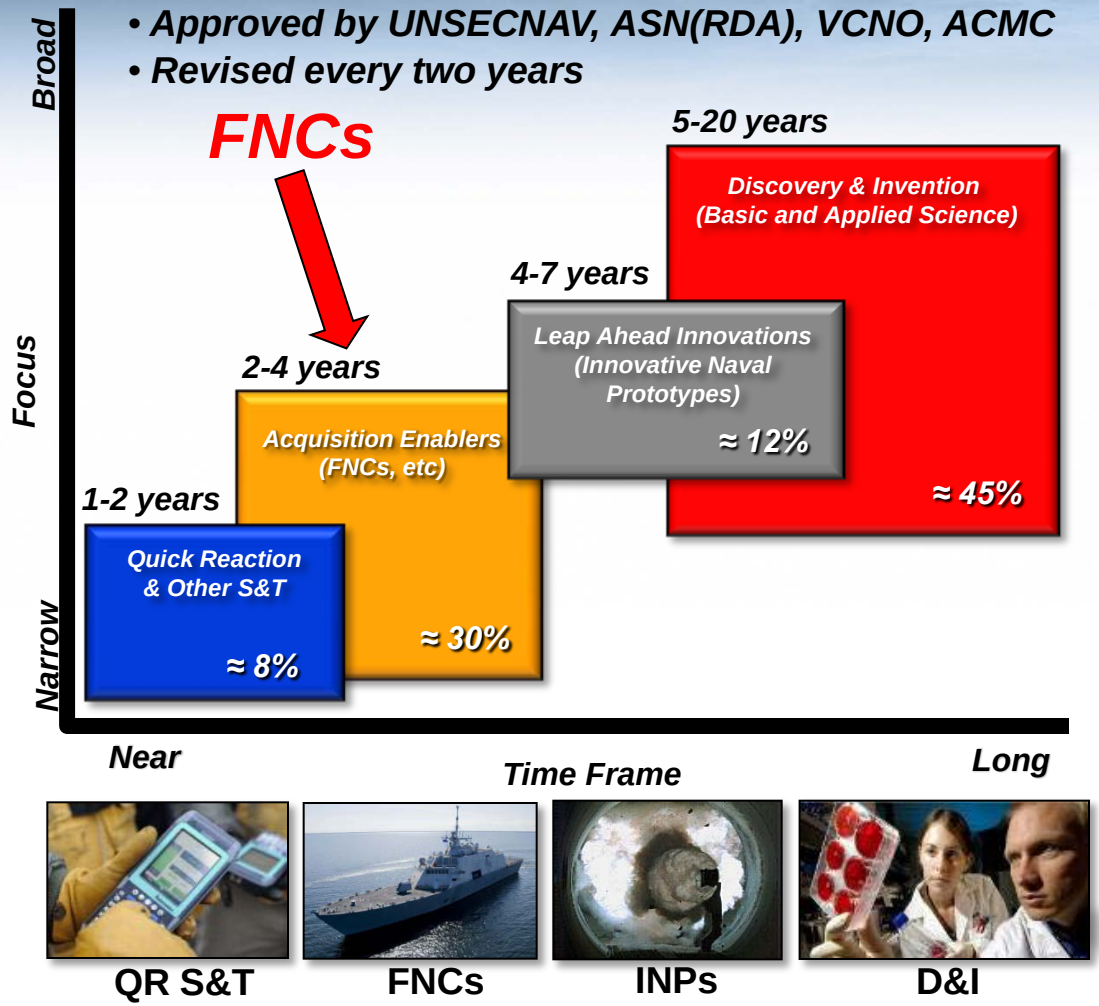
Future Naval Capabilities

NDIA 15th Annual Science and Engineering Technology Conference
College Park, MD
April 9, 2014

Dr. Thomas Killion
Director of Technology

Naval S&T Strategic Plan

- *Approved by UNSECNAV, ASN(RDA), VCNO, ACMC*
- *Revised every two years*



QR S&T

FNCs

INPs

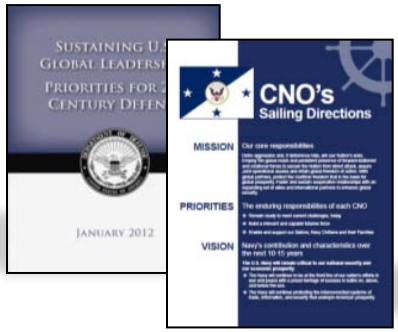
D&I

S&T Focus Areas:

