

# **NAVSEA Systems Engineering and Technical Authority**



**Presented to  
SEA Enterprise Board of Directors  
22 April 2004**

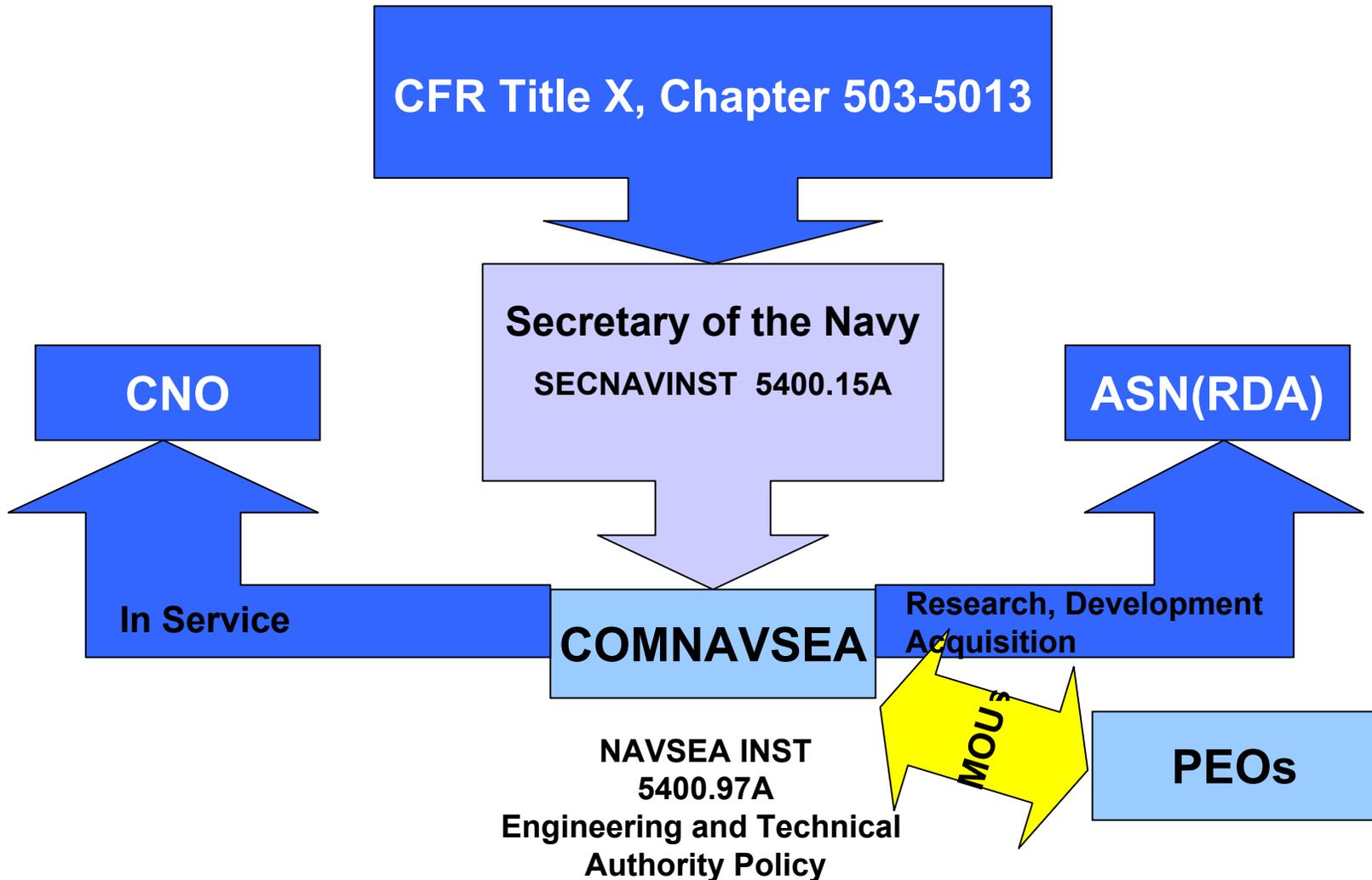


# Why Are We Here?

- To use Technical Authority and Systems Engineering to run our business smarter
  - New and different purpose than in the past
  - Not aligned to do this today
- Incorporate recent Navy experiences
  - NAVSEA chartered independent review findings parallel the Columbia Accident Investigation Board Report
- Benefits
  - Safety
  - Interoperability
  - Cost savings



