The Office of Naval Research
The S&T Provider for the Navy and Marine Corps

- 4,000+ People
- 23 Locations
- $2.1B / year
- >1,000 Partners

Discover
Develop
Deliver
Technological Advantage

Distribution Statement A: Approved for public release
Enhancing the CNO’s Strategic Vision

- Strengthen Naval Power at and from Sea
- Achieve High Velocity Learning at Every Level
- Strengthen our Navy Team for Future
- Expand and Strengthen Partner Networks

Distribution Statement A: Approved for public release
Warfighting Capabilities Enabled by S&T Investments

CNR’s S&T Investment Priorities

- Directed Energy/Electric Weaponry
- Cyber
- Electromagnetic Maneuver Warfare
- UxS Maneuver Warfare
- Synthetic Biology/Bio-Inspired Technologies

Discovery & Invention
(Basic and Applied Science)

- Technology Push
  (Leap Aheads, Innovative Naval Prototypes)
  ≈ 12%
- Technology Pull
  (FNCs, ManTech, TechSolutions)
  ≈ 30%
- Quick Reaction S&T
  (SwampWorks, Experimentation)
  ≈ 8%
- 1-2 years
- 2-4 years
- 4-8 years
- 5-20 years

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

Distribution Statement A: Approved for public release
CNR & VCNR are both dual-hatted; CNR Reports to ASN(RD&A) & CNO
The nine S&T Focus Areas cut across all departments

The two Directorates manage cross-cutting programs

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Partnering with the Best Performers

Key Criteria:
- Technical Quality
- Relevance / Responsiveness
- Cost & Affordability

Driving Innovation and Fostering Partnerships
ONR is part of the NR&DE, Providing Full-Spectrum RDT&E

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**Naval R&D Establishment**
(ONR, SYSCOMs and their Warfare Centers, PEOs)

**Office of Naval Research**
Future Naval Capability (FNC) Program

A collaborative Naval process involving the S&T, Acquisition, Resource Sponsor (RS), and Fleet and Force communities which:

• Responds to Navy / Marine Corps requirements (Technology Gaps)

• Matures technology from proof of concept (Technology Readiness Level (TRL) 3), to a prototype tested in a relevant environment (TRL 6) within 5 years

• Transitions S&T solutions to Acquisition Programs of Record (PORs) for deployment to the Fleet and Force

Goal: Effectively deliver new capabilities to the warfighter
Example FNC
Advanced Material Propeller

Leverages Basic Research (6.1 / 6.2)
- Cavitation Erosion-Resistant Coating & Matrix Materials
- Hydro-Elasticity Effects of Composite Materials
- Large-Eddy Simulation of Crashback Loads

FNC Product (6.2 / 6.3)
- Pitch-adapting Composite Submarine Propeller for:
  - Enhanced Performance
  - Reduced Weight
  - Less Maintenance
  - Reduced Acquisition & Life Cycle Costs

Delivers to Acquisition POR (6.4 / 6.5)
- Advanced Submarine Systems Development
- Next Generation Submarines

- Carbon Fiber Composite Prop
- Individual Blade-Hub Connection

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Innovative Naval Prototypes

**EMRG**
A high-power, kinetic-energy weapon capable of launching precision guided projectiles using electricity instead of chemical propellants. Fabrication in process for first of four full-scale Railgun launcher prototypes and power hardware to support repetition-rate and bore life objectives.

**SSL**

**Claws**
Develop and demonstrate a new class of payloads, delivered and deployed from LDUUV. Focus is new autonomy for operations near the surface, avoiding surface obstacles and threats, and in deploying payloads that will act as a significant force multiplier. Will develop C4I and IA necessary for precision delivery of payloads in potentially contested waters and A2/AD environments.

**HIJENKS**
In a joint USAF/USN program using HPRF, develop a payload integrated on an air platform capable of engaging multiple electronic targets with a single scalable effects weapon, from outside of excessive standoff ranges across a variety of warfighting missions.

**TPCP**
Delivers cybersecurity S&T tools for protecting Naval platforms across surface, ground, subsurface and air domains from today and tomorrow’s cyber threats.

**EMC²**
Enables a strike group to work cooperatively in the EM Spectrum to optimize EW, IO, Comms, and Radar performance to achieve Commander’s intent to a set of priorities. Preliminary work has begun to look at how to translate Commander’s intent to a set of priorities.

