITT)—designed to provide students, faculty, and staff with better connection to the Fleet and Force as well as more robust internal support systems for nascent groundbreaking research. The NIX teams develop ITTs and work collaboratively to identify technical solutions to fleet problems, prototype options, and provide recommendations for testing, evaluation, and eventual transition to the operational force.

JIFX/Experimentation: NIX team solutions are then field tested—in the sky, on the ground, and in the water—at Joint Interagency Field Experimentation (JIFX) events four times a year. In 2023, more than 100 experimentations were conducted with nearly 500 people from NPS, industry, and DOD partners. Linking these events into the innovation life cycle at NPS ensures that good ideas are prototyped, matured, and resourced appropriately for future research and transition.

Transition: These efforts are enabled and supported by the Interdisciplinary Transition Teams, which are designed to educate and assist students and faculty with transitioning their innovative solutions to the force, either via sponsorship to a program of record or non-traditional acquisition paths. The WIC, NIX, JIFX and ITT programs define the innovation process at NPS accelerating “ideas to impact.”

Naval Innovation Center at NPS: The NPS Strategic Framework is laying the groundwork in support of the SECNAV’s Naval Education Strategy and vision for a purposefully designed facility at NPS to house the Naval Innovation Center (NIC) at NPS. The NIC facility will leverage NPS innovation to accelerate solution development at greater speed and scale. In 2023, NAVFAC’s Environmental Assessment (EA) was launched with a public comment period and the final draft was recently completed. A second public comment period for the final EA is planned for the spring of ’24.

Partnerships: In response to the NPS Strategic Framework and the ongoing innovation efforts at NPS, OR&I was able to expand its capabilities by bringing in a new NavalX Tech Bridge Director, Marco Romani, who will further expand opportunities between NPS, NavalX, the Office of Naval Research, the fleet, the warfare centers, academia, and industry. ■

TAKE A DEEPER DIVE



WIC Workshop Kicks Off NPS’ Annual Innovation Continuum



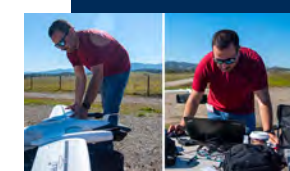
NPS Consortium Advances Innovative Naval Applications of Additive Manufacturing



NPS Professor, New Innovation Lab Honored With Prestigious Contracting Award



NPS Professor and Student Develop Patented Self-Sealing Fuel Line



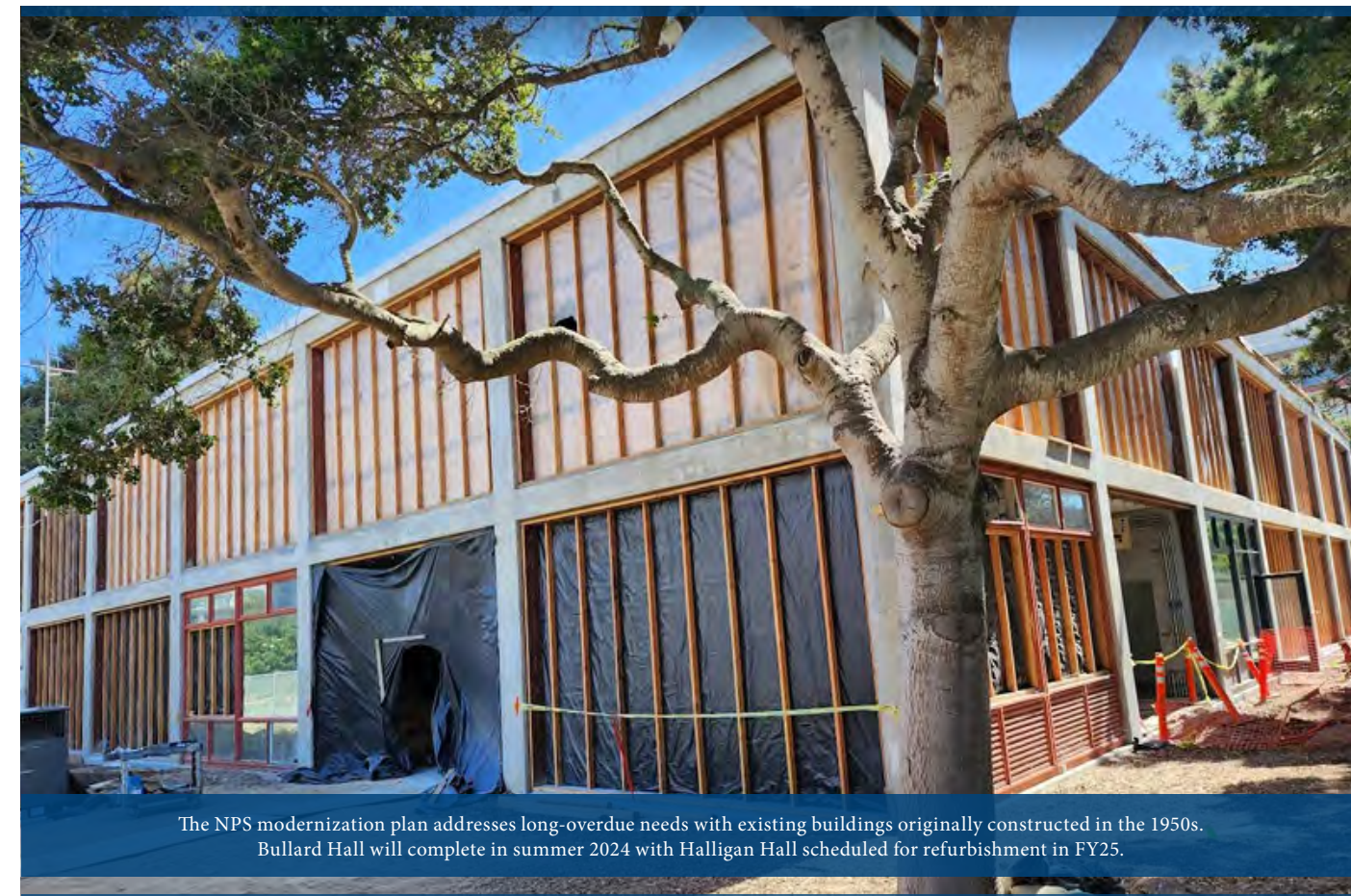
NPS Hosts JIFX 23-2 With Focus on Innovation, Collaboration

INSTITUTION



Our maintenance and modernization plans are addressing long-over due needs associated with our existing classrooms and labs built in the 1950s and will lay the ground work for a purposefully-designed facility to house the Naval Innovation Center at NPS.”

**Vice Adm. Ann Rondeau, USN (ret.),
President, Naval Postgraduate School**



The NPS modernization plan addresses long-overdue needs with existing buildings originally constructed in the 1950s. Bullard Hall will complete in summer 2024 with Halligan Hall scheduled for refurbishment in FY25.



Conceptual view of Bullard Hall when complete and reopened in summer 2024.

In Institution... The sound of construction is the sound of progress. Our facilities and staff have been busy improving the quality of work life for all at NPS.

Budget: A significant amount of work has gone into the “business of NPS” and making the NPS budget sustainable in the requirements-based world of the Fiscal Year Defense Plan (FYDP). While the FY24 budget remains flat (decreased after adjusting for inflation), NPS submitted documented FY25 issues to increase the direct mission budget. All issues were discussed with NPS and the resource sponsor and were ultimately supported and approved.

Process: After more than a year of planning and preparation for the NPS Enterprise Resource Planning (ERP) system, the final phase of implementation was completed in 2023 and officially launched in January 2024. The NPS comptroller worked through the black-out period as legacy financial data systems were shut down and transitioned. The new system is foundational to the vision of NPS, and offers the efficiency of a single IT system that encompasses budgets, purchasing, and labor with

room for future integration, greater transparency, and effectiveness as part of NPS’ broader enterprise transformation efforts.

Infrastructure: Modernizing the NPS campus continues, with Bullard Hall expected to reopen in fall 2024, and preparations for renovating Halligan Hall next are well underway. NPS Facilities Management has been managing the efforts, juggling major multi-million dollar projects on top of other much-needed facilities maintenance. In fact, NPS is on track to renovate all of its original 1950s campus buildings.

1. The NPS **Classified Task Force** led by the Director of the Dudley Knox Library, will expand classified facility capability. The team began by identifying existing classified courses and classified research projects in order to increase capability where needed most.

Two-thirds of NPS faculty hold a Secret or above clearance, 1/4 hold Top Secret or related; existing spaces include STBL, SCIF, and a classified Library space (being expanded, will complete in June ’24); new spaces are being planned for Bullard and Halligan to meet needs for more IT applications in these spaces.

2. The new **Café Del Monte** was opened during the summer and provides not only a much improved dining option, but a new outdoor gathering place that fosters community and engagement.