# We Have A Legal Requirement to Execute Technical Authority





# Roadmap: Technical Authority and Systems Engineering

## Resource Sponsor Breakout

	N43	N75	N76	N77	N78	N70
Human Systems Integration						
Certification						
Future Fleet Capabilities						
Mission Capability Systems Engineering						
Embedded Interoperability Engineering						
In-Service Submarine Systems Engineering						

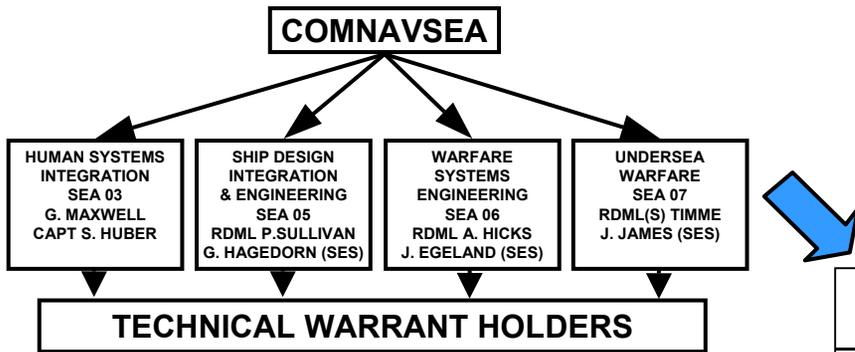
## PEO Breakout

	AIR	C4I	CV	IWS	LMW	SHIP	SUBS
Human Systems Integration							
Certification							
Future Fleet Capabilities							
Mission Capability Systems Engineering							
Embedded Interoperability Engineering							
In-Service Submarine Systems Engineering							

***It Requires a Corporate Focus and a Corporate Solution***

# How We Are Executing Technical Authority

## Phase I: Policy instructions Issued



## Phase II: 156 Warrants Issued

Anti-Terrorism/Force Protection for Ships 03/18/2004

### Long-Term Health Metrics

Mission Competencies

Technical Documentation

Leadership Competencies

Overall Health

### Demographics

filled/vacant

Technical Warrant Holder	1 0
Engineering Managers	17 0
Lead Engineers	40 2

### Actions to Improve Long-Term Health

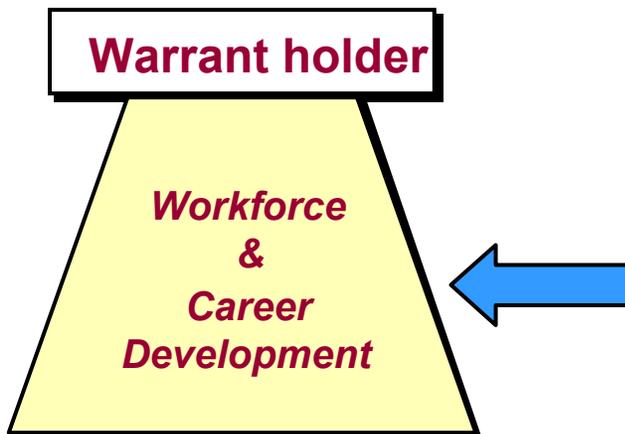
Mission	a. Define Roles and Responsibilities
Competencies	b. Improve Systems Engineering of AT/FP
	c. Enhance Contractor Support Base
Technical	d. Standards Development
Documentation	e. Specifications Development
	f. Improve Configuration Control
Leadership	g. Improve next generation Systems Engineering Skills
Competencies	h. Improve TWH Subject Matter Expertise
	i. Develop Interdependence, vs. Independence

### Sourcing Pyramid

Annual Engineering MY's in this Area: 144

Government	Contractor
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## Phase III





