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The Naval Postgraduate School's Role in the Naval Research Enterprise

Ferrari, Leonard

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The Naval Postgraduate School's Role in the Naval Research Enterprise

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The 2006 Naval S&T Partnership Conference is presented by NDIA with technical support from ONR





Outline



- Introduction to NPS
- Selected Research
 - Operational Support
 - Experimentation
 - Humanitarian Relief
 - Process Improvement
 - Counter-Terrorism
 - Science & Technology
- Partnerships



NPS MISSION



Provide relevant and unique advanced education and research programs in order to increase the combat effectiveness of U.S. and Allied armed forces and enhance the security of the United States.



"The single greatest advantage we hold over every potential adversary is the genius of our people."

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-- Adm. Vern Clark, Chief of Naval Operations



Naval Postgraduate School



- Provides unique education and research based on the operational experience of NPS students.
- Encourages students and faculty to be innovative in finding solutions to current and near-term warfighting needs.
- Provides opportunities for:
 - NPS students and faculty to demonstrate and evaluate latest technologies in an operational environment
 - the operational community to utilize and experiment with new technologies



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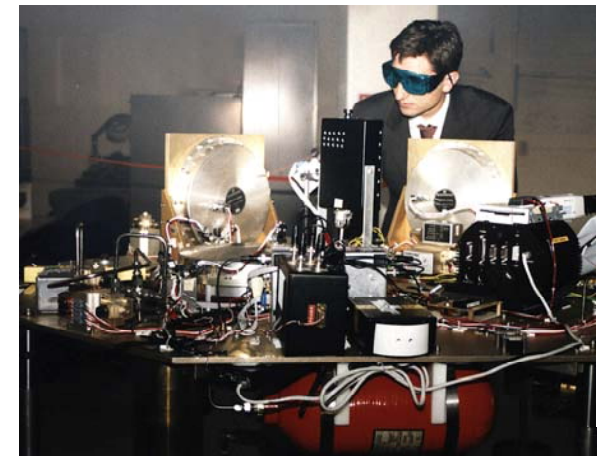