A2/AD

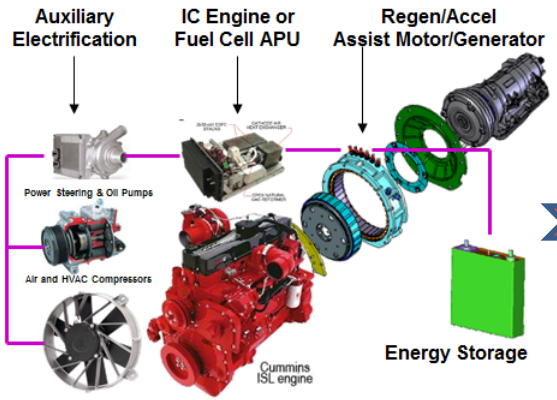
- *Autonomy & Unmanned Systems*
- *Assure Access to Maritime Battlespace*
- *Information Dominance*
- *Expeditionary & Irregular Warfare*
- *Power Projection & Integrated Defense*
- *Platform Design & Survivability*
- *Power & Energy*
- *Warfighter Performance*
- *Total Ownership Cost*

- *STEM*
- *CNO's Quick Reaction Efforts (S2F/CRIC)*



FNCs Leverage Basic Research to Deliver Mature Products to PORs

Basic/Applied Research Leveraged	FNC Product	Acquisition POR
• Advanced Fuel Efficient Engine and Idle Reduction Technologies • Electrification and Variable Output Control of Mechanical Auxiliaries • Electric Drive with Regenerative Braking	• Reduces TOC of MTVR through fuel efficiency improvements • At least 15% fuel efficiency improvement in the deployed MTVR	• Transitions to PEO Land Systems • PM Medium & Heavy Tactical Vehicles



Fuel Efficient Medium Tactical Vehicle Replacement (MTVR)

FNC Oversight Structure

Technology Oversight Group (TOG) & Pillar IPTs

- **Co-Chairs: N8 / MCCDC** ★★★
- **Other Voting Members: PMD ASN (RDA), DCOM USFF, CNR**
- **Equity Members: N1, N4, N093, N2/N6, N9, MARFORCOM, Deputy CNOs and Deputy Commandants**

N84 – Executive Secretary

TOG

TOG Working Group

- 0-6/GS-15 Level Representatives of Each TOG Member
- Interacts with IPTs and makes recommendations to TOG

FNC IPTs

Sea Shield	Sea Strike	Naval Expeditionary Maneuver Warfare	Sea Basing	Power & Energy
• OPNAV N96/N97	• OPNAV N98/N97	• OPNAV N95	• OPNAV N95	• OPNAV N45
• MCCDC	• HQMC Aviation	• HQMC PP&O	• Dep.CG MCCDC	• USMC HQ E20
• USFF N87	• USFF N88	• USFF N85	• USFF N85	• USFF N88
• PEO LCS	• PEO U&W	• MCSC	• PEO Ships	• NAVSEA 05
• ONR 32	• ONR 35	• ONR 30	• ONR 33	• ONR 33

FORCEnet	Enterprise & Platform Enablers	Force Health Protection	Capable Manpower
• OPNAV N2/N6F	• OPNAV 9I	• OPNAV N0931	• N15
• Dir HQMC C4	• HQMC I&L	• TMO, USMC	• USMC Training/Ed.
• FLTCYBERCOM	• USFF N88	• FFC N02H	• USFF N1D
• SPAWAR 07	• NAVSEA 05	• CDR, NMRDC	• NAVAIR HSD
• ONR 31	• ONR 33	• ONR 34	• ONR 34