# Technical Authority Pyramid Anti-Terrorism/Force Protection for Ships

VADM Balisle

RADM(s) Sullivan

ATFP – Ships  
Technical Authority  
Tom Merten

<u>ATFP Ships Engineering Managers</u>					
Access Control	-	Jeffrey Edwards	Unmanned Vehicles	-	Harry Guthmuller
Naval Coastal Warfare	-	Harry Guthmuller	IROSSS	-	Dustin Wilson
Non-Lethal Devices/Barriers	-	Joseph Coleman	Swimmer Defense Systems	-	Steven Gorin
Situational Awareness	-	Jenny-Marie Pulliam	Shipboard Protection System	-	CDR John Day
Small Arms	-	Jeffrey Edwards	Explosive Ordnance Disposal	-	William Boyle
Technology Roadmap	-	John Tanke	SEA 06 Weapons Sys Interface	-	James Donegan
Total Ship Integration	-	William Kuran	Homeland & Force Protection	-	Stanley Blankenship
SPARTAN	-	Richard Erwin	Product Area Lead Engineer		
Explosive Detection System	-	Richard Low			

Engineering Agents

NAVSEA  
Dahlgren

NAVSEA  
Crane

NAVSEA  
Panama City

NAVSEA  
Keyport

NAVSEA  
Indian Head

NAVSEA  
Carderock

NAVSEA  
Newport



# Technical Authority Pyramid Standard Missile

VADM Balisle

RDML Hicks

Surfaced Launched Missiles  
Technical Authority

## Standard Missile Engineering Managers

Guidance, Navigation & Control  
Flight Computers & Embedded Software  
Batteries, Power Conditioning  
Materials, Airframes, Structural Components & Joints

Comm. Links & Telemetry  
RF Sensors & Signal Processing  
IR/Optical Sensors & Signal Processing  
Aerodynamics, Flight Dynamics/Control and M&S  
Fuzes & Guidance-Integrated Fuzing  
Fleet Logistics Concepts & Actions  
Test Equipment and product acceptance  
Fleet Assessment

Propulsion, Interior Ballistics and Jet Flow Dynamics & Control  
Insensitive Munitions & Systems Safety  
Electromagnetic Environmental Effects  
System Integration & Missile, Launcher, Combat System  
& Platform Interface Control  
Range Integration, Test & Evaluation and Test Flight Analysis  
Target Vulnerability, Lethality and System Effectiveness  
Warheads/Initiators, Electro-Explosive Devices  
Safe-Arm Devices & Intelligent Firesets  
Energetic Materials & Processes  
Reliability, Maintainability & Availability Analyses  
Missile Simulators

## Technical Agents (Located at Field Activities)

Acquisition Engineering  
Agent  
(PM & TECHREP)

Technical Direction  
Agent  
(WC's & JHU/APL)

In-Service Engineering  
Agent  
(NSWCPHD)

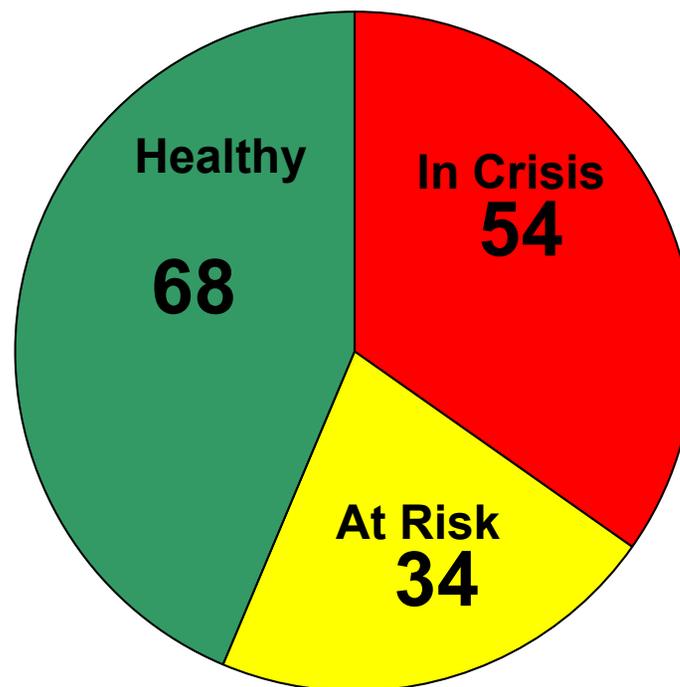
# What is at Risk?

