Future Technologies

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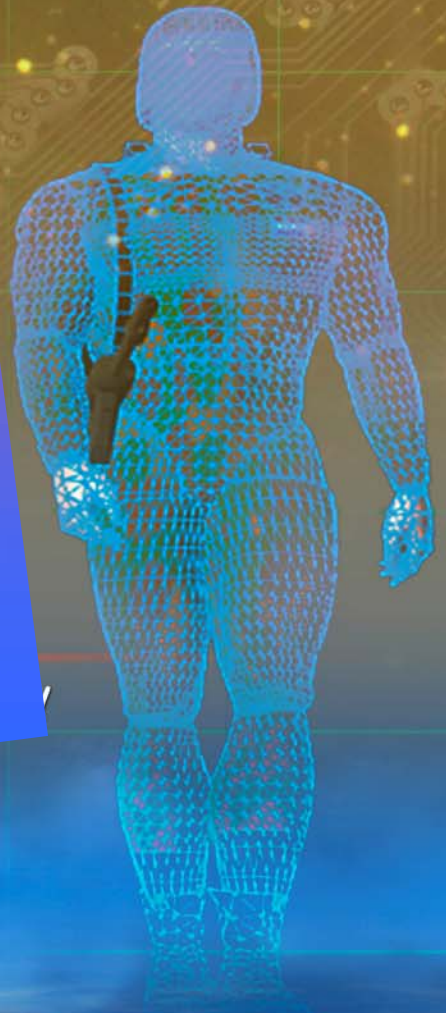

Revolutionary Research . . . Relevant Results

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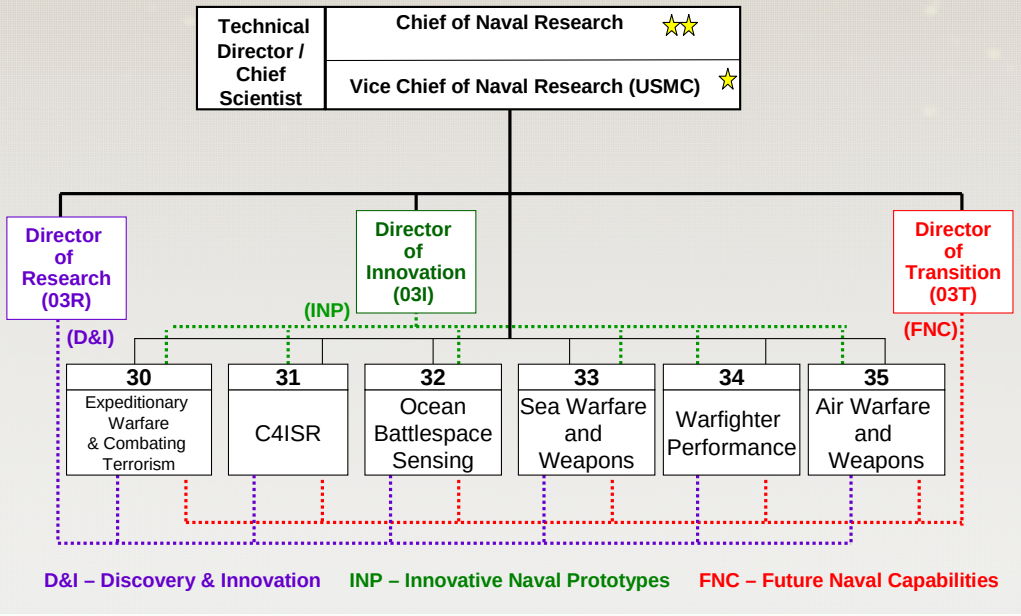
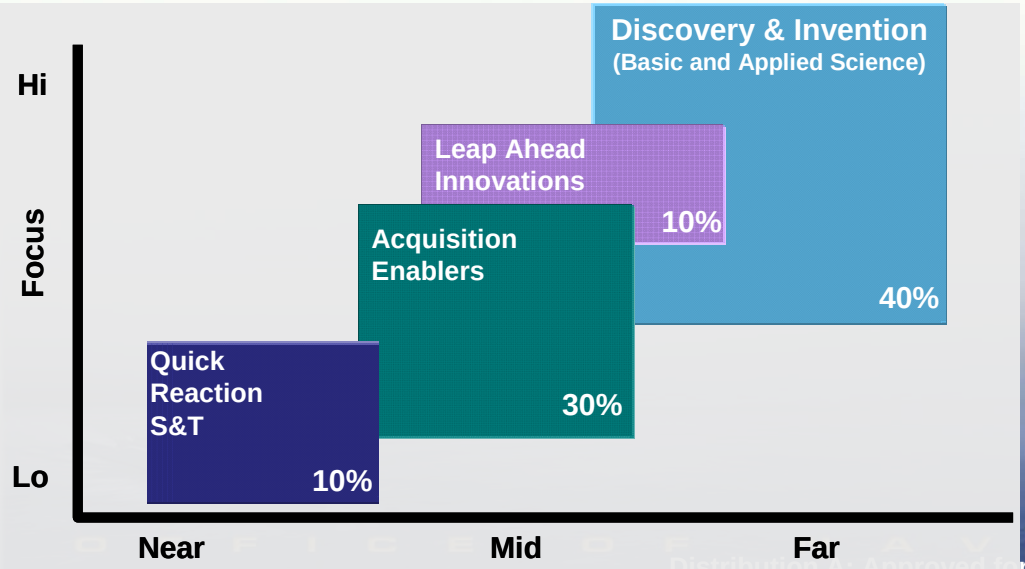
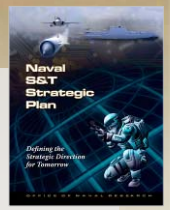
Revolutionary Research . . . Relevant Results





