The Navy-Marine Corps Vision of the Future

NDIA Expeditionary Warfare Conference

RADM Bill Landay

22 October 2007

Technological Dominance

Revolutionary Research . . . Relevant Results

Laser-Guided Munitions

Today, Marines and Sailors have at their disposal the world's most sophisticated military technology

Mobile Communications

GPS Navigation and Targeting

Network-Centricity, Information Warfare, and Intelligence

Technological Democratization

Revolutionary Research . . . Relevant Results

Internet—Information Warfare and Intelligence

In Afghanistan, Iraq, and elsewhere, our adversaries are leveraging sophisticated technology that is now easily available anywhere in the world—and at modest cost.

Cell Phones—Mobile Comms

Commercial Laser Rangefinder—Precise Targeting

Handheld GPS—Location with Extreme Accuracy

A Technological "Perfect Storm"?

Revolutionary Research . . . Relevant Results

For decades, Western militaries have held a decisive technological advantage…

"It is by devising new weapons, and above all by scientific leadership, that we shall best cope with the enemy's superior strength."

--Winston Churchill

Today, enemies are able to acquire weapons and technology quickly and cheaply…

"Acquiring weapons for the defense of Muslims is a religious duty. If I have indeed acquired these weapons, then I thank God for enabling me to do so. And if I seek to acquire these weapons, I am carrying out a duty. It would be a sin for Muslims not to try to possess the weapons that would prevent the infidels from inflicting harm on Muslims."

--Osama bin Laden

And there also are adversaries willing to invest significantly in new technology…

"The 21st Century is also going to be an age of scientific change, with certain cutting-edge technologies likely to be applied to naval warfare…high-tech arms will make direct attacks on naval battlefields possible from outer space, remote altitudes and remote land bases…superconduction technology will bring superconductor ships to the naval order of battle, enabling ships to travel faster without noise…submarines will be able to go faster and deeper, with the seabed being the ideal place to build military bases."

--Chinese Naval Officers at the Navy Research Institute in Beijing

Providing a Vision of the Future

Revolutionary Research . . . Relevant Results

ONR has built a concrete vision of the Navy and Marine Corps after Next with the Naval S&T Strategy....

But how do you get from

here...

to here?

S&T Strategy Objectives

- **Ensure alignment of Naval S&T with Naval missions and future capability needs**
- **Balance and manage S&T portfolio based on key tenets:**
  - **Strive to engage with intellectual capital worldwide**
  - **Leverage U.S. and global technology insights**
  - **Maintain equilibrium between long-term basic research and near-term advanced prototyping**
  - **Be innovative and adaptive—lead science where it is critical to the Navy/Marine Corps vision**
  - **Leverage technology development efforts across the entire DoD**
- **Communicate S&T vision and approach to senior decision makers, key stakeholders, S&T partners, customers, and performers**

International Engagement

- 50 States
- 70 Countries
- 1,035 Universities & Non-Profit Entities
- 914 Companies
- 3,340 Principal Investigators
- 3,000 Grad Students

EUCOM
Armenia, Austria, Azerbaijan, Belgium, Bulgaria, Croatia, Denmark, Estonia, Finland, Czech Rep., France, Georgia, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Latvia, Lithuania, Moldova, Monaco, Norway, Netherlands, Poland, Portugal, Romania, Russia, Switzerland, Slovenia, Spain, Sweden, Turkey, United Kingdom, Ukraine

