



NAVAL
POSTGRADUATE
SCHOOL

Command Brief 08-09 October 2008

Overview of the Naval Postgraduate School

Excellence Through Knowledge



NPS provides high-quality, relevant and unique advanced education and research programs that increase the combat effectiveness of the Naval Services, other Armed Forces of the U.S. and our partners, to enhance our national security.



- **Graduate University**

Responsive to joint, interagency, and coalition requirements

- **Research Institution**

Pursuing innovative technology and improving national security

- **Community of Alumni**

Leading and defending the Nation and transforming the Department of Defense (DoD)

History Highlights

- 1909** Founded at the U.S. Naval Academy
- 1951** Moved to Monterey
- 1951** Operations Research Department
- 1956** Systems Management Department
- 1972** National Security Affairs Department and War-Fighting curricula (e.g., Anti-Submarine Warfare)
- 1996** Information Warfare Curriculum
- 1999** Joint Professional Military Education (JPME) campus
- 2003** Homeland Security Curriculum
- 2004** Information Operations



• ***Integrated*** • ***Systems-Oriented*** • ***Flexible*** • ***Partnered for Strength***

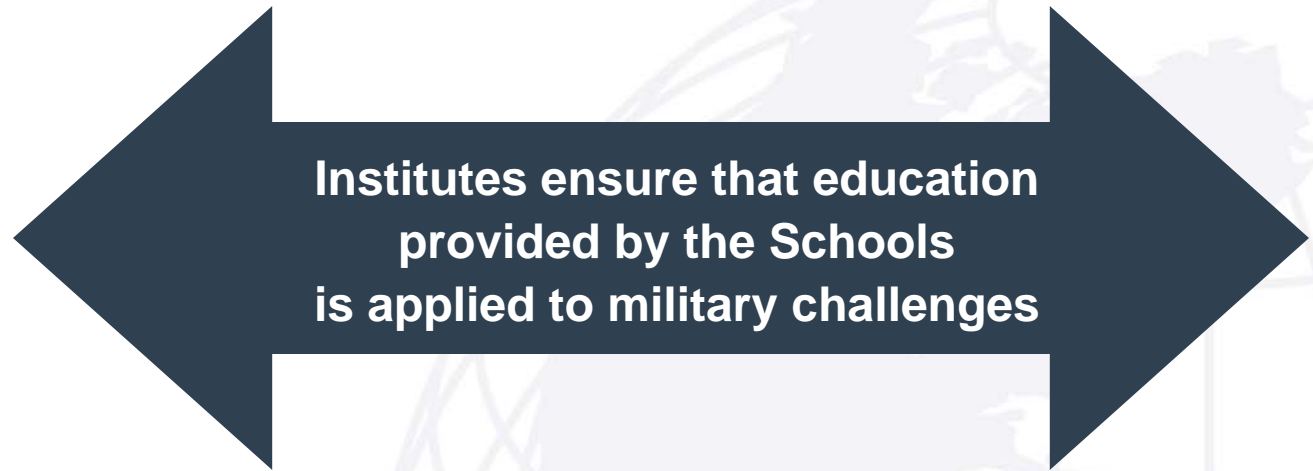
4 Institutes

The Cebrowski Institute for
Information Innovation and
Superiority

The MOVES Institute
Modeling, Virtual
Environments, and
Simulation

The Meyer Institute
National Security Systems
and Technology

National Security Institute
Partnership developed for
National Security research
and education



4 Schools

Graduate School
of Engineering and
Applied Science

Graduate School
of Operational and
Information Sciences

Graduate School
of Business and
Public Policy

School of
International
Graduate Studies



15 Curricula and 406 Degree Resident Students (Summer (4th) Qtr AY 2008)

- Applied Mathematics
- Combat Systems Science and Technology
- Electronic Systems Engineering
- Mechanical & Astronautical Engineering
- Meteorology and Oceanography
- Meteorology
- Oceanography
- Operational Oceanography
- Space Systems Engineering
- Space Systems Operations (with GSOIS)
- Space Systems Operations (International) (with GSOIS)
- Systems Engineering
- Systems Engineering Management
- Undersea Warfare
- Undersea Warfare (International)



18 Curricula and 563 Degree Resident Students (Summer (4th) Qtr AY 2008)

- Computer Science
- Computer Technology
- Electronic Warfare Systems
- Human Systems Integration
- Information Sciences
- Information Systems & Operations
- Information Systems & Technology
- Information Warfare
- Joint C4I Systems
- Joint Information Operations
- Joint Operational Logistics
- Modeling, Virtual Environments, and Simulation (MOVES)
- Operations Analysis
- Operational Logistics
- Software Engineering
- Space Systems Operations
- Special Operations
- Systems Analysis



15 Curricula and 272 Degree Resident Students (Summer (4th) Qtr AY 2008)

- Acquisition & Contract Management
- Contract Management
- Program Management
- Defense Business Management
- Defense Systems Management (International)
- Manpower Systems Analysis
- Information Systems Management
- Executive MBA
- Executive Management
- Financial Management
- Material Logistics Support
- Resource Planning and Management for International Defense
- Supply Chain Management
- Systems Acquisition Management
- Transportation Management