IT Internal Network: NPS ITACS completed Phase 1 of a major upgrade of the Student Information System. A multi-year, joint effort with Naval War College, the project supports the Secretary’s Navy Education Strategy 2023 to strengthen the Naval University System (NUS) by designing and building a key component of an interoperable learning ecosystem.

1. Upgraded High Performance Computing capability with a 25% increase in total computing capability. At over 12,000 cores and over 140 GPUs, NPS HPC is supporting faculty and student AI research. Electrical and cooling systems were modernized to support this larger demand.

2. The NPS Secret Defense Research and Engineering Network (SDREN) implementation is 90% and will be fully operational in 2024. ■

YEAR-IN-REVIEW

Naval Postgraduate School

2023 — Activities & Impacts



More than 160 participants attend the fourth quarterly Naval Artificial Intelligence Summit at NPS.



Aaron Weis, the Department of the Navy's Chief Information Officer joined Kim Koro, senior vice president of Qualcomm Technologies, Inc., to announce a new partnership on naval applications of 5G between NPS and Qualcomm Technologies at the DON IT West Coast Conference.

Researchers from NPS and the Naval Surface Warfare Center in Florida test the NPS Disposable Reusable Expeditionary Warfare Underwater Vehicle, designed by naval research labs and industry to demonstrate how these partnerships accelerate innovations from concept to outcome.



Over 181 registered participants observe and conduct 21 experiments on human performance monitoring and situational awareness during the quarterly JIFX event.



Secretary of the Navy Carlos Del Toro, joined senior leaders at the DOD and at NPS to examine the challenges, needs and opportunities of space operations unique to the maritime domain at the NPS-sponsored Naval Space Summit.

NPS and the Stanford Doerr School of Sustainability led the second DON Climate Tabletop Exercise for climate strategists from the DOD, federal agencies, Congress, think tanks, non-governmental organizations, and the private sector to discuss solutions to the Navy's climate priorities and sustainability initiatives.



NPS faculty completed a TRL 6 demonstration of the Fast Light-weight Altitude Solid-state circuit breaker for Hybrid-electric (FLASH) electric propulsion aircraft.



NPS Oceanography student Lt. Kyle Wheeler and faculty John Joseph and Ben Reeder, deployed to the Beaufort Sea (Alaska) to test experimental cryophones during ARCEX23.



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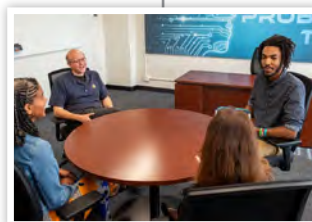
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NPS creates the Office of Research and Innovation in response to the National Security Strategy and National Defense Strategy's call to leverage emerging technologies and innovation.



Through a CRADA with Northrop Grumman, NPS Physics professors Drs. Alves, Karunasiri and Grbovic demonstrated their Micro-electromechanical Systems (MEMS) acoustic directional sensor's capabilities showing marked improvements over conventional units.



The inaugural cohort of graduate students for the NPS-Naval Information Warfare Systems Command (NAVWAR) Scholarship-for-Ser-vice Program with the nation's Historically Black Colleges and Universities and Minority-serving Insitutions funded by OUSD/R&E was announced.



NPS hosted the Black Sea Security Symposium in February with 100+ participants, nearly half from NATO countries bordering the Black Sea/ Caspian regions, including Ukraine, joining U.S. counterparts and energy experts at the event.



NPS alumnus and Chief of Navy Reserve Vice Adm. John Mustin addresses 218 graduates, including 19 international students from 15 countries, during the Winter Quarter graduation ceremony.



March 2023 Graduation



Chilean Navy Vice Adm. Alberto Soto was inducted into the NPS Hall of Fame on March 24, 2023.



The NPS Rapid Innovation Design Challenge brought together Monterey County high school students to develop real-world solutions to one of today's most significant security issues—climate change. Rep. Jimmy Panetta (D-Calif.) presented the awards.



Through a CRADA with Hybrid Air Vehicles, U.S. Marine Corps Capt. Ben Cohen and Capt. John Schmaltz researched the potential of civilian hybrid aircraft technologies and evaluated how to adapt the airships for USMC logistics that led to support from DOD's Operational Energy Office use case studies.



YEAR-IN-REVIEW

Naval Postgraduate School

2023 — Activities & Impacts



The Acquisition Research Program and Naval Warfare Studies Institute sponsor the 20th annual Acquisition Research Symposium for nearly 800 registered attendees.



In a partnership with Middlebury Institute of International Studies (MIIS), Foreign Area Officer and National Security Affairs student U.S. Air Force Capt. Jordan Garcia was one of 12 fellows in the MIIS summer symposium to Armenia and Georgia.

NPS recognized its 2023 Spring Quarter graduates—349 including six doctoral degrees and 25 international students representing 16 countries—during a commencement ceremony with commencement speaker Gary Wipfler.

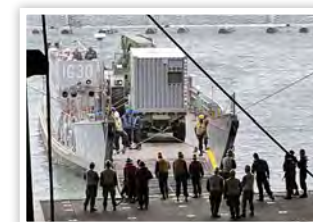


The Naval Innovation Exchange (NIX) program is created to support multidisciplinary teams in developing prototype research solutions in intelligent autonomous systems, artificial intelligence, and additive manufacturing.



NPS professor Frank Narducci receives a Defense University Research Instrumentation Program award to build the most precise atomic instrument of its kind for applications to quantum sensing experiments in navigation and timekeeping.

Researchers from NPS study the impact of the extreme environment on crew performance and potential mitigations, as well as advanced additive manufacturing technologies in adverse sea conditions, during a seven-week Arctic transit aboard the U.S. Coast Guard icebreaker USCGC Healy (WAGB 20).



NPS took the latest step in its innovative additive manufacturing research efforts, teaming up with Commander, Naval Surface Forces (CNSF) to transfer a Xerox ElemX liquid metal 3D printer aboard USS San Diego.

may

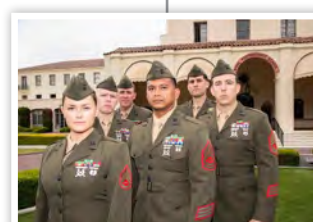


Dr. Sam Buttrey, Associate Professor of Operations Research, was back on the Alex Trebek Stage to compete in the first-ever "Jeopardy!" Masters Tournament.

jun



NPS professor Dr. Ray Gamache and Christopher Phifer, an NPS alumnus, receive a patent for a self-sealing fuel line, created by their novel application of elastomeric materials.



MARADMIN 430/23 enabled the Marine Corps Graduate Education Program—Enlisted (MCGEP-E), which increased opportunities for enlisted Marines to attend NPS, and the initial cohort arrived in June.



Ten Navy and Marine Corps officers graduate from the Leadership Education and Development (LEAD) Program, which prepares highly-qualified, mid-career officers to serve as Company Officers at the U.S. Naval Academy for two years upon completion of their 1-year NPS degree through the Department of Defense Management.



The NPS Consortium for Advanced Manufacturing Research and Education completes the first successful demonstration of an in-flight 3D printing of a medical cast aboard a U.S. Marine Corps MV-22 Osprey tiltrotor aircraft.



Dr. Britta Hale, with her students, led research/tested Messaging Layer Security (MLS) on networks, UxVs, and lightweight devices in drone swarms. MLS is the first internationally standardized, end-to-end group communication-supporting encryption protocol.

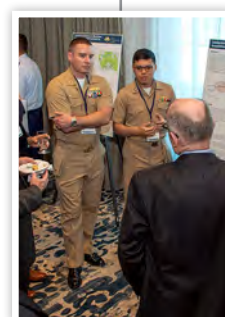
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NPS alumna U.S. Marine Corps Lt. Col. Jasmin Moghbeli launched aboard the NASA-SpaceX Crew-7 mission team as commander of the four-person crew for a six-month stay on the International Space Station.



At the Joint Interagency Field Experimentation (JIFX) event, "Autonomy and Human Machine Teaming," 202 participants conducted 23 technology experiments.



NPS pilots a capstone opportunity for NPS students to partner with DON sponsors to present, develop and transition innovative ideas into practical solutions within a year.



YEAR-IN-REVIEW

Naval Postgraduate School

2023 — Activities & Impacts



The International Graduate Programs Office at NPS hosts its first Regional Alumni Symposium in Singapore for 100 international graduates representing 14 countries throughout the region.



Using NPS POTION software, a team of faculty researchers from the Naval Postgraduate School (NPS) and the Naval Research Laboratory (NRL) helped break UAV flight record during Arctic test flights.



NPS professor Dr. Nita Shattuck's latest Crew Endurance video lecture based on years of research, "Sleep Is a Weapon: A Clear Mind, A Combat Edge," was added to the Navy's General Military Training (GMT) catalog on the MyNavy Portal.

