
ONR
Revolutionary Research . . . Relevant Results
Sharpening the Edge
Serving the Next Generation Warfighter . . . Now
Navy Energy Forum
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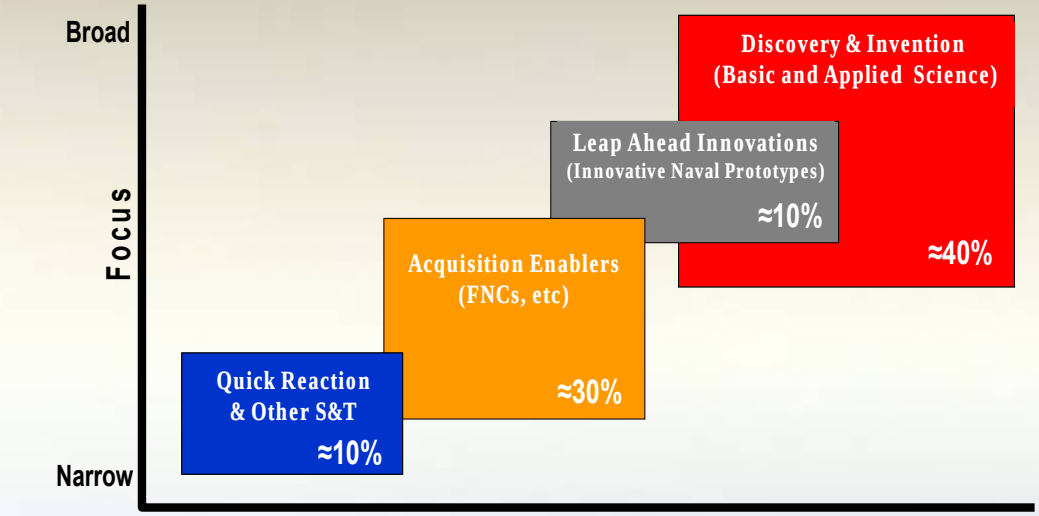
Chief of Naval Research
Presented by
Dr. John Pazik, Director
Ship System & Engineering Research Division
Office of Naval Research
OFFICE OF NAVAL RESEARCH

Naval S&T Strategic Plan

Revolutionary Research . . . Relevant Results



Focus Areas

- Power and Energy
- Operational Environments
- Maritime Domain Awareness
- Asymmetric & Irregular Warfare
- Information Superiority and Communication
- Power Projection
- Assure Access and Hold at Risk
- Distributed Operations
- Naval Warfighter Performance
- Survivability and Self-Defense
- Platform Mobility
- Fleet/Force Sustainment
- Total Ownership Cost

Solid State Lights for Submarines

Advanced Materials

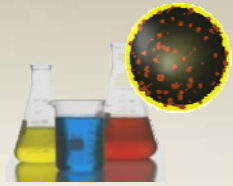
EMRG

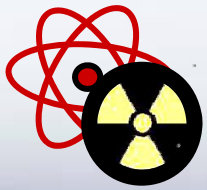
D&I

Power & Energy Technologies

Revolutionary Research . . . Relevant Results

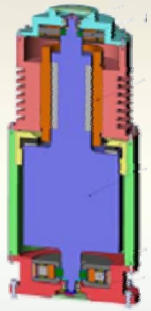
Fuel	Power Generation	Energy Storage	Distribution & Control	Power Loads
Fuels Chemistry	"Ion Tiger" UAV Fuel Cell	Batteries	Electrical Architectures & Pulse Forming Networks	Electric Weapons
Alternative Fuels	Fuel Cells	Flywheels	High Voltage Silicon Carbide (SiC) Switches	Powering & Resistance
Nuclear	Aircraft Engines	Capacitors		UV Sensor Loads
	Gas Turbine Generators			Reconfigurable Blades / Blade Loading

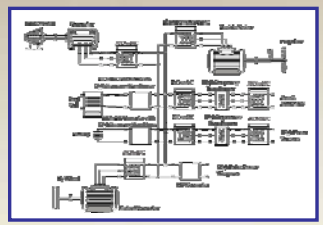
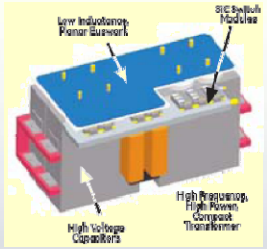












S&T Energy Investments

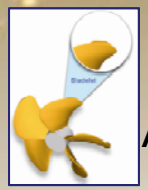
Revolutionary Research . . . Relevant Results