11 Curricula and 324 Degree Resident Students (Summer (4th) Qtr AY 2008)

- Regional Studies

 - Middle East, South Asia and Africa

 - Europe and Eurasia

 - Far East, Pacific, Southeast Asia

 - Western Hemisphere (Latin America)

- Security Studies

 - Civil-Military Relations

 - Stabilization and Reconstruction Operations

 - Defense Decision Making and Planning

 - Combating Terrorism: Policy and Strategy

 - Homeland Defense and Security (Military and Civilian)

 - Security Studies

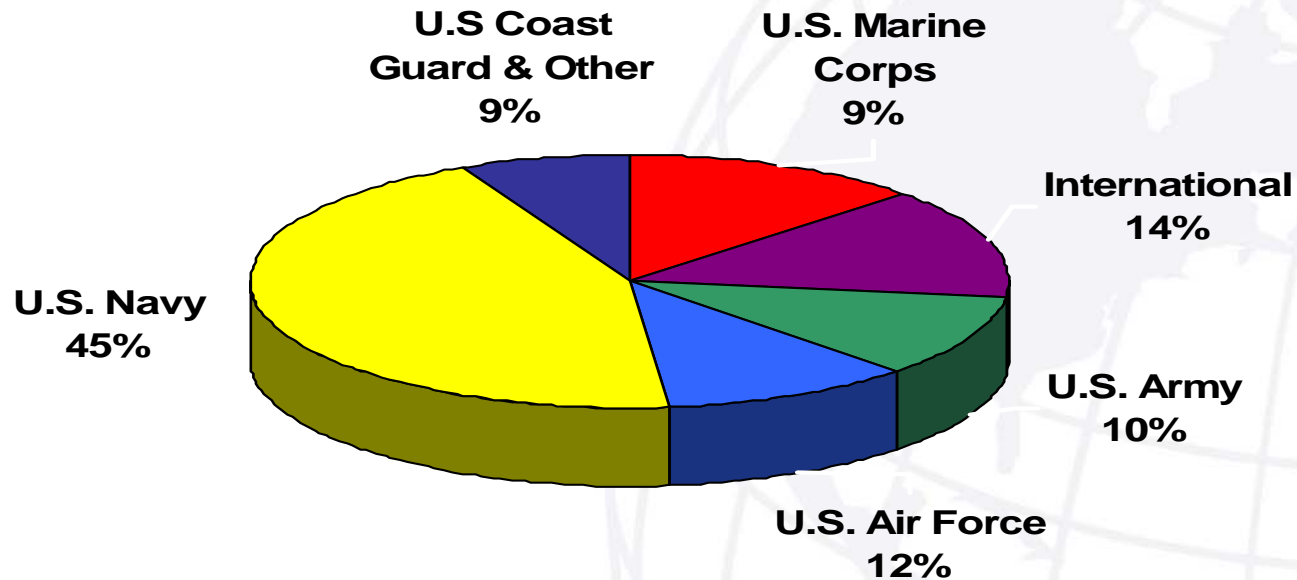


Resident Degree Program Enrollment (Summer (4th Qtr) AY 2008)

Total Resident: 1, 592

U.S. 86% - All Military Services and Other Government Agencies

International 14% - 234 Residents from 37 countries





International Degree Students Spring Quarter 2008

North America

Canada	3
Mexico	<u>3</u>
	6

Caribbean, Central & South America

Brazil	1
Colombia	1
Paraguay	<u>1</u>
	3

Africa

Ethiopia	1
Kenya	2
Tunisia	<u>1</u>
	4

Europe

Azerbaijan	1
Bosnia	2
Germany	14
Greece	50
Hungary	2
Latvia	1
Moldova	1
Norway	3
Poland	2
Portugal	3
Romania	1
Spain	1
Sweden	2
Turkey	52
Ukraine	2
United Kingdom	<u>1</u>

138

Central/East Asia & Middle East

Bahrain	2
Israel	1
Pakistan	<u>4</u>
	7

Far/Near East

Brunei	1
India	1
Indonesia	1
Japan	1
Korea	14
Philippines	3
Singapore	41
Taiwan	9
Thailand	<u>2</u>
	73

Australia 3





- Recruits from *top Ph.D. programs*
- Has *robust mix* of tenured faculty, lecturers, visiting professors, and others
- Includes *10% military personnel*, with strong academic credentials and recent operational expertise
- Integrates *teaching* with *research*
- Has *no teaching assistants*
- Develops *technologies* which are eligible for *patents*

Faculty Highlights

584 Faculty Members (Summer Qtr AY 2008)
227 with Tenure or Tenure-Track
99% with Doctorates

Sources of Graduate Degrees

Stanford	18
UC Berkeley	16
UCLA	11
MIT	10
Harvard	6
Yale	5

Recent Patents

Vest Antenna
High-Intensity Light
and Sound Control Device
Turbulence-Resolving Acoustic
Sediment Flux Probe



Over 46,000 Graduates

- Representing all U.S. Military Services and many government agencies
- 4,812 OFFICER GRADUATES FROM 98 COUNTRIES
- 33 Astronauts
- 25% of U.S. Navy active-duty Flag Officers
- **About 50,000 Non-Degree Participants** annually (includes RSEP)
- Resident and Nonresident