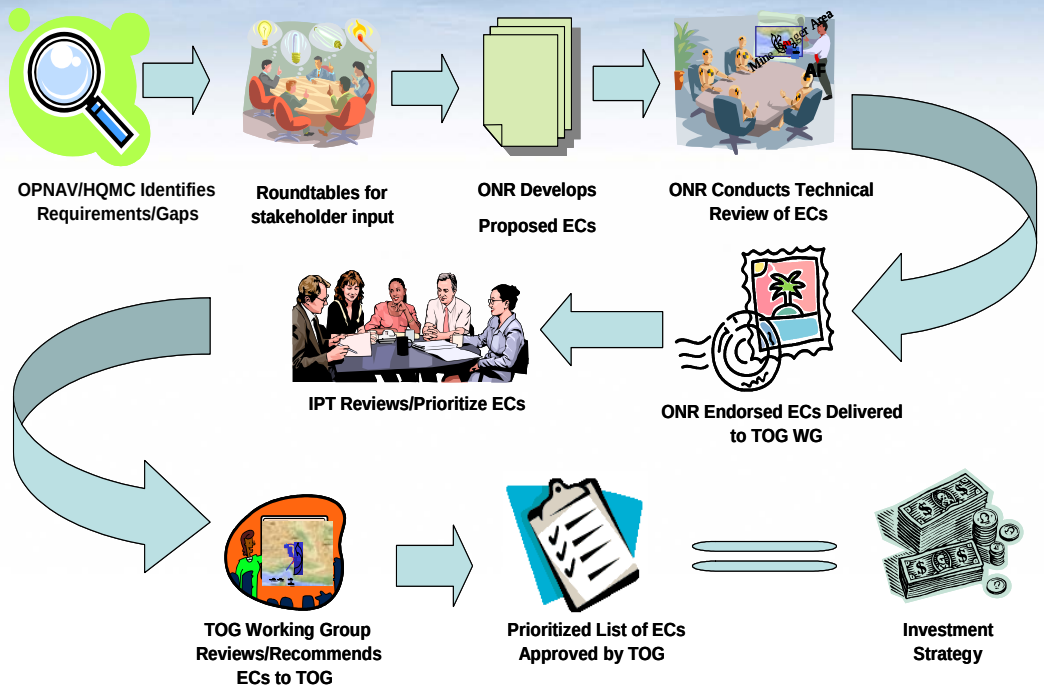
FNC Program Process

Objective/Goal:

•The FNC program is composed of Enabling Capabilities (ECs) that develop and deliver quantifiable products in response to validated requirements (Naval S&T Gaps) for insertion into acquisition programs of record after meeting agreed upon exit criteria within five years.

Typical Performers:

- ***DoD Labs/Warfare Centers***
- ***Industry***



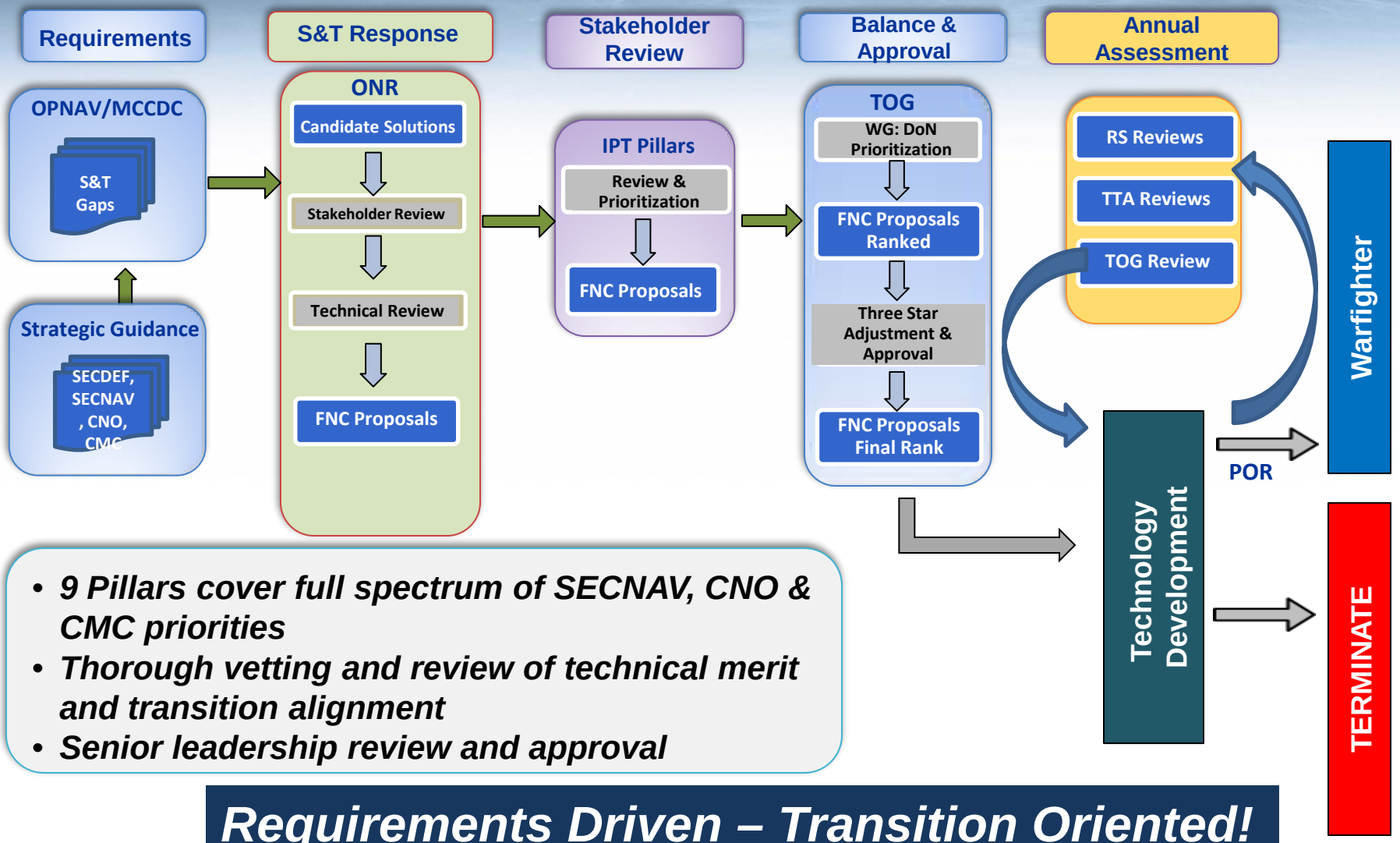
FNC Annual Cycle

Basic Process:

•FNC investments are refreshed by an established process that begins when the TOG approves the annual Naval Capability Gaps

•The ECs that do get funded represent the highest priorities of the Navy and Marine Corps

FNC Management Process

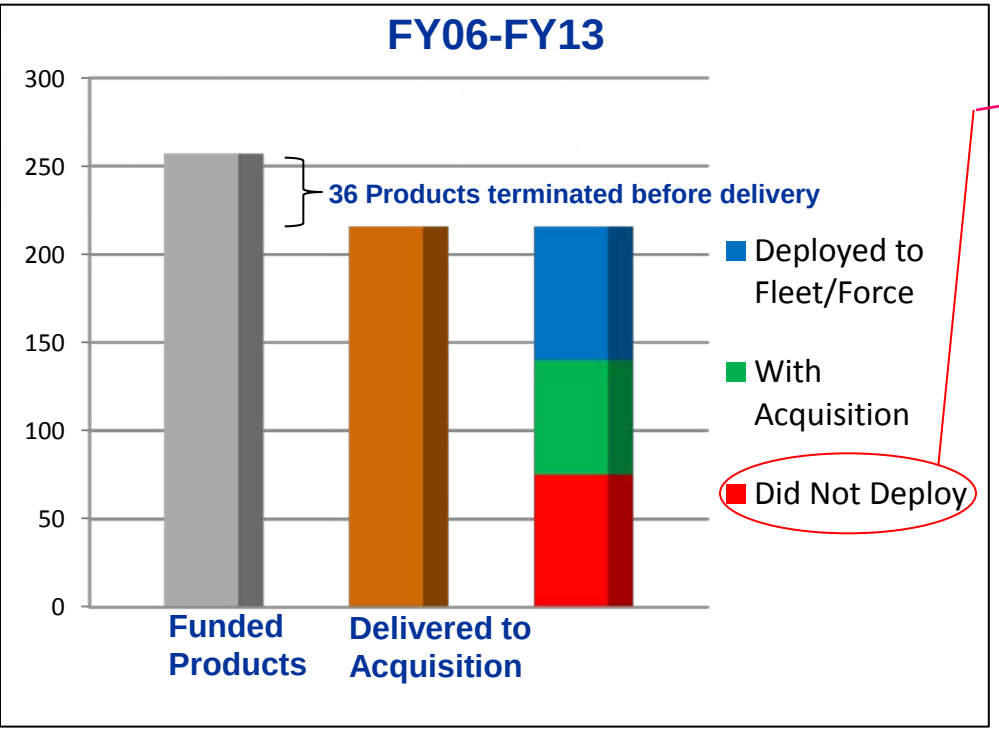


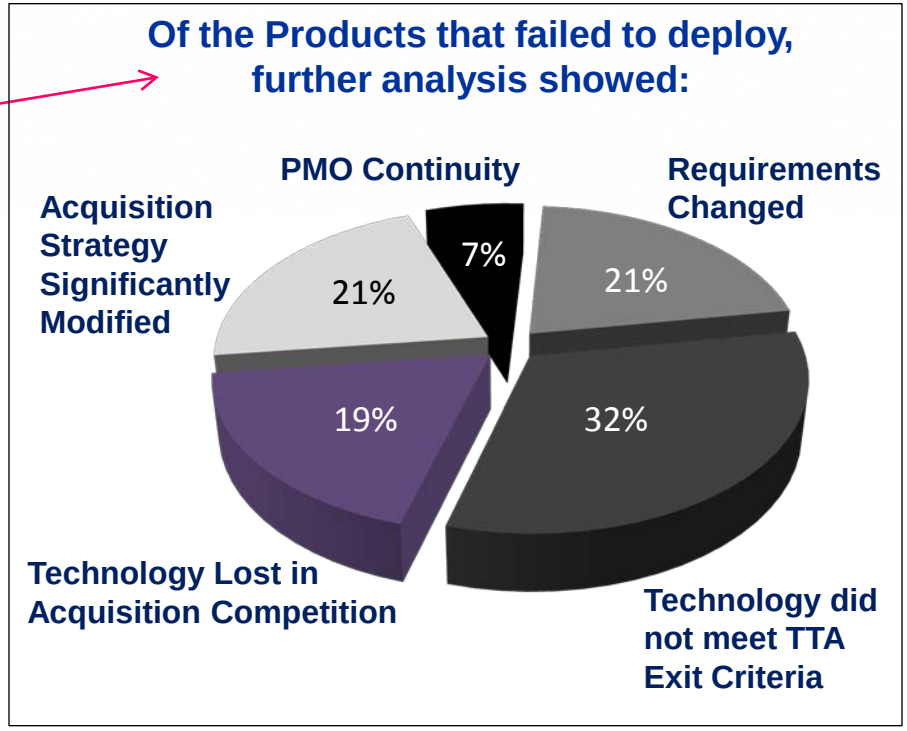
- *9 Pillars cover full spectrum of SECNAV, CNO & CMC priorities*
- *Thorough vetting and review of technical merit and transition alignment*
- *Senior leadership review and approval*