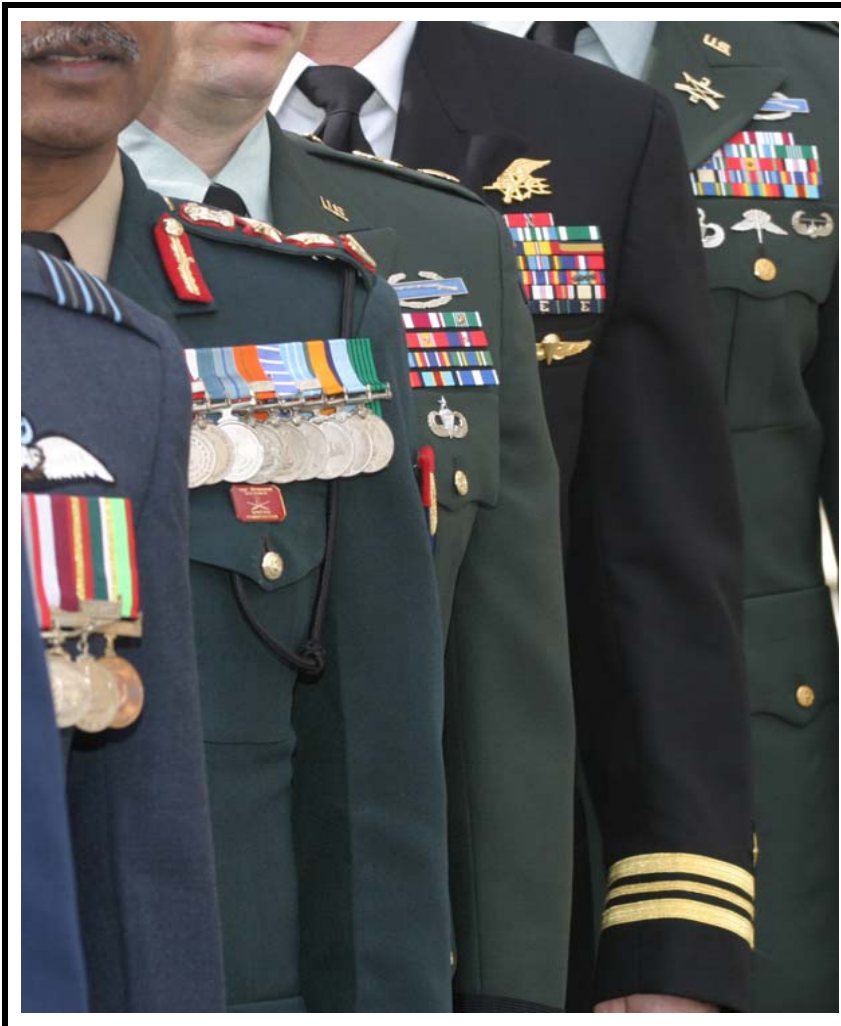


Faculty Expertise Includes



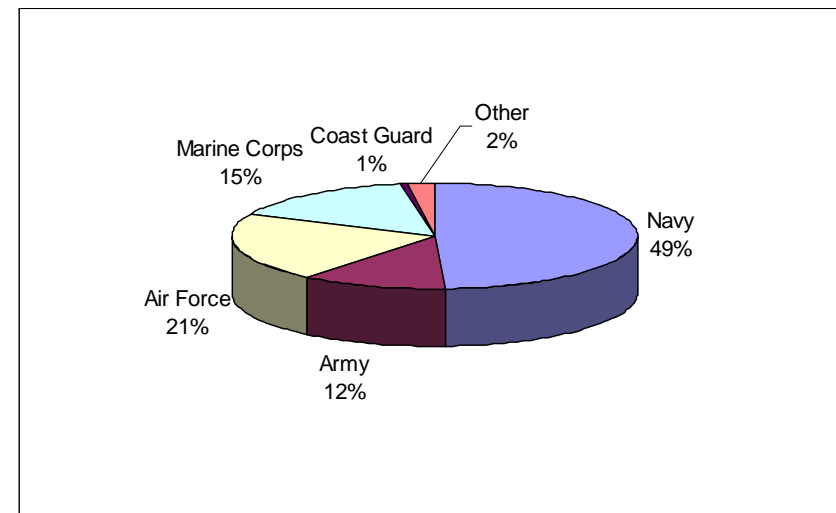
- Operations Research
- Autonomous Vehicles
- Directed Energy Systems
- Software Engineering
- Combat System Physics
- Electronic Warfare
- SIGINT, MASINT and ISR
- Modeling and Simulation
- Human Systems Integration
- Materials Technology
- Information Assurance
- Systems Engineering
- Information Operations
- Computer and Information Sciences
- Counterterrorism
- Homeland Security & Defense
- Business, Management and Acquisition





NPS students are:

- ❖ Joint Service
- ❖ Coalition Partners
- ❖ Interagency
- ❖ Intergovernmental





NPS International Resident Degree Enrollment



North America

Canada	4
Mexico	10
	<hr/>
	14

Caribbean, Central, and South America

Argentina	1
Brazil	2
Chile	2
El Salvador	1
Honduras	1
Paraguay	1
Peru	1
Trinidad-Tobago	1
Uruguay	1
	11

Australia 4

Europe

Bosnia	1
Bulgaria	2
Czech Rep.	2
Estonia	1
France	2
Germany	14
Greece	54
Hungary	2
Latvia	1
Lithuania	1
Moldova	1
Norway	2
Poland	8
Portugal	1
Romania	4
Spain	2
Sweden	3
Turkey	44
Ukraine	1
U.K	1

147

Central/East

Asia, and

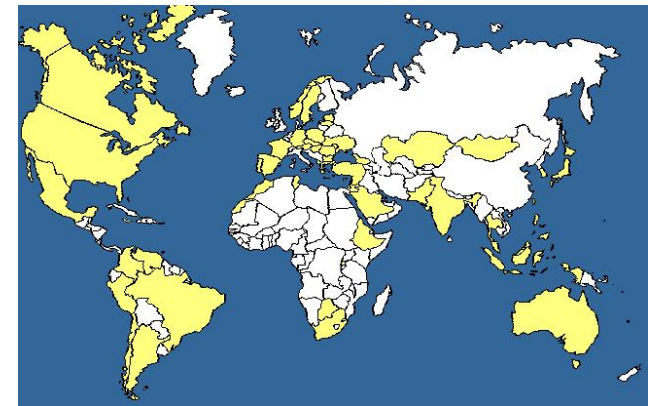
Middle East

Armenia	1
Bahrain	4
Israel	1
Jordan	3
Lebanon	1
Pakistan	4
Saudi Arabia	2
Uzbekistan	2
	18

Africa

Botswana	1
Ethiopia	1
Kenya	1
Nigeria	1
Rwanda	1
Senegal	1
Tanzania	1
Tunisia	4

11



Far East, Near East

Bangladesh	1
India	4
Indonesia	7
Japan	2
Korea	6
Malaysia	1
Philippines	3
Singapore	30
Taiwan	16
Thailand	1
	70



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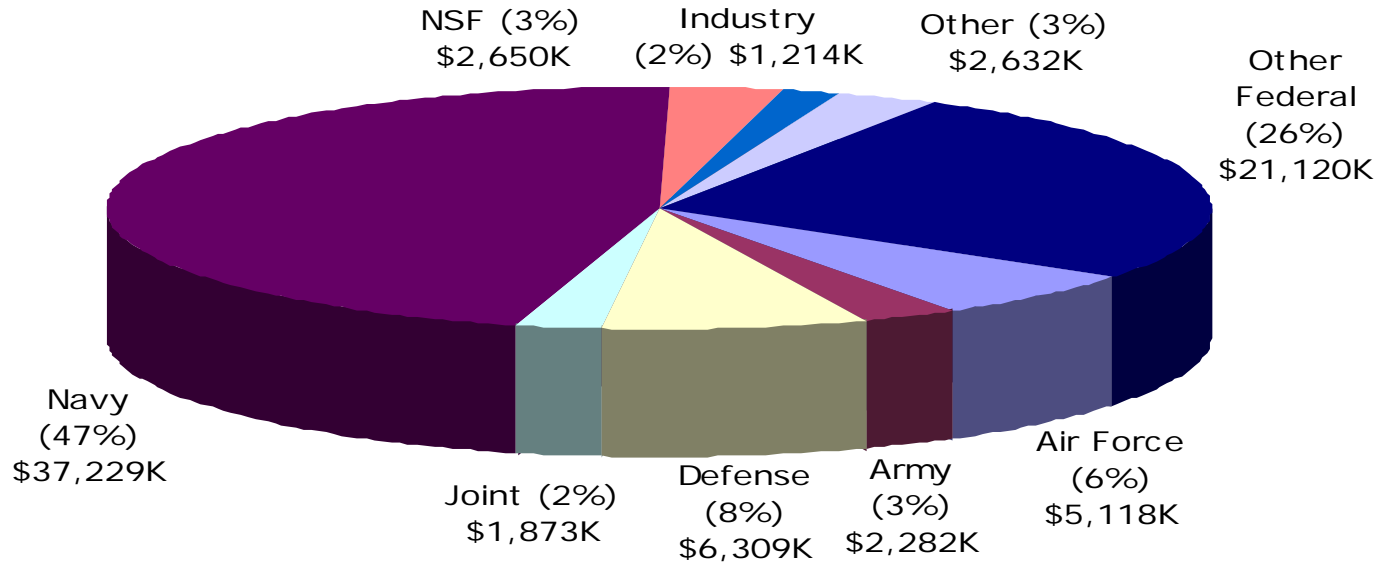