Power Loads

Solid State Lighting

Advanced Sensors

Coatings & Cleaning



Advanced Propellers

Electric Weapons

Distribution and Control

SiC Devices

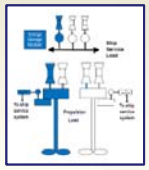
Bi Directional Power Converters

Power Management Controllers

Medium Voltage Direct Current Architecture

HTS Power Transmission Cables

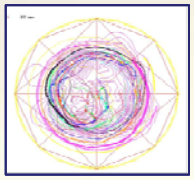
Energy Storage



Hybrid Electric Drive

High Density Energy Storage Advanced Batteries

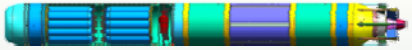
Antimatter/ Particle Storage



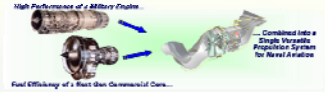
Power Generation

UAV Fuel Cells

Mobile Power Fuel Cells

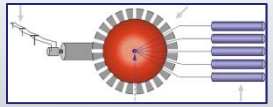


UUV Power



Variable Cycle Advanced Technology (VCAT)

Fuel



Laser Fusion

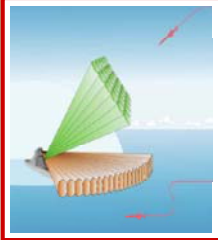
Near **Far**

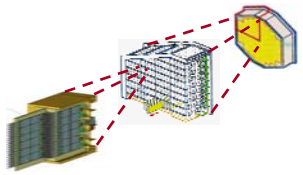
Advanced Electric Warship
Next Generation Integrated Power System (NGIPS)

