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Sponsored Research Annual Reports

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2007

**Sponsored Programs Annual Report /  
Graduate School of Engineering and Applied  
Sciences, Fiscal Year 2007**

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 2007

### Program Information

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 is composed of seven technical academic departments (in applied mathematics, electrical and computer engineering, mechanical and astronautical engineering, meteorology, physics, oceanography, systems engineering, meteorology, physics, oceanography, systems engineering) and one interdisciplinary academic group (space systems). Degree programs are 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, rockets 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.

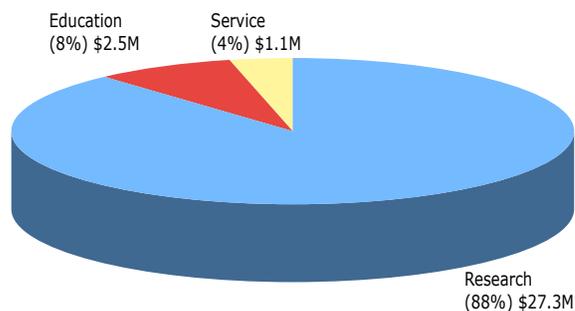
GSEAS' defense-related research aggressively develops and incorporates advances in learning and technology, ensuring that our faculty, instruction, and students remain at the crest of their disciplines. Instruction is "real world:" our students handle the latest defense technologies and nascent systems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

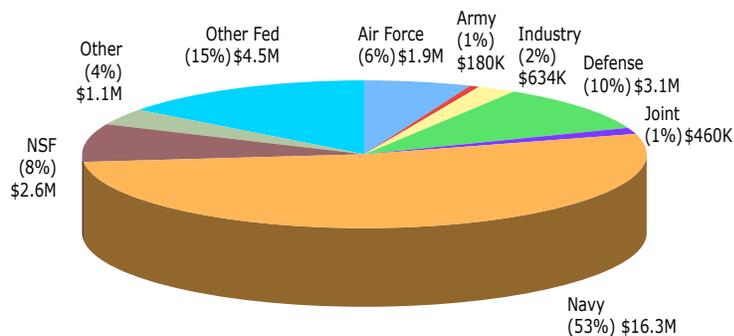
### Sponsored Program Expenditures

October 2006–30 September 2007  
Total Expenditures: \$31M

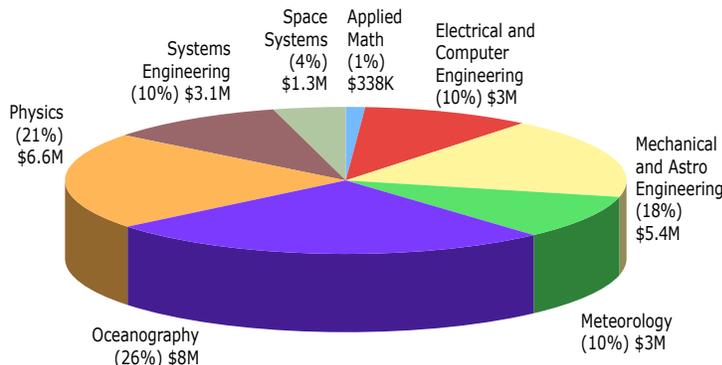
By Type of Activity \_\_\_\_\_



By Sponsor \_\_\_\_\_



By Department \_\_\_\_\_

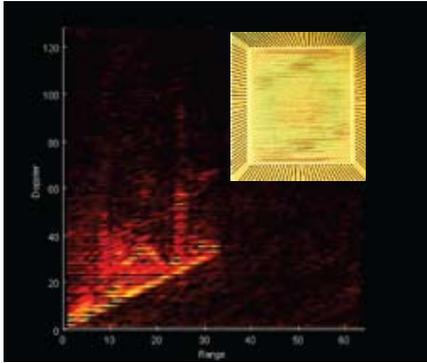


## Applied Mathematics (MA)

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 nineteen regular faculty and offers both the M.S. and PhD.

## Electrical and Computer Engineering (ECE)

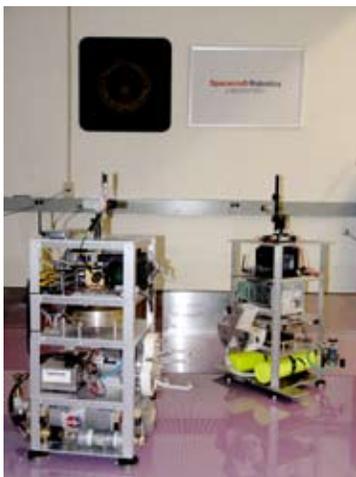
The Department of Electrical and Computer Engineering is the major contributor to education in the electronic systems-engineering curriculum and provides service courses for a variety of other curricula, including space systems, information warfare, electronic warfare, information systems, and undersea warfare. The department offers programs leading to the electrical-engineer degree (EE), doctor of philosophy, and master of science (MSEE and MSES), typically awarding over 40 MSs, several EEs, and a number of PhDs each year. The core curriculum spans the breadth of electrical and computer engineering. Students can elect to concentrate in any of a number of specialty tracks. These tracks support Sea Power 21 and include sensor systems, network engineering, communications, signal processing, nano-electronics, computers, ship electric power and control. The department employs twenty-two tenure-track faculty, seven non-tenure-track faculty and several active emeritus faculty.



