

# **Revitalization of Naval Surface Warfare Center Excellence in Early Stage Combat Systems Engineering 9th Annual Acquisition Research Symposium**

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# Overview

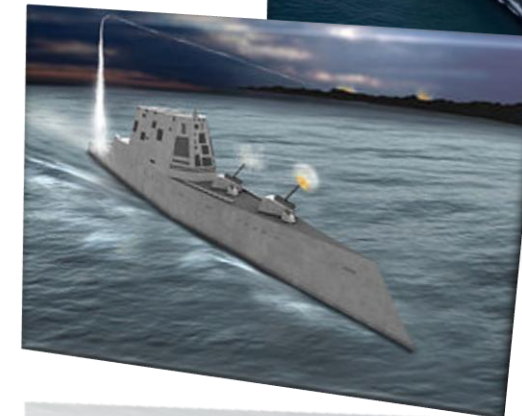
- Discuss how the Naval Sea Systems Command (NAVSEA) enterprise is responding to lessons learned from contemporary early stage ship and mission system development efforts
- The Naval Surface Warfare Centers are an integral part of early stage ship design, responding to changes in the evolution of acquisition improvements
- Topics:
  - The Pendulum
  - Technical Accountability
  - Four Critical Aspects of Combat Systems Engineering
  - Summary



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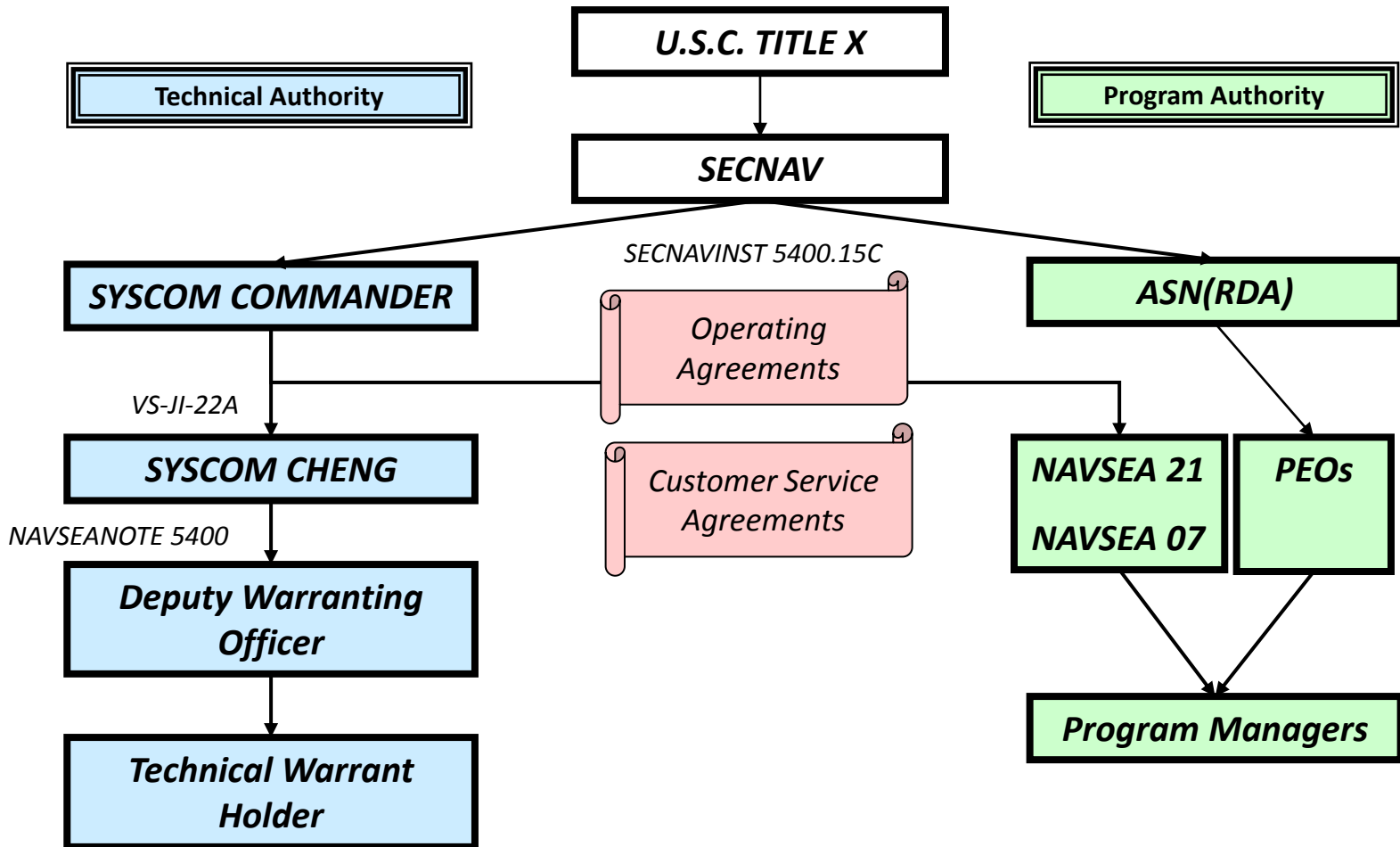
# The Pendulum