**Healthy** – Technical area has required capability, capacity and development pipeline.

**At Risk** – Technical area has required capability, but capacity or development pipeline is deficient.

**In Crisis** – Technical area does not have required capability, capacity and development pipeline.

## Health of the 156 Technical Focus Areas of Technical Authority and Systems Engineering

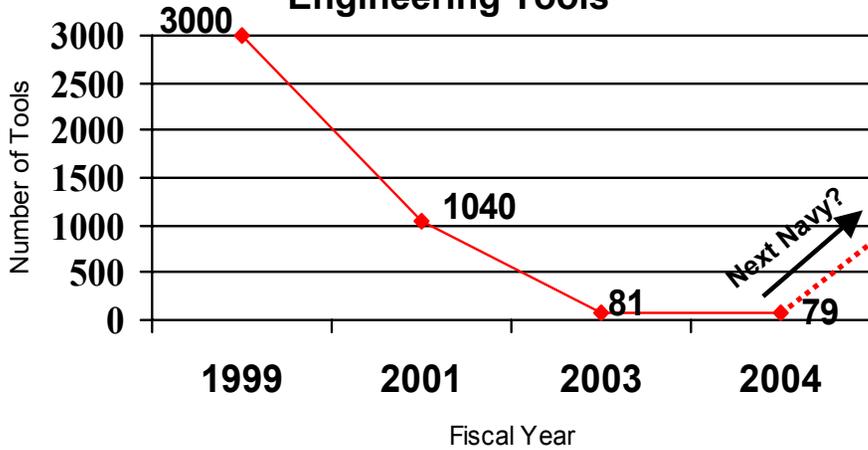


***Personnel Development Model → One-Deep in Some Areas***

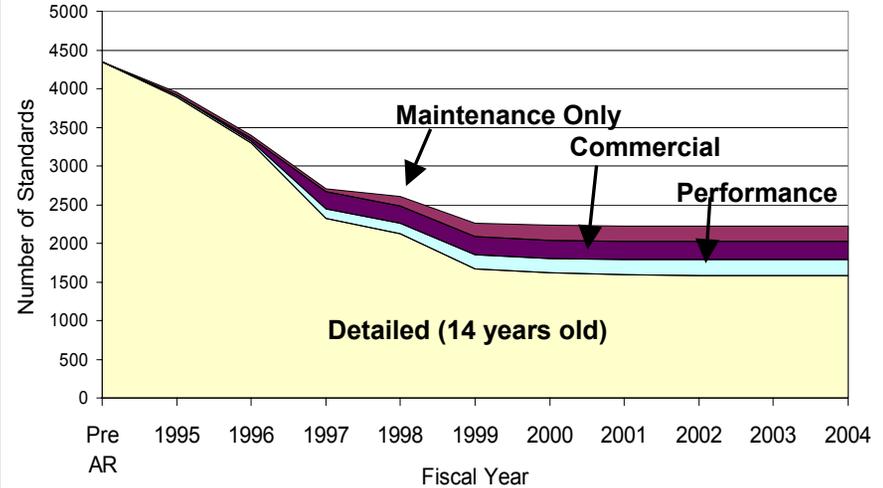


# Declining Resources – Obsolete Standards and Tools

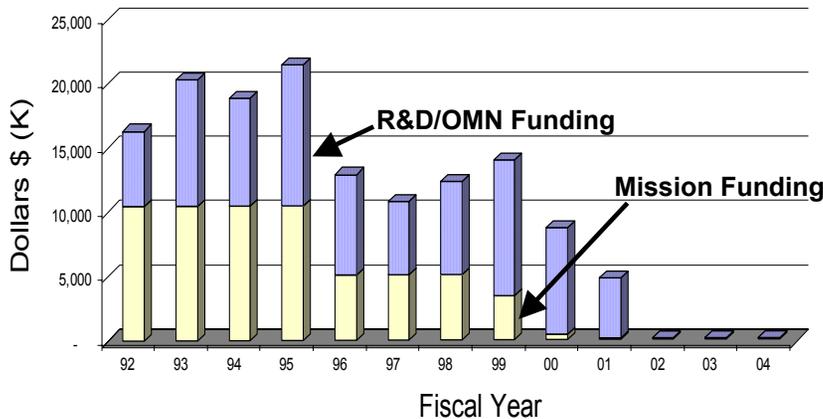
### Engineering Tools



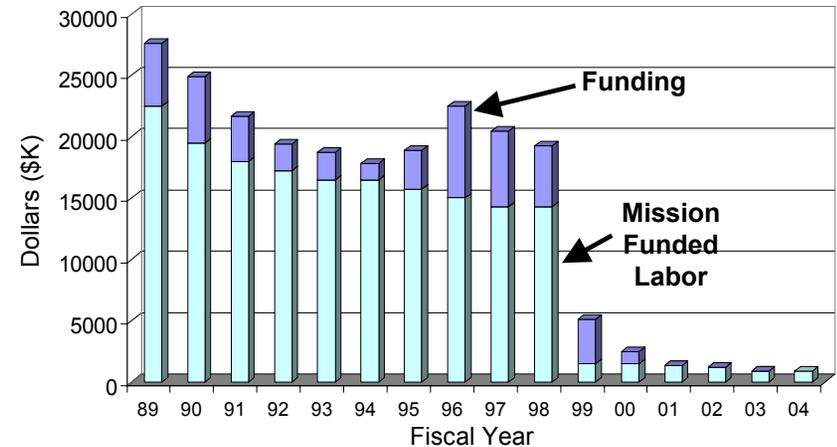
### Technical Standards



### Engineering Tools Resources



### Technical Standards Resources



**Fleet, New Construction, and INSURV All Depend on Us to Keep This Body of Knowledge Current**



# Impact on Shipbuilding and Repair



National Shipbuilding Research Program  
Executive Control Board  
1300 International Boulevard  
North Charleston, South Carolina 29418

September 28, 2000

Vice Admiral George P. Nassi, Jr., United States Navy  
Commander, Naval Sea Systems  
2331 Jefferson Davis Highway  
Arlington, Virginia 22242-4346

Subject: Shipyard Recommendation Regarding MIL-DOC Commercialization

Dear Admiral Nassi,

The shipbuilders support commercialization of military specifications and standards. The shipbuilders that serve you in Lead Design Yards or Planning Yards for combatants have technically sound resources with professional detailed knowledge of combatant ships and systems immediately accessible to NAVSEA. Existing contracts for Lead Design Yards and Planning Yards are vehicles that provide access to the processes, methods and extensive configuration control to manage the MIL-DOC commercialization initiative.

