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Research and Sponsored Programs Office (RSPO)

Sponsored Research Annual Reports

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2005

**Sponsored Programs Annual Report /  
Graduate School of Engineering and Applied  
Sciences, Fiscal Year 2005**

Monterey, California. Naval Postgraduate School, Research and Sponsored Programs Office

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# SPONSORED PROGRAMS ANNUAL REPORT

## GRADUATE SCHOOL OF ENGINEERING AND APPLIED SCIENCES

NAVAL POSTGRADUATE SCHOOL • FISCAL YEAR 2005

### About GSEAS

The Graduate School of Engineering and Applied Sciences (GSEAS) at the Naval Postgraduate School in Monterey, California provides graduate education leading to the master of science, engineer, doctor of philosophy, and doctor of engineering degrees.

GSEAS comprises seven technical academic departments (applied mathematics, electrical and computer engineering, mechanical and astronautical engineering, meteorology, physics, oceanography, systems engineering) and one interdisciplinary academic group (space systems). These entities offer degree programs tailored to the specific needs of the Navy and defense community at large, at the same time providing the technical foundation for student theses and interdisciplinary projects of faculty and students. Research centers and unique laboratory facilities (e.g., the spacecraft research and design lab, rocket and combustion lab, signal enhancement lab, ocean acoustics observatory, interactive digital environment analysis lab, secure space-systems research lab, secure computer-network research lab, and directed energy lab) add rigor to the resident academic and sponsored programs.

GSEAS' defense-related research aggressively develops and incorporates advances in learning and technology, ensuring that our faculty, instruction, and students remain at the crest of their disciplines. Instruction is "real world:" our students handle the latest defense technologies and nascent systems on a routine basis, including electric-powered ships; nano-technologies; directed-energy weapons; electric railguns; the electrical and computer-engineering systems underlying concepts such as net-centric warfare; unmanned underwater, aerial, and land systems; space systems; battle space environments and their impact on combat; and many others.

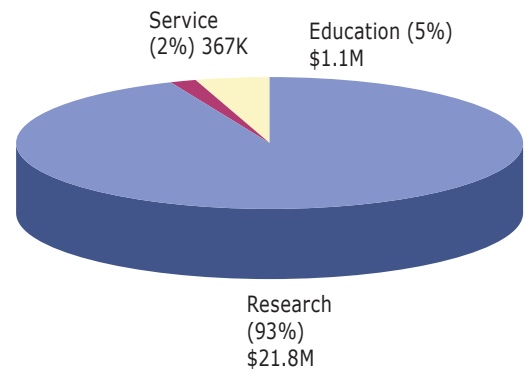
Conceptual mastery is paramount in our teaching philosophy. GSEAS students not only learn why things work, but why they don't, as well as how scientific and engineering principles can be applied to the integration of the U.S. military with various defense systems (such as sonar, radar technologies, and others) to enable future warfighting concepts and capabilities. GSEAS is truly a "joint" school, with healthy enrollments of all military services. No other graduate school can compete with the combination of rigorous education and joint-military orientation found at the Naval Postgraduate School.

Sponsored-program activities at GSEAS have a direct payoff to the graduate-education program. GSEAS's program and contribution are robust.