Dr. Nita Shattuck completed a seven-week transit north of the Arctic circle aboard icebreaker USCGC Healy (WAGB 20) researching crew endurance factors expected to translate to Navy applications in future ship designs, crew considerations, and Arctic CONOPS.



NPS hosts the Warfare Innovation Continuum Workshop, one of the pillars of the NPS innovation process, focused on challenges and solutions related to "Integrated Naval Campaigning."



Experts in the field of directed energy from the public and private sectors and academia came to NPS for the 2023 Directed Energy Systems Symposium hosted by the Directed Energy Professional Society (DEPS).



The Winter Naval AI Summit brought together AI experts from throughout the Navy, DOD, academia and industry to discuss how AI can transform naval capabilities and tackle current maritime challenges.

Rear Adm. Kurt Rothenhaus, 27th Chief of Naval Research, congratulated 284 NPS graduates, including 3 Ph.D. students, 31 international students from 19 countries, and 63 DOD civilians in his keynote address during the university's Fall Quarter graduation ceremony.



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The Summer Quarter graduation ceremony for 210 students, including 20 international students from 10 countries, is led by U.S. Marine Corps Maj. Gen. Roberta L. Shea, Legislative Assistant to the Commandant of the Marine Corps.



Ensign Nate Macdonald, a U.S. Naval Academy grad and Shoemaker Scholar, conducted his NPS applied research on an innovative detonation-piloted afterburner, a novel engine design that uses less fuel, reduces weight and can increase the speed and range of tactical missiles.



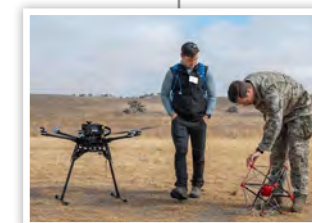
Former Secretary of State Condoleezza Rice visits NPS to meet with senior leaders and Defense Analysis students and to present a Secretary of the Navy Guest Lecture to the campus.



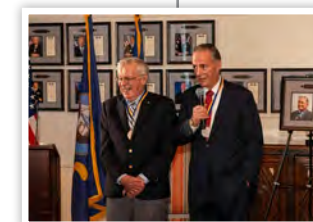
NPS students and faculty working together as the Intelligent Autonomous Systems NIX team successfully demonstrated their prototype for USV targeting at Gray Flag '23, in collaboration with PMW 170/A and NSWG-4, that enabled real-time Over-The-Horizon C2 via proliferated Low-Earth Orbit (pLEO) architecture.



NPS Space Systems Academic Group delivered its first Five Eyes (FVEY) CubeSat, called Mola, to Rocket Lab's Launch Complex 2 in Wallops Island, Va., where it will be launched aboard an Electron rocket.



NPS faculty and students evaluate new technologies and conduct research related to DOD priorities in the November JIFX event, "Operations at the Edge."



NPS inducts two icons into its Hall of Fame: Retired U.S. Navy Capt. Thomas Kelley and retired Adm. Robert Natter.



NPS hosts a Northwest Pacific Wargaming planning conference with U.S. Pacific Fleet and U.S. Seventh Fleet for more than 100 international participants.



OUR COMPARATIVE ADVANTAGE

WARFIGHTER DEVELOPMENT

Critical and strategic thinkers able to problem-solve, adapt, innovate, and lead

Naval Engineering

Combat Systems

Cyber and Information Systems

Data Science and Decisions

Global Security and Strategic Competition

Defense Systems Management

Space Technology and Operations

Maritime Battlespace Environments

Modeling, Simulation, and Visualization



Minimum

Viable Solutions



Rapid Prototyping and

Field Experimentation

WARFIGHTING DEVELOPMENT

Classified and applied research and innovative solutions

C-C5ISR

Long Range Fires

Terminal Defense

Contested Logistics

Maritime Domain Awareness

Artificial Intelligence

Intelligent Autonomous Systems

Naval Operational Architecture

Modeling & Simulation GEMS/LVC

Energy and Climate Security

The Department of the Navy is driving innovation

across every corner of the enterprise.

"The best way to deter our adversaries is for the department to restore its technological superiority..."

Education is the key connector for this work. Our educational institutions hold great promise and opportunity."

— Secretary of the Navy Carlos Del Toro

MISSION MEASURES

Naval Postgraduate School

Current Leadership

President: Dr. Ann E. Rondeau, Vice Admiral, USN (Ret.)
Provost: Dr. Scott Gartner
Chief of Staff: Capt. Brandon Bryan, USN
Chief Operating Officer: Rob Sweeney
Command Information Officer: Scott Bischoff
Vice Provost for Academic Affairs: Dr. James Michael
Vice Provost for Research: Dr. Kevin B. Smith
Vice Provost for Academic Leadership: Dr. Jomana Amara
Dean of Students: Capt. Thor Martinsen, USN
Naval Warfare Studies Institute: Col. Randy Pugh, USMC (Ret.)

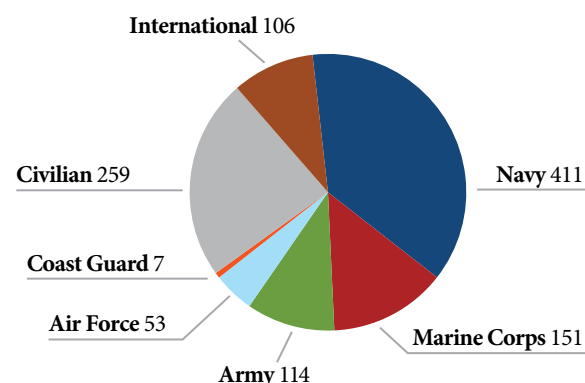
Student Engagement

1,856 Master's Students (includes 172 international)
 99 Ph.D. Students
 542 Certificate/Non-Degree
 10,062 EE/PD*
 12,560 total engagement

Degrees Awarded

1,090 Master's Degrees
 11 Doctorates (Ph.D.)
 1,101 total degrees

Graduate Degrees Conferred by Service



* EE/PD = Executive Education/Professional Development

Faculty & Staff

178 Tenure Track Faculty
 Non Tenure Track Faculty:
 150 Instructional Faculty
 166 Research Faculty
 369 Administrative/Staff
 94 Military

Financials

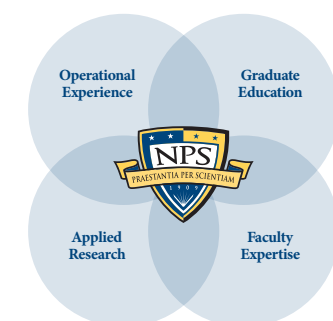
■ \$125 million FY23 Direct Authorization (w/o military salary)
 ■ Approx \$103 million FY23 in sponsored/reimbursable education and research programs

Research

■ 574 Funded Research Projects
 ■ 560 Public Theses and Dissertations
 ■ 81 Public Faculty Research and Technical Reports
 ■ 63 Classified and Restricted Thesis/Dissertations
 ■ 10 Patents Received
 ■ 30 Patents Submitted in FY23
 ■ Partnerships: CRADAs: 32 | PIAs: 3 | TSAs: 7 | MOU/MOAs: 47
 ■ Education Partnership Agreements: 4

Accreditation

■ WASC Senior College and University Commission (WSCUC)
 ■ Accreditation Board for Engineering and Technology (ABET)
 ■ Association to Advance Collegiate Schools of Business (AACSB)
 ■ Network of Schools of Public Policy, Affairs, and Administration (NASPAA)



NPS synchronizes student operational experience and graduate education with applied research and faculty expertise to deliver warfighting solutions and leaders educated to employ them.



NPS meets naval-unique needs in graduate education. Our students are mid-career, operationally experience warrior scholars from across DoD and international partners.



STUDENTS & PROGRAMS

Graduate Program Enrollment (Average)

2023 — Degrees, Certificates, and Non-Degree

1,360 Full-Time Resident Degree

595 Distance Learning (DL) Degree

542 Graduate Certificate and Non-Degree

*Numbers may not sum to total due to rounding.



Energy technology research applied to expeditionary needs.

Graduate Student Enrollment (Average)

By Service

In 2023, 2,497* students attended the Naval Postgraduate School. NPS is a place where operationally experienced officers from the joint services, civilians from various defense and homeland security organizations, and international students from nearly 50 countries come together to learn from, and work with, a world-class faculty focused on global security issues vital to our national security strategy.

Type of Enrollment By Service	Full-Time Resident Degree	Distance Learning Degree	Graduate Certificate & Non-Degree
USN/R	544	199	189
USMC/R	259	40	56
USA/R	146	8	23
USAF/R	74	1	21
Other Services	7	1	1
Civilian	177	343	240
International	155	3	14
Grand Total	1,360	595	542

* Does not include EE/PD

**Numbers may not sum to total due to rounding.



DON civilian engineers can earn their advanced degrees alongside NPS warrior scholars.