- Acquisition reform was created to “institutionalize processes that facilitate affordable and timely delivery of best-value products to meet the warfighter needs”
- The Navy community is instituting changes based on lessons learned from Arsenal Ship, DDG 1000, and Littoral Combat Ship projects in their approach to early stage design while retaining the positive aspects of these programs
- NSWCDD provides an increased technical role in the implementation of technical authority to support the NAVSEA enterprise



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# Technical and Program Authorities



**This can *not* be delegated to private industry**

# Technical Capabilities

## Analysis

- Warfare Analysis
- Systems Analysis
- Cost Analysis
- Engineering Analysis
- Operational Systems Analysis

## Science and Technology (S&T)

- Materials
- Physics
- Chemistry
- Biology
- Numerical Analyses and Algorithm Development
- Emergent Technologies
- Complexity science and Networks
- Computer Science

## Test and Evaluation (T&E)

- R&D Test Engineering
- Integrated Systems Operational T&E
- Data Collection & Analysis
- T&E Quality Management
- Test Execution Operations
- Software T&E

## Software Engineering and Integration (SWE&I)

- Software Architecture Engineering
- Software Requirements Analysis
- Software Design & Development
- Real-time Software Design and Development
- Software Integration
- Software Integration Testing
- Software Quality Assurance
- Software Lifecycle Support
- Software Engineering Management

## Warfare Systems Engineering and Integration (WSE&I)

- Requirements Engineering
- Architecture Engineering
- Integration & Interoperability
- Systems Engineering Management (e.g., configuration management, requirements management, cost)
- Operational Engineering Support
- System Design and Integration
- System Certification
- Early System Engineering
- Systems Engineering

## Combat System Element Engineering (CSEE)

- Systems Safety
- Aero vehicle Engineering
- CBR Defense Systems Science and Engineering
- Directed Energy Science and Engineering
- Electromagnetic Environmental Effects
- Electro-optic Systems Science and Engineering
- Geographic Information Systems Engineering
- Human Systems Integration
- Information Ops Engineering
- Information Security Engineering
- Integrated Topside Design
- Missile & Launchers Systems Integration
- Munition and Gun Weapons Systems Engineering
- Project Management
- Pulsed Power Science and Engineering
- Radar Systems Science and Engineering
- Natural Environment Effects on Systems
- Electronic Warfare
- Sensor Fusion

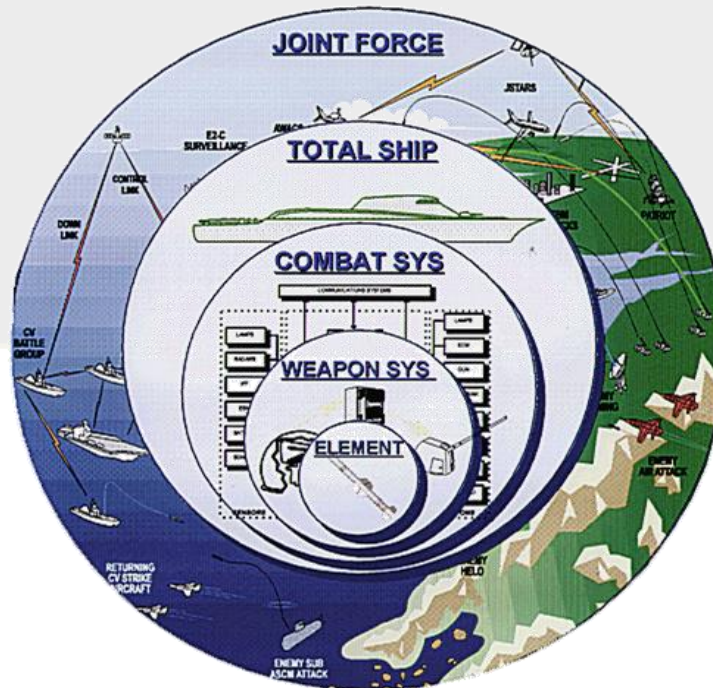
# Critical Combat Systems Engineering Aspects