NORTHCOM
Canada
Mexico

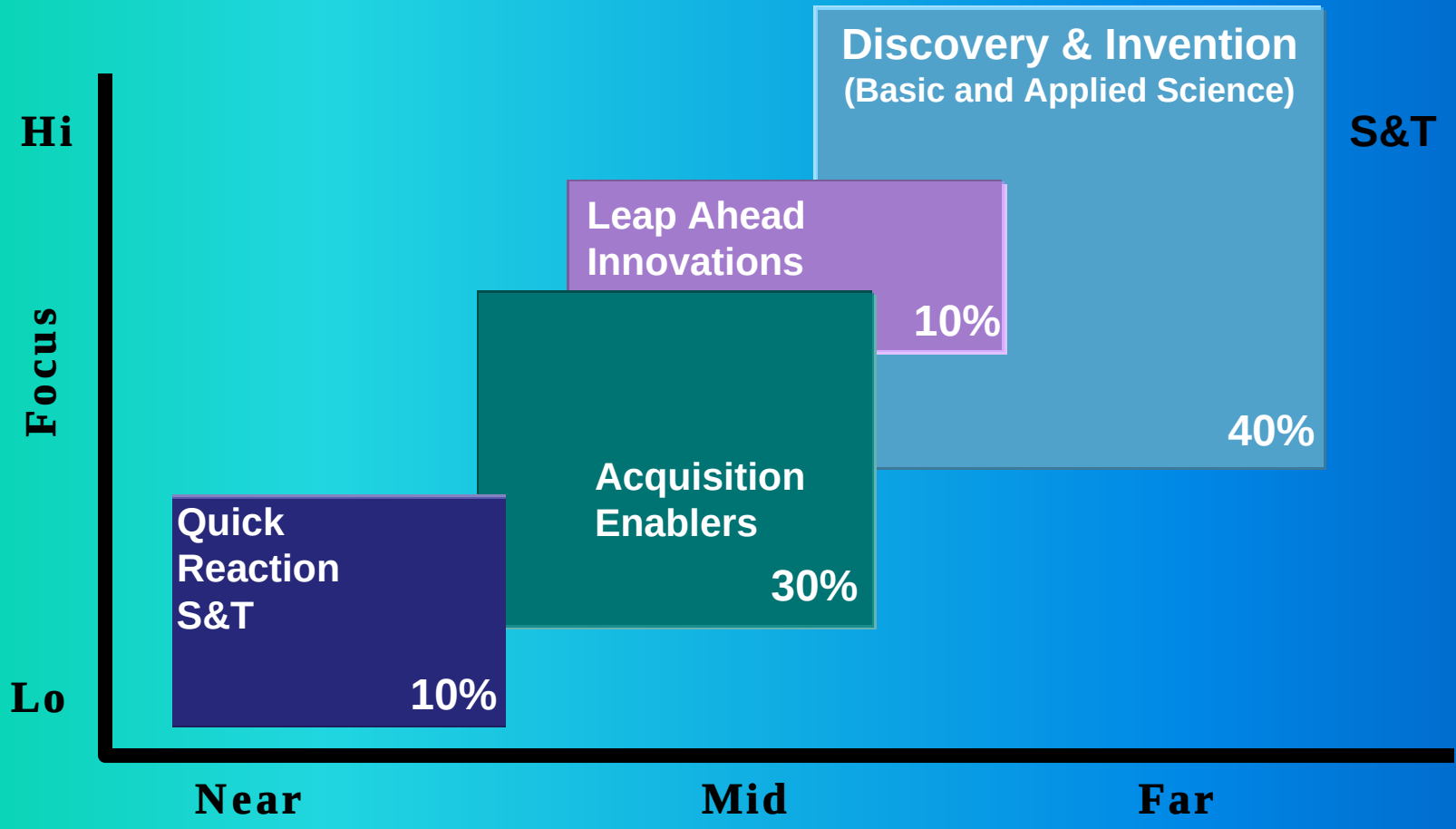
PACOM
Australia
China
Hong Kong
India
Indonesia
Japan
Malaysia
Mongolia
New Zealand
Singapore
South Korea
Taiwan
Thailand
Vietnam

