DARPA STO:
Contesting the Contested Environment

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DARPA Technical Offices

Strategic Technology Office

Director, Arati Prabhakar
Deputy Director, Steve Walker

Biological Technologies

Geoffrey S. F. Ling
Barry Pallotta (Acting)

- Biological Complexity at Scale
- Neurotechnologies
- Engineering Biology
- Restore, Maintain and Improve Warfighter Abilities

Defense Sciences

Stefanie Tompkins
William Regli

- Math, Modeling & Design
- Physical Systems
- Human-Machine Systems

Information Innovation

Brian M. Pierce (Acting)
John Launchbury (Acting)

- Empower the Human within the Information Ecosystem
- Guarantee Trustworthy Computing and Information

Microsystems Technology

William J. Chappell
Yiftach Eisenberg

- EM Spectrum
- Tactical Information Extraction
- Globalization

Strategic Technology

Nils R. Sandell, Jr.
Khine Latt

- System of Systems (SoS)
- Battle Management/Command and Control (BMC2)
- Communications and Networks (C&N)
- Electronic Warfare (EW)
- Intelligence Surveillance, and Reconnaissance (ISR)
- Positioning, Navigation, and Timing (PNT)

Tactical Technology

Bradford C. Tousley
Pamela A. Melroy

- System Focus Areas:
  - Ground, Maritime, Air and Space
- Crosscutting Themes:
  - Agile development
  - Cooperative Autonomy
  - Unmanned Systems
  - Power and Propulsion

High End Threat Increasing In Quantity and Quality

Chinese J-31 Stealth Fighter

Russian PAK-FA (T-50) Stealth Fighter

Russian SS-N-26 Cruise Missile

Chinese DF-21D

Chinese Luyang III Destroyer

- Weapon capabilities enhanced by robust battle networks
- Networks draw on globally available communications and computing technology

Chinese YJ-62 ASCM

Chinese Liaoning Aircraft Carrier

Iranian Kilo-class Diesel Submarine

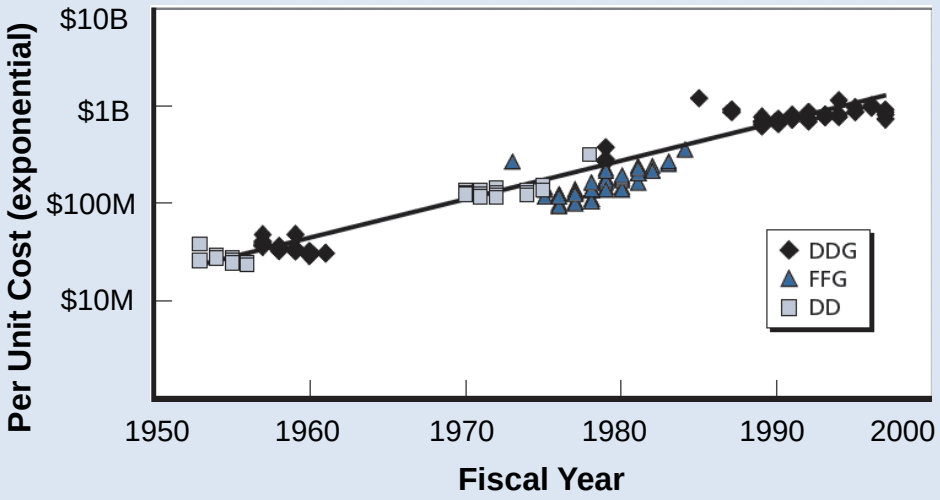
Chinese Jin-class Nuclear Powered Ballistic Missile Submarine