ADM Mike Mullen
Chairman, Joint Chiefs
of Staff



GEN Michael Hagee
Former Commandant
U.S. Marine Corps



King Abdullah
of Jordan



James G. Roche
Former Secretary
of the Air Force



The Research Mission

- Research is an integral part of a high-quality graduate education, teaching students how to recognize new problems, how to formulate problems so they can be solved, and how to solve problems using both existing resources and creative (outside the box) solutions.
- Research encourages faculty to maintain their expertise in a chosen field of study and to develop new expertise in related areas.
- Research provides direct support to the Navy/DoD by solving the technical, strategic, tactical, logistical, managerial, acquisition and personnel problems of the sponsors.
- Research indirectly supports the Navy/DoD through NPS graduates taking their new knowledge and skills back to their communities and applying their new abilities to solve real world problems.



Center for Inter-Disciplinary Remotely Piloted Aircraft Studies (CIRPAS)



The facility provides unique flight operation and scientific measurement services by:

- Providing access to manned aircraft, UAVs and support equipment, as well as to scientific instruments, to spare users the cost of ownership, guaranteeing equal access by all interested parties on a first-come, first-served basis.
- Instrumenting and operating aircraft to meet the requirements of a variety of individual research and test programs.
- Developing new instrumentation to meet increasing challenges for improvements in meteorological and oceanographic measurements.
- Calibrating, maintaining, and operating the facility's airborne instruments in accordance with individual mission specifications.
- Integrating auxiliary payloads, as required, and handling flight safety and logistics tasks, allowing the user to concentrate on his specific mission goals.

The Center for Interdisciplinary Remotely-Piloted Aircraft Studies (CIRPAS) is a research center at the Naval Postgraduate School. CIRPAS provides measurements from an array of airborne and ground based meteorological, aerosol and cloud particle sensors, radiation and remote sensors to the scientific community. The data are reduced at the facility and provided to the user groups as coherent data sets. The measurements are supported by a ground based calibration facility. CIRPAS conducts payload integration, reviews flight safety and provides logistical planning and support as a part of its research and test projects around the world. The center operates a variety of manned aircraft and Unmanned Aerial Vehicles. CIRPAS is also a National Research Facility of UNOLS.

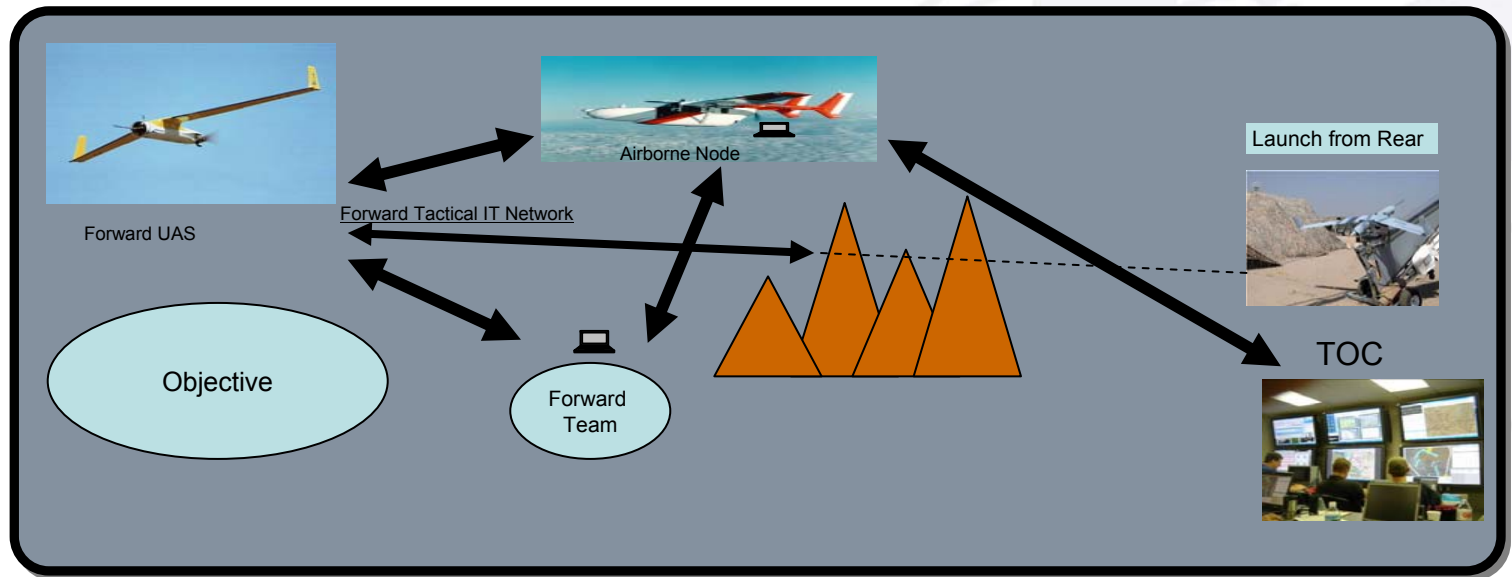
CIRPAS Customers:

Naval Postgraduate School
Naval Research Laboratory (DC and Monterey)
Army Night Vision Laboratory
Naval Air Warfare Center
Joint Forces Command: JOTBS
Naval Strike and Air Warfare Center
University Of Washington
California Institute of Technology
University of California, Irvine
Colorado State University
NASA Ames, Goddard, and Dryden
University of Miami
Air Force Space Command

NAVAIR: PMA-263
N6 TENCAP
NCAR
University of Denver
NOAA ETL
University of Nevada
U.S. Army
SPAWAR
Texas A&M
Arete
DoE
Lockheed Martin
Sandia National Laboratory

Project Objective

The objective of the Tactical Horizon Extension Project is to define and demonstrate a concept by which task-force-level commanders and below can obtain a persistent, over-the-horizon surveillance capability for target development and other missions, without tasking national or theater-level assets.



Operational Payoff

A beyond line-of-sight ISR capability to commanders who would not normally rate the priority to task a satellite, U-2, or Predator.

Project Objective

Develop new tools for robust inter-vehicle cueing, situational awareness, and distributed sensing for teams of heterogeneous vehicles (aerial, ground, surface, underwater), and demonstrate new capabilities in the field.

Operational Payoff:

- The cost of unmanned systems in a large area will be less expensive than using equivalent manned systems
- The search capabilities of unmanned systems rivals that of manned systems
- A distributed unmanned system will increase productivity by permitting personnel to place greater emphasis on achieving objectives rather than understanding the situation through information discovery



Technical Objective: Give autonomous systems the ability to collaborate together to improve mission effectiveness, using aerial vehicles as communications relays and video cueing agents.

Technology Challenge: Coordination of autonomous-vehicle teams to meet objectives.

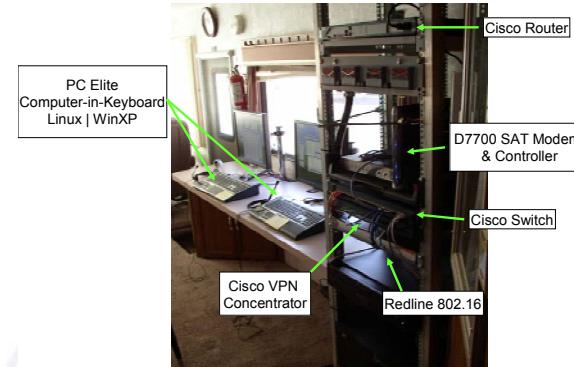
Technical Approaches: We have identified a wireless solution for our network communications and video transition and are studying multi-vehicle control.



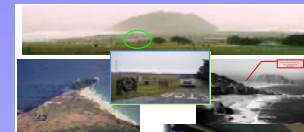
Nemesis Mobile Research Facility

Nemesis is:

- A mobile and portable fully self-contained research platform
- A converted 33-foot class-A motor coach (RV)
- A reconfigurable, deployable vehicle, initially for 802.11 WLAN research. Deploys in CONUS in support of thesis field research, disaster relief (Katrina), and DoD exercises (Strong Angel)
- Capabilities
 - 1.2 m MotoSat satellite dish
 - Internal wired/wireless network
 - 802.16 Broadband Pt-Pt / Pt to Multi-Pt capable
 - RF analysis (Anritsu Spectrum Analyzer)
 - WLAN analysis (AiroPeek NX/AirMagnet)
 - Video surveillance
 - VHF/UHF/SATCOM capable with PRC-117F
 - 30' telescoping pneumatic antenna mast with pan/tilt/zoom