The Shipbuilders agree that the MIL-DOC commercialization process must be carefully managed to achieve the goals of affordability and technical rigor while avoiding cost and schedule risks. Classification society processes that develop appropriate technical consensus have advantages that should be applied. Combatant shipbuilders are concerned however that classification society participation in non-traditional roles will require increased classification society staff with advanced technical skills associated with warship design and construction. The staff buildup would be redundant to the skills already available through the Lead Design Yards and Planning Yards. Additionally, commercial shipbuilders are concerned that increased military involvement by classification societies will detract from the affordability of the societies' effect in commercial markets.

For a period of time the technical work supporting ships and ship systems can continue to go forward based on contractual MIL-documentation. Risks remain as the "cancelled" or "not maintained" MIL-documents lose currency. These financial and safety risks expose ship acquisition programs to increased costs due to obsolete or non-standard material, as well as material or system failures to ships in service caused from incorrect specification substitution and lack of proper litigation support.

The undersigned, through the ECB of the NSRP, are ready to work with the Naval Sea Systems Command and the government Program Managers for the Lead Design Yards and Planning Yards in establishing a proper commercialization process for the specs and standards which underlie all combatant ship designs. The effort will result in a process that makes efficient use of skills and knowledge readily available.

We would like to discuss this subject with you in the near future.

Sincerely,

*Greg Ladd*  
Harvey Walden  
Chairman, ECB (NSRP)  
Member Shipbuilding & Repair

*Mike Powell*  
Mike Powell  
Vice Chairman, ECB (NSRP)  
Newport News Shipbuilding

*Jim Bradburn*  
Jim Bradburn  
Chief, R&D  
Littorite Armaments Industries, Inc.