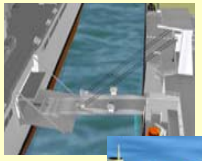


Naval S&T Focus Areas

- Power and Energy
- Operational Environments
- Maritime Domain Awareness
- Asymmetric and 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

A Revolution in Platform Capability

Revolutionary Research . . . Relevant Results



Ship-to-Ship Transfer & Material Handling

Structures & Affordability

Next Generation Integrated Power Systems

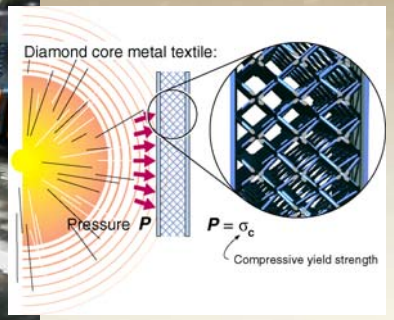
INtegrated TOPside

Launch and Recovery of Unmanned Vehicles

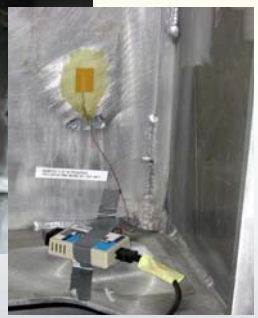
Fighting at the Speed of Light

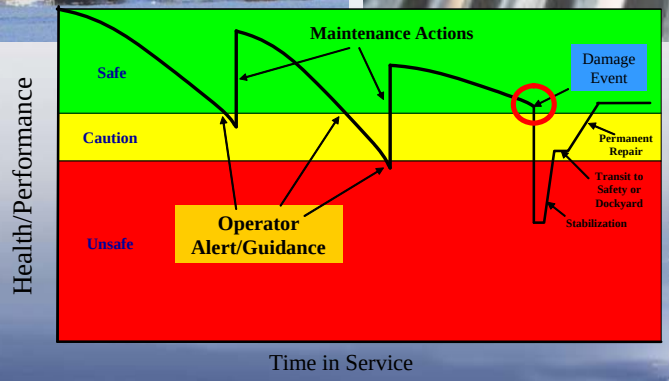
Structures & Affordability

- **Low Cost, High-Strength Materials & Processes**
  - **HSLA-65 Steel, Titanium, Marine-grade 10% Nickel Steel, Friction Stir Welding**