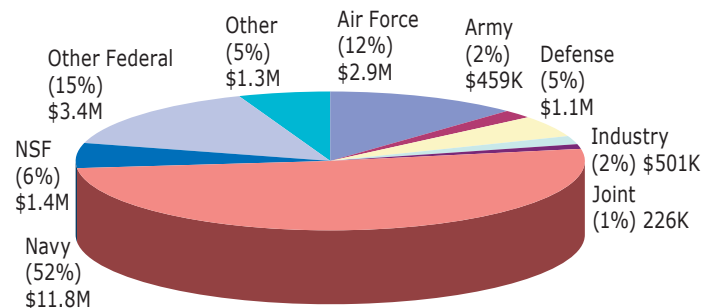
### Sponsored Program Expenditures

1 October 2004–30 September 2005  
Total Expenditures: \$23.2M

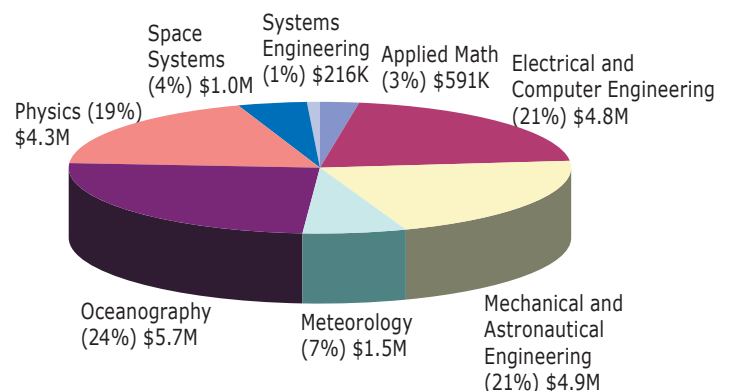
#### By Type of Activity



#### By Sponsor



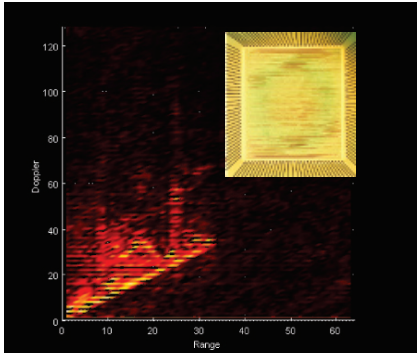
#### By Department



## Applied Mathematics (MA)

The Department of Applied Mathematics provides exceptional education supporting relevant and strategic research for our sponsors. Our curriculum emphasizes modern mathematical techniques and the cultivation of analysis, reasoning, and creativity. We serve our clients, students, and profession not only through research and education, but by leadership in professional organizations and scholarly contributions to the body of mathematical knowledge. The department employs eighteen regular faculty and offers both the M.S. and PhD.

## Electrical and Computer Engineering (ECE)



NPS-developed ISAR radar ECM chip superimposed on false target of ship it created. Sponsor: ONR

The Electrical and Computer Engineering Department is the major contributor to officer education in the electronic-systems engineering curriculum and provides service courses for a variety of other programs including space systems, information warfare, electronic warfare, information systems and undersea warfare. The department offers programs leading

to the electrical-engineer degree (EE), doctor of philosophy, and master of science (MSEE and MSES), typically awarding 40+ master's degrees, and several EEs and Ph.D.s annually. The core curriculum spans the breadth of electrical and computer engineering. Students concentrate in a major area through advanced courses. Major areas of study support Sea Power 21 and include sensor systems, network engineering, communications and digital signal processing, nanoelectronics and computers and electric power and control. The department employs 37 tenure-track, non-tenure track and active emeritus faculty.

## Mechanical and Astronautical Engineering (MAE)



Faculty, students, with autonomous underwater vehicle

The Mechanical and Astronautical Engineering Department supports NPS's mission by producing graduates commanding broad knowledge and technical competence for purposes of national security.

The department's rigorous academic program covers thermal-fluid sciences, structural mechanics, dynamic systems and control, materials science and

engineering, and total-ship-systems engineering. These disciplines are mixed and crossed creatively as the engineering needs of surface vessels and submarines may require. Graduates have the ability to identify, formulate, and solve problems in MAE and related disciplines using all available practices, including modeling and simulation, and research, design, develop, procure, operate, maintain, and dispose of systems for military applications.