SOUTHCOM
Argentina
Brazil
Chile
Colombia
Panama
Peru
Uruguay

AFRICOM
Cameroon
Cape Verde Islands
Ghana
Nigeria
South Africa
Tunisia

CENTCOM
Egypt
Iraq
Kyrgyzstan
Pakistan

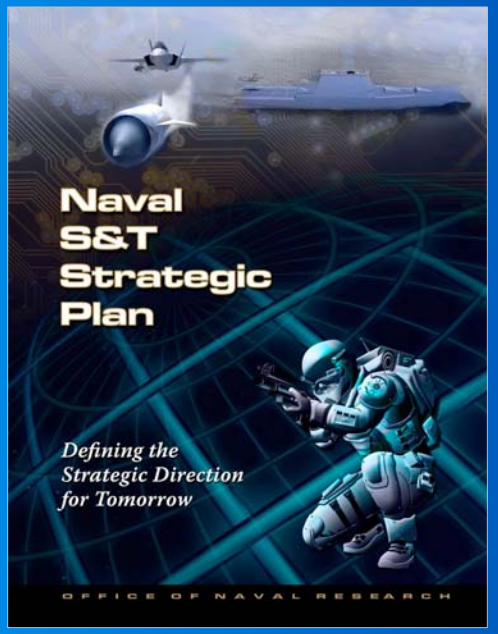
ONR S&T Portfolio Balance



S&T has a long-term focus but is responsive to near-term Naval needs

Naval S&T Focus Areas

- Power and Energy
- Operational Environments
- Maritime Domain Awareness
- Asymmetric & Irregular Warfare
- Information, Analysis, and Communication
- Power Projection
- Assure Access and Hold at Risk
- Distributed Operations
- Naval Warrior Performance and Protection
- Survivability and Self-Defense
- Platform Mobility
- Fleet/Force Sustainment
- Affordability, Maintainability, and Reliability



S&T Research Sub-Areas

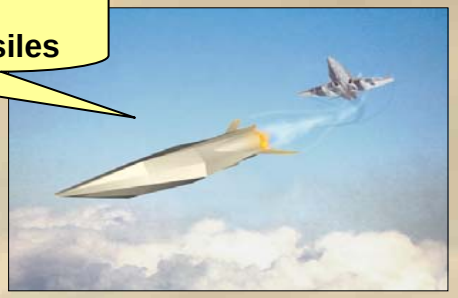
Revolutionary Research . . . Relevant Results

- Air/Ground Vehicles
- Advanced Sea Platforms
- Ship and Austere Site Compatibility
- Survivable Air Platforms
- Signature Control and Sensors
- Survivable Sea Platforms
- Affordability/Reduced Platform Life-Cycle Cost
- Advanced Energetics
- Directed Energy
- Electromagnetic Guns
- High-Speed Weapons Technologies
- Precision Strike
- Undersea Weaponry
- ASW Rapid Attack
- Mining
- Non-Lethal Weapons
- Nanometer-Scale Electronic Devices and Sensors
- Navigation and Precision Timekeeping
- Electro-Optics
- Networked Sensors
- Solid-State Electronics
- Littoral Geosciences, Optics, and Biology
- Marine Meteorology
- Ocean Acoustics
- Marine Mammals
- Physical Oceanography
- Space Environmental Effects
- Spacecraft Technology
- Expeditionary ISR
- ISRT-EM
- Integrated Apertures
- ASW Performance Assessment
- ASW Surveillance
- ASW Distributed Search
- Mine Hunting
- WMD Detection
- Biometrics
- Intelligent and Autonomous Systems
- Unmanned Undersea Vehicle Technologies
- Unmanned Air and Ground Vehicles
- Advanced Naval Power Systems
- Air Platform Power
- Power Electronics
- Personal Power
- Advanced Naval Materials-Functional Materials
- Advanced Naval Materials-Prediction and Simulation
- Advanced Naval Materials-Structural Materials
- Environmental Quality
- Expeditionary Firepower
- Expeditionary Maneuver/Individual Mobility
- Expeditionary Force Protection
- Communications and Networks
- Information Assurance and Anti-Tamper
- Complex Software System Tools
- Automated Image Understanding
- Computational Analysis
- Information Processing, Discovery, and Integration
- Information Presentation
- Decision Support Tools
- Expeditionary Logistics
- Seabase Enablers
- EW Attack
- Precision Localization
- Air Defense
- Torpedo Defense
- Counter IED
- Land Mine Countermeasures
- Mine Neutralization
- Special Warfare/Explosive Ordnance Disposal
- Large Vessel Stopping
- Human Factors, Organizational Design, and Decision Research
- Manpower and Personnel
- Training, Education, and Human Performance
- Biosensors, Biomaterials, Bioprocesses, and Bio-Inspired Systems
- Casualty Care and Management
- Casualty Prevention
- Social, Cultural, and Behavioral Modeling
- Undersea Medicine