- **Hull Structural Health Monitoring**
  - **Aluminum, Composites, Unconventional Hullforms**
  - **Real-Time Feedback/ Monitoring, Service Life Prognoses**



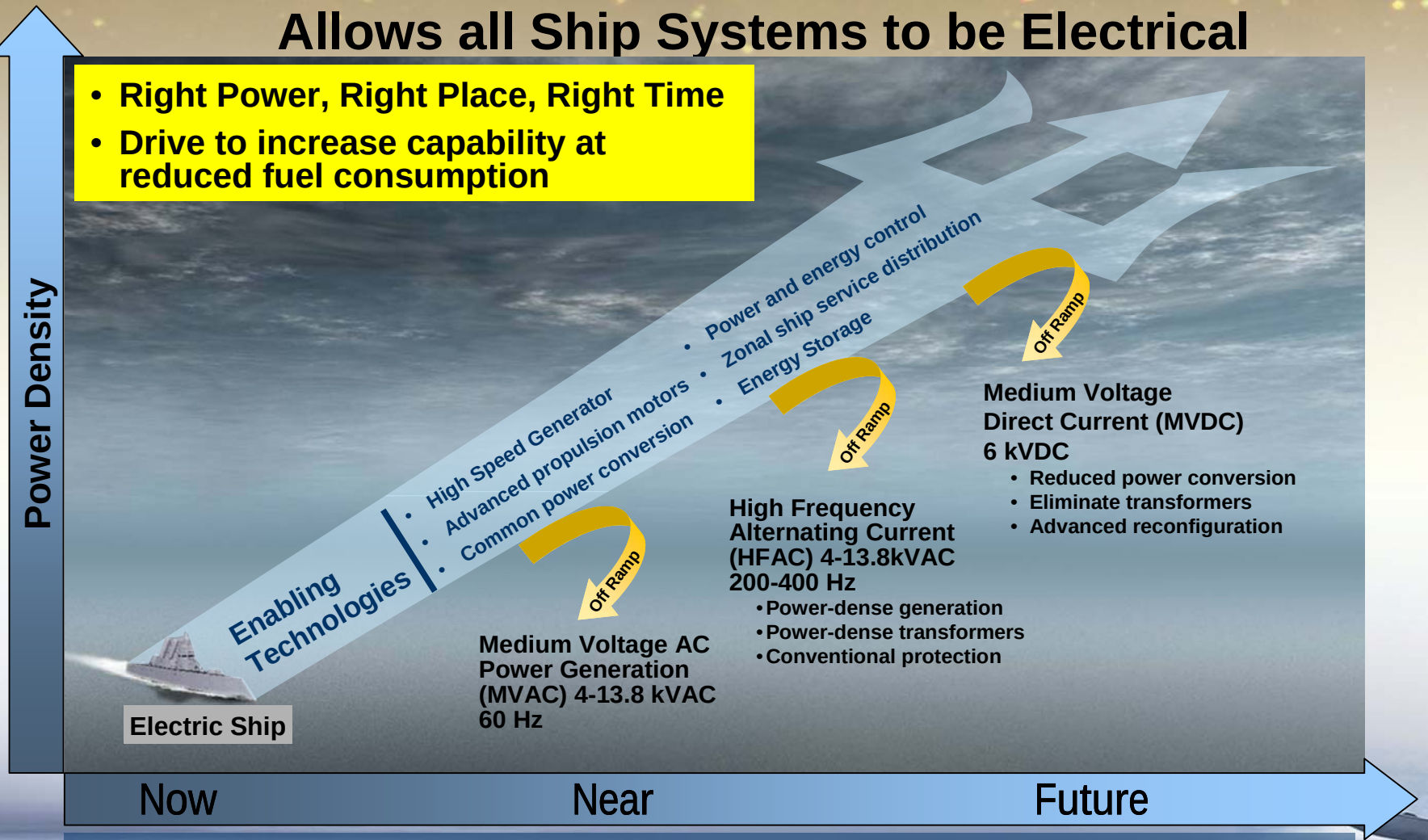


Next Generation Integrated Power Systems

Revolutionary Research . . . Relevant Results

Allows all Ship Systems to be Electrical

- **Right Power, Right Place, Right Time**
- **Drive to increase capability at reduced fuel consumption**