Sponsored Programs



FY05 by Sponsor



TOTAL: \$80,430,864



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Operational Support



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The Center for Interdisciplinary Remotely-Piloted Aircraft Studies



Camp Roberts



Remote UAV Facility



UAV Surrogate



Predator (2)



Aerodynamic Decelerator
Precision Delivery Systems



Altus



GNAT 750



UV 18-A Twin Otter



AN/MPQ-64 Sentinel Air
Surveillance and Target
Acquisition/Tracking Radar

- Expendable Sensors:
- Wave Buoy
 - T-Drop
 - Visibility Sonde
 - Chem Sonde



Experimentation



NPS field experiments utilize military assets and are staged near campus and around the world. Research teams are composed of faculty, students and partners such as ONR, NRL, SOCOM, LLNL and others.



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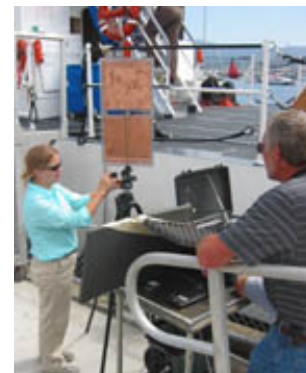




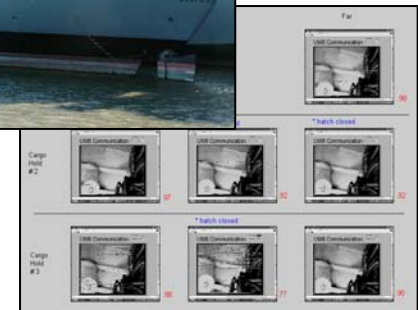
Data and Video in Real Time from Within a Boarded Ship to External Networks



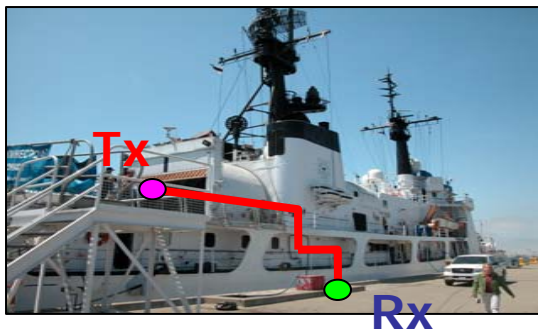
Feb 05 TNT: 802.11B affected by radar



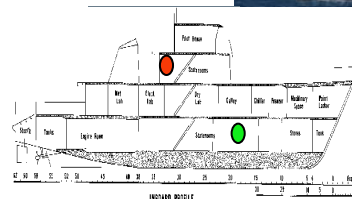
May, August 05 TNT UWB comms demonstrated within Cutter



Suisun Bay: UWB able to transmit between holds of a container ship with holds closed!



UWB on board USCGC Munro (multi-deck, no radar)



Collected system performance data on operational ship

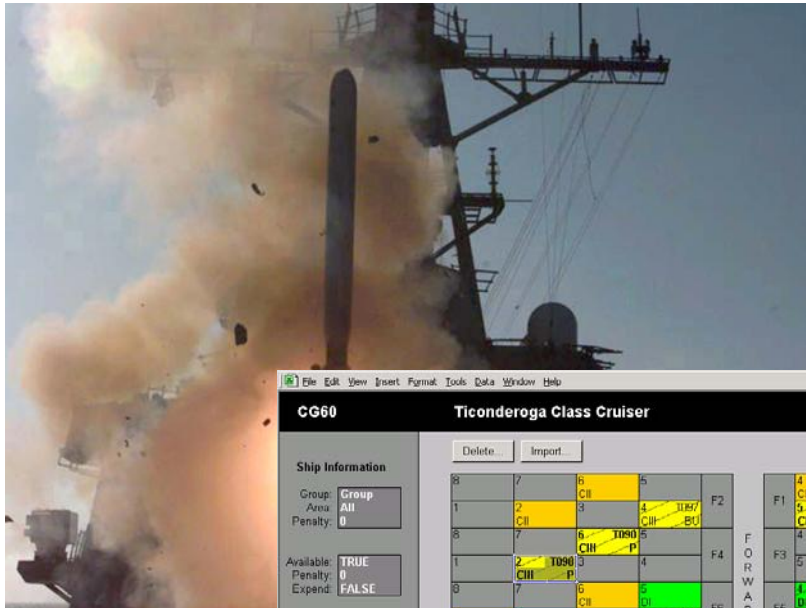


Polar Star – Planned experiment w/ USCG





Optimizing Tomahawk Strikes



NPS Operations Research has developed a decision-support tool to optimize Tomahawk strike predesignation for single firing units, an entire battle group, or a complete theater.

CG60 Ticonderoga Class Cruiser

Ship Information
 Group: All
 Area: All
 Penalty: 0
 Available: TRUE
 Penalty: 0
 Expend: FALSE

Ship Salvo

	Now	AFP
All	32	25
CII	19	19
CIII	21	17
DI	8	7
DII	3	3

Tasks, Fleet, Main

Delete, Import, Phase II

FORWARD

B	7	6	CII	5	F2
1	2	3	CII	4	1017
8	7	6	CII	5	BO
1	2	3	CII	4	1090
8	7	6	CII	5	P
1	2	3	CII	4	1090
8	7	6	CII	5	P
1	2	3	CII	4	1012
8	7	6	CII	5	P
1	2	3	CII	4	1008
8	7	6	CII	5	P

AFT

F1	4	3	2	1	CII
5	1014	6	7	8	CII
4	3	2	1	1000	CII
F3	5	6	7	8	CII
4	3	2	1	1054	CII
F6	5	6	7	8	CII
4	3	2	1	1081	CII
F7	5	6	7	8	CII
4	3	2	1	1036	CII
4	3	2	1	1045	CII
A1	4	3	2	1	CII
5	1070	6	7	8	CII
A3	4	3	2	1	CII

One button on this dashboard optimizes an entire fleet-wide Tomahawk strike in seconds.