Dominating the Battle at Sea: Fighting at the Speed of Light

Revolutionary Research . . . Relevant Results

Time-Critical Long-Range Strike: Supersonic and Hypersonic Missiles



Shipboard Defense at Speed of Light: Free Electron Laser

Unmanned Over-the-Horizon Defense, Strike, and Surveillance: UAVs

Strike from the Sea—250 nm: Electromagnetic Rail Gun

Remote Vessel Stopping and Search: Directed Energy WMD Search

Platform Stealth: Reduced Surface and Subsurface Signatures

Advanced Materials and Automated Damage Control for Survivable Platforms

Rail Gun Test

Revolutionary Research . . . Relevant Results

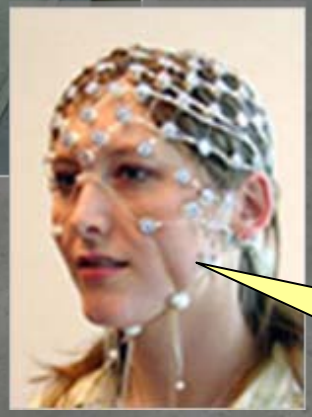
Outthinking and Out-Adapting the Enemy

Revolutionary Research . . . Relevant Results

Immersive Virtual Reality Training Systems

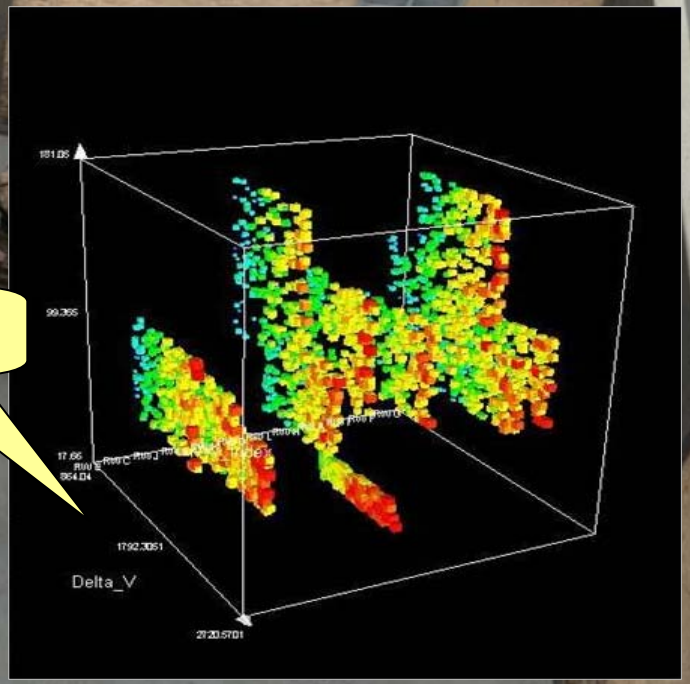
Scalable, Deployable, Interactive Combat Environment Simulators

Virtual Reality Treatment and Medical Systems



Enhanced Team/Individual Combat Performance

Multidimensional Data Visualization



Virtual Technologies and Environments
Virtual Environment Human Immersive Training

Revolutionary Research . . . Relevant Results

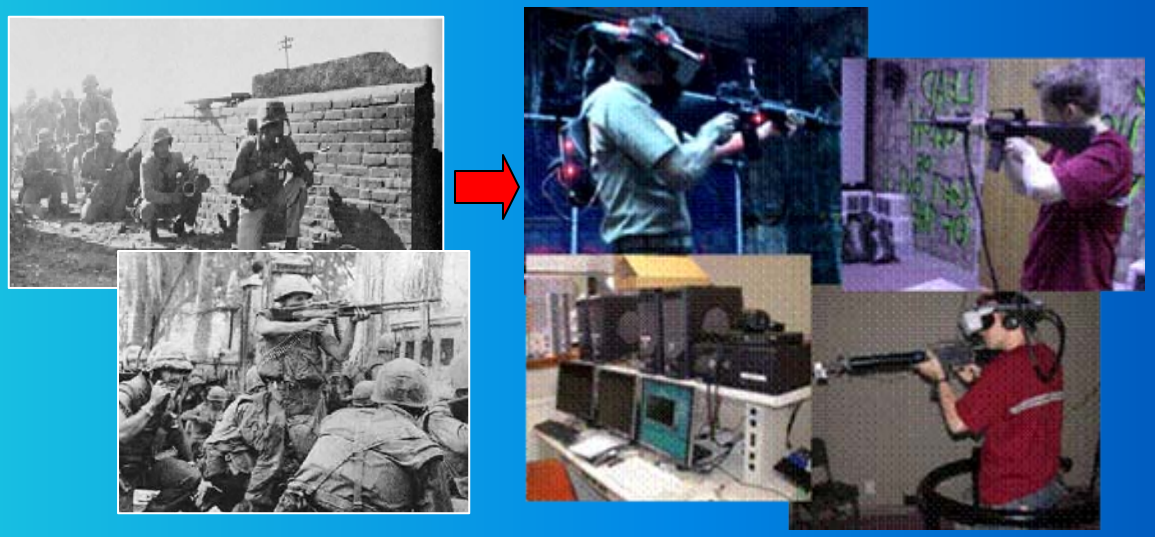
Product Description:

Range of interactive M&S technology solutions for training and mission rehearsal of Marines and Navy SEALs

- Desktop
- Partial Immersion
- Full Immersion

TRL at Start: 4

TRL at Transition: 6



Planned Demos/Transitions:

- PMTRASYS; 4Q FY06
- Ongoing Experiments at Clemson
- AAV Turret Trainer
- ISMT-E (Indoor Simulated Marksmanship Trainer -Enhanced)
- 263rd Army Air and Missile Defense Command, South Carolina

Warfighting Payoff:

- Improved, validated, training and skill retention capabilities at reduced cost.
- First-ever fully-immersive infantry training simulator.
- Cutting edge technologies supporting high fidelity Human Computer Interfaces
- Range of system configurations enables maximum exposure to wide audience.

Dominating the Battle in the Littorals

Revolutionary Research . . . Relevant Results

Unmanned Land Transport, Sensor, and Combat Systems

Maneuver and Connectivity Down to Platoon/Squad Level: Distributed Operations

Non-Lethal Weapons

Seabased Logistics and Communications: Intraship Cargo Systems

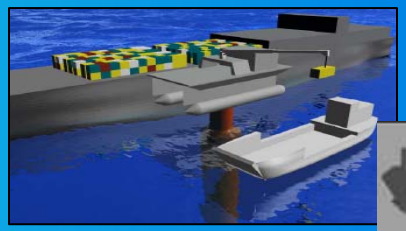
Personal Exoskeleton: Integrated Power, Armor, Comms, and Combat Systems

Seabased Logistics and Communications: Ship-to-Ship Cargo Systems

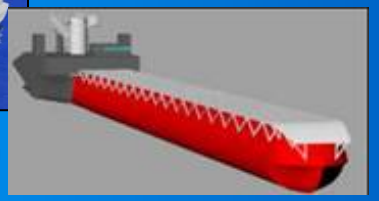
Sea Basing

T-CRAFT

E-CRAFT



Stable Transfer Platform



Objective/Payoff:

- Investigate and develop technologies that will:
  - Improve the capability to transfer cargo between Sea Base platforms
  - Provide for high speed / heavy lift transport of material to and over the beach
- Improve warfighter effectiveness through improved material transfer & delivery capability

Technology Approach;

- Integrate spar technology and platform design (hinge and connector interface materials)
- Evaluate multiple concepts in:
  - Multi-mode propulsion systems
  - Multi-pressure lift systems and retractable cushion sealing efficiencies
  - Hull design and materials
  - Equipment transfer methods
  - Naval Architectural aspects of platform transformability in varying sea conditions

Planned Transitions;

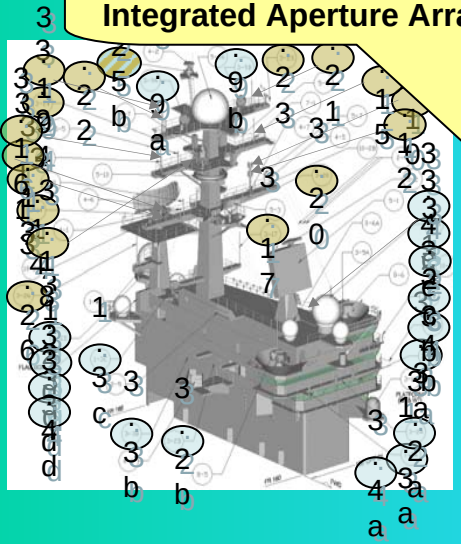
- Stable Transfer Platform
  - 6.3 => Prototype Technology Demonstrator
- T-CRAFT
  - 6.3 => Prototype Technology Demonstrator
- E-CRAFT
  - 6.3 =>Technology Demonstrator => Matanuska-Susitna Borough, Alaska