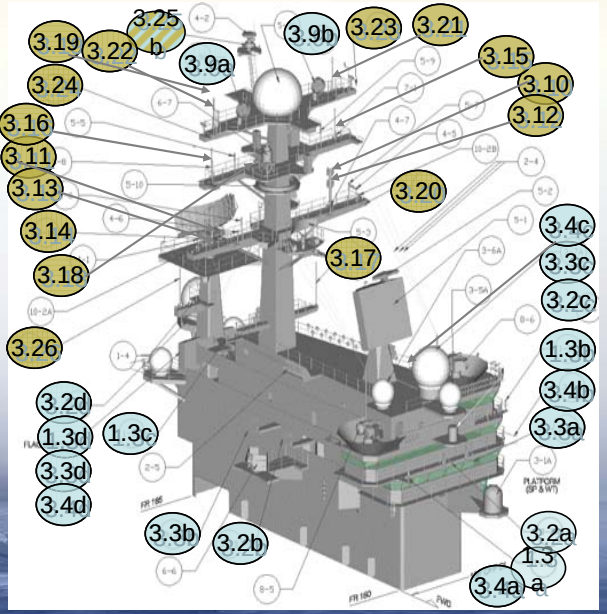


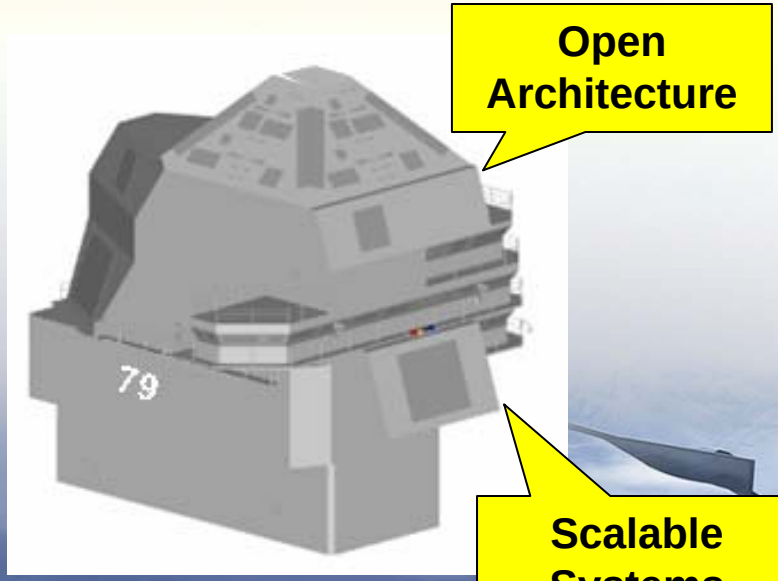
"Directing the Future of Ship's Power"

INtegrated TOPside

INTOP is a…

- Multi-function, multi-beam aperture that radically reduces the number of antennas required
- Scalable family of EW, RADAR (not high power) & communications capability to support multiple classes of ships
- Modular / open RF design (apertures and electronics) to facilitate best of breed technology and cost effective upgrades