NPS-developed inverse-synthetic-aperture radar electronic-countermeasures chip superimposed on false target of ship it created.

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## Mechanical and Astronautical Engineering (MAE)



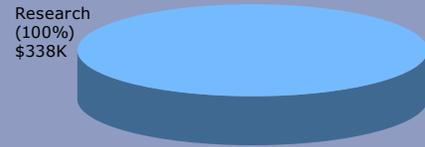
Autonomous docking and servicing test bed, Spacecraft-Robotics Lab

1/3/07 The Mechanical and Astronautical Engineering Department conducts wide-ranging fundamental and applied research. Master's and doctoral students are integrally involved in projects, working alongside faculty, postdoctoral fellows, and staff to resolve complex problems in national security. Focus includes thermal-fluid sciences and propulsion, structural mechanics, autonomous-vehicle control and navigation, materials science, total-ship systems engineering, and satellite and spacecraft design and engineering. Research supports development and operation of submarines, surface combatants, aircraft, autonomous vehicles, missiles, and satellite systems. A breadth of expert personnel and

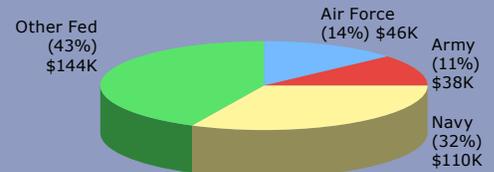
unique labs contribute to theoretical, computational, M&S, and experimental research, classified and unclassified.

## Applied Mathematics

By Activity



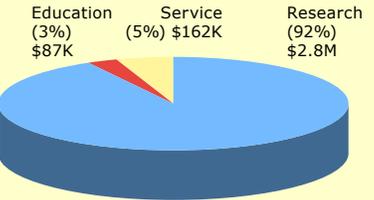
By Sponsor



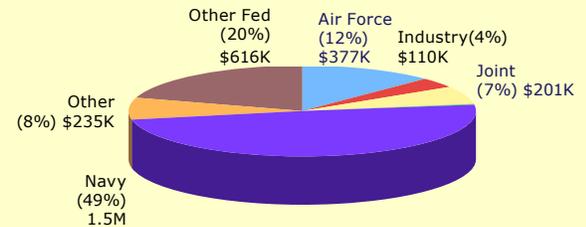
Size of Program: \$338K

## Electrical and Computer Engineering

By Activity



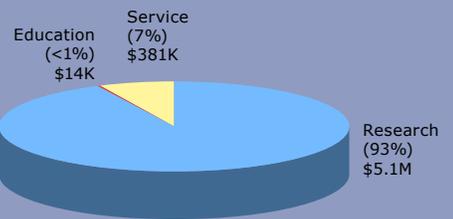
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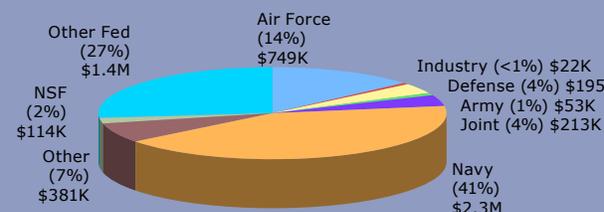
Size of Program: \$3M

## Mechanical and Astronautical Engineering

By Activity



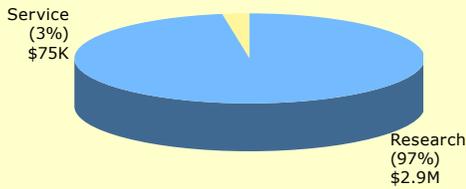
By Sponsor



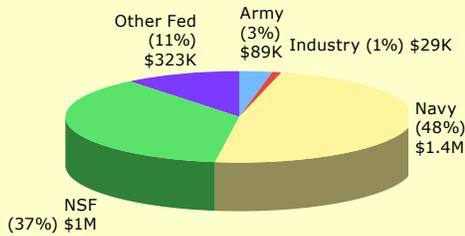
Size of Program: \$5.5M

## Meteorology

By Activity



By Sponsor



**Size of Program: \$3M**

## Meteorology (MR)

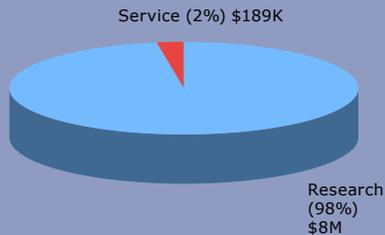
Since 1946, the Department of Meteorology's premier program has featured multimillion-dollar facilities and expert instruction, offering master's and doctoral degrees to U.S. and allied officers and government civilians. The curricula provide grounding in meteorology and expertise for working with data and models in weather-dependent operations. 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 and enhanced by collaboration with Fleet Numerical Meteorological and Oceanographic Center and the Naval Research Laboratory.