**Force-Level  
Assessment**

**Combat  
System  
Optimization**

**Building the  
Pyramid of  
Expertise**

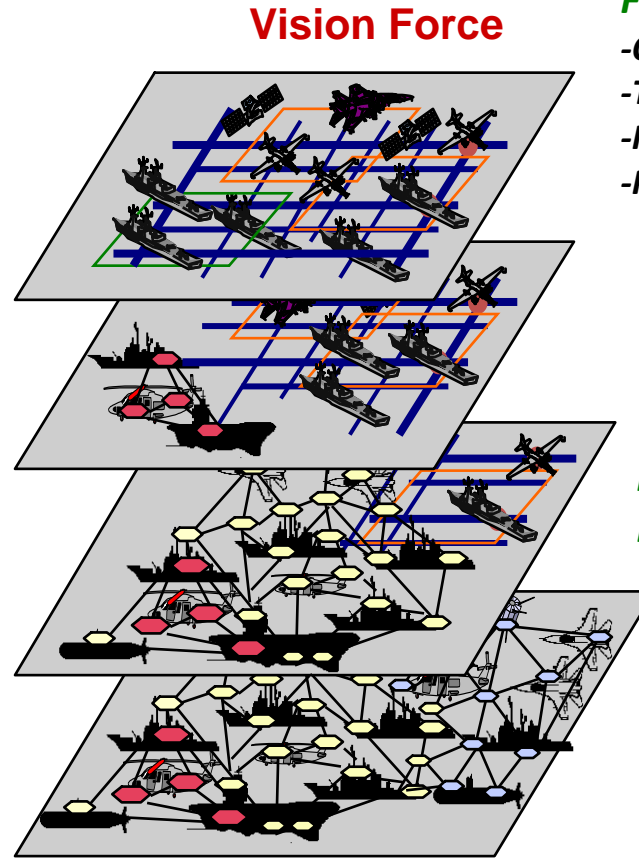
**SYSCOM and  
Warfare Center  
Collaboration**



**Enhance NSWCCD's success to support the objectives and implementation of technical authority in early stage design**

# Force-Level Assessment

## Force Strategic Planning



**Baseline Force**

### Vision Force

- Joint CONOPS, Force Structures
- Joint Mission Areas
- Service Responsibilities
- Op Concepts and Capabilities

### Naval Force

#### Desired Capabilities

- Op Forces and Tac. Groupings
- Threat
- Mission Success Criteria
- C2 Concept
- Performance Categories (UJTL) and Thresholds

#### Projected Baseline Force Capabilities

#### Baseline Force Capabilities

### Vision

#### Force Architecture

- Command Architecture
- Task Architecture
- Information Architecture
- Physical Concepts