*Jeff Gieger*  
Jeff Gieger  
Littorite Armaments Industries, Inc.

*Tom Jones*  
Tom Jones  
Atlantic Marine Holding Co.

*Greg Ladd*  
Greg Ladd  
Cascadia General, Inc.

*Ruffie Wade*  
Ruffie Wade  
Todd Pacific Shipyards Corporation

*Tim Colton*  
Tim Colton  
Halter Marine, Inc.



National Shipbuilding Research Program  
Executive Control Board  
1300 International Boulevard  
North Charleston, South Carolina 29418

February 3, 2003

VADM Philip Belink, Commander  
Naval Sea Systems Command  
Attn: SEA-06  
1333 Innes Hall Avenue SE Stop 4003  
Washington Navy Yard, DC 20376-4003

Dear VADM:

On behalf of my colleagues, thank you for joining as the director in Belink. We thoroughly enjoyed the evening and found the discussion with you and RADM Cohen very insightful. We are seeing in your enthusiasm to talk with FEDs and OPNAV concerning the Navy ROI from the National Shipbuilding Research Program.

As we discussed at the end of the evening, the shipyards remain very interested in the Navy's plan regarding Naval vessel specifications. Our needs worked collectively with NAVSEA through the NSRP during 2000 to derive a cost effective transition approach. While we reached agreement on a mutually agreeable approach, Greg Hagelers (SEA 08) was unable to execute that plan due to budget issues. A brief synopsis of the consensus document perspective on this matter is attached.

The Executive Control Board remains very interested in further discussions on this matter to explore alternative and ship repair concepts consensus and desires to work cooperatively with your staff to find the best available solution for Navy and the industry. We are available to meet at your convenience.

Thank you for your support of the National Shipbuilding Research Program. We remain committed to reducing the repair and conversion process costs through joint efforts on highly leveraged R&D investments.

Sincerely,

*Mike Powell*  
Mike Powell  
CHAIRMAN, NSRP EXECUTIVE CONTROL BOARD

Attachments



The Shipbuilding and Repair Industry has repeatedly expressed concern on obsolete technical standards and tools...

➤ “Risks mount as the cancelled or not maintained Mil-documents lose currency...”

➤ “These financial and safety risks expose ship acquisition programs to increased costs due to obsolete or non-standard material...”



National Shipbuilding Research Program  
Executive Control Board  
1300 International Boulevard  
North Charleston, South Carolina 29418

MAR ADP009-3117

September 18, 2003

Vice Admiral P. M. Belink  
Commander, NAVSEA  
Attn: SEA-06  
1333 Innes Hall Avenue SE Stop 1810  
Washington Navy Yard, DC 20376-1810

Subject: Specifications and Standards - MIL-DOC Commercialization

Dear Admiral Belink,

The NSRP Executive Control Board appreciated the opportunity to meet with Mr. Gregg Hagelers and your staff on August 28, 2003 on the subject of Naval Ship Specifications and Standards. The session was informative in bringing the shipyards up to date and in establishing an important dialog for the benefits of reducing ship construction and maintenance costs. The shipyards have discussed what was learned and would like the opportunity to share our insights with you in the near future. The letter highlights our observations and desires to work with NAVSEA in a manner defined by each party's constraints.

We believe that there is general agreement to all parties with regard to the overarching objective of the Naval Ship Specifications and Standards initiative - to lower government acquisition and maintenance costs through transition to commercial specifications while preserving the critical information necessary to ensure complex, naval ship design meets the rigorous demands of naval performance, safety, and survivability. We also indicated the fiscal constraints that bound NAVSEA's solution options.

The shipyards are, and want to provide important contributions to achieving the MIL-DOC Commercialization goals of affordability and technical rigor while avoiding cost and schedule risks. An example that we recently identified is the NSRP Common Parts Catalog capability to communicate MIL-DOC disposition across the enterprise in a manner that will minimize the impact to affected parties. The Bureau and NAVSEA Technical Authority, Warren Halkins and help to manage the impact on Navy part commonality - a key consideration that affects the shipbuilders, vendor base and government maintenance organizations. Another example was our identification of the cost and schedule risk to DDXX posed by ITAR barriers that will impede the Naval Vessel Rates committee over the next several months. (We are working on the ITAR issue in parallel with ABS and NAVSEA in order to be able to participate in the contractor's work).