Requirements Driven – Transition Oriented!

Future Naval Capabilities Transition Status through 2013

- **ONR successfully delivered 86% of funded FNC Products (217 of 253) to Acquisition.**
- **An Independent Transition Review Board determines status after delivery.**
- **Of the 217 Products delivered through FY13:**
  - **35% Deployed**
  - **30% With Acquisition**
  - **35% Did Not Deploy**





Sea Shield FNC Pillar

Pillar Description:

Missile defense, ASW, MCM and fleet/force protection technologies -- global defensive assurance

33 S&T Products
PB-14 Investment = $112.8M

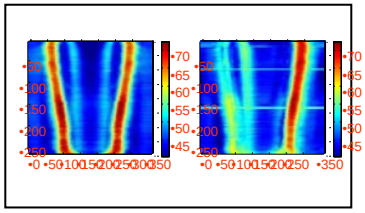
Placement of Active ASW Distributed Systems (deployed)

Provide automated capabilities to aid in planning the deployment of active distributed sensor systems for both shallow and deep waters of interest.

Operator Training (finishing)

Develop high fidelity target; geologic, biologic, and man-made clutter and reverberation modeling and simulation capability in low- and mid-frequency ranges.

Vector Sensor Towed Array (VSTA) (ongoing)



Develop high gain advanced thin line VSTA test segment that incorporates highly advanced array processing algorithms, common array acoustic modules, and physics-based performance modules.

Sea Strike FNC Pillar

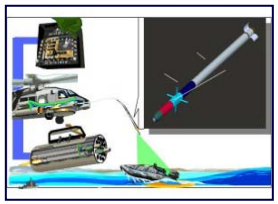
Pillar Description:

Weapons, aircraft, and expeditionary warfare technologies -- precise and persistent offensive power

13 S&T Products

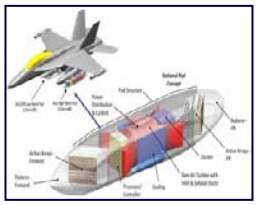
PB-14 Investment = $66.9M

Low-Cost Imaging Terminal Seeker (delivered)



Provides guidance and control technologies to combat asymmetric threats posed by small boat swarm tactics, increasing engagement capability, launch envelope, and Pk.

Next Generation Airborne Electronic Attack (finishing)



Provides airborne electronic attack capabilities for suppression of enemy air defenses, deliver non-kinetic fires, and suppression of C3 links and data networks.

Extended Range Modular Undersea Heavyweight Vehicle (ER MUHV) (planned)

Upgrades to the Mk-48 Advanced Capability (ADCAP) Heavyweight Torpedo.

FORCEnet FNC Pillar

Pillar Description:

C4ISR, networking, navigation, decision support and space technologies – architectural framework for naval warfare in the information age

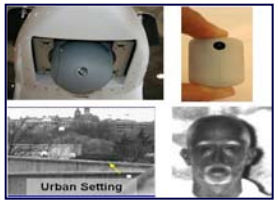
14 ECs composed of 28 S&T Products

PB-14 Investment = $92.3M

Combat ID in the Maritime Domain to Reveal Contact Intent (delivered)

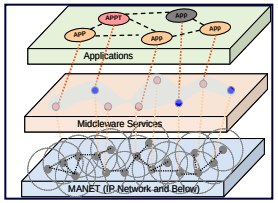
Provides an automated understanding and interpretation of relationships among objects, including recognition of anomalies, & proactive means to confirm or discount.

Agile Sensors for GWOT Focused Tactical Persistent Surveillance (finishing)



Provides the next generation of smart tactical netted sensors for individual warfighters and small tactical units engaged in urban and asymmetric operations.

Self Organizing Networks (ongoing)



Provides for network auto-configuration and continuous adaptation to deliver mission critical traffic in A2/AD environments.