Nemesis Missions



Department of Information Sciences

Graduate School of Operations and Information Sciences

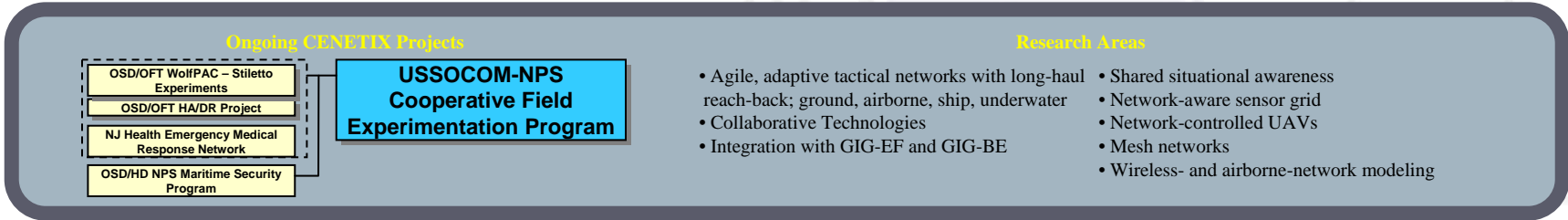
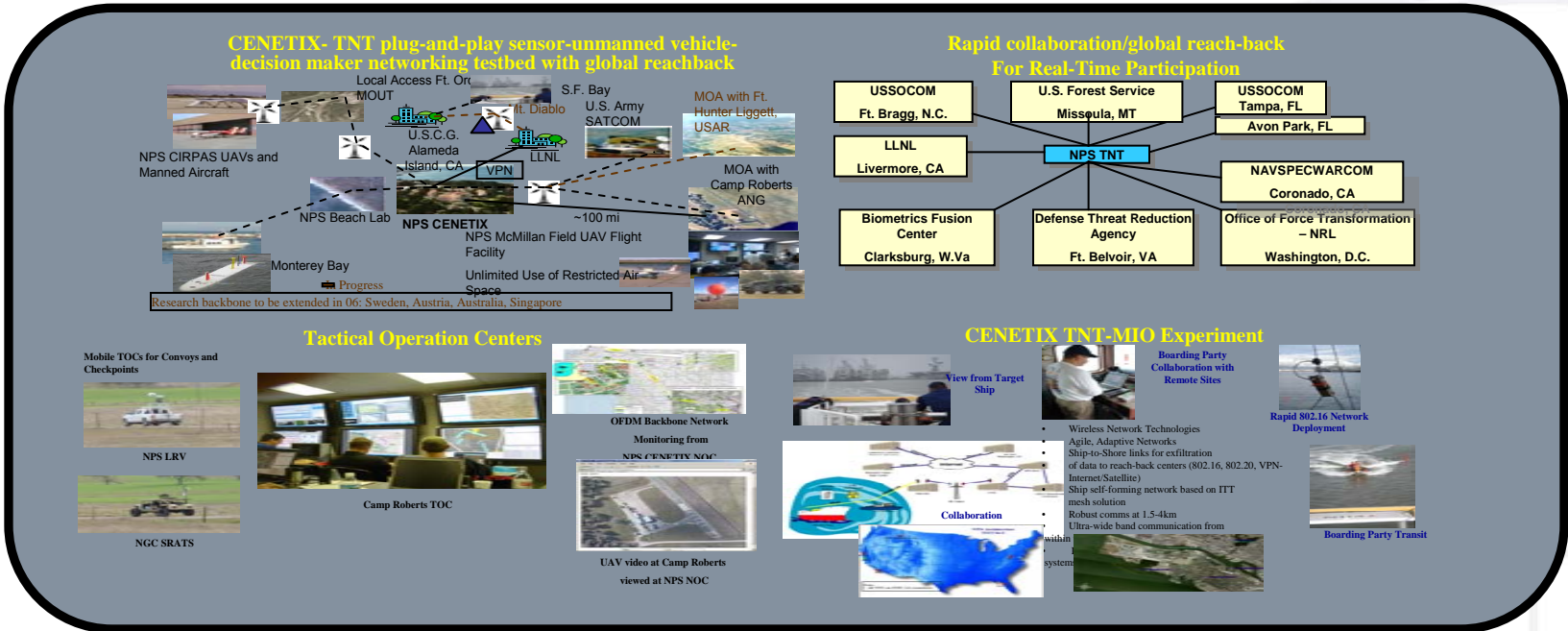
LtCol Carl Oros, USMC, cloros@nps.edu

Mr. Brian Steckler, steckler@nps.edu



Objectives

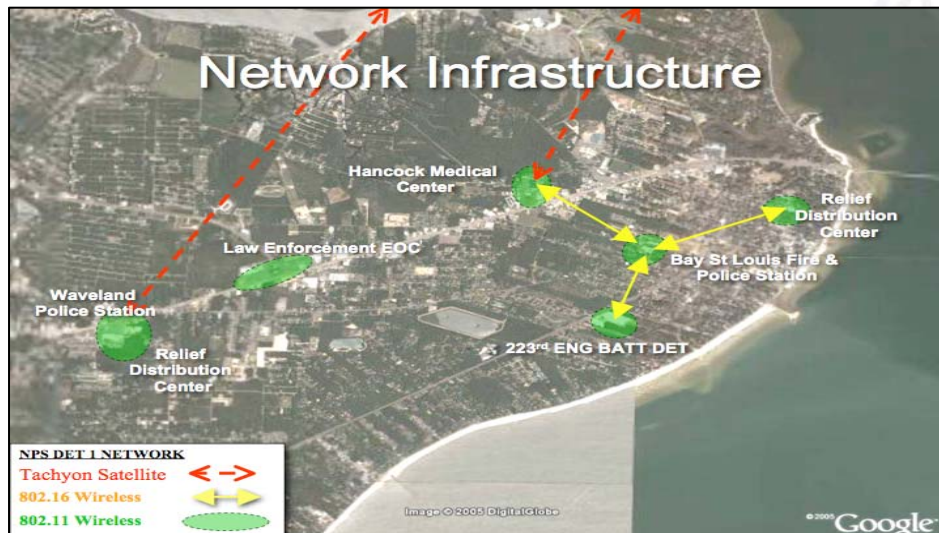
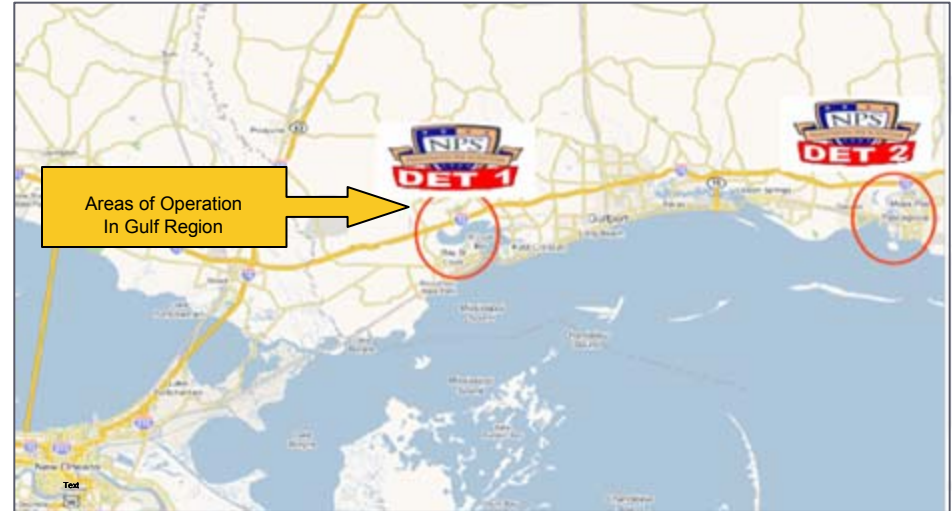
- Provide interdisciplinary studies of multiplatform sensor-unmanned vehicle-decision maker self-organizing networks; tactical network integration with Global Information Grid, collaborative technologies, situational-awareness systems, and multi-agent architectures.
- Integrate and operate NPS-SOCOM Tactical Network Topology and Maritime Interdiction test bed.