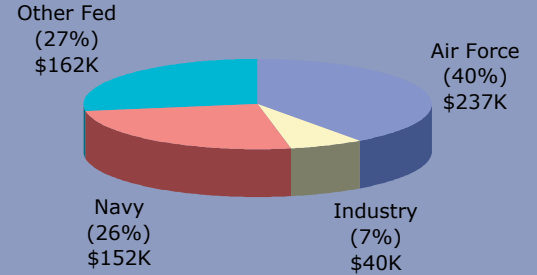
### Applied Mathematics

By Activity



Research  
(100%)  
\$555K

By Sponsor



Other Fed  
(27%)  
\$162K

Air Force  
(40%)  
\$237K

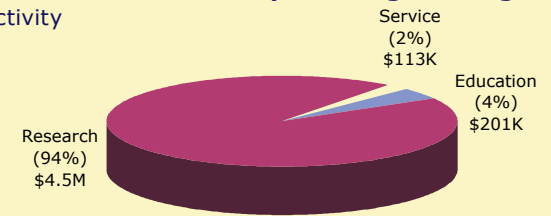
Navy  
(26%)  
\$152K

Industry  
(7%)  
\$40K

Size of Program: \$592K

### Electrical and Computer Engineering

By Activity

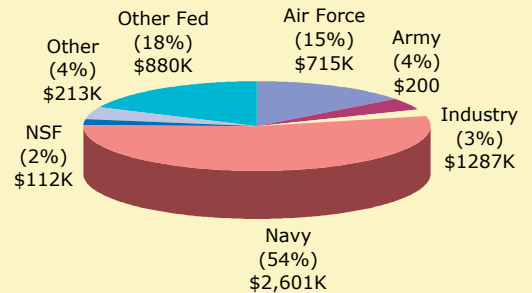


Service  
(2%)  
\$113K

Education  
(4%)  
\$201K

Research  
(94%)  
\$4.5M

By Sponsor



Other Fed  
(18%)  
\$880K

Air Force  
(15%)  
\$715K

Army  
(4%)  
\$200

Industry  
(3%)  
\$1287K

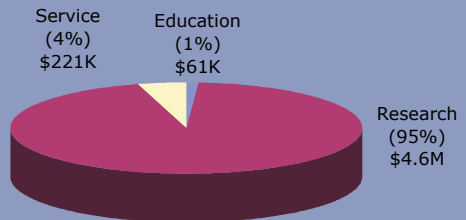
NSF  
(2%)  
\$112K

Navy  
(54%)  
\$2,601K

Size of Program: \$4.8M

### Mechanical and Astronautical Engineering

By Activity

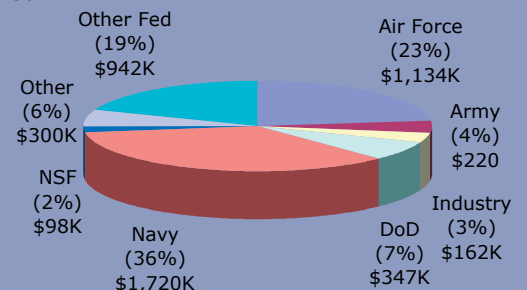


Service  
(4%)  
\$221K

Education  
(1%)  
\$61K

Research  
(95%)  
\$4.6M

By Sponsor



Other Fed  
(19%)  
\$942K

Air Force  
(23%)  
\$1,134K

Other  
(6%)  
\$300K

Army  
(4%)  
\$220

NSF  
(2%)  
\$98K

Navy  
(36%)  
\$1,720K

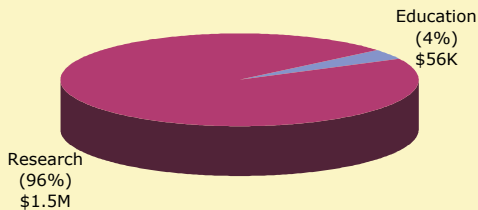
DoD  
(7%)  
\$347K

Industry  
(3%)  
\$162K

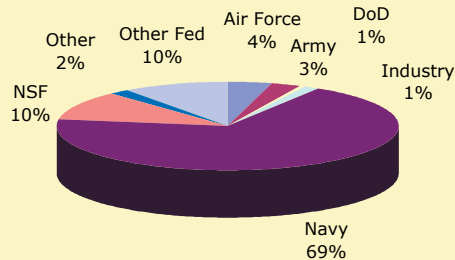
Size of Program: \$4.9M

## Meteorology

By Activity



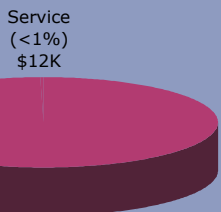
By Sponsor



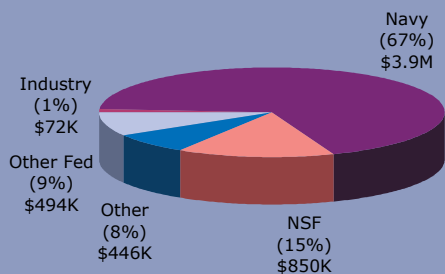
Size of Program: \$1.5M

## Oceanography

By Activity



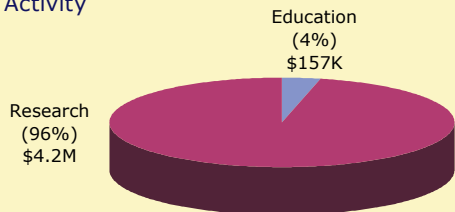
By Sponsor



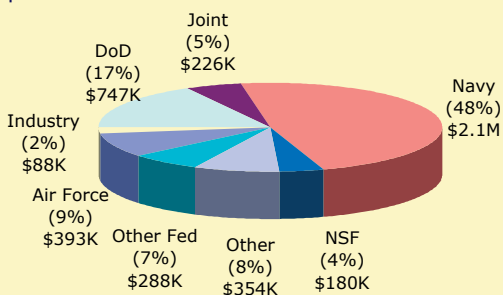
Size of Program: \$5.8M

## Physics

By Activity



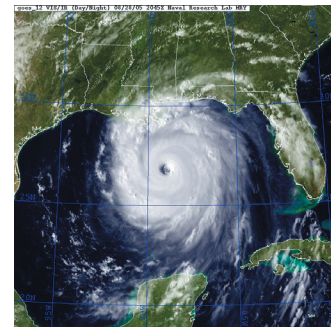
By Sponsor



Size of Program: \$4.4M

## Meteorology (MR)

Since inception in 1946, NPS's Department of Meteorology has conducted one of the premier programs in the United States and the world, featuring multimillion-dollar facilities and instruction by expert faculty. The department offers M.S. and Ph.D. degrees to U.S. military officers, government civilians, and officers from allied countries. The curricula provide a thorough grounding in meteorological science and instill the expertise required for working with meteorological data and models in all aspects of weather-dependent operations.



Hurricane Katrina. Credit: Naval Research Lab, NPS