Graduate Student Enrollment

Total U.S. Navy

544 Full-Time Resident Degree

199 Distance Learning (DL) Degree

189 Graduate Certificate and Non-Degree



NPS autonomy research includes developing algorithms for swarming applications.

Graduate Student Enrollment

By USN/R Community

In 2023, 931 USN/R students attended the Naval Postgraduate School. Student research addresses critical real world requirements relevant to combatant commander and warfighter needs through a unique integration of government agencies, commercial enterprises, other notable research universities and our allies.

Type of Enrollment By USN/R Community	Full-Time Resident Degree	Distance Learning (DL) Degree	Graduate Certificate & Non-Degree
Aviation	42	60	51
Enlisted	8	0	7
Limited Duty	1	2	2
Restricted Line	259	35	71
Special Operations and Warfare	14	2	1
Staff Corps	89	30	30
Submarine Warfare	49	31	11
Surface Warfare	80	38	14
Warrant Officer	1	1	2
Grand Total	544	199	189

* Does not include EE/PD. **Numbers may not sum to total due to rounding.



Space systems academics includes hands-on applications in satellite and CubeSat development.



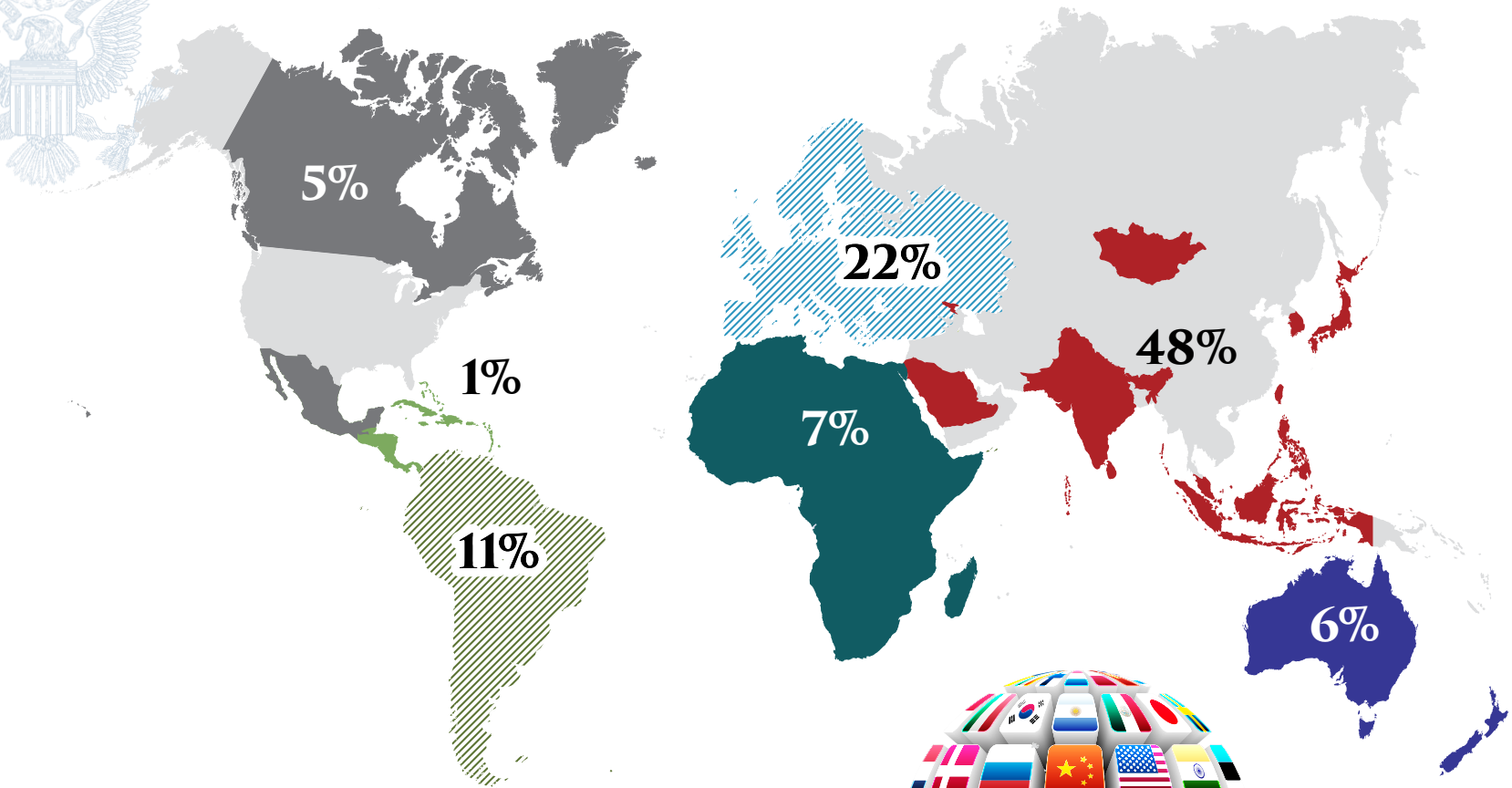


NPS hosts quarterly Joint Interagency Field Experimentation (JIFX) events at test ranges/facilities for student/faculty research with industry to test and assess potential defense applications of emerging technologies.

International Enrollment (Average)

By Region

Asia		Africa		Europe		Oceania	
Armenia	1	Algeria	2	Belgium	1	Australia	11
Georgia	2	Djibouti	1	Croatia	2		
India	1	Ghana	2	Denmark	1	South America	
Indonesia	5	Mozambique	1	Estonia	1	Argentina	2
Israel	5	Niger	1	Germany	8	Brazil	12
Japan	1	Nigeria	3	Greece	10	Chile	3
Jordan	3	Sierra Leone	2	Lithuania	1	Colombia	1
Maldives	1	Caribbean & Central America		Netherlands	2	Peru	1
Mongolia	3	Belize	1	Norway	4		
Nepal	3	Trinidad and Tobago	1	Romania	1		
Oman	1			Sweden	4		
Pakistan	4			Ukraine	1		
Philippines	7			North America			
Saudi Arabia	1			Canada	2		
Singapore	21			Mexico	6		
South Korea	12						
Sri Lanka	4						
Taiwan	6						
Turkey	3						
Yemen	1						



172 Total Enrollment



Degrees Conferred

By Degree Type

1,090 Master's Degrees

11 Doctor of Philosophy Degrees (Ph.D.)



U.S. Marine Corps Maj. Gen. Roberta L. Shea was the summer quarter graduation speaker in King Hall, Sept. 2023.



Degrees Conferred

By Academic Unit

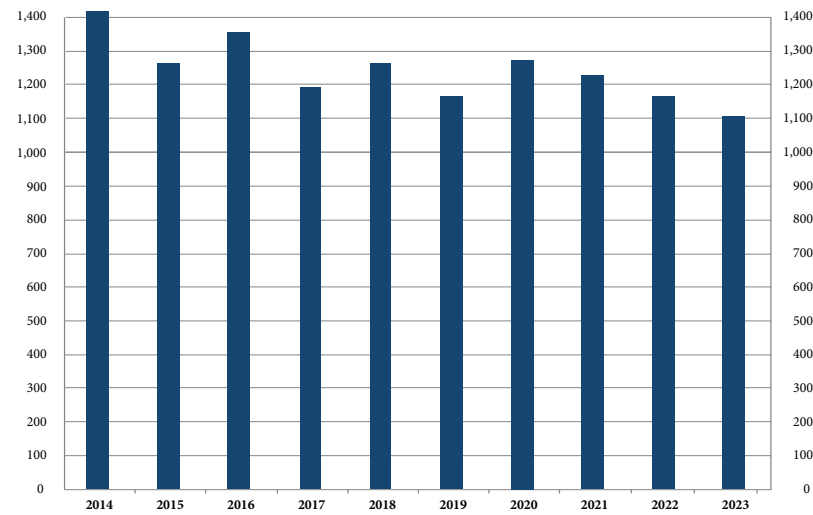
CAG – CYBERACADEMIC GROUP	21
MS Computer Science	9
MS Cyber Systems and Operations	9
MS Electrical Engineering	2
MS Engineering Science (Electrical Engineering)	1
CS – COMPUTER SCIENCE	40
MS Computer Science	30
MS Modeling, Virtual Environments and Simulation	7
PhD Computer Science	2
PhD Modeling, Virtual Environments and Simulation	1
DA – DEFENSE ANALYSIS	83
MS Applied Design for Innovation	24
MS Defense Analysis (Irregular Warfare)	38
MS Information Strategy and Political Warfare	21
DDM – DEPARTMENT OF DEFENSE MANAGEMENT	248
EMBA Executive Master of Business Administration	46
MBA Master of Business Administration	116
MS Contract Management	23
MS Defense Financial Management	2
MS Management	26
MS Program Management	20
MS Systems Acquisition Management	1
PMBA Leadership Education and Development	11
PMBA Professional Master of Business Administration	3
ECE – ELECTRICAL AND COMPUTER ENGINEERING	34
MEng Electrical Engineering	9
MS Electrical Engineering	23
MS Engineering Science (Electrical Engineering)	1
MSES Electrical Engineering	1
IS – INFORMATION SCIENCES	38
MS Applied Cyber Operations	6
MS Information Technology Management	10
MS Information Warfare Systems Engineering	7
MS Network Operations and Technology	12
PhD Information Sciences	3
MA – APPLIED MATHEMATICS	4
MS Applied Mathematics	4
MAE – MECHANICAL AND AEROSPACE ENGINEERING	57
MS Aerospace Engineering	17
MS Engineering Science (Aerospace Engineering)	3
MS Engineering Science (Electrical Engineering)	1
MS Engineering Science (Mechanical Engineering)	6
MS Mechanical Engineering	30
MR – METEOROLOGY	15
MS Meteorology	3
MS Meteorology and Physical Oceanography	12