Katrina and NPS Hastily Formed Networks

Hurricane Aftermath, 9/1/05:

- Power out
- Fiber/copper infrastructure down
- Push-to-talk comms scarce
- Cellular jammed
- Satellite phones jammed
- Few satellite equipment suites
- No web, email, VOIP



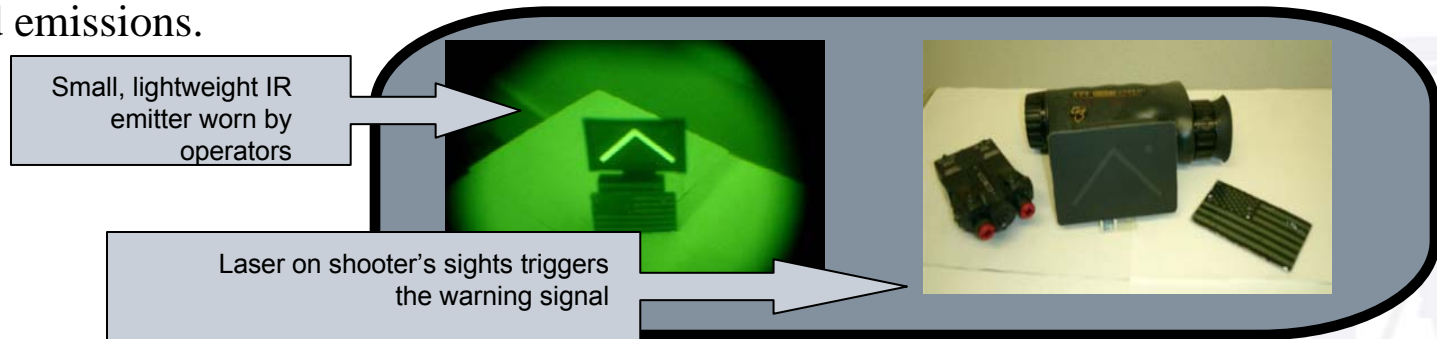
NPS HFN Team, 9/3/05:

- Rushed rapidly deployed, portable/mobile networks to ground zero (Mississippi)
- Led team of over 25 personnel from NPS, OASD, and industry to set up broadband hotspots in 100% downed zone
- Gave first responders ability to work together
- Brought connectivity, dial-tone telephony to entire region
- Provided SATCOM, WiFi, WiMax, broadband internet, web, email, VOIP dial-tone, Skype, and Groove



Individual Identify Friend or Foe (IIF)

IIF Purpose: To prevent shooter-on-shooter fratricide during night ops by detecting triggered infrared emissions.



Key Advantages

- “Smart” emitter
- Immediate warning, but only when triggered by coded U.S. targeting laser
- Lightweight, low cost
- Emitter on flexible substrate
- Integrates seamlessly into existing SOPs
- No splashback of other incident IR light
- Laser modulation in requirement for LA5-PEQ, easily incorporated into ATPIAL, IPIM, Mini IPIM (MFAL program)
- Sponsor: Marine Corps Warfighting Laboratory

