Naval Science & Technology in the Asia-Pacific OpTech-EAST

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ONR is part of the NR&DE, Providing Full-Spectrum RDT&E

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<th>RDT&amp;E Budget (6.1-6.7)</th>
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**Naval R&D Establishment**
(ONR, SYSCOMs and their Warfare Centers, PEOs)

**Office of Naval Research**

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ONR Global Mission

Discovering the Best Science
- Innovate fundamental research
- Help shape future U.S. Naval investments and strategies
- Engage global S&T talent through cooperation
- Support publication of S&T research

Enabling Global Technical Awareness
- Prevent technological surprise
- Fundamental research is universal
- Continued contributions to global technology awareness

Science & Technology Collaborations
- Advance mutually beneficial science
- Embed in Navy and Marine Corps staffs to connect the warfighter and the Naval Research Enterprise
- Develop and maintaining US Navy military to military research relationships

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Strategic Guidance is the Foundation for our Naval S&T

National & Naval Strategy/Direction

Warfare Enterprise’s S&T Objectives

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Warfighting Capabilities Enabled by S&T Investments

- Assure Access to Maritime Battlespace
- Autonomy & Unmanned Systems
- Electromagnetic Maneuver Warfare
- Expeditionary & Irregular Warfare
- Information Dominance/Cyber

- Platform Design & Survivability
- Power & Energy
- Strike & Integrated Defense
- Warfighter Performance

Portfolio is balanced across near, mid, and long term S&T investments

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Naval S&T Knowledge, Technology, Capability

1-2 years
Quick Reaction
& Other S&T ≈ 8%

Transportable Electronic Warfare Module (TEWMM) Upgrade

USSV Autonomous Operations

XFC UAV

Advance Aircraft Topcoats

GBAD OTM

Data Triage

SLQ-32

Mk18 Family of UUVs

Next Generation Countermeasures Technologies for Ship Missile Defense

Integrated Topside (InTop)

FEDECO

LDUUV INP

Embedded Humans

MURI: Optical Metamaterials

Graphene

ZRay Glider

Graphene

5-20 years
Discovery & Invention
(Basic & Applied Science) ≈ 45%

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S&T in the Asia-Pacific

- Challenging Aspects for S&T
  - Physical Environment
  - Distance
  - Crowded
  - Policy/Governance

- Emphasis areas for S&T
  - Dual-use technologies
  - ISR
  - Logistics
  - Full range of engagement
  - Experimentation, Demonstration, and Exercises
  - Technology Innovation Game (TIG)

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S&T Research Goals

- Develop lightweight, flexible and high-efficiency solar cells and modules which can be used for a terrestrial mobile power source by combining:
  - Flexible solar modules currently developed for satellite power, based on triple-junction solar cells using the inverted metamorphic (IMM) technology
  - Lightweight mobile solar panel for terrestrial use

- Specifically, develop and optimize the cell fabrication methods, including the selection and preparation of appropriate substrate materials

High-efficiency flexible solar cells and modules for terrestrial use

NICOP (S&T Grant)
New Start Oct 2015 - Japanese Industry

The lattice mismatch problem is solved by the buffer layer (left). When the Metalorganic Chemical Vapor Deposition (MOCVD) epitaxial growth is complete, the substrate is removed and replaced by a support substrate of desired mechanical properties.
Sample S&T Projects: PACFLT JCTD

- Maritime Domain Awareness Using Commercial Satellites: *Coalition Tactical Awareness and Response (CTAR)*
  - Provide rapid access to task and receive ad-hoc, unclassified, shareable, wide area, space based, routine Geospatial Intelligence (GEOINT) data to augment ISR needs in maritime domain.
  - Introduce new RADAR business model: save ~80% current costs
  - Unclassified and Shareable to support coalition operations and partnerships
  - Simultaneously augments and compliments National means

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Sample S&T Projects: Mil-Mil Research

• Multi-Hull Naval Ship Design with Japan
  • Improve USN and Japan MoD capabilities for design and performance assessment of multi-hull naval ships.
  • Improve the knowledge, design tools, and processes to support performance evaluation of current multi-hull ships, as well as development of future multi-hull ship concepts.

From Concepts…to Analysis…to Evaluation
• Continue to push boundaries of science and technology
• ONR Global’s unique structure and mission enable continued and enhanced collaboration across the Asia-Pacific region
• The development, testing, and transition of technologies to address unique challenges of the Asia-Pacific region continues to be a major focus
Questions?
Naval S&T Focus Areas

Assure Access to the Maritime Battlespace
- Ocean/Atmospheric Sciences
- Underwater Acoustics
- Ocean Sensing

Autonomy and Unmanned Systems
- Robotics
- Machine Learning
- Perception
- Human Machine Interface

Expeditionary and Irregular Warfare
- Situational Awareness
- Decision Making
- Mobility / Logistics
- Soldier Protection

Information Dominance / Cyber
- Communications / Information Technology
- Computer Science
- Mathematics / Data Analytics

Power Projection and Integrated Defense
- Directed Energy
- Energetic Materials

Platform Design and Survivability
- Air/Surface/Subsurface Vehicles
- Materials
- Corrosion / Biofouling
- Manufacturing Technologies

Power and Energy
- Renewable Energy
- Propulsion
- Power Control
- Thermal Management

Electromagnetic Maneuver Warfare
- EM Propagation & Waveforms
- Sensors and Electronics
- Optical Systems

Warfighter Performance
- Biomedical / Bioengineering
- Cognitive / Neural Sciences
- Training Technologies
- Health Protection

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