Concentrations include synoptic, mesoscale, and coastal meteorology; numerical weather prediction; environmental analysis and visualization; air-sea interactions; satellite- and ground-based remote sensing; tropical meteorology; tropical cyclones; boundary-layer meteorology; climate dynamics; and atmospheric factors in electromagnetic/electro-optical propagation. Military operations and research are emphasized across the board and enhanced by collaboration with the Fleet Numerical Meteorological and Oceanographic Center and Naval Research Laboratory.

## Oceanography (OC)



NPS-designed arctic autonomous ocean-turbulence buoy beams data to NPS, thence to internet

The Oceanography Department supports curricula sponsored by the oceanographer of the Navy: air-ocean science, operational oceanography, oceanography. The department also offers the MS in physical oceanography to undersea-warfare curricula (USN and international) and provides core courses for undersea warfare and the space-systems curricula.

The OC department focuses primarily on physical oceanography, acoustical oceanography, numerical modeling, and nearshore and coastal oceanography, and has strong interests in remote sensing and geospatial information systems. Topics include ocean dynamics, numerical ocean prediction and simulation, satellite remote sensing of the ocean, air-sea interaction, polar oceanography, upper ocean dynamics and thermodynamics, near-shore processes, mesoscale dynamics, coastal ocean circulation and environmental acoustics.

## Physics (PH)

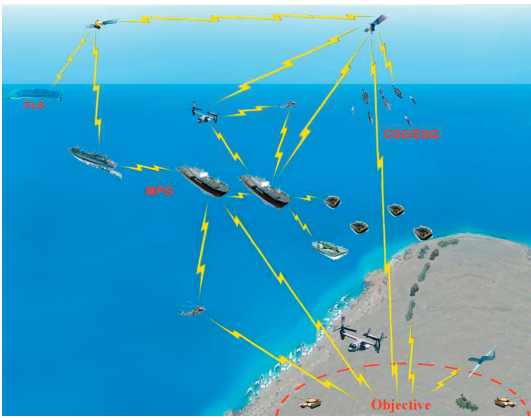
The Department of Physics conducts basic and applied research in



Electromagnetic railgun under development at NPS

acoustics, optics, opto-electronics, directed-energy weapons (railguns and free-electron lasers), sonar and radar, shaped-charge explosives, advanced semiconductor sensors, and remote sensing. The department offers the master's and PhD degrees in physics, applied physics, and engineering acoustics. Our graduates fill a spectrum of assignments in the development of future combat systems, working creatively and practically in conceiving, developing, and acquiring advanced combat systems.