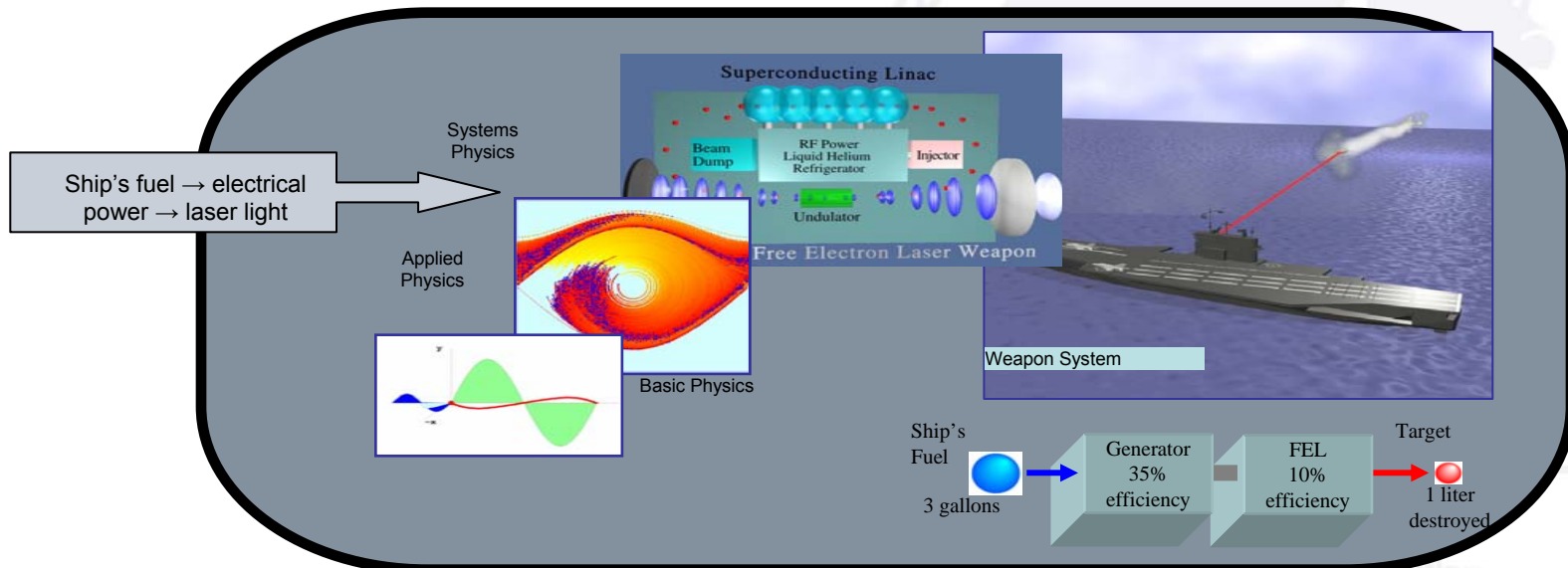
The NPS Directed Energy and Electric Weapons Center studies free electron lasers and electromagnetic rail guns, and their power and cooling support systems.

Primary Missions: Ship defense against missiles, small watercraft and aircraft, and theater ballistic missiles; employs structural or soft kills

Free Electron Laser Weapon System:

- All-electric ships provide power for free-electron laser
- Integrated power systems support laser and electromagnetic gun, launch, and drive
- Megawatts of power, MegaJoules of energy destroys maneuvering target
- Laser weapon range is 5km to 8km at the speed of light
- Free electron laser produces powerful beams of TeraHertz radiation for materials research and homeland security applications

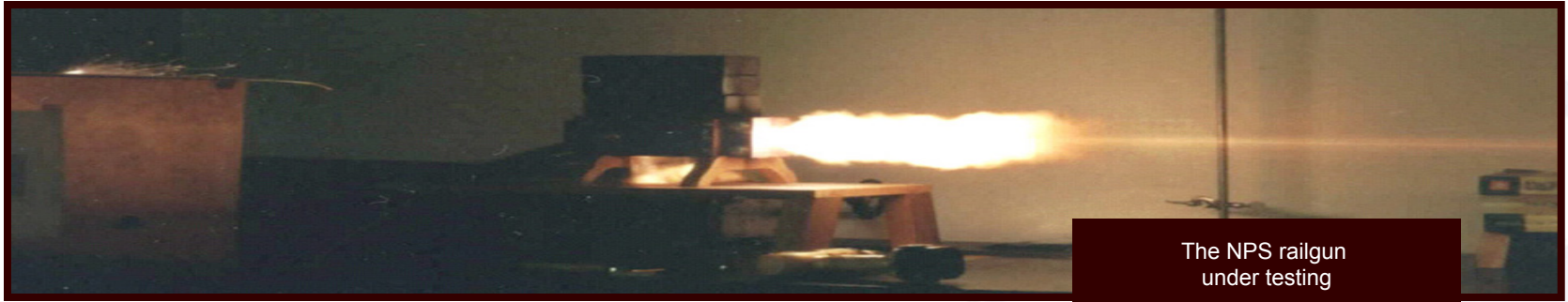
Free Electron Lasers - Directed Energy





U.S. Naval Railgun Program

Long-range (greater than 200 mile) naval-fire support



The NPS railgun under testing

NPS Railgun Objectives

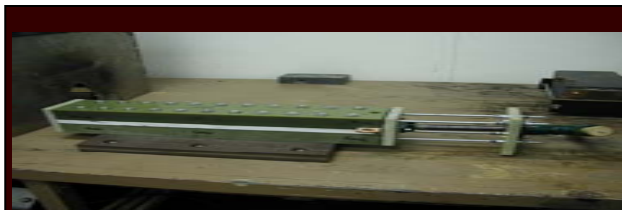
- Apply innovative approaches to technical problems
- Contribute significantly to naval railgun technology
- Educate U.S. military officers in EML technology