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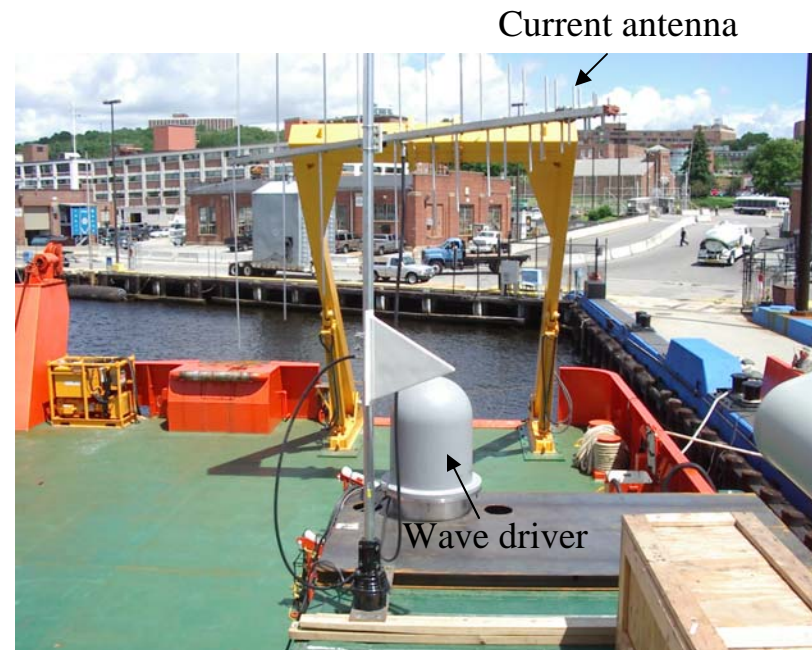
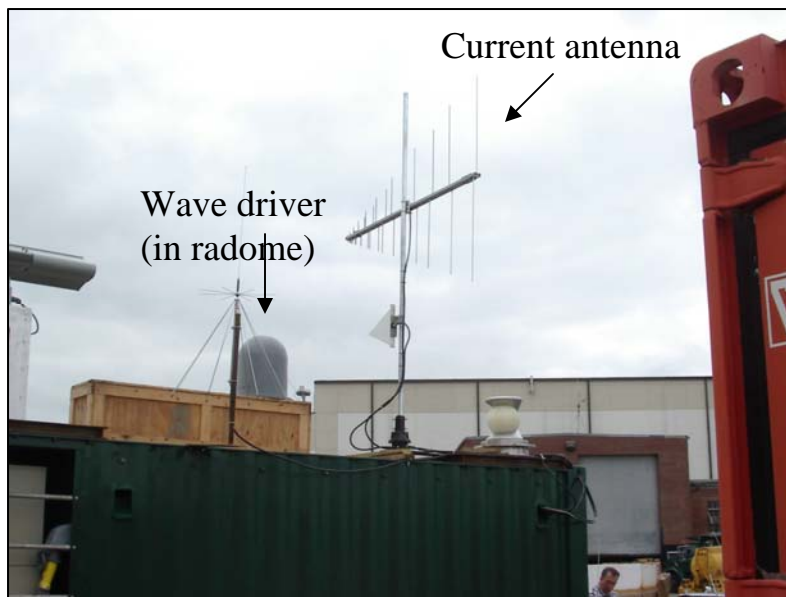


Wave-Driver Antenna



Antenna comparison in operational scenarios performed as a part of the Mustang Canter Naval Exercise

Wave-Driver out-performed the competition



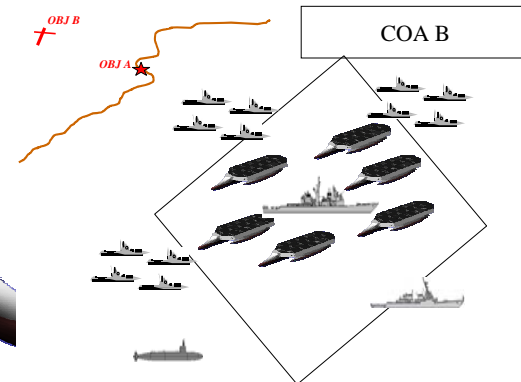
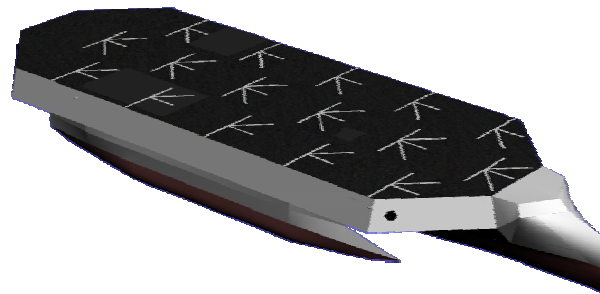
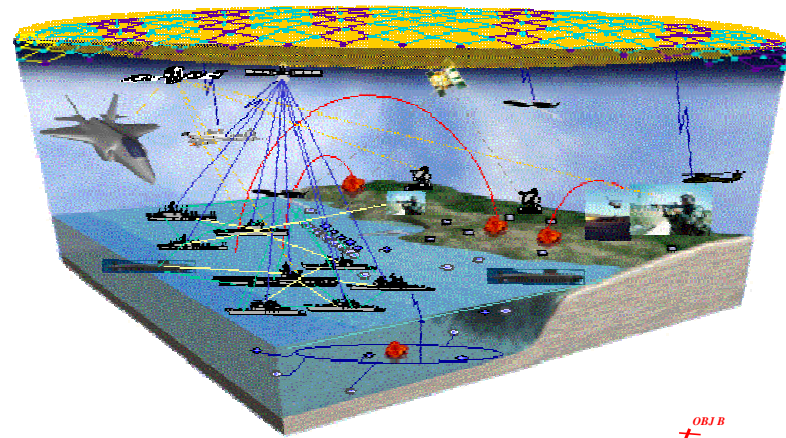


Student Integrated Project



Study topics are provided by CNO N-7 and final reports are briefed Navy-wide.