NSA – NATIONAL SECURITY AFFAIRS	192
MA Security Studies (Civil-Military Relations)	1
MA Security Studies (Combating Terrorism: Policy and Strategy)	13
MA Security Studies (East Asia and the Indo-Pacific)	36
MA Security Studies (Europe and Eurasia)	23
MA Security Studies (Homeland Security and Defense)	87
MA Security Studies (Middle East, South Asia, Sub-Saharan Africa)	20
MA Security Studies (Strategic Studies)	6
MA Security Studies (Western Hemisphere)	5
MS Strategy (Space Operations)	1
OC – OCEANOGRAPHY	3
MS Physical Oceanography	1
PhD Physical Oceanography	2
OR – OPERATIONS RESEARCH	127
MS Cost Estimating and Analysis	15
MS Human Systems Integration	13
MS Systems Analysis	30
MS Applied Science (Operations Research)	7
MS Human Systems Integration	2
MS Operations Research	60
PH – PHYSICS	23
MS Applied Physics	20
MS Engineering Acoustics	1
PhD Applied Physics	2
PH/ECE – PHYSICS/ELECTRICAL AND COMPUTER ENGINEERING	9
M Engineering Acoustics	8
MS Engineering Acoustics	1
SE – SYSTEMS ENGINEERING	158
MS Engineering Systems	2
MS Systems Engineering	88
MS Systems Engineering Management	67
PhD Systems Engineering	1
SE/OR – SYSTEMS ENGINEERING/OPERATIONS RESEARCH	6
MS Systems Engineering	3
MS Systems Engineering Analysis	3
SP – SPACE SYSTEMS ACADEMIC GROUP	30
MS Astronautical Engineering	10
MS Space Systems Operations	20
USWAG – UNDERSEA WARFARE ACADEMIC GROUP	13
MS Applied Mathematics	1
MS Applied Physics	4
MS Engineering Acoustics	2
MS Mechanical Engineering	2
MS Physical Oceanography	4
NPS TOTAL	1,101



Degrees Conferred *continued*

Degrees Conferred



YEAR	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Degrees	1,411	1,269	1,358	1,193	1,260	1,161	1,275	1,221	1,162	1,101



Dr. Clare Morton of Naval Information Warfare Center (NIWC) Pacific is presented with her NPS doctoral hood at the Fall quarter graduation, Dec. 2023.



U.S. Marine Corps Lt. Col. Pedro Ortiz, Ph.D. was the first Hispanic Marine to earn his doctorate in Computer Science through the Marines' Ph.D. Program-Technical (PHDP-T).



RESEARCH

Program Overview

The Naval Postgraduate School (NPS) has robust research and innovation programs. Per U.S. Code, Title 10 — 8541, NPS will... *provide advanced instruction and professional and technical education and research opportunities...* Sponsored programs (research, education, and professional development) are integral to the Naval Postgraduate School mission. The research programs support graduate education by providing militarily relevant thesis topics that address issues from the current needs of the fleet and joint forces to the science and technology required to sustain long-term superiority of the Navy/DOD. Research varies from the fundamental to the applied and covers all levels of classification. Sponsored research includes:

- ▶ Fleet Support
- ▶ Basic and Applied Research
- ▶ Individual and Interdisciplinary Group Projects
- ▶ Cooperative Research and Development Agreements

Sponsored education programs include integrated graduate education and research in space systems, total ship systems engineering, combat systems, systems engineering and homeland security and defense, supplemented by off-campus graduate and certificate programs. Professional development programs utilize NPS faculty expertise and student experience to support various communities within the Navy and DOD through short courses and web-based services.

Research Portfolio

Annually, research is aligned to top priority naval needs per Program Area detailed by Naval leadership in the fleet and force strategies.

574 Funded Research Projects:

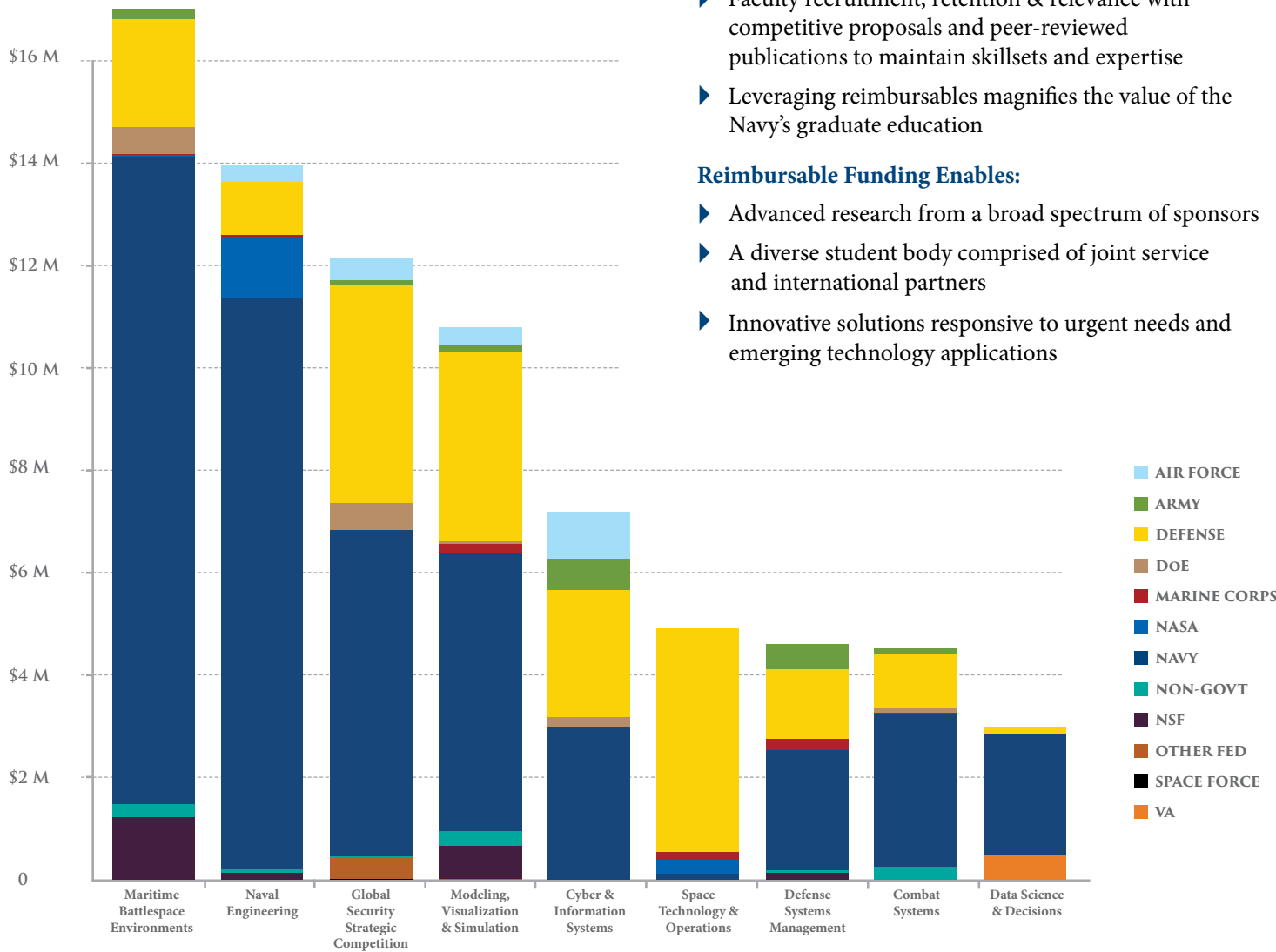
- ▶ 413 Reimbursable
- ▶ 161 Direct

Research & Innovation Support:

- ▶ Operational relevance through resource sponsors
- ▶ Educational quality through theses and capstone projects
- ▶ Faculty recruitment, retention & relevance with competitive proposals and peer-reviewed publications to maintain skillsets and expertise
- ▶ Leveraging reimbursables magnifies the value of the Navy's graduate education

Reimbursable Funding Enables:

- ▶ Advanced research from a broad spectrum of sponsors
- ▶ A diverse student body comprised of joint service and international partners
- ▶ Innovative solutions responsive to urgent needs and emerging technology applications





Innovation driven, NPS develops warfighters and warfighting solutions. At the graduate level, experience and expertise combine with education and research to drive innovative defense applications across all departments.