#### Force Architecture Migration Strategy

#### Projected Baseline Force Architecture

#### Baseline Force Architecture

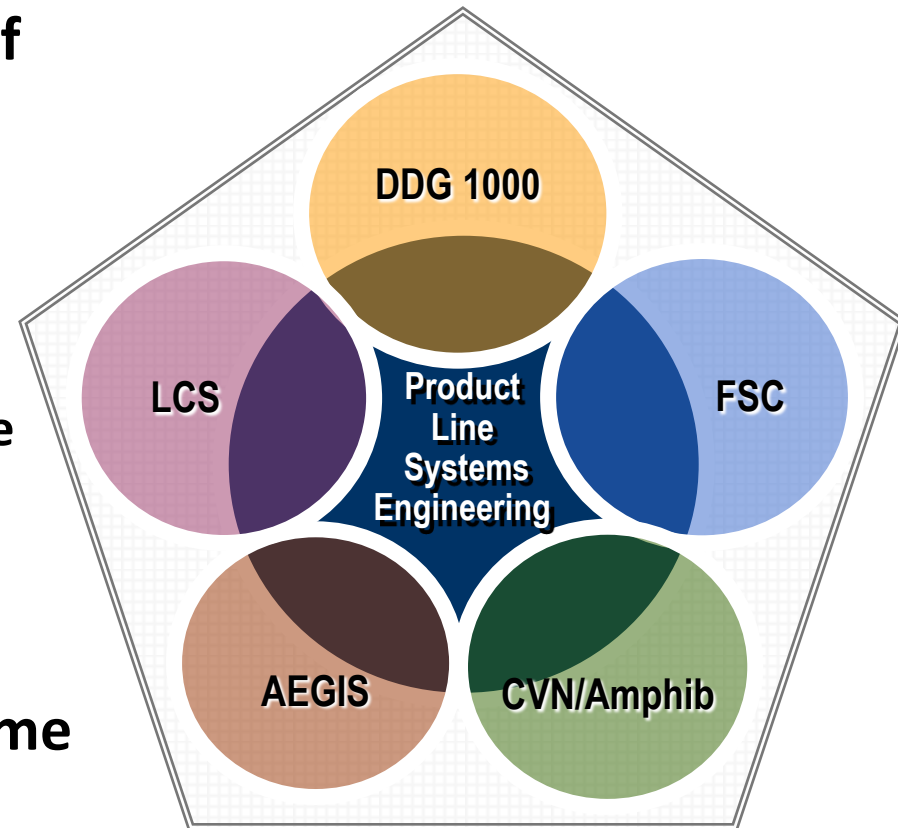
(to Ship and Component System Level)

The Evolving Mission Architecture

The Evolving System and Technical Architecture

# Combat System Optimization

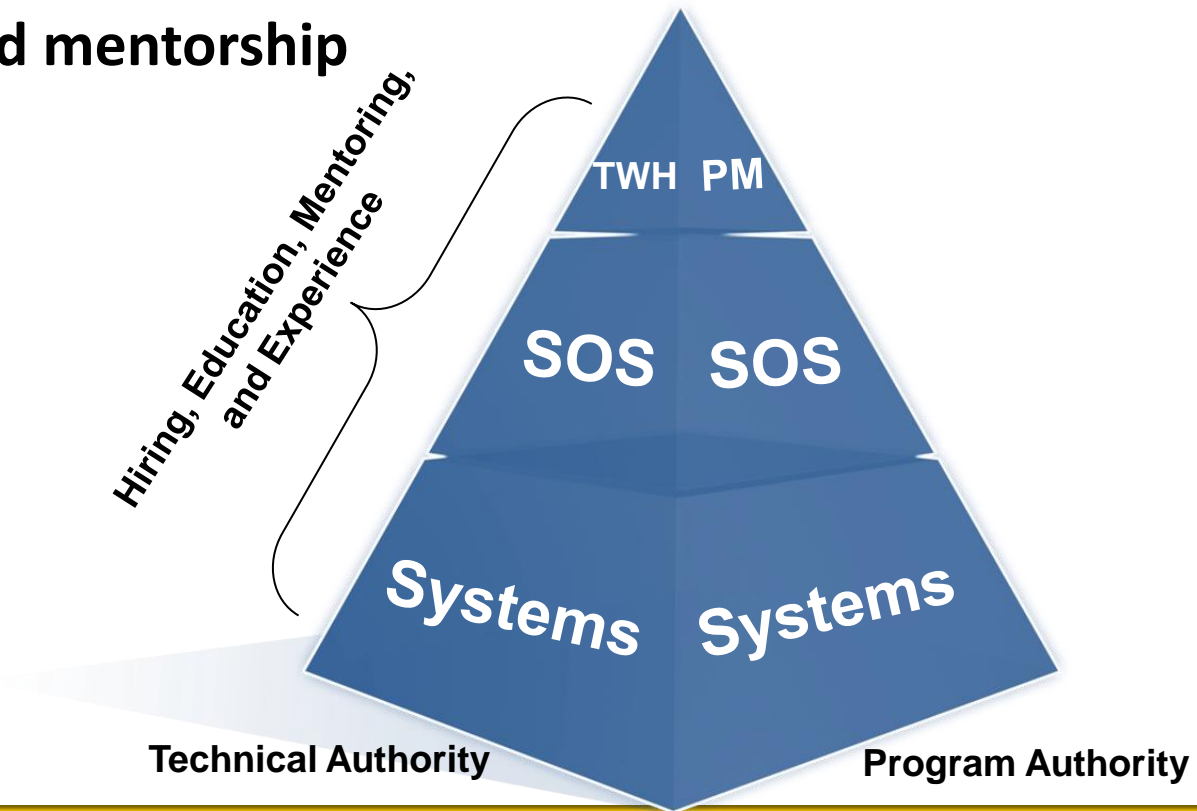
- **Enterprise mindset in the face of fleet force reductions**
  - Opportunities for information networking and intelligent, coordinated, force-level, tactical decision making
  - Pursuit of product line architecture
- **Strike a balance between performance improvement and variant reduction**
- **Analysis and engineering of “game changer” technologies (e.g., Air and Missile Defense Radar, Rail Gun, Laser Weapon System)**