Deliverables

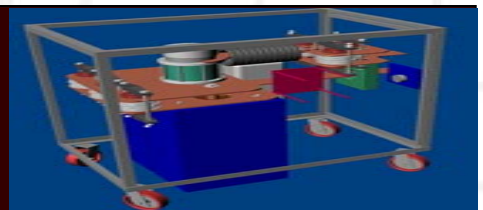
1. Test operational prospects for new barrel concepts
2. Projectile designs and materials for improved rail life
3. Railgun test facility with high-velocity projectile capability (including larger energy source, 100-600 kJ)
4. 50-kA working pulse-forming inductive network
5. U.S. military officers educated about EML technology

Where we are

- New barrel designs proposed
- Some improved projectile designs proposed
- Army infantry railgun round designed
- 60-cm railgun test-bed operational (larger power supply—two 100 kJ modules—being assembled)
- Various rail materials acquired
- 50-kA pulse-forming inductive network module tested
- Railgun class notes ready, course regularly taught
- Thirteen EML thesis students from 2003—now



60 cm railgun



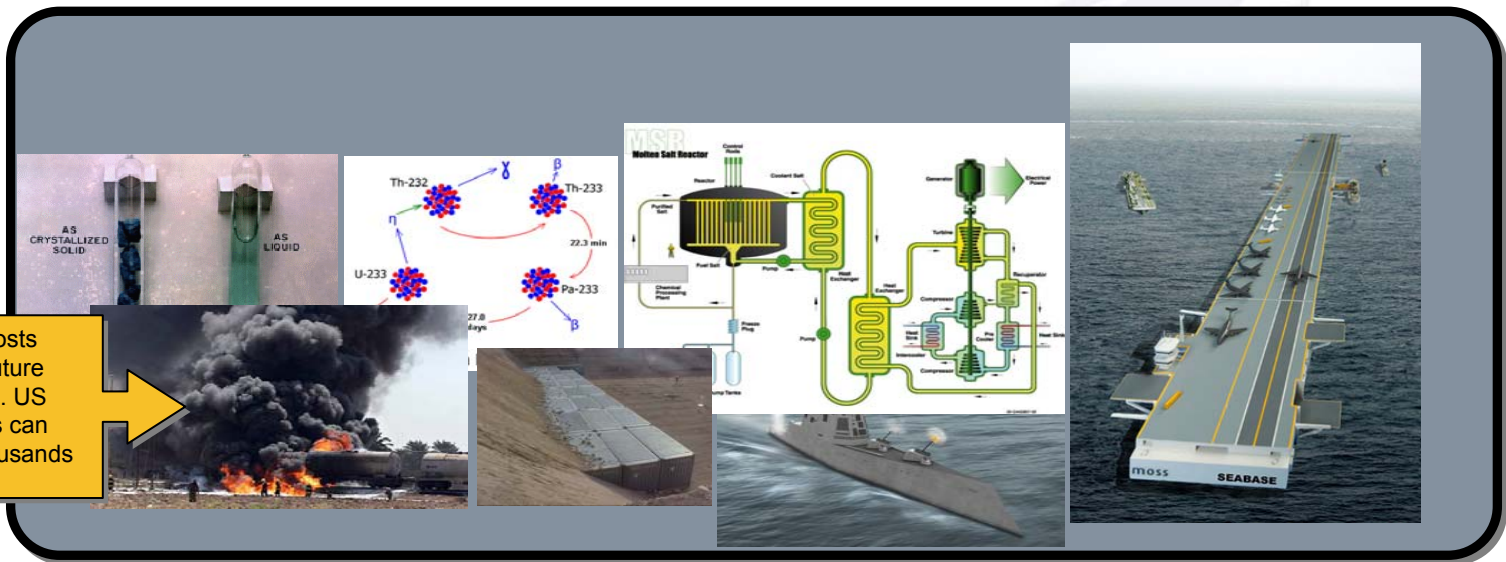
Railgun test bed

Department of Physics
Graduate School of Engineering
and Applied Sciences

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Project Objective

An NPS-student design team is investigating the benefits of a liquid-fluoride thorium reactor (LFTR) as a ship power plant. The LFTR offers greater power system density, deep inherent safety, and a simple, closed nuclear fuel cycle using abundant thorium rather than uranium. Successful development of LFTR power plants enable future naval operations for any size vessel even if fossil fuel prices rise dramatically.



Increased fuel costs could threaten future naval operations. US thorium reserves can power us for thousands of years.

The payoff for this work would be a fleet that could operate with impunity to fuel price/availability with a reactor design that is simpler, safer, and less expensive than today's pressurized-water reactors. Unrestricted electrical power for propulsion, weapons, communications, and land support services (water desalination, electrical power, hydrogen or fuel production).



A World-Class University

- Agile, unique programs focused on joint military applications
- Relevant research
- Executive, distance, and continuing education
- Coalition building

A Strategic Investment



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