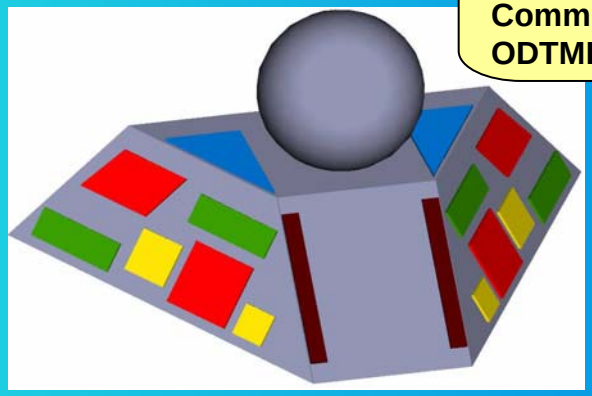
BigDog

Dominating the Electromagnetic Spectrum

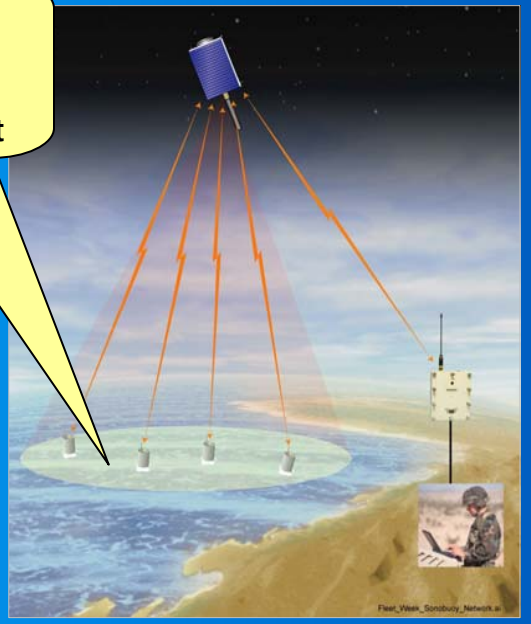
Revolutionary Research . . . Relevant Results

Reduced Antennae Clutter: Integrated Aperture Array



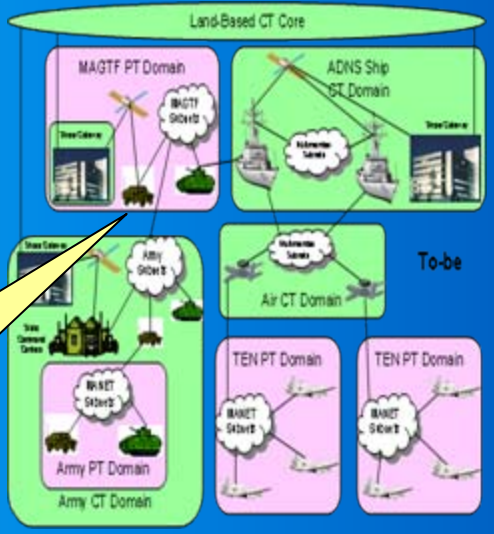


Adaptable, Quickly Deployable Communications: ODTML and TacSat



EM and Electro-Optical Camouflage

Electronic Suppression: Counter-IED Systems



Self-Organizing, Dynamic Tactical Communications Networks

Tactical Satellite

TacSat 4 Hardware Assembly/Test at Naval Research Laboratory

Tactical Satellite (TACSAT) INP

Joint program demonstrates technology to rapidly place useful payloads in orbit for low cost.

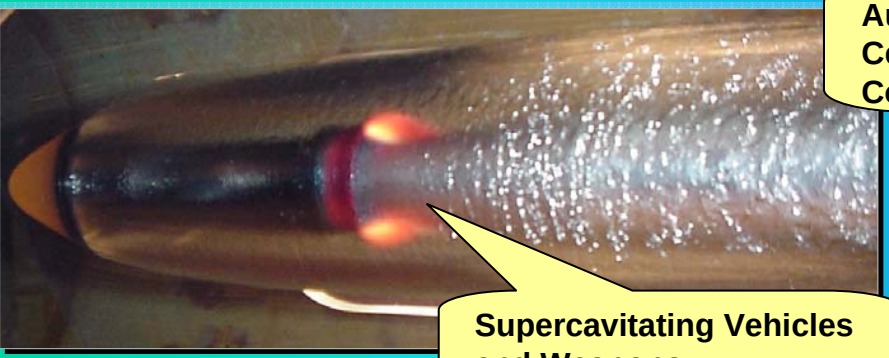
- Common bus—open architecture
- Tasking by way of SIPRNET "Virtual Mission Operations Center"
- Maritime Domain Awareness: ELINT, SEI, AIS
- Hyperspectral Sensing
- Jam-resistant communications
- Data exfiltration from unmanned ocean sensors