A Systems Engineering and Analysis (SEA) student lead, cross campus interdisciplinary study that's purpose is to provide educational experience in addressing large-scale warfighting issues relevant to the Navy.



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Humanitarian Relief



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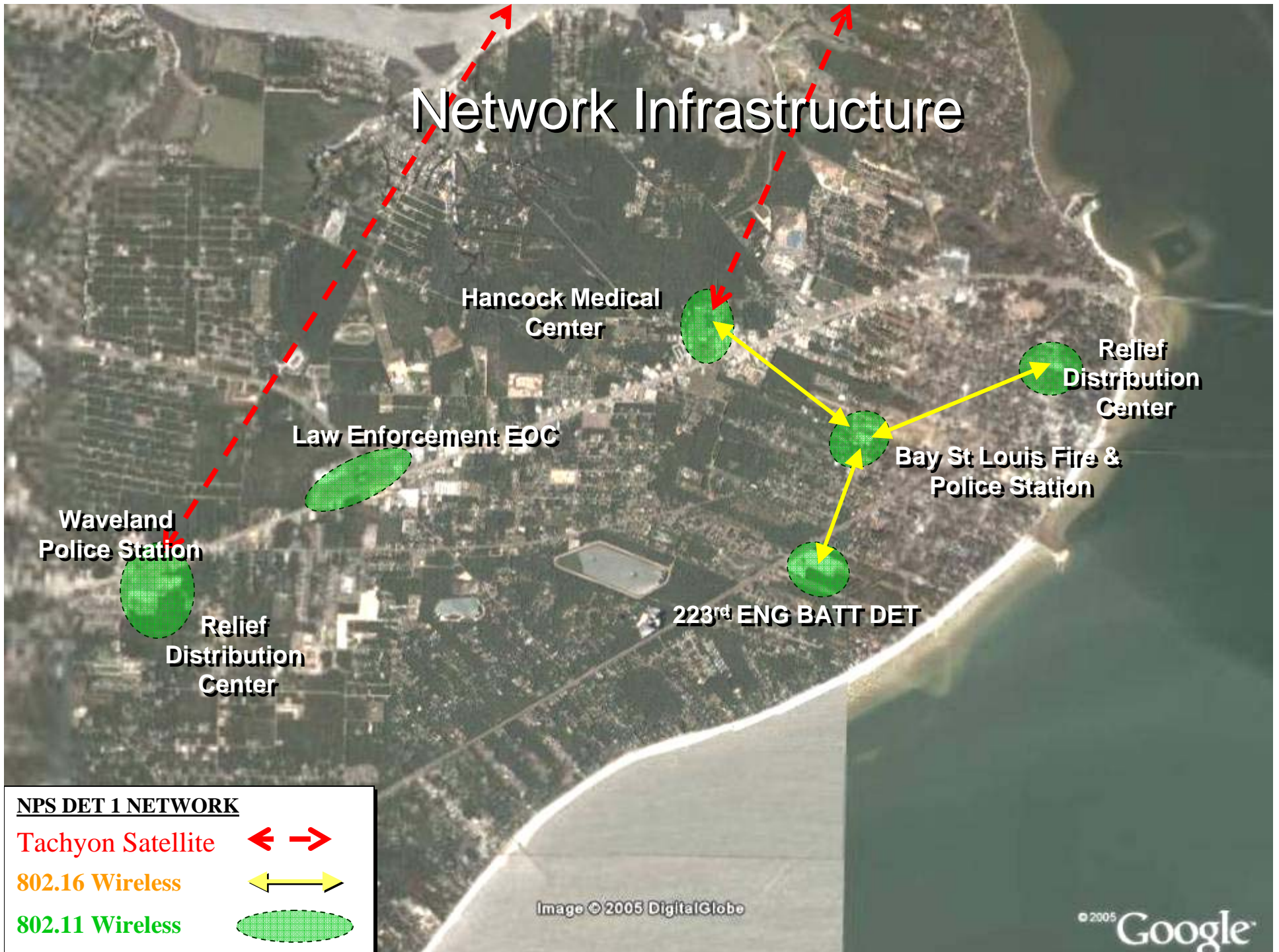
Katrina.....



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Network Infrastructure



NPS DET 1 NETWORK

Tachyon Satellite ← →

802.16 Wireless ↔

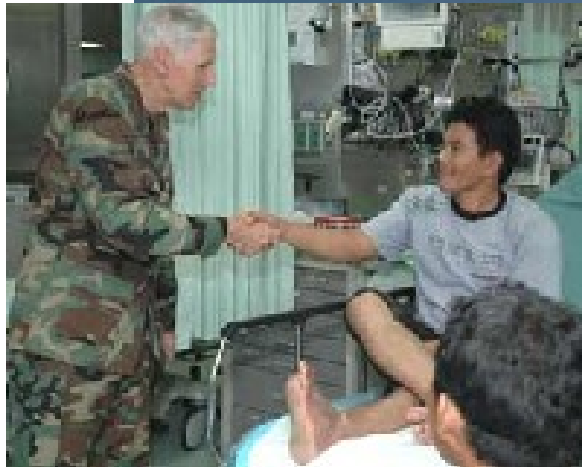
802.11 Wireless ○

Image © 2005 DigitalGlobe

© 2005 Google



2006 Hastily Formed Network Experiments on USNS Mercy Ship



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Process Improvement



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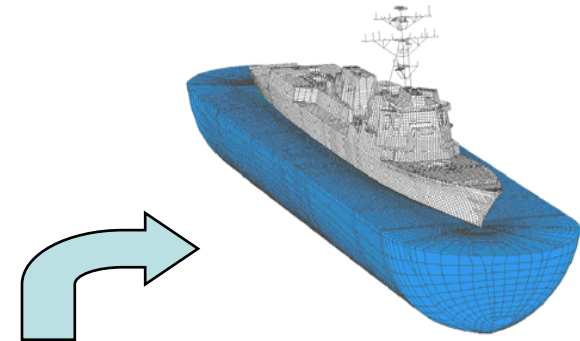




Naval Ship Shock Trial Simulation



Accurately predicts the Shock Response of a surface ship in an Underwater Explosion Event.