Naval Expeditionary Maneuver Warfare
FNC Pillar

Pillar Description:

Enhance the warfighting capabilities of naval ground forces with special emphasis on regular and irregular warfare

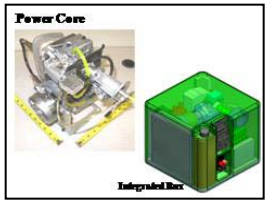
6 ECs composed of 11 S&T Products

PB-14 Investment = $32.6M

Advanced Electromagnetic Armor (delivered)

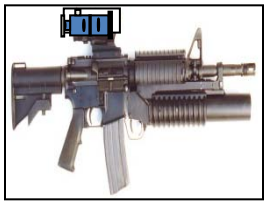
Provides protection for the Mine Resistant Ambush Protected (MRAP) vehicle against RPG threats, the use of which is increasing in both major theaters of operation in and in complex attacks and ambushes.

Advanced Power Generation (finishing)



Provides lunchbox-sized, JP-8 fueled, 500-1000W power-generation technologies and modular power-conversion technologies to provide power for Marine Corps applications, reducing dependence on batteries.

Integrated Day – Night Sight (on-going)



Provides an affordable, universal sighting system with integrated day/night optics, reducing carrying load and allowing vision into dark rooms, shadows, and obscured areas.

Capable Manpower FNC Pillar

Pillar Description:

Match Sailors and Marines to the right jobs, design intuitive systems, and train for mission essential competencies

7 ECs composed of 15 S&T Products

PB-14 Investment = $27.1M

Integrated System for Language Education & Training (delivered)

Provides language-in-culture learning in the target language using task-based sequences of scenarios designed for individual and team action.

Manpower & Personnel Modeling, Simulation, & Optimization Tools (finishing)

Develops integrated analytical tools to assist community managers in forecasting the effects of personnel recruitment resulting from Navy policy decisions.

Display Information with Uncertainty (ongoing)

Provides submarine command teams with automated algorithms for real-time in situ mission planning in support time-critical decision making.

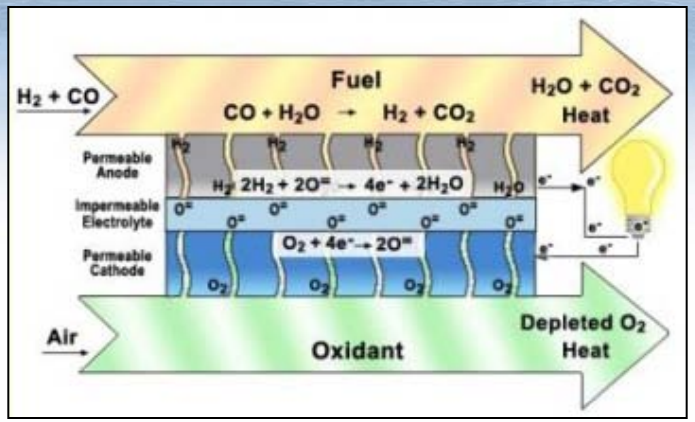
Power & Energy FNC Pillar

Pillar Description:

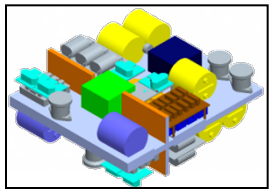
Energy security, efficient power and energy systems, high energy and pulse power

4 ECs composed of 4 S&T Products

PB-14 Investment = $18.4M

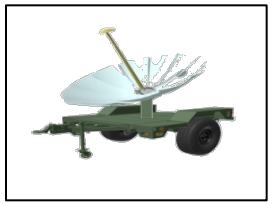


Bi-directional Power Control Module (finishing)



Provides a bi-directional power control module that leads to 2-3 times increase in power density and enables new shipboard energy storage and power distribution configurations.

Renewable Thermal Engine (ongoing)



Provides a 3-5 kW tactical deployable thermal engine capable of utilizing existing and alternative fuels, and concentrated solar thermal energy to reduce fuel consumption.

Air Independent Propulsion System (ongoing)

Provides scalable long endurance air independent energy dense propulsion with safe, gas-and-go rapid turn-around capability to enable future Naval ISR and MCM missions.