ASCM = Anti-ship Cruise Missile

Higher Unit Costs, Smaller Quantities

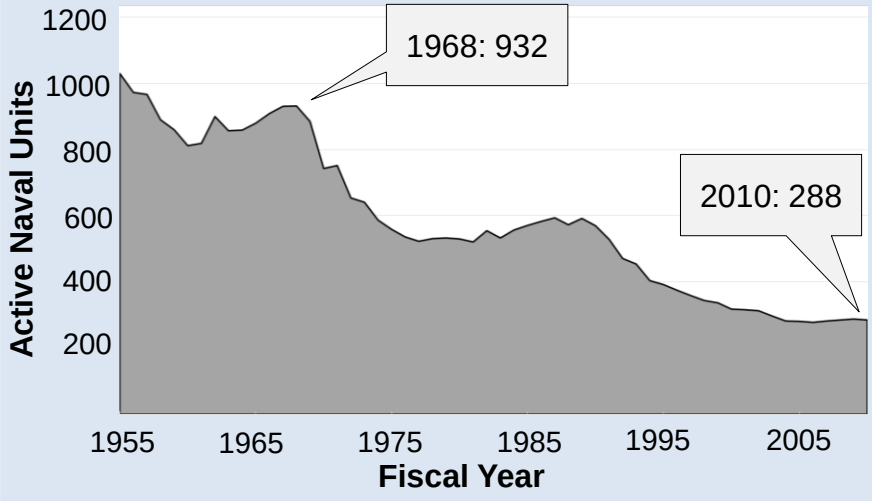
Strategic Technology Office

Increasing Cost per Unit



Source: *Why Has the Cost of Navy Ships Risen: A Macroscopic Examination of the Trends in U.S. Naval Ship Costs Over the Past Several Decades,* Arena, Blickstein, Younossi, Grammich. RAND National Defense Research Institute, Nov 2006

U.S. Naval Inventory Smallest Since 1916



Source Data: *"What size is the US navy - and how has it changed since 1917?",* Simon Rogers. The Guardian, Data Blog, Nov 2012

- Trending toward highly capable but monolithic assets
  - Increasing cost per unit
  - Decreasing overall volume of assets

DDG: Guided Missile Destroyers
FFG: Guided Missile Frigates
DD: Destroyers

New Technologies and Processes Provide Opportunities for the Future

- Technologies
  - Innovative platforms
  - Unmanned systems and autonomy
  - Miniaturization, increasing capability and decreasing cost of electronics
  - Expanding spectrum use for communications, electronic warfare, sensing, navigation
  - Advances in algorithm and software technology
- Processes
  - Schedule and cost not requirements-driven programs
  - Open architectures
  - Commercial processes, e.g., “platforming” as a means of cost sharing across products

Widespread desire for better ways of developing, acquiring, and operating systems

System of Systems Approach Exploits Opportunities to Address National Security Challenges

- Individual platforms, however capable, cannot meet challenge of highly networked, lethal, proliferated threat
  - Need a network to fight a network
- System of Systems (SoS) Approach: Employ architectures networking lower cost, lower capability platforms with higher cost, higher capability platforms
  - Lower cost platforms enhance military effectiveness and survivability of higher cost platforms
  - Heterogeneity minimizes common failure modes/attack vulnerabilities
  - Can buy lower cost SoS elements in quantity
  - Imposes cost and complexity on adversaries
  - Advanced integration technologies and open architectures reduce time, cost, and risk for integration of new capability into legacy platforms
  - Faster development time for new capability and opportunities across a more diversified industrial base

Maritime System of Systems Focus

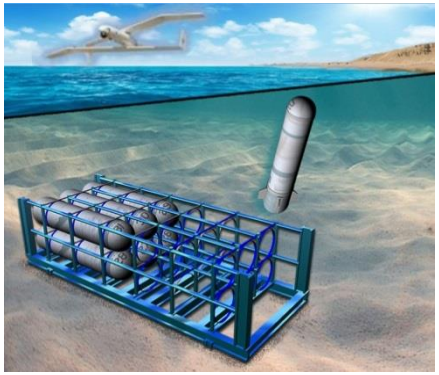
- Enabled by new advances in autonomous platforms
  - Provide persistence in all domains (surface, subsurface) with minimal operational burden
  - Lower cost than conventional manned platforms
  - Practical to proliferate over large operating areas
  - Enable cross-domain operations – air, surface, subsurface
  - Provide greater combined force projection
- Technologies needed
  - Communications – low-latency, cross-domain, moderate to high bandwidth
  - Command & Control – cross-domain battle management to guide autonomy
  - Position, Navigation, Time – cross-domain synchronization
  - Power & Logistics – Enable long-duration autonomous operations

** All graphics are Artist's Concepts*

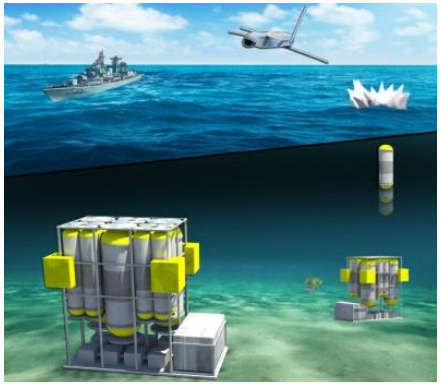
Air: Tactically Exploited Reconnaissance Node

Surface: Anti-submarine warfare Continuous Trail Unmanned Vessel

Undersea: Large Diameter Unmanned Undersea Vehicle (USN image)



Undersea: Hydra



Undersea: Upward Falling Payloads

UFP Video Vignette