Fighting at the Speed of Light & Hypervelocity

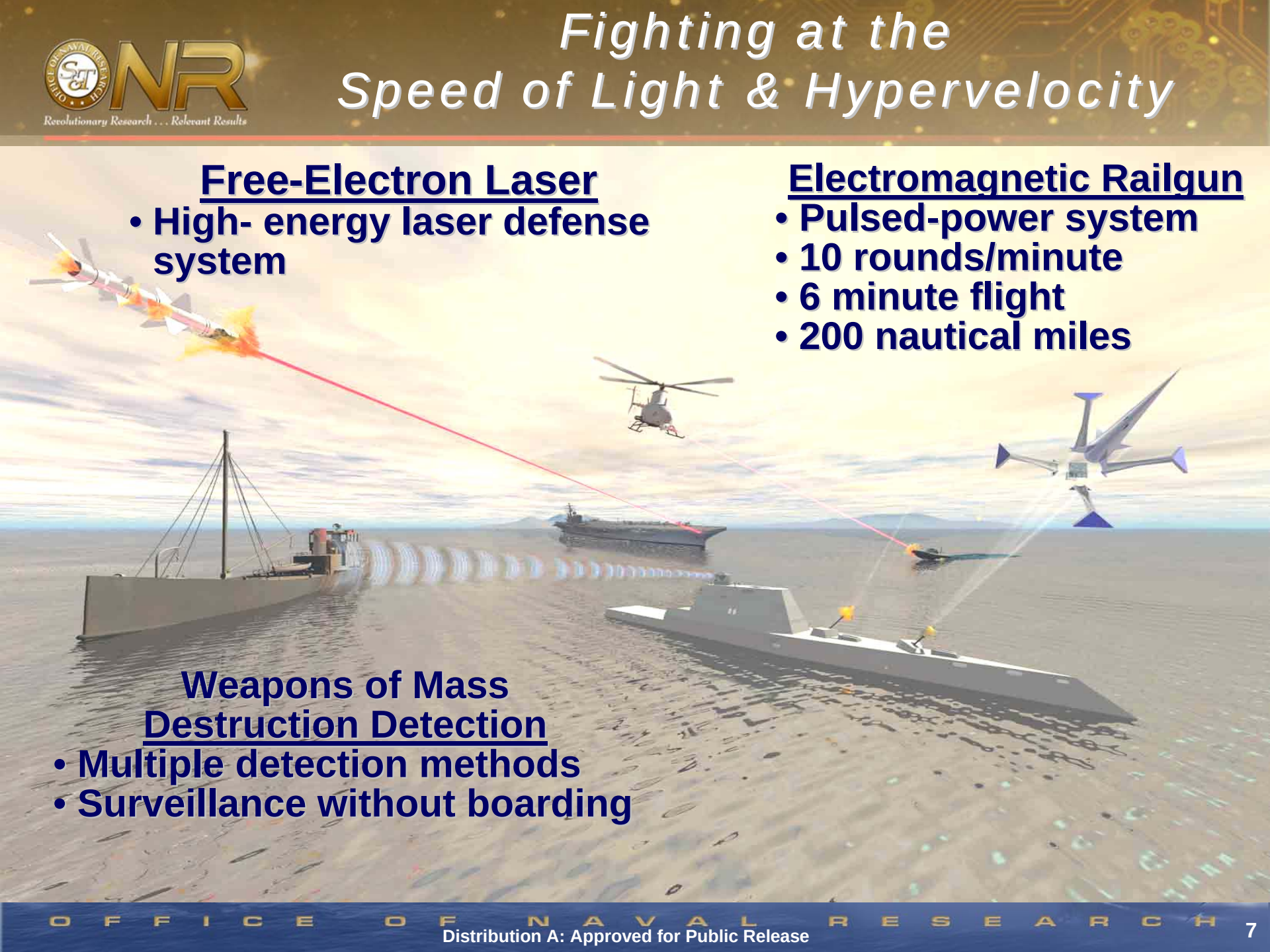
Revolutionary Research . . . Relevant Results

Free-Electron Laser

- High- energy laser defense system

Electromagnetic Railgun

- Pulsed-power system
- 10 rounds/minute
- 6 minute flight
- 200 nautical miles



Weapons of Mass Destruction Detection

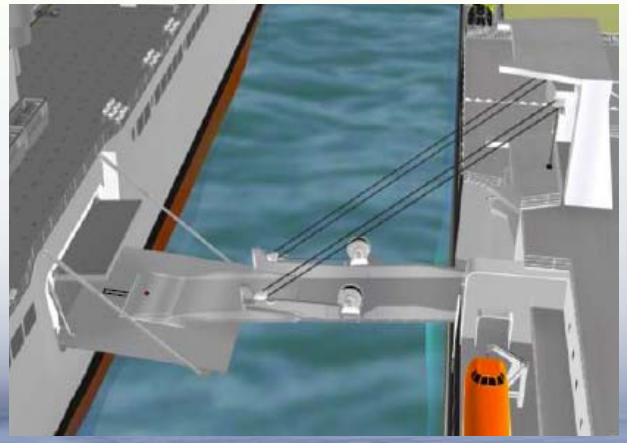
- Multiple detection methods
- Surveillance without boarding