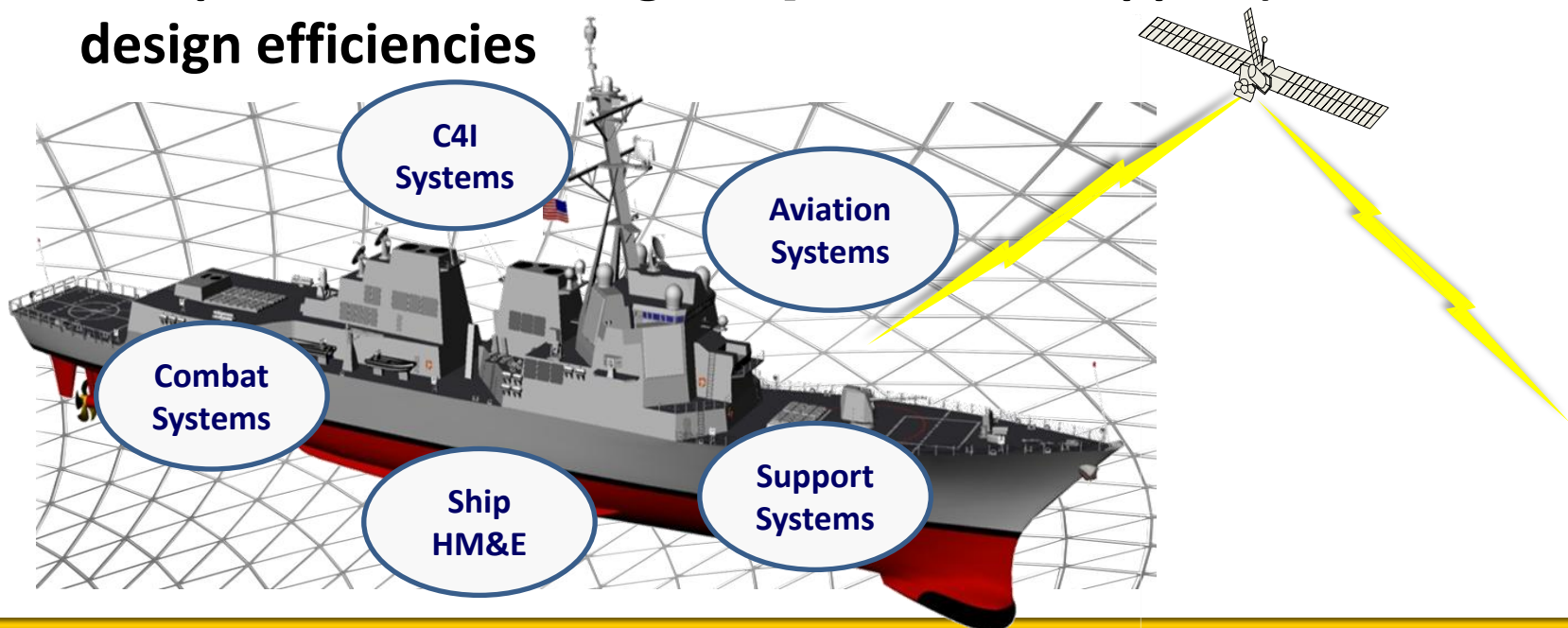
# Building the Pyramid of Expertise

- Workforce development to ensure enduring technical capabilities
- Implications of hiring practices, continued education, rotations, and mentorship



# SYSCOM and Warfare Center Collaboration

- Interacting and partnering with both government and industry
- Process improvement for collaboration with other design areas (e.g., ship, C4I [Command, Control, Communications, Computers, and Intelligence], aviation, support) for total ship design efficiencies



# Summary

- **NSWCDD is a crucial component in the application of technical excellence in early stage ship and combat system design**
- **It is of utmost importance to apply these technical capabilities to force- and enterprise-level perspectives**
- **Combat system efforts must be integrated with other ship design disciplines**

**Executing the Government's Technical Role for the Navy**

# Questions



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