Revolutionary Research . . . Relevant Results

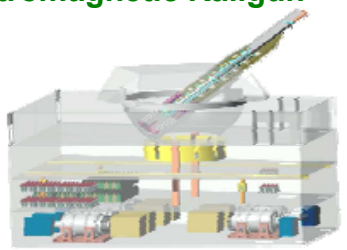
Laser Self-Defense System

High Power Radar

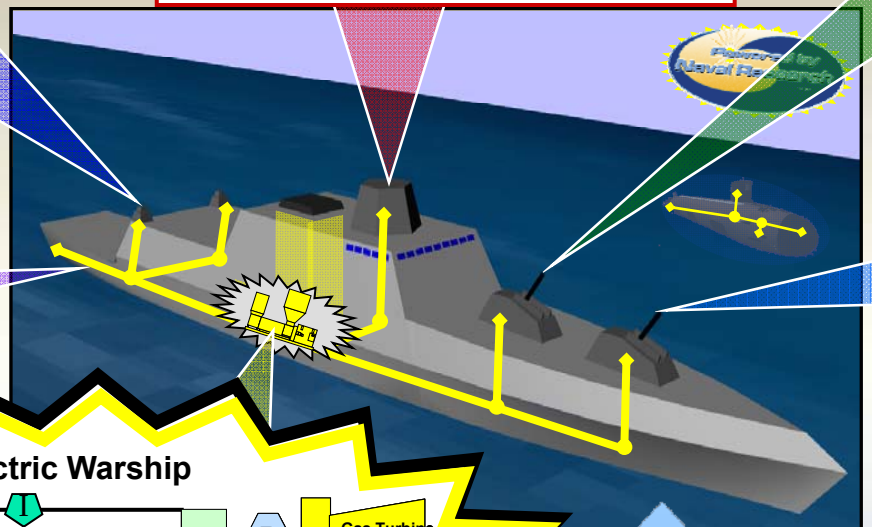




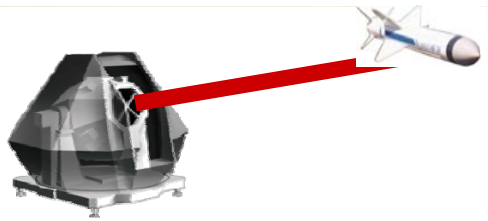
Electromagnetic Railgun



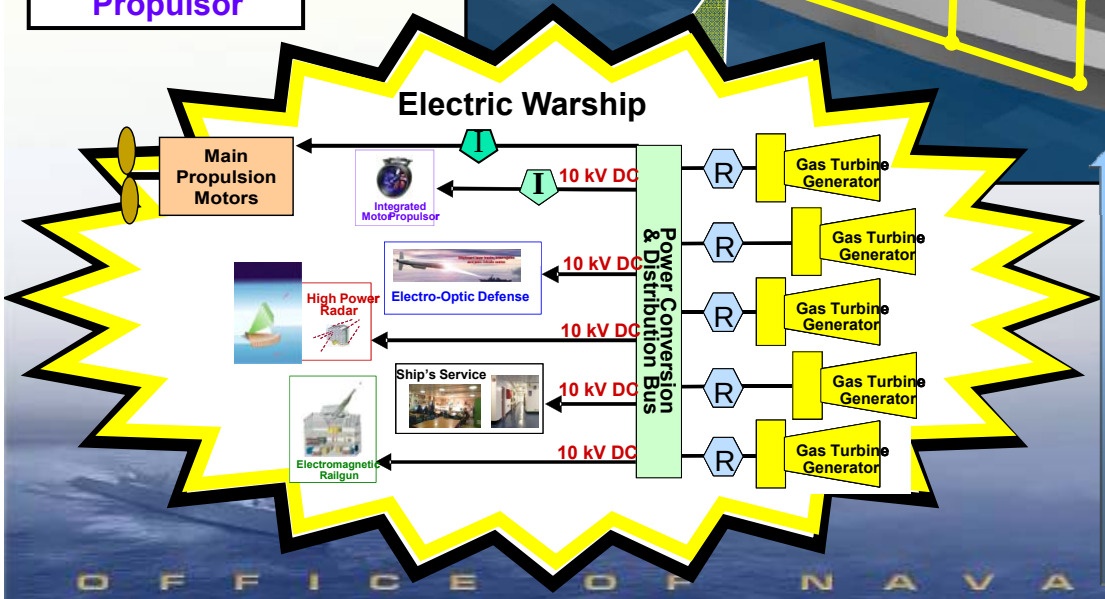
Integrated Motor Propulsor

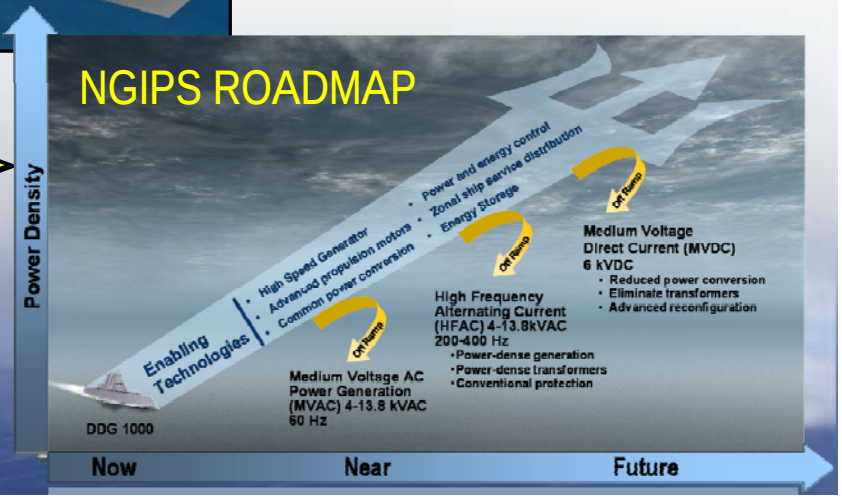


Free Electron Laser System



Electric Warship





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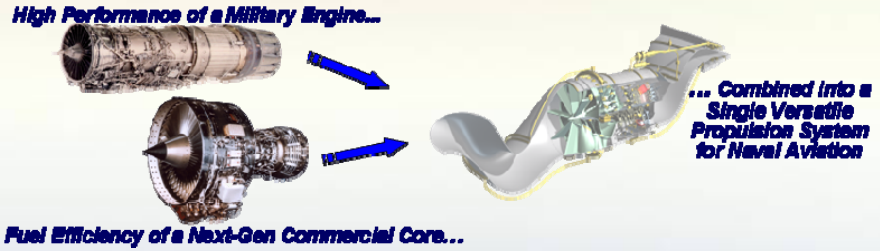
Advanced Aerospace Propulsion Science and Technology

Develop and transition advanced airbreathing propulsion technology to the Navy and Marine Corp Air Warfighter

- **Engine materials, coatings and processing techniques**
- **Critical propulsion system component technologies**
- **Modeling and Simulation**
- **Propulsion Health Management**



Payoffs:

Reduced fuel consumption

Lower life cycle costs

Higher performance and increased durability

Improved environmental compliance

Additional Slides

Expeditionary Portable Power

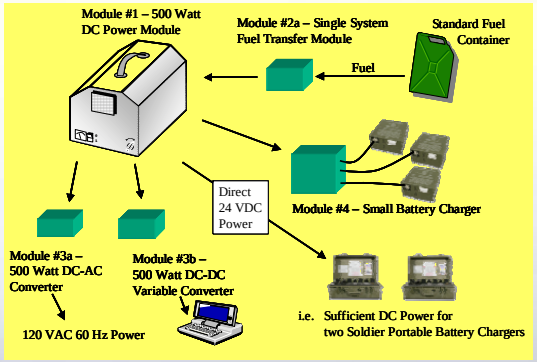
Solid Oxide Fuel Cell for Tactical Vehicle APU and Towable Generator