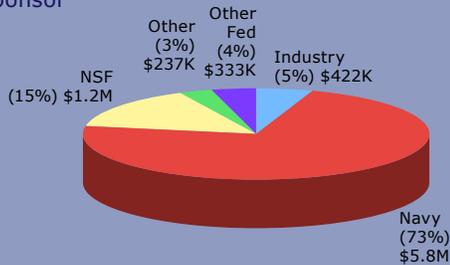
Hurricane Katrina. Credit: Naval Research Lab, NPS

## Oceanography

By Activity



By Sponsor



**Size of Program: \$8M**

## Oceanography (OC)

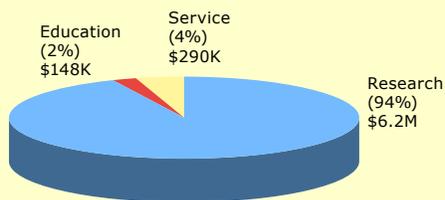
The Oceanography Department offers internationally recognized research and education that extend the frontiers of physical oceanography while anticipating the needs of the Navy, to the benefit of both science and the military. Curricula sponsored by the oceanographer of the Navy include oceanography, air-ocean science, and operational oceanography, as well as core courses for undersea warfare and the space-systems curricula. The department offers the M.S. and Ph.D in physical oceanography and a joint M.S. in meteorology and physical oceanography. Research is predominantly Navy and NSF-funded, with strong naval relevance providing urgency to theses. Expertise fielded includes global and littoral/regional numerical prediction (including polar), nearshore oceanography and impact on mine countermeasures and amphibious warfare, littoral/coastal oceanography, especially the impact of littoral processes, eddies, and boundary currents on surveillance systems, and acoustical oceanography with an antisubmarine focus.



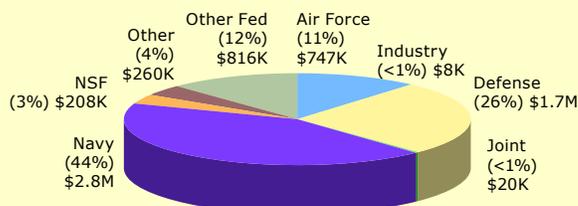
NPS Research Vessel *Pt. Sur*

## Physics

By Activity



By Sponsor



**Size of Program: \$6.6M**

## Physics (PH)

The Department of Physics conducts basic and applied research in acoustics, optics, opto-electronics, directed-energy weapons (rail guns 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.



Electromagnetic rail gun under development at NPS

## Systems Engineering (SE)

Systems engineering is the study of creating and executing an interdisciplinary process to ensure that a customer and stakeholder's needs are satisfied in a high quality, trustworthy, cost-efficient and schedule-compliant manner throughout a system's life-time. NPS's 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 eighteen faculty members with primary appointments, ten with joint appointments, three research staff, and three administrative staff. We offer master's degrees and will soon offer the PhD in systems engineering; students number about 70 resident and 210 nonresident. The department works closely with NPS's Wayne E. Meyer Institute of Systems Engineering, especially in research.



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

Preparation of 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; FLTSATCOM 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 dynamics-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 theses have been written on the second, soon-to-be-launched NPS satellite, NPSAT1; the first student-built satellite, 1998's PANSAT, generated over fifty theses.

## Space Systems Academic Group (SP)

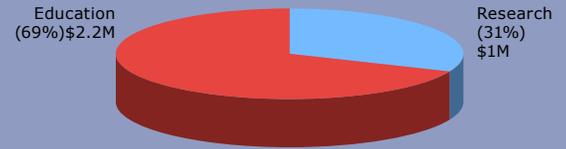


NPSAT1 demonstration satellite engineering-development unit under vibration testing, Naval Research Lab, 9/2005.

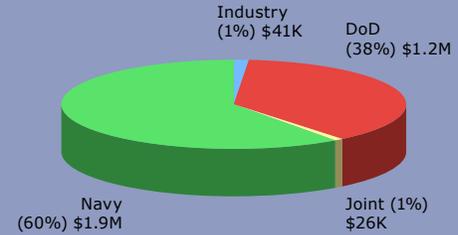
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## Systems Engineering

By Activity



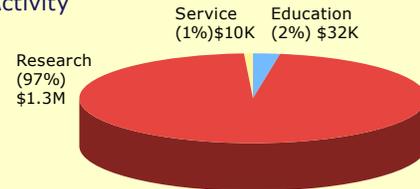
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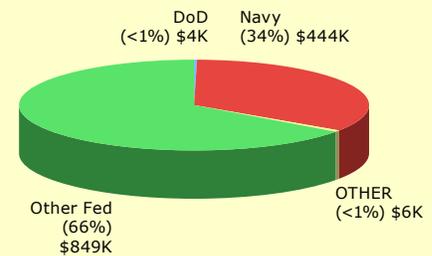
Size of Program: \$3.2M

## Space Systems Academic Group

By Activity



By Sponsor



Size of Program: \$1.3M

## 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

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

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