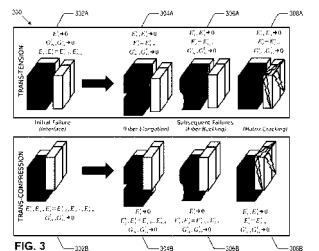
INNOVATION – PATENTS

NPS received 10 patent awards and submitted 36 more in 2023. With an extensive portfolio of over 140 patents covering important technological developments, NPS innovation addresses a wide variety of scientific and engineering disciplines.

FIBROUS COMPOSITE FAILURE CRITERIA WITH MATERIAL DEGRADATION FOR FINITE ELEMENT SOLVERS

Darcy, Joseph; Kwon, Young Wuk; (The United States of America, as represented by the Secretary of the Navy, Arlington, VA (US) 2023-01-23).

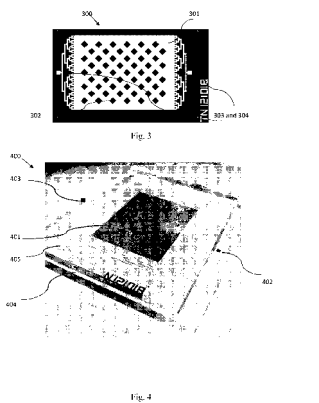
A method and system for modeling fibrous composites. Initially, material properties are obtained for a model of a fibrous composite, where the model includes integration points and unit cells. For each integration point, composite level stresses and strains are determined based on the material properties, the composite level stresses and strains are decomposed into component level stresses and strains for the integration point, the component level stresses and strains are used to calculate failure quotients at the integration point, an appropriate material reduction model is applied at a component level based on the failure quotients to detect a component failure, the component failure is upscaled to determine updated material properties at a composite level, and the updated material properties are incorporated into the model. At this stage, a composite failure is detected based on the updated model.



MICROFLUIDIC MICROBACTERIAL FUEL CELL CHIPS AND RELATED OPTIMIZATION METHODS

Kartalov, Emil Paskalev; Nguyen, Tricia; Arias-Thode, Yolanda Meriah; (The United States of America as represented by the Secretary of the Navy, San Diego, CA (US) 2023-01-24).

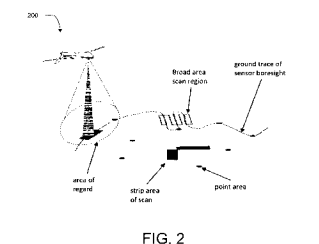
Benthic microbial biofuel cells (BMFCs) are a potential non-toxic and renewable source of under-water power. BMFCs function by coupling an anaerobic anode to an oxygenated cathode. However, current in-situ BMFCs on average produce less than 1 W of power. Potential causes are internal ohmic resistance and low capture efficiency of the bacteria-generated charge due to macroscopic average distances between bacteria and electrodes. A microfluidic BMFC chip is enclosed to study those potential causes. The chip is built using elastomer microfluidics to provide biologically-inert microfluidic confinement of the bacteria, forcing them to be no further away than the height of the containment microchamber (90 μm) from the microelectrode matrix built on the glass substrate of the chip. The matrix captures the charge without location bias (due to its H-architecture) and conducts it to the outside circuit. The microfluidic chip system can be used as an evaluation station to optimize biological parameters, geometry, and electrode scaling towards increased power. That would lead to the development of an optimized power unit that can then be arrayed to build renewable power stations in maritime environments.



METHOD AND SYSTEM FOR OPTIMAL TRAJECTORY PATH TASKING FOR AN UNMANNED AERIAL VEHICLE (UAV)

Ross, Isaac M.; Proulx, Ronald J.; Karpenko, Mark; (The United States of America, as represented by the Secretary of the Navy, Arlington, VA (US) 2023-02-07).

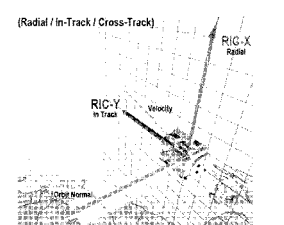
A method and system for generating an optimal trajectory path tasking for an unmanned aerial vehicle (UAV) for collection of data on one or more collection targets by a sensor on the UAV.



SYSTEM & METHOD FOR AUTOMATED INTERCEPT AVOIDANCE FOR SPACECRAFT

Yakimenko, Oleg; Hanlon, Edward; (The United States of America, as represented by the Secretary of the Navy, Arlington, VA (US) 2023-06-06).

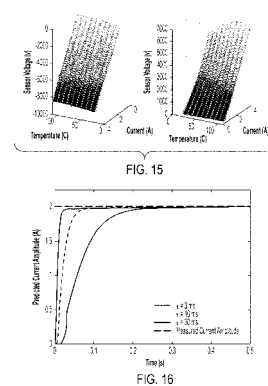
Embodiments in accordance with the invention address potential co-orbital threats to a spacecraft through the use of a plurality of evasion pattern maneuvers selected to prevent a rendezvous with a potential co-orbital threat from occurring within a finite horizon. Embodiments in accordance with the invention maintain separation from the potential co-orbital threat while minimizing a defending spacecraft's fuel consumption.



CONTROL & PROGNOSIS OF POWER ELECTRONIC DEVICES USING LIGHT

Corzine, Keith; Weatherford, Todd; Porter, Matthew; (The Regents of the University of California, Oakland, CA (US); The Government of the United States of America, as Represented by the Secretary of the Navy, Monterey, CA (US) 2023-04-04).

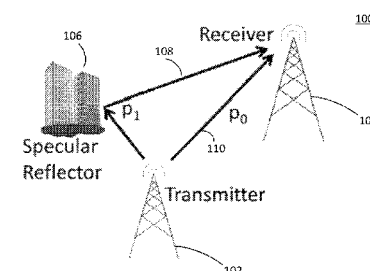
An optically-monitored and/or optically-controlled electronic device is described. The device includes at least one of a semiconductor transistor or a semiconductor diode. An optical detector is configured to detect light emitted by the at least one of the semiconductor transistor or the semiconductor diode during operation. A signal processor is configured to communicate with the optical detector to receive information regarding the light detected. The signal processor is further configured to provide information concerning at least one of an electrical current flowing in, a temperature of, or a condition of the at least one of the semiconductor transistor or the semiconductor diode during operation.



METHOD AND APPARATUS FOR MILLIMETER-WAVE PHYSICAL LAYER AUTHENTICATION

Lord, Scott Frederick; Roth, John David-Dickson; Tummala, Murali; McEachen, John Collin; (The United States of America, as represented by the Secretary of the Navy, Arlington, VA (US) 2023-04-04).

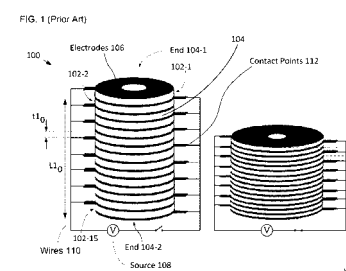
Physical-layer authentication based on the channel response over a wireless medium are described. In a first authentication scheme, a count is kept of how many significant multipath taps remain empty or occupied from one channel estimate to the next for authentication purposes. In a second authentication scheme, which does not require an alternative means of initial authentication, the presence of a multipath component based on a reported position of a transmitter and the side knowledge of planar reflectors in the environment may be leveraged for authentication purposes.



MICROFLUIDIC-BASED ARTIFICIAL MUSCLES AND METHOD OF FORMATION

Kartalov, Emil P; Scherer, Axel; (California Institute of Technology, Pasadena, CA (US); The Government of the United States of America, as represented by the Secretary of the Navy, Arlington, VA (US) 2023-04-25).