# Systems Engineering (SE)

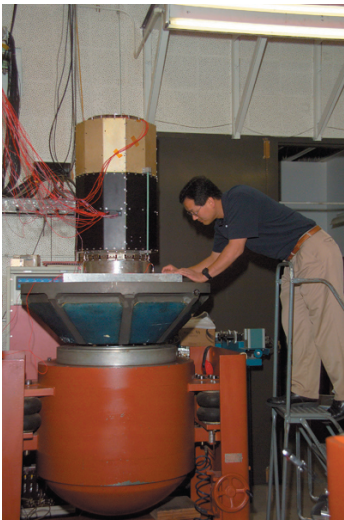


An operational view of a recent system of systems design for expeditionary warfare

Systems engineering is the discipline responsible for creating and executing an interdisciplinary process to ensure that the customer and stakeholder's needs are satisfied in a high quality, trustworthy, cost-efficient and schedule-compliant manner throughout a

system's entire life cycle. The SE department prepares graduates for national-security challenges by equipping them to design, analyze, build, operate, maintain, and improve defense systems-of-systems that are reliable, capable, effective, and affordable. The department has fifteen faculty members with primary appointments, ten with joint appointments, and two administrative staff. We currently offer master's degrees and will soon offer the PhD in systems engineering; students number about 60 resident and 150 non-resident. The department works closely with NPS's Wayne E. Meyer Institute of Systems Engineering, especially in research.

# Space Systems Academic Group (SP)



NSAT engineering-development unit under vibration testing, NRL, 9/2005.

Preparing students to lead DoD transformation and exploit technological change is the space-systems academic group's reason for being. Our graduates emerge as pioneers, innovators, and determined problem solvers in science and engineering. Special facilities of the group include an electron linear accelerator; flash X-ray facility; FLT-SATCOM satellite operations; NPS-AFRL optical-relay spacecraft laboratory; open-site EMI/EMC facility; radiation-effects laboratory; satellite ground station; simulation- and test laboratory; small-satellite test- and development laboratory; smart-structures laboratory; solar-simulation facility; space-warfare computer laboratory; spacecraft-attitude dynam-

ics-and-control laboratory; spacecraft environmental simulation- and test laboratory; spacecraft-servicing and robotics laboratory; and a sensitive-compartmented-information facility for classified research and thesis work. A number of these have been written on the second, soon-to-be-launched NPS satellite, NPSAT1; the first student-built satellite, 1998's PANSAT, generated over 50 theses.



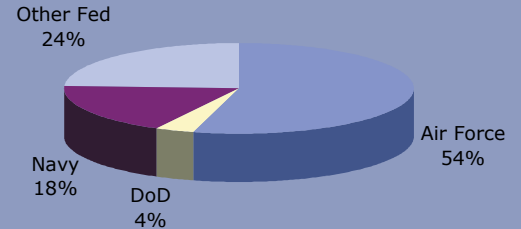
NAVAL POSTGRADUATE SCHOOL  
THE U.S. MILITARY'S CORPORATE UNIVERSITY

## Systems Engineering

By Activity



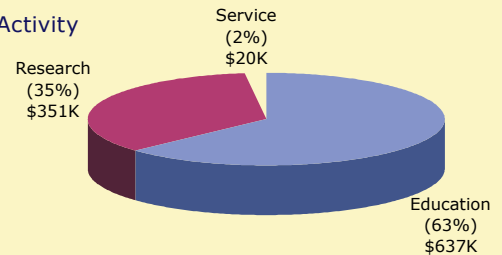
By Sponsor



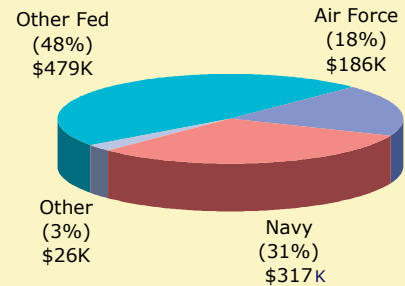
Size of Program: \$217K

## Space Systems

By Activity



By Sponsor



Size of Program: \$1.0M

# Graduate School of Engineering and Applied Sciences

Naval Postgraduate School

1 University Circle

Monterey, CA 93943

(831) 656-7859

Fax: (831) 656-7861

[gseas@nps.edu](mailto:gseas@nps.edu)

<http://www.nps.edu/Academics/GSEAS/index.html>