FY15 Enabling Capabilities

Enabling Capability Title	EC Descriptive Summary
Accelerating Development of Small Unit Decision Makers (ADSUDM)	Accelerate the development of small unit decision making (SUDM) skills in infantry squad leaders and units through development of a decision making learning management system, a tailored simulation training system, and a scenario generation tool.
Environment Designed to Undertake Counter A2AD Tactics Training & Experimentation (EDUCAT2E)	Modeling and simulation techniques to train and experiment with A2/AD CONOPS & TTPs.
Target Processing Center (TPC) Sensor Correlation and Fusion	Targeting decision aids incorporating multiple information sources. Enables high fidelity projectile recognition, point of origin and point of impact estimates by fusing multiple radar inputs with other available information sources as well as operational context.
Gas Turbine Upgrades for Reduced Total Ownership Cost (TOC) and Improved Ship Impact	High temperature capable rotor, marinized single crystal alloys, and oxidation hot corrosion-resistant coatings for power turbine blades and vanes in hot-section components.
Data Focused Naval Tactical Cloud	Develop efficient and effective mechanisms to ingest large and diverse data sets into a cloud computing environment and apply analytic techniques to extract critical, mission-focused insight in support of improved decision making across multiple warfighting mission areas.
Scalable Integrated RF System for Undersea Platforms (SIRFSUP)	Multi-function Integrated RF system scalable from large to SWaP constrained undersea platforms, enabling rapid upgrade and maintenance through software centric architecture design. Effort includes efficient operator interfaces and training and will transition as the Next Gen Submarine EW Architecture.
Multifunction Energy Storage for Navy / USMC Applications to Maximize Operational Effectiveness and Efficiency	Modular energy storage system which can integrate and optimize power generation systems to meet USMC environments. Components and methods to enable high density, high cycle rate megawatt energy storage systems.
Synthetic Aperture Radar Electronic Protection	Improve electronic protection techniques for radar imaging.
Rotor-craft Advanced Protection from IR/EO/RPG (RAPIER)	Intercept and defeat RPG threats with an expendable countermeasure. Multiple EO/IR countermeasure techniques, components and technologies for rotary wing aircraft defeat of MANPADS.
Extended Range Modular Undersea Heavyweight Vehicle (ER MUHV)	Upgrades to the Mk-48 Advanced Capability (ADCAP) Heavyweight Torpedo

FY16 Enabling Capabilities

Enabling Capability Title	EC Descriptive Summary
Flexible Sea-based Force Projection (FSFP)	Develops inflatable structure technologies to facilitate cargo transfer operations, surface connector interfaces, and amphibious vehicle launch and recovery in the sea base by mitigating the local sea state through SS4 and increasing the functionality of existing platforms.
Operational Planning Tool	Provide a multi-mission multi-platform operational planning tool to facilitate the "Plan-Brief-Execute-Assess" planning cycle structure to allow commander and staff to rapidly and confidently move from data to options to informed decisions.
Densified Propellant Fire From Enclosure - Confined Space (FFE/CS) Propulsion Technologies	Provide a Fire From Enclosure (FFE)/Confined Space (CS) capable propulsion system that meets length, weight, and sound pressure level requirementsfor the next generation Shoulder-launched Multipurpose Assault Weapon (SMAW) system.
Advanced Topcoat System (ATS)	Develop, demonstrate and implement high performance non-isocyanate topcoat systems and advanced protection primers to significantly reduce total ownership cost, increase Naval aircraft and USMC ground vehicle readiness and improve long-term survivability.
Incapacitation Prediction for Readiness in Expeditionary Domains - an Integrated Computational Tool (I-PREDICT)	Develop an integrated physiologically-relevant human body model and associated software tool to predict injury outcomes in response to specific stressors (ballistic, blast/acceleration, vibration and blunt traumas), enabling risk assessment for improved injury prediction, casualty flow modeling and design criteria for personnel protective equipment and platform design.
Combined EO/IR Surveillance and Response System (CESARS)	Develop a combined Electro-Optical/Infrared (EO/IR) surveillance and response solution for shipboard use that encompasses the entire kill chain of threat detection, identification, tracking, engagement, and assessment of engagement effectiveness.
Ship-launched EW Extended Endurance Decoy (SEWEED)	Provide a ship-launched, rapid reaction, long endurance, expendable flight vehicle designed to carry electronic warfare payloads.
Surface Ship Periscope Detection and Discrimination (SSPDD)	Demonstrate a surface ship based optical periscope detection and discrimination capability that compliments radar techniques, results in a high probability of overall detection with near zero false alarms, and is resistant to countermeasures.
Softkill Performance and Real-Time Assessment (SPARTA)	Provides a means to detect and measure the response of threats, allowing real-time adjustments.
Reactive Electronic Attack Measures (REAM)	Deliver detection and classification techniques to identify new or waveform agile radar threats and automatically respond with an effective electronic attack.