Ship-to-Ship Transfer & Material Handling

Flexible, responsive afloat warehousing technology

- Enables improved ship-to-ship logistics
- Improves sustainment of assembled Naval forces
- Reduces response times to humanitarian mission requirements

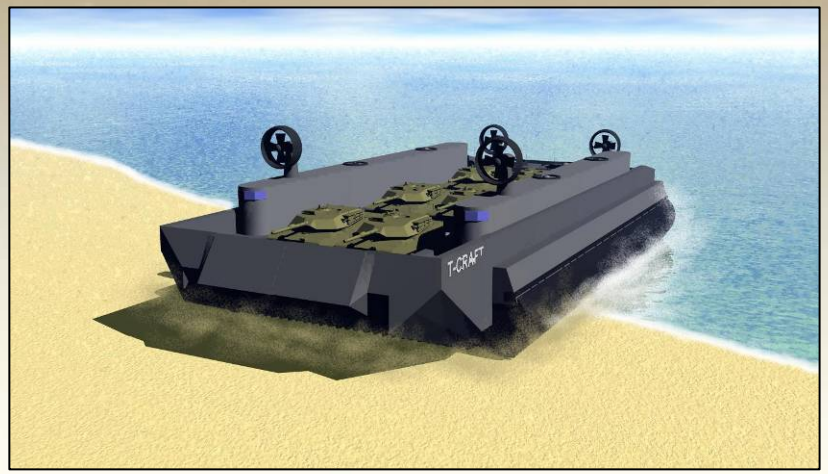
Interface Ramp Technologies

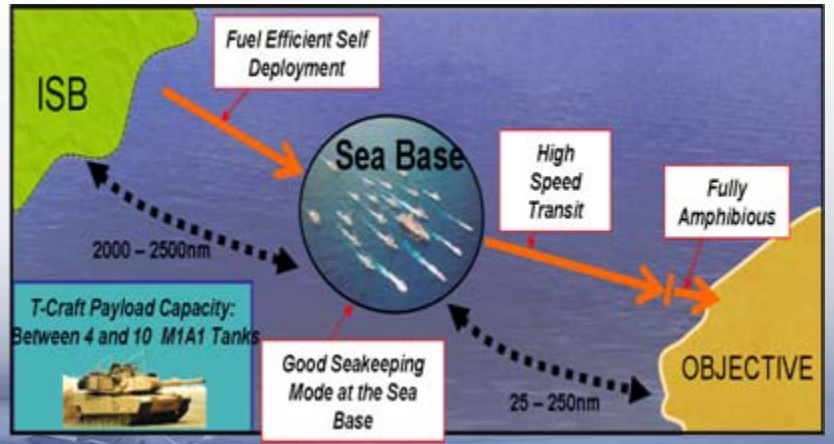


Large Vessel Interface Crane Technology

High Rate Vertical/Horizontal Material Movement

T-Craft Challenges





Problem:

Current Navy surface connectors have to be carried into theater within the well decks of our Amphibious ships. These Amphibious connectors carry small payloads over small distances and can only operate in low sea states.