Progress:

- TacSat 2 launched 11 Dec '06 from Wallops Island; ELINT and AIS payload working
- TacSat 1 launch scheduled for Aug '07 from Kwajalein with ELINT payload
- TacSat 3 launch scheduled for Dec '07 from Wallops. Data Exfiltration payload
- TacSat 4 launch scheduled for early FY09. Comms payload
- Hyperspectral payload on Intl. Space Station July '09

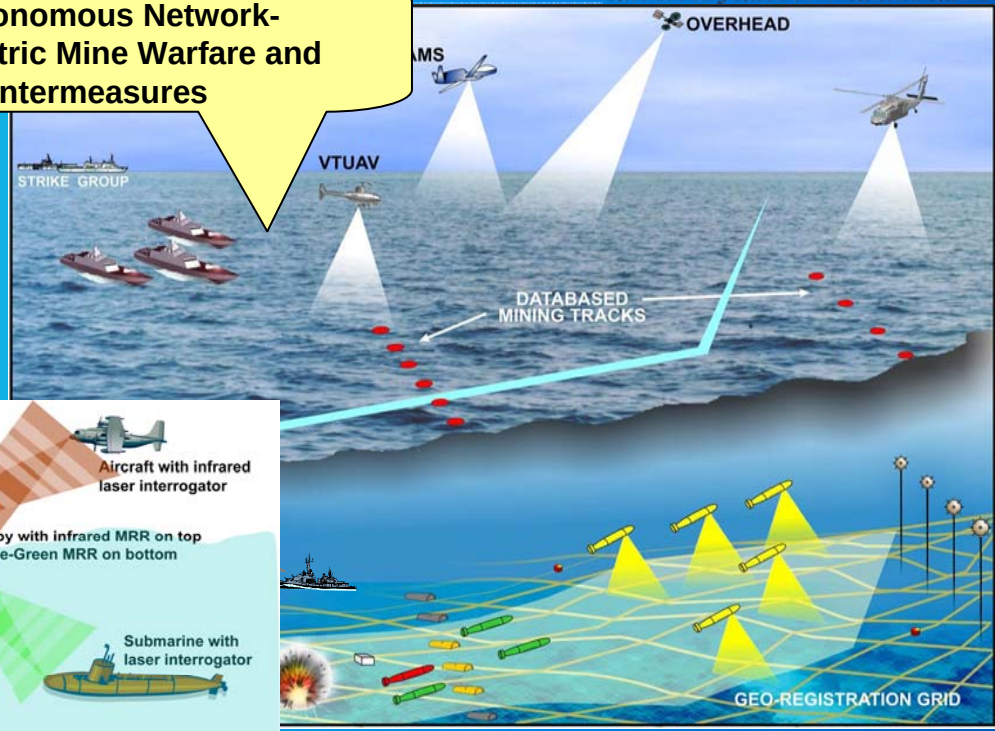
Dominating the Undersea Battlespace

Revolutionary Research . . . Relevant Results

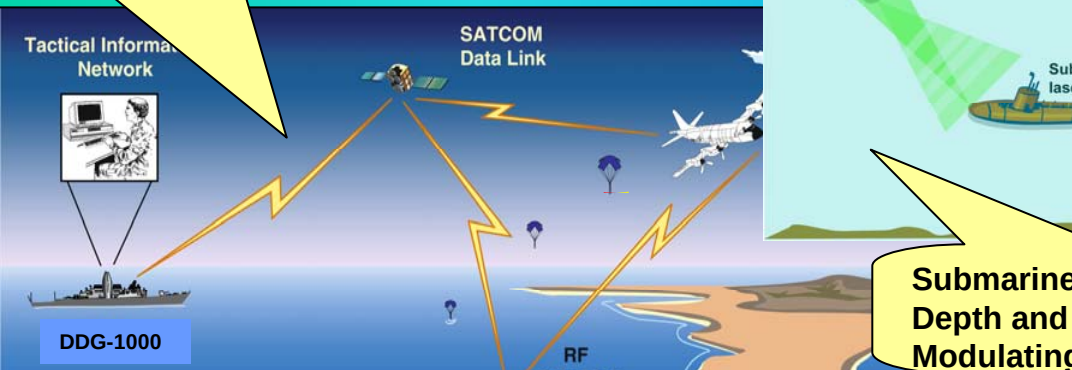


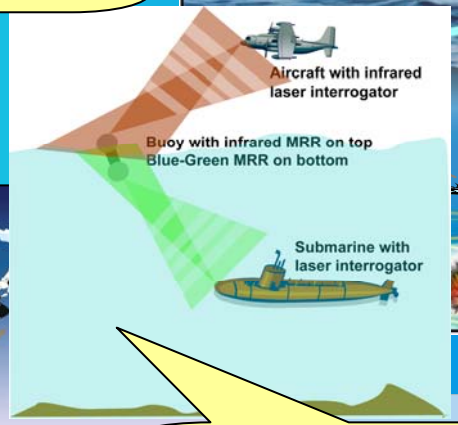
Supercavitating Vehicles and Weapons

Autonomous Network-Centric Mine Warfare and Countermeasures



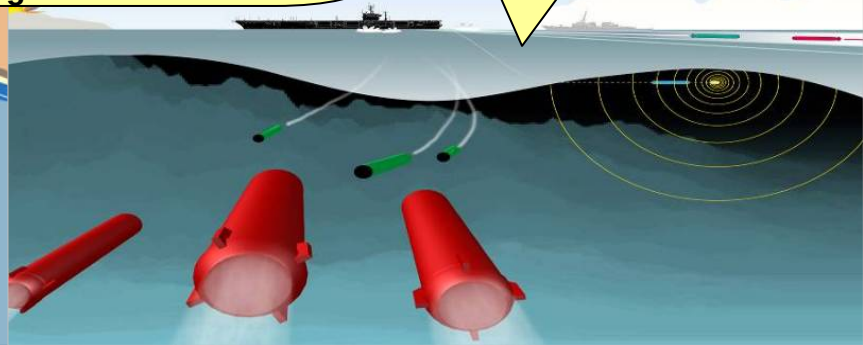