Potential Industry Opportunities

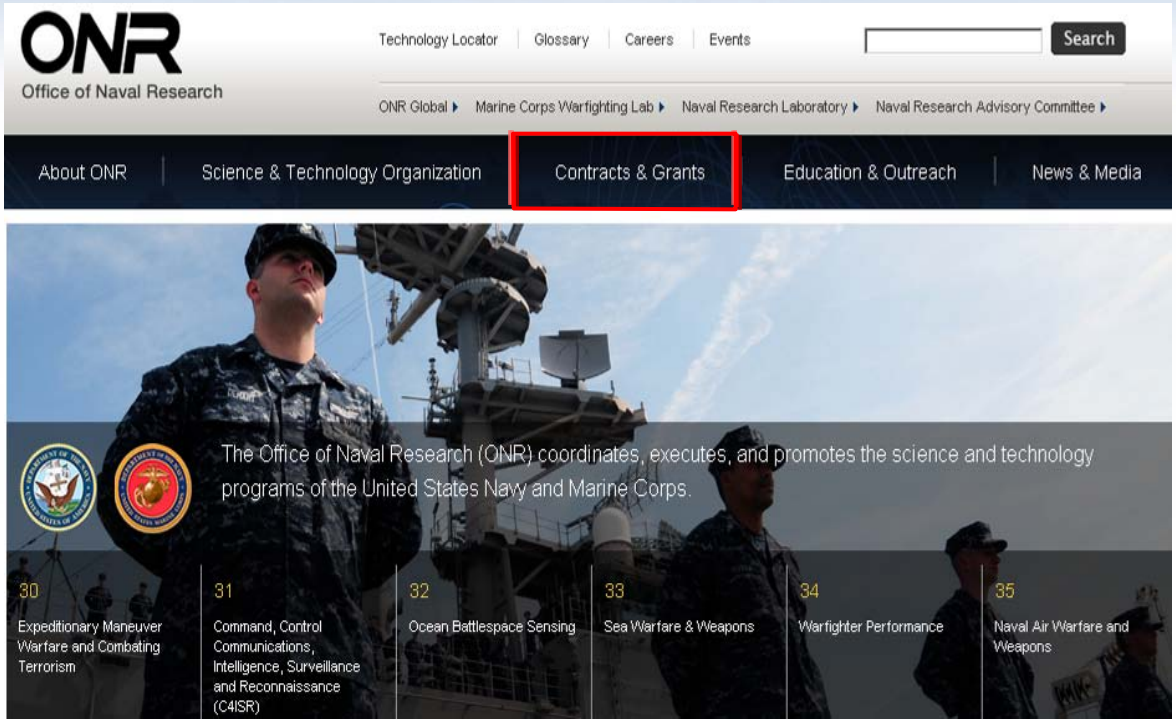
FY16 EC Projects Below the Funding Line	
Enabling Capability Title	**EC Descriptive Summary**
Combat Power Control	Enable high power weapons and sensors in combat by automating optimal and timely alignment of resources to loads from distributed, shared energy generation and storage. Manages associated cooling and auxiliary system demands.
Autonomous Unmanned Surface Vehicles for MiW Operations	Autonomous Situational Awareness and Hazard Avoidance System for USVs reduces minefield clearance timeline via night operations, operations during communications dropouts and in sea state 3, and reduces human operator workload. Underway Refueling and Data Transfer for USVs & RMMVs provides greater clearance rates via time savings in the refueling/data transfer process and greater standoff of the host ship from the minefield
Multi-Threat Passive Ship Armor	Significantly improve ship survivability by defeating a wide range of threats using a composite system at a lower life-cycle cost than current systems.
Mine Drift Prediction Tactical Decision Aid (MDP TDA)	Tactical Decision Aid (TDA) to enable real-time adaptive operations in areas threatened by drifting mines by using all available sources of environmental data and real-time detection information to predict mine drift, dispersion and probability of detection to enable effective MCM ops and improved ship maneuver plans.
Operate to Know (OtK)	Develop analytics to enable the use of actions or events to cause specific responses, the interpretation of which can help address information requirements.
Persistent Renewable Energy for Undersea Systems	Extends the mission life of ASW distributed systems by resupplying energy in-situ by exploiting geothermal energy sources in the ocean.
Surface X-Band Radar (Surf-X)	Develop and demonstrate an affordable, open architecture surface X-band active electronically scanned radar by integrating fighter X-band AESA radar apertures with a digital array radar open architecture back-end.
Autonomous Reacquisition Manipulator System (ARMS)	Underwater robotic system consisting of a compact, highly maneuverable, stable UUV with a dual-manipulator system that enables reacquisition and mitigation of underwater explosive hazards by providing EOD forces the capability to remotely access, diagnose, render safe, neutralize or move/remove underwater IEDs, mines and UXO from a safe distance.

FNC Program Summary

- ***There is a structured, annual DoN FNC process governed by formal Charters and Business Rules***
- ***Annual S&T Gaps (requirements) are developed by Pillar IPTs and issued by the TOG***
- ***Investments are selected by a collaborative process that involves all stakeholders***
- ***Every FNC Product has a transition path documented by a Technology Transition Agreement***

Requirements Driven – Transition Oriented!

Questions? Where to find us…



www.onr.navy.mil

YouTube
Broadcast Yourself™