In a more general sense, NSRP can play a constructive role as an efficient communications channel. While funding constraints prevent direct NSRP participation in the MIL-DOC commercialization process, the ECB has provided NAVSEA with considerable assessment of MIL-DOC commercialization issues from those "wider perspectives" since 1999.

Shipyards producing large commercial ships and naval warships, NASSCO and NASSI, are available to have considerable experience with commercial specifications and the classification processes for the vessels they produce. Their questions and concerns are derived from their experience relating to the



*We are in extremis.*

Funding levels do not support the NAVSEA's statutory requirement for executing technical authority. Present manning policy further complicates the situation.

CNO 2004 Guidance

“Examine the organizational options for technical authority...”

# Impact On Safety

## USS DOLPHIN

*We were approximately 1½ minutes from losing ship.*



- Root causes
  - no clear technical authority
  - complacent technical work force
  - insufficient resources to watch

## Loss of Independence

**Cost of 1 Engineer = \$180K per year**

**Cost to Fix DOLPHIN = \$22.8M; HUGE Negative ROI**

**Cost of Submarine = Priceless**

**Technical Authority**



# OIF Joint Interoperability Lessons Learned: Link Architecture in Land-Sea Interface

- Interoperability Improves:
  - Engagement coordination/Weapons Allocation/Track Deconfliction
  - Prevents Fratricide!
- OIF Showed...Poor Link Interoperability Degrades Warfighting

Land/Sea Networks  
Used Separate Time  
Reference; Air Picture  
Control Point

- Over-land Net
  - US/UK AWACS
  - Patriot only as needed (self-defense, TBMD)
- Maritime Net
  - US/coalition Naval forces
- Land-Sea interface
  - Networks/sensor coverage converge w/high risk track hand-offs



**USN Strike aircraft endangered due to air/surface assets intersecting in separate Nets:**

**Inbound** – known source of FRD aircraft, fewer issues in Force track deconfliction

**Outbound** – Challenge:

- F/A-18 (with and without Link 16) had different capabilities to see some Land tracks (if at all)
- Patriot looking for pop-up, TBM/CM threat

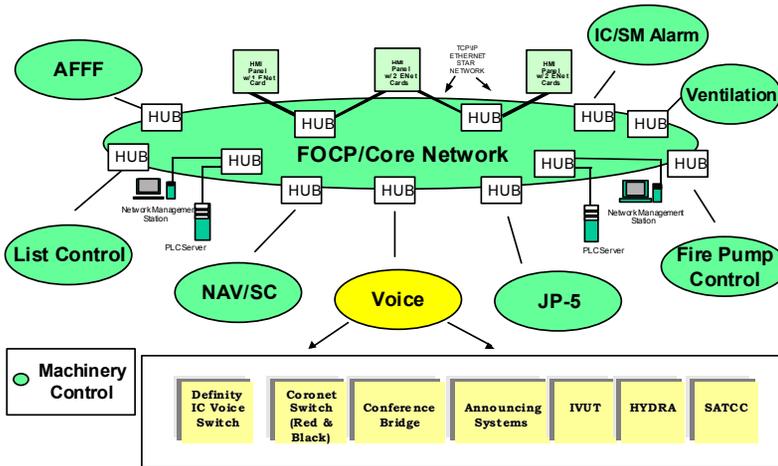
**Different networks caused differing ID to IFF to track correlation**

**Cost Arising From Lack of Interoperability:**  
**Fratricide - One F/A-18 (\$80M);**  
**One Patriot Missile (\$1M);**  
**One Trained Pilot (Priceless)**

# Impact on Operational Readiness



Integrated Communications Advanced Network (ICAN)



**USS REAGAN**  
**CVN 76**  
*Integrated Communications*  
*Advanced Network*  
 Rework required for  
 deployment

## Root Causes:

- Incomplete Systems Engineering Process
- Limited Software & Hardware Configuration Management and Documentation
- No Clear Technical Authority
- Inadequate Life Cycle Support & Training