Potential savings of over \$100M for the Navy by replacing LFT&E Ship Shock Trials with modeling and simulation.



Serious Games and Simulations



NPS researchers have been pioneers in modeling, simulation and the development of games for the military.

Left: Free electron laser simulation and scene from America's Army

Right: Deployable flight trainer



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Counter-Terrorism



Red Cell Support for Maritime Security Operations



Olympics Security Maritime Interdiction Operations



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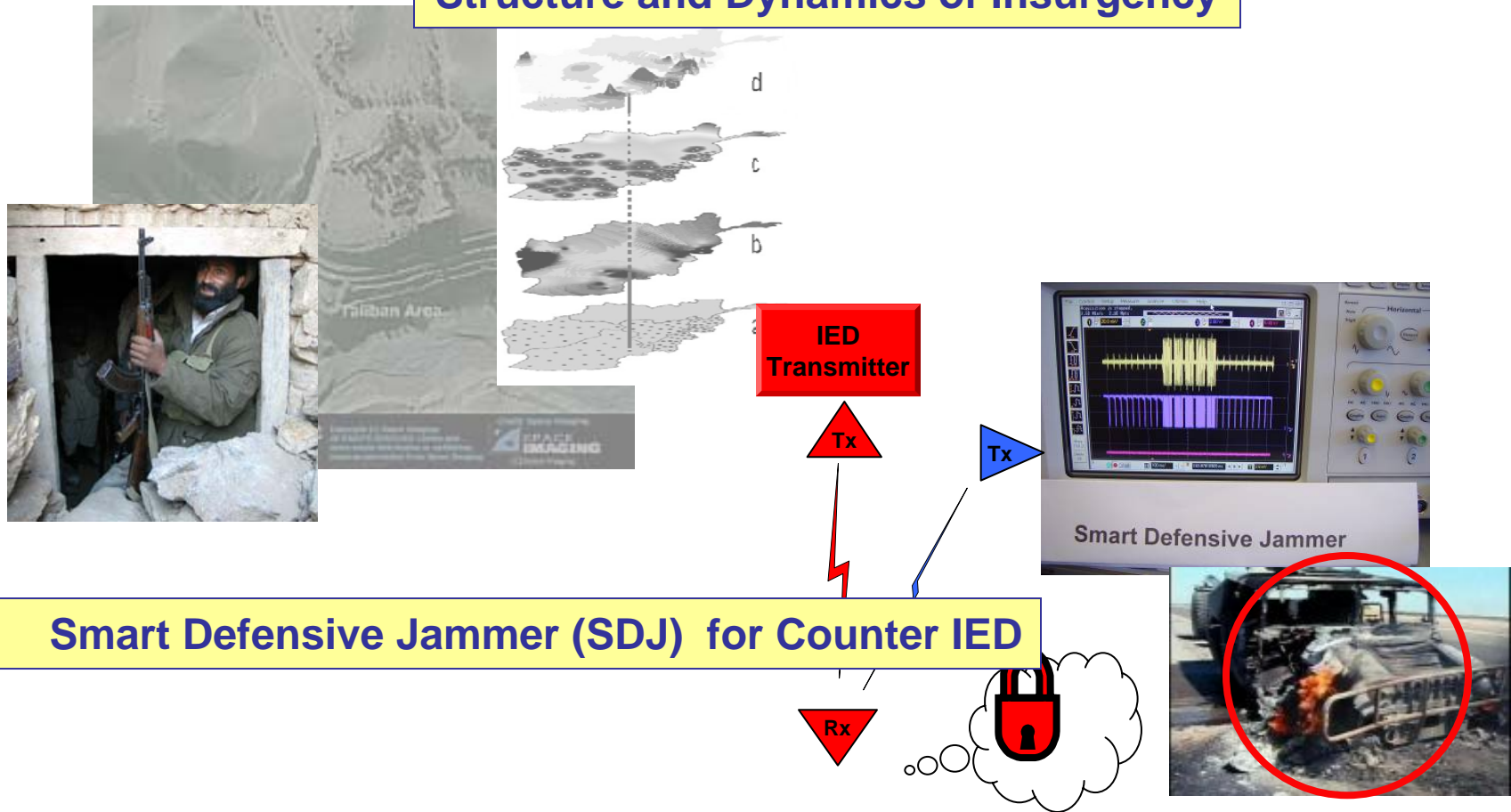




Irregular Warfare



Structure and Dynamics of Insurgency





Maritime Security



NPS has been working on MDA and MDP for the past three years with support from OSD-HD and the Congress



Anti-Terrorism Force Protection (AT/FP)

Using XML & Agent-based Simulations

Visualization

- Rehearse with first-person point of view
- Realistically assess defensive tactics
- Replay dangerous "what-if" scenarios