Efficient, low emission, and low signature

Solid Oxide Fuel Cell

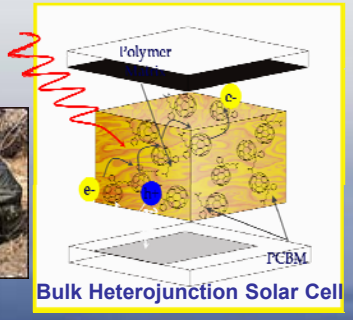
Vehicle Based

Towable Power



GREENS – Ground Renewable Expeditionary Energy System

Man-Portable Power Generation



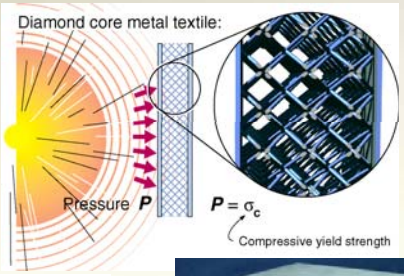
Bulk Heterojunction Solar Cell

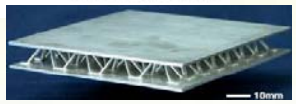
Synergy: Energy Efficiency & Affordability

- ***Anti-Biofouling Coatings & Hull Husbandry***
- ***Lightweight Structural Materials***
- ***HTS Degaussing Cable***
- ***Turbine Engine Materials Systems***
- ***Corrosion Prevention and Mitigation***
- ***Advanced Shipboard Water Desalination***
- ***Nano-Ceramic Coatings for Life-of-System Wear Surfaces***

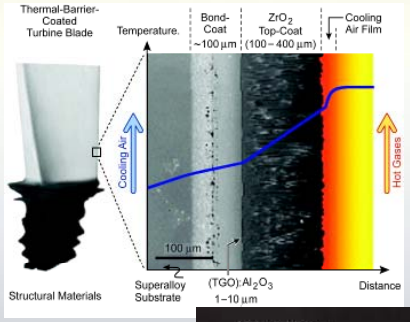
Hull Bug

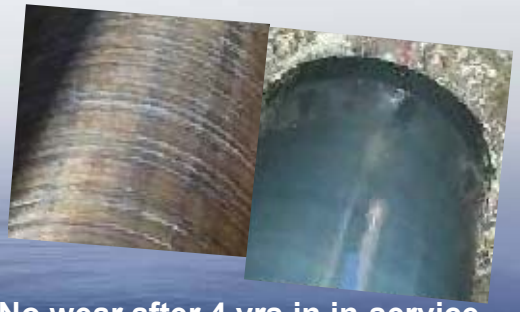
HTS Degaussing Cable



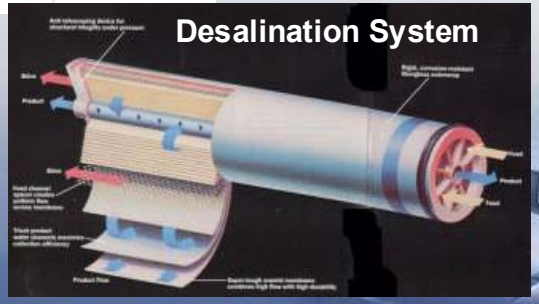


Al-alloy formed pyramidal core





No wear after 4 yrs in in-service

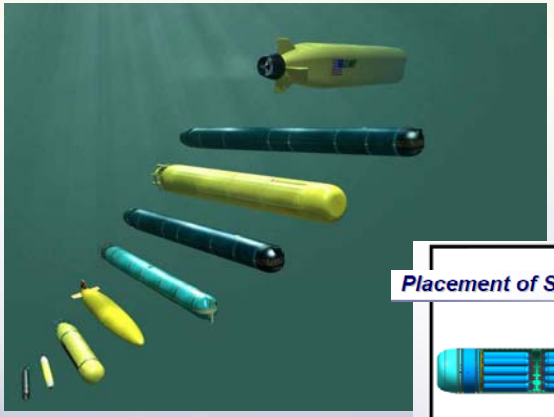


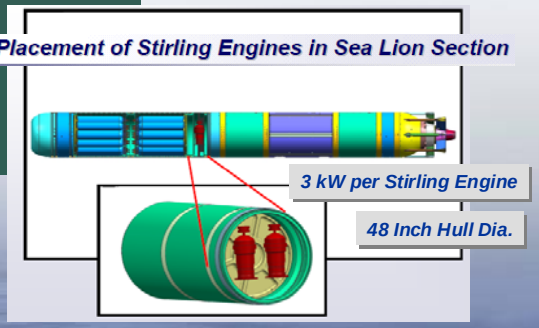
Desalination System

Unmanned Systems Power

Unmanned Air Vehicle Power

- **Long endurance fuel cell power** (26hr flight Nov 2009)
- **Low noise & heat signature**
- **Affordable**





Unmanned Undersea Vehicle Power

- **Lithium-ion battery safety**
- **Long endurance , air independent power systems**