Challenges:

- Self deploying over a long distance in high sea state unloaded
- Significantly higher payloads (4 to 10 times)
- Fully loaded unrefueled range >500nm at 40kts
- Cargo Transfer at the Sea Base in high sea states
- The ability to traverse sand bars and mud flats
- Fully amphibious landing capability

Technical barriers:

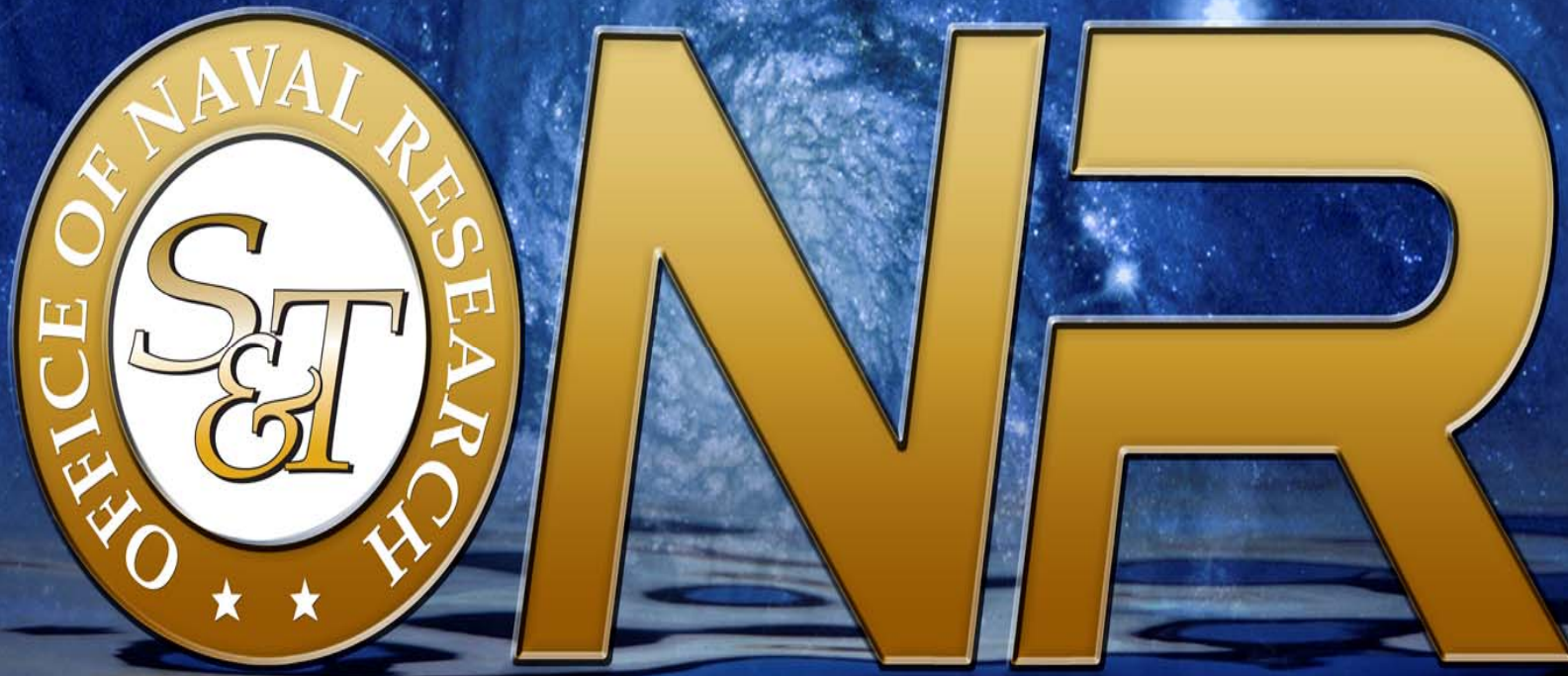
- Transition of Propulsion systems from in-water to out-of-water
- Variable/retractable skirt geometry
- High strength, lightweight, long-wear materials
- Active ride control systems
- Human system integration
- Vehicle transfer at the sea base
- Complexity of mechanical drive system
- Hybrid electric drive options
- Light weight structural materials

Launch and Recovery of Unmanned Vehicles

Revolutionary Research . . . Relevant Results

High-level Autonomy

- Dynamic mission planning/re-planning
- Advanced perception, vision-guided maneuvers
  - Obstacle avoidance
  - High Sea State Launch/Recovery



Revolutionary Research . . . Relevant Results