Simulation

Planning

LT James Harney USN
xmsf-Contact@MovesInstitute.org

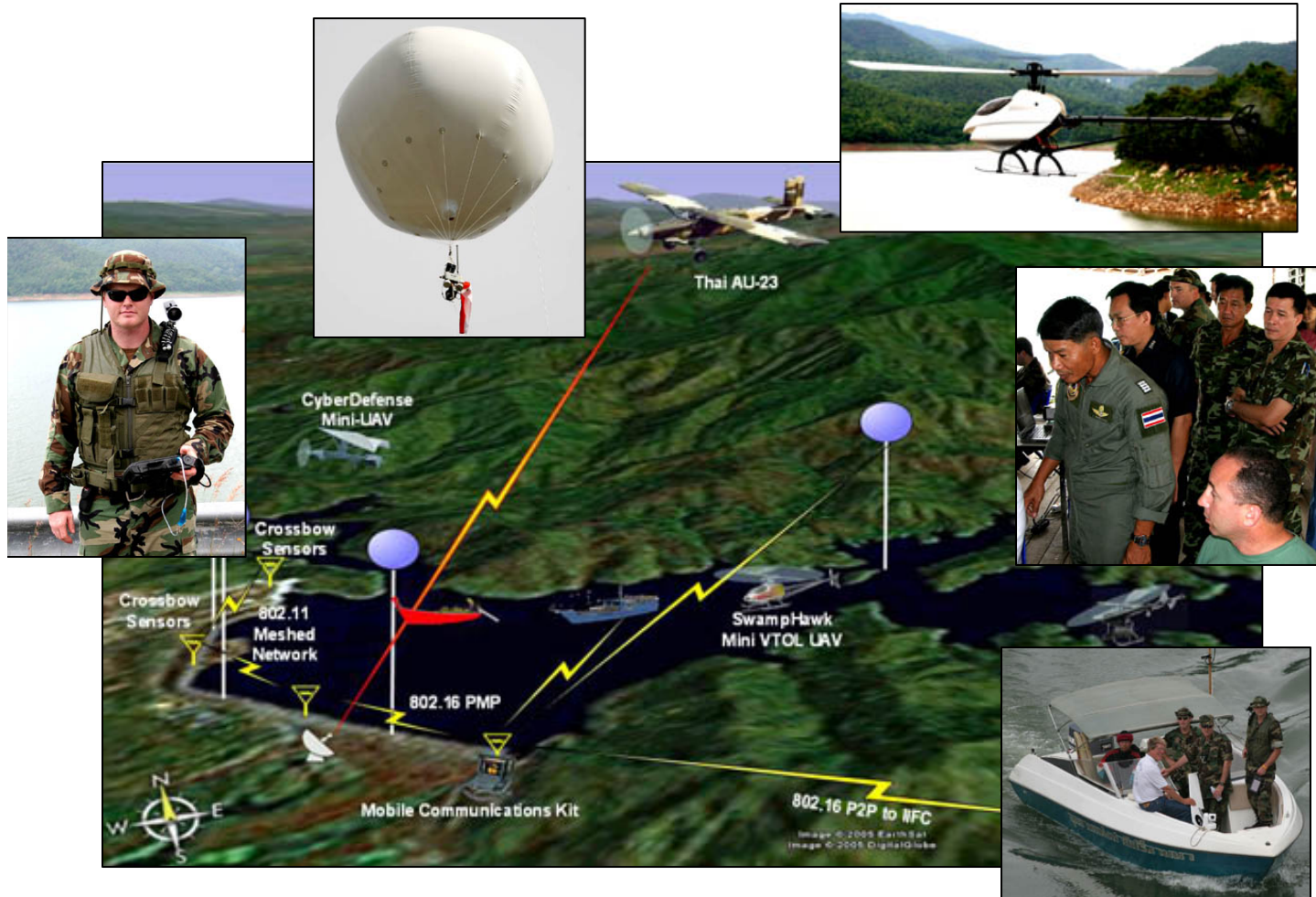


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Coalition Operating Area Surveillance and Targeting System: Thailand Phase



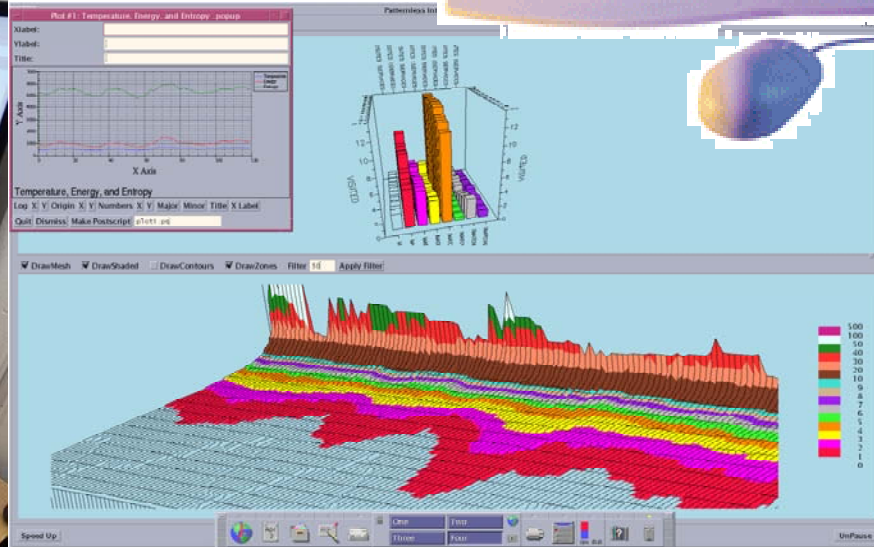
Investigate and match current and evolving participant operational C4ISR needs with integrated, low cost, state-of-the-art, unclassified, networked COTS solutions.