Network-Centric Unmanned Systems for ASW: Deployable Autonomous Distributed System



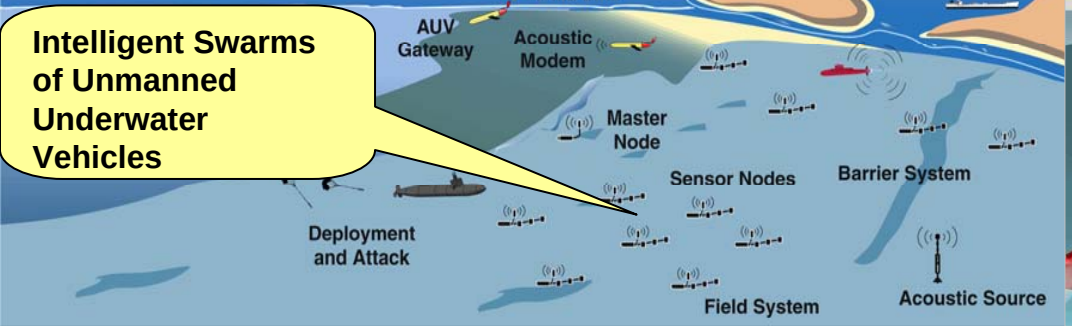


Submarine Communications at Depth and Speed: Lasers and Modulating Retro-Refllectors

Adaptive Acoustic Countermeasures and Anti-Torpedo Torpedoes



Intelligent Swarms of Unmanned Underwater Vehicles



Final Thoughts

Revolutionary Research . . . Relevant Results

We have the vision.
Now we need you to help us …

- **Better engage with inventive & innovative companies—both big and small?**
- **Help to bring international technology to U.S. weapon systems?**
- **Better enable IRAD investment with Navy needs?**
- **Align internal processes to meet industry's needs?**

Questions?

www.onr.navy.mil