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Railgun is a high-power, kinetic energy weapon capable of launching precision guided projectiles using electricity instead of chemical propellants. Magnetic fields created by high electrical currents accelerate a sliding metal conductor, or armature, between two rails to launch projectiles to velocities up to Mach 6 at muzzle exit.


Phase II (2012-2019): Goal is to advance technology for transition to an acquisition program. Technology efforts will concentrate on demonstrating launcher and pulsed power system capable of 10-rounds-per-minute firing rate including thermal management techniques required for sustained firing rates.

- Railgun INP will deliver a 32MJ barrel and power system capable of high firing rate operations.
- HVP FNC will deliver an NSFS round for conventional Mk 45 gun systems
- Both will contribute to the development of a 32MJ railgun weapon system firing guided projectiles 100+ NM with a multi-mission capability:
  - Naval surface fire support or land strike
  - Ship defense
  - Anti-air and anti-surface warfare

When combined with Hyper Velocity Projectile, Railgun will transform the capabilities of the warfighter.
Innovative Naval Prototypes

Provides affordable architectures, standards and technology for wide-band, multi-beam, multi-function RF systems capable of supporting all warfare areas simultaneously by implementing priorities in order to meet the commander’s intent.

Coordination and synchronization of EW techniques and systems across a variety of distributed EW platforms, both above and below the surface. Elements of mission planning command and control infrastructure will be demonstrated during Trident Warrior’16.

Effort to increase capacity of ISR by using large UUVs capable of 1,000+ nm and 70+ day endurance launched from piers and large amphibious ships.

Sensor suite and software package suitable for installing and integration into an existing USMC rotary wing aircraft to enable optionally unmanned autonomous flight. A UH-1 is being modified to facilitate future technology maturation and capability expansion and demonstrate optional unmanned aircraft capabilities in support of an Assault Support Mission.

Provides an expeditionary infrastructure for undersea energy and information distribution. Scalable game-changing capability that will provide composable and relocatable resources for undersea warfare.

Develop and deliver DC3 autonomy science and architecture, C2 architecture, and a series of modular payloads to provide a robust, scalable, flexible, multi-functioned swarming UAV system providing cross-domain capability. Employable from surface, sub-surface, airborne, and ground manned and other unmanned systems.

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Large Displacement Unmanned Undersea Vehicle

Characteristics:
• Long endurance (60+ days)
• Autonomous over horizon ops
• Multi-Mission Capability
• Open Architecture
Demonstrate multi-mission versatility of MDUSV using MIW, ASW and EW payloads. Identify key interface requirements for future payloads and assess the autonomy performance with EO/IR components.

Develop the ability for a UUV to autonomously conduct ASW missions using two sensor types.

Develop novel, air-independent, UUV energy system technology to meet the Navy’s increasing energy endurance needs. Seeking a 2X-3X+ increase in energy density over current state of art battery technology.

Develop and demonstrate highly autonomous, multi-USV operations for offensive and defensive missions, using small inexpensive USVs. Demonstrate and assess operational utility and develop CONOPs, and demonstrate autonomous control performance to generate human operator trust.

Demonstrate multi-mission versatility of Sea Hunter using MIW, ASW and EW payloads. Identify key interface requirements for future payloads and assess the autonomy performance with EO/IR components.

Demonstrate Air Vehicle technologies enabling long range sustained air presence at medium altitudes with vehicles operable from small decks. Enable persistent ISR, BLOS comms to enable long range weapons & operations.

Develop non-GPS dependent precision ship-relative navigation (PS-RN) technologies for automated ship landings, suitable for use in degraded weather and EMCON Alpha. Enable robust, routine UAV operations from Navy air capable ships in expanded conditions.

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Sea Hunter

Characteristics:
- Ocean-Spanning Range
- Autonomous Control
- Multi-Mission Capability
- Large Payload Capacity
Basic Research: From Test Tubes to Launch Tubes

- Advanced Materials
- Algorithmic Phenomenology
- Synthetic Biology

Enabling the Future Generation of Warfighting Capabilities
Co-located with other Service S&T components

- London (USA/USAF)
- Tokyo (USA/USAF)
- Santiago (USA/USAF)
- Singapore (USA)
- Sao Paulo (USA)

ONR’s Global Offices are the Bridge to International Partnership;
S&T Diplomacy in More than 60 Countries
“Technology Locator”

“Contracts and Grants”