Information Assurance



CISR is an NSA Center of Excellence for Information Security and Trusted Computing



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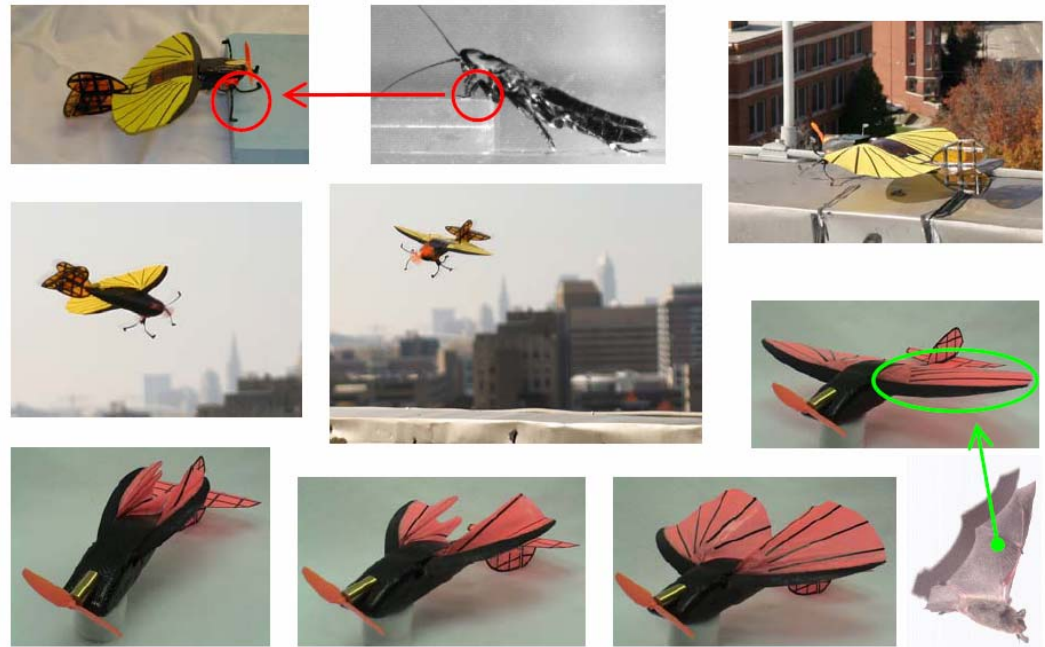




Science and Technology



Basic research on autonomous vehicles



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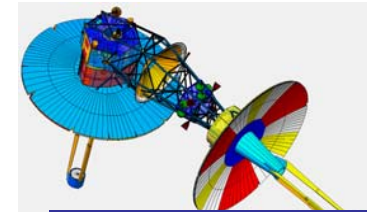




Flexible Spacecraft Simulator



Ultra-Quiet Platform



Space-Based Relay Mirror



Three-axis-simulator

Spacecraft Research and Design Center



Positioning Hexapod



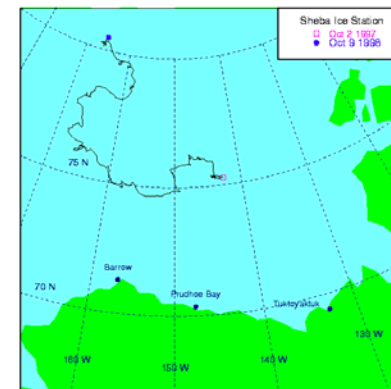
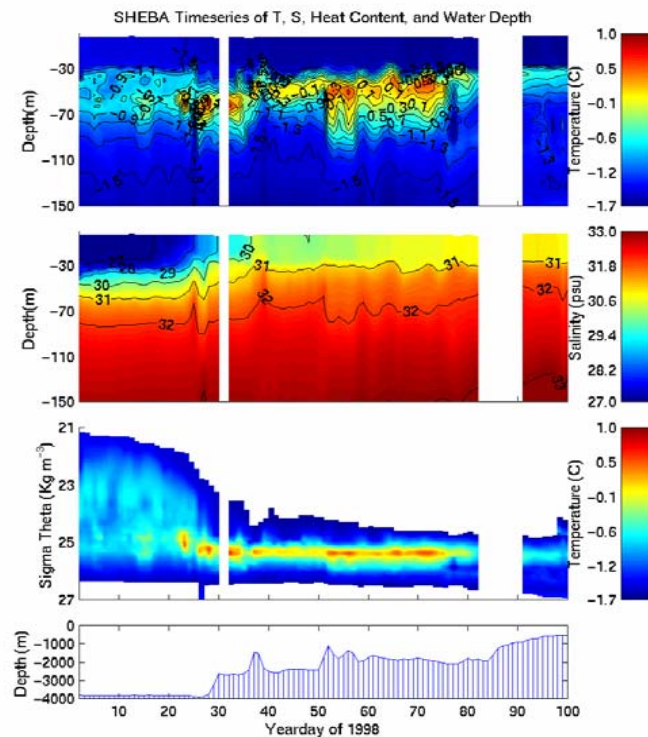
Space Robot Simulator



Surface Heat Budget of the Arctic (SHEBA)



A year-long ice camp measuring processes controlling the sensitive air-ice-ocean feedbacks which make the Arctic particularly sensitive to global climate change



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ATMOSPHERIC MEASUREMENT LABORATORY



Shipboard assessment of EM/EO properties; design, develop, install instruments



Buoy measurements of near-surface properties; radar propagation, remote sensing



Land (Coastal) continuous measurements; develop forecast models



NOAA, USN, UC, NPS, MBARI



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Partnerships



- University Partnerships: UCSB, VT, LLNL, CSUMB, GMU, Stanford, UCB, UMW, NUS, UoC, NMT.....
- 50 CRADAS with Industry
- 35 Chair Professors
- New CNO Distinguished Fellows Program



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NAVAL
POSTGRADUATE
SCHOOL

Chief of Naval Operations Distinguished Fellow Program

The Nation's top scientists, engineers, political scientists, educators, religion scholars, military strategists, economists and business leaders will be brought together, under one umbrella, to engage in the Global War on Terrorism.





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