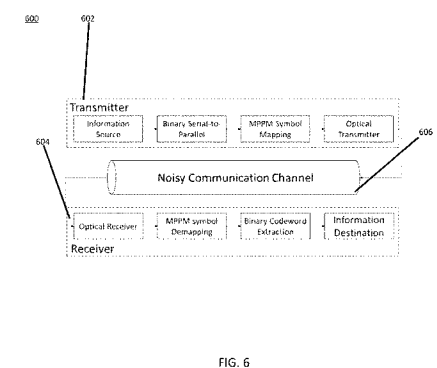
Artificial muscles comprising a body of dielectric elastomer, wherein the body contains a pair of microfluidic networks are presented. Each microfluidic network includes a plurality of channels fluidically coupled via a manifold. The channels of the microfluidic networks are interdigitated and filled with conductive fluid such that each set of adjacent channels functions as the electrodes of an electroactive polymer (EAP) actuator. By using the manifolds as compliant wiring to energize the electrodes, artificial muscles in accordance with the present disclosure mitigate some or all of the reliability problems associated with prior-art artificial muscles.



SYMBOL GENERATION AND FRAME SYNCHRONIZATION FOR MULTIPULSE-PULSE POSITION MODULATION

Koss, Shawn Christian Koss; Tummala, Murali; McEachen, John C; (The United States of America, as represented by the Secretary of the Navy, Arlington, VA (US) 2023-06-20).

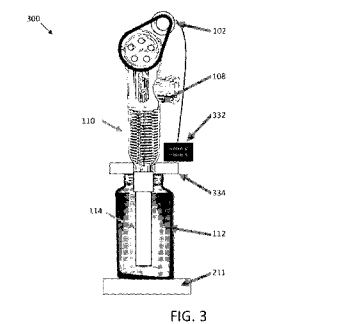
A method and system for multipulse-pulse position modulation optical transmission that includes selecting a multipulse-pulse position modulation having a symbol alphabet having an upper-bound symbol alphabet size, and determining, based on at least one transmission characteristic associated with a transmitter, a subset of symbols of the selected symbol alphabet capable of being transmitted by the transmitter, the subset of symbols having a set of binary codewords. The method and system may include identifying two-symbol concatenation of binary codewords in the set of binary codewords, calculating a cross correlation of binary codeword in the set of binary code words through every two-symbol concatenation, determining a set of one or more acceptable codeword combinations by eliminating a portion of two-symbol concatenation of codewords corresponding to overlapping peaks in the respective calculated cross correlations, and transmitting, by the transmitter via an optical communication channel, information encoded based on the determined acceptable codeword combinations.



DUAL STIRLING CYCLE LIQUID AIR BATTERY

Bailey, Nicholas Anthony; Girouard, Christopher Michael; Pollman, Anthony Gerard; (The United States of America, as represented by the Secretary of the Navy, Arlington, VA (US) 2023-07-04).

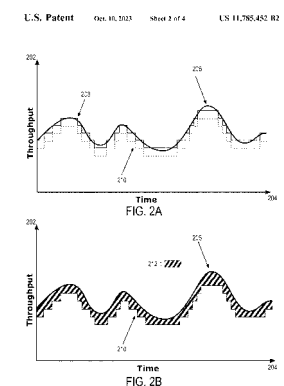
The invention relates to a liquid air energy storage system. The storage system includes a cryocooler, a dewar, and a Stirling engine. The cryocooler cools a tip of a cold head to cryogenic temperatures, the cryocooler further includes a heat sink to reject heat from the cryocooler and a cold head that protrudes into a dewar through a cryocooler cavity, the cold head to condense ambient air to create liquified air in the dewar. The dewar holds the liquified air at low temperatures, the dewar having the cryocooler cavity and a Stirling cavity. The Stirling engine drives an electric generator, the Stirling engine further including a cold finger protruding into the dewar through the Stirling cavity, the cold finger to move the liquified air from the dewar to a Stirling heat sink; the Stirling heat sink to expand the liquified air; and the electric generator to generate output electricity.



ERROR CORRECTION CODE-BASED EMBEDDING IN ADAPTIVE RATE COMMUNICATION SYSTEMS

Harley, Peter Michael Baab; Tummala, Murali; McEachen, John Colin; (The United States of America, as represented by the Secretary of the Navy, Arlington, VA (US) 2023-10-10).

The invention relates to concealing information within error correction codes of adaptive rate wireless communication systems. In some embodiments, the invention includes selecting a modulation and coding scheme with a more robust error correction capacity than needed by current channel conditions; encoding a hidden message with a pre-shared key that is known by a covert transmitter and a covert receiver, and after a standard message is encoded by a transmitting station of the wireless communication systems, replacing codeword parity bits of codewords in the encoded standard message with the encoded hidden message at designated locations. Before a receiving station of the wireless communication systems decodes the encoded standard message, a covert receiver extracts the embedded hidden message from the encoded standard message, replaces bit values of the embedded hidden message with zero at the designated locations, and decodes the extracted hidden message with the pre-shared key.





The Center for Executive Education at NPS hosts continuing education short courses and workshops to keep leaders abreast of trends impacting defense.



EXECUTIVE EDUCATION & PROFESSIONAL DEVELOPMENT

Executive Summary

The Naval Postgraduate School (NPS) extends world-class executive education and professional development (EE/PD) programs to mid- and senior-grade professionals who are unable to take the time out of their careers to attend degree programs, or who need targeted information at their locations on their time schedules. In addition to degree and certificate courses offered for credit, Schools, Centers, Departments, Institutes and other organizations of NPS provide executive education, numerous short courses, seminars, fly-away teams and conferences to meet specific sponsors' needs. NPS' short courses do not award academic credit, but selected short courses may award continuing education units (CEUs).

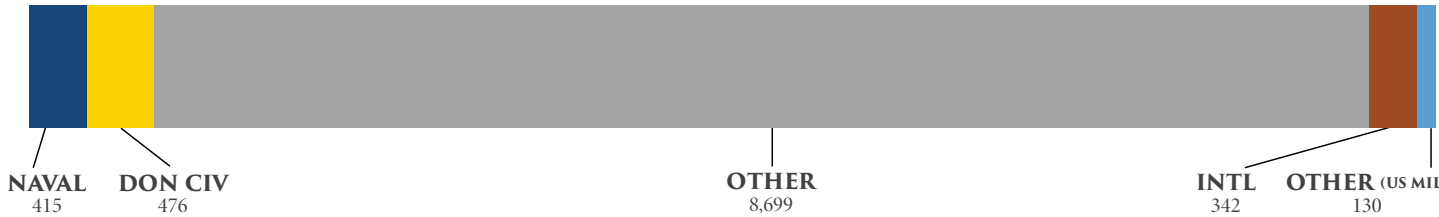
The primary organizations involved in EE/PD at NPS are:

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- ▶ Center for Security Cooperation Support (CSCS)
- ▶ Defense Resources Management Institute (DRMI)
- ▶ Center for Executive Education (CEE)
- ▶ Center on Combating Hybrid Threats (CCHT)
- ▶ Academic Units (EAG, DA, EAG, OR, SE)

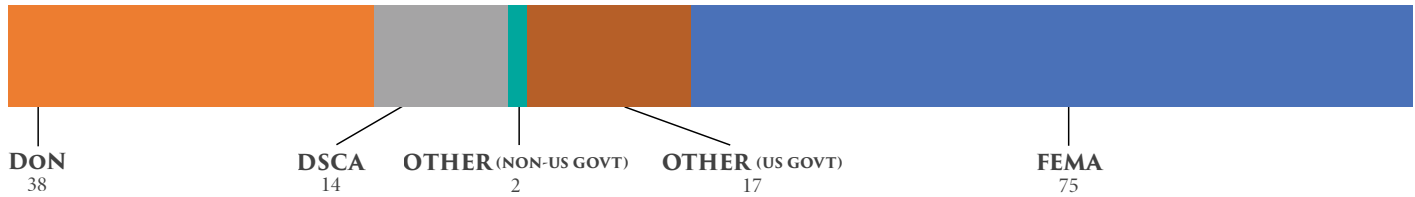
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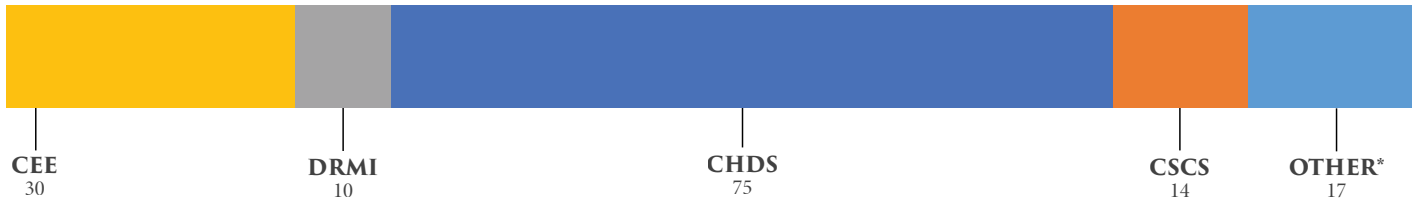
TOTAL STUDENTS BY AFFILIATION
(10,062 Total Students)



TOTAL COURSES BY SPONSOR
(146 Total Courses)



COURSES BY ORGANIZATION
(146 Total Courses)



*Other includes: OR, EAG, DA, and SE

NPS Hall of Fame Honorees

ADMIRAL ROBERT J. NATTER

UNITED STATES NAVY (RET.) — INDUCTED DECEMBER 1, 2023

In 2003, Adm. Robert Natter completed a distinguished 41-year Navy career as Commander of the U.S. Atlantic Fleet, the first Commander of U.S. Fleet Forces Command, the first Commander of all U.S. Navy and Coast Guard homeland defense forces under the newly created Northern Command, and the Commander-in-Chief of the NATO Western Atlantic Command. Natter enlisted in the Naval Reserve at age 17. Following one year of enlisted service and graduation from the U.S. Naval Academy, Natter saw duty in the rivers and coastal waters off Vietnam for three years, during which he was awarded the Silver Star and Purple Heart medals. Natter would go on to serve in multiple ashore and afloat assignments, eventually rising to the rank of admiral. Following his retirement, he continued to make significant contributions to national defense in the defense industry, serving in executive roles for multiple companies and leading his own consulting service. Natter is a staunch supporter of naval education, having graduated from the Naval Academy, Naval War College and Naval Postgraduate School, and remains engaged in all institutions through philanthropic and leadership support on boards and respective foundations. Natter's leadership and performance in peacetime and war were instrumental in the success of the Navy and outstanding support for naval forces. His lifetime of work continues to bring great credit upon himself and to the Naval Postgraduate School, and now as a member of the NPS Hall of Fame.

CAPTAIN THOMAS G. KELLEY

UNITED STATES NAVY (RET.) — INDUCTED DECEMBER 1, 2023

Thomas Kelley dedicated his professional life to the defense of the United States of America as a military leader and to the support of veterans as a civilian leader. A recipient of both the Medal of Honor and Purple Heart for combat actions in Vietnam, Kelley was slated to be mustered out of the Navy by a medical review board due to serious wounds sustained in combat. Undeterred, Kelley rallied support for his continued service in the Navy, convincing Chief of Naval Operations Adm. Elmo Zumwalt to intercede on his behalf. Thereafter, Kelley continued to serve in the Navy for another two decades across a variety of command and staff positions until his mandatory retirement date. After retiring as a captain, Kelley continued to serve the Department of Defense and the veteran community in a variety of senior leadership positions, culminating in his service as the Massachusetts Secretary of Veteran Services. Kelley is a graduate of the College of the Holy Cross, Class of 1960, and graduated from the Naval Postgraduate School in 1972 with a master's degree in Defense Management. His lifetime of work continues to bring great credit upon himself and to the Naval Postgraduate School, and now as a member of the NPS Hall of Fame.

VICE ADMIRAL ALBERTO SOTO

CHILEAN NAVY (RET.) — INDUCTED MARCH 24, 2023

Vice Adm. Alberto Soto Valenzuela began his career in the Chilean Navy in 1982. He completed operational assignments on the Chilean Navy frigates Almirante Riveros and Almirante Lynch. Soto later served on the staff of Commander, Task Force 176.1 during RIMPAC 2012 and as head of the Strategic Planning Department for the Chilean Joint Chiefs of Staff, head of the Plans Department of the General Staff of the Navy, and as Commander in Chief of the Fourth Naval Zone. In 2000, Soto graduated from the Naval Postgraduate School with a Master of Science degree in Operations Research. He leveraged his education to significantly impact the effectiveness of Chilean Navy operations, elevating the service to become a premier navy in the U.S. Southern Command (SOUTHCOM) area of operations. In 2000, Soto was selected as the Commander of Naval Operations (COMOPER) for the Chilean Navy and was promoted to the rank of vice admiral. Under his astute leadership, the Chilean Navy participated in multiple fleet exercises, tactical development events, and combined operations with the U.S. Navy and U.S. Coast Guard as part of the Joint Interagency Task Force South. As COMOPER, Soto directed the Chilean Navy's participation in multiple cooperative deployments, including the highly successful Pacific Ocean deployments of the frigate Almirante Blanco Encalada and the oiler Almirante Montt. Soto's exemplary and remarkable leadership in service to his country is commendable and distinguishes him as an exceptional graduate and ambassador for the Naval Postgraduate School.



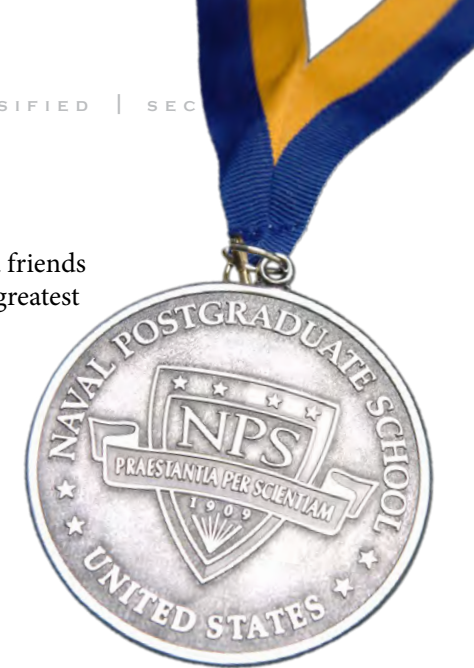
Adm. Robert Natter, USN (Ret.)

Capt. Thomas Kelley, USN (Ret.)

Vice Adm. Alberto Soto, Chilean Navy (Ret.)

NPS Hall of Fame Honorees

The NPS Hall of Fame recognizes the accomplishments of NPS' most distinguished alumni and friends who, through the attainment of positions at the highest levels of public service, have made the greatest contributions to society, their nations and to the Naval Postgraduate School.



Admiral Cecil D. Haney, USN (Ret.)
(Inducted 15 Dec 2022)

The Honorable Robert O. Work
(Inducted 23 Sep 2022)

Vice Admiral Edward Moore Jr., USN (Ret.)
(Inducted 26 Jan 2021)

Vice Admiral Jan E. Tighe, USN (Ret.)
(Inducted 15 Jun 2018)

The Honorable Jack R. Borsting
(Posthumously inducted 27 Apr 2017)

The Honorable Everett Alvarez, Jr. (Ret.)
(Inducted 27 Mar 2015)

General Keith B. Alexander, USA (Ret.)
(Inducted 21 June 2013)

Colonel Walt Havenstein, USMCR (Ret.)
(Inducted 30 Nov 2012)

Admiral Eric T. Olson, USN (Ret.)
(Inducted 30 Nov 2012)

Admiral Stanley Arthur, USN (Ret.)
(Inducted 2 Dec 2011)

Dr. J. Phillip (Jack) London
(Inducted 2 Dec 2011)

Vice Admiral Pat Tracey, USN (Ret.)
(Inducted 3 Dec 2010)

Admiral T. Joseph Lopez, USN (Ret.)
(Inducted 3 Dec 2010)

Vice Admiral Thomas J. Hughes, USN (Ret.)
(Posthumously inducted 3 Dec 2010)

General Apichart Penkitti, Permanent Secretary for Defense, Thailand (Ret.)
(Inducted 30 Jul 2010)

Admiral Michael Mullen, USN (Ret.)
(Inducted 11 Aug 2009)

General Michael Hagee, USMC (Ret.)
(Inducted 23 May 2009)

The Honorable Dan Albert, Mayor of Monterey (Ret.)
(Inducted 23 Feb 2007)



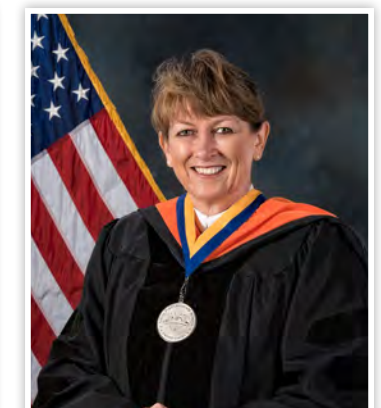
ADMIRAL CECIL D. HANEY



HONORABLE ROBERT O. WORK



VICE ADMIRAL EDWARD MOORE JR.



VICE ADMIRAL JAN E. TIGHE



VICE ADMIRAL PAT TRACEY



GENERAL KEITH B. ALEXANDER



COLONEL WALT HAVENSTEIN



ADMIRAL ERIC T. OLSON

For the full list of Hall of Fame honorees and inductees see: nps.edu/web/alumni/hall-of-fame



VISION

The Naval Postgraduate School will become the nation's leading institution for defense higher education and applied research, delivering transformative solutions and innovative leaders for decisive U.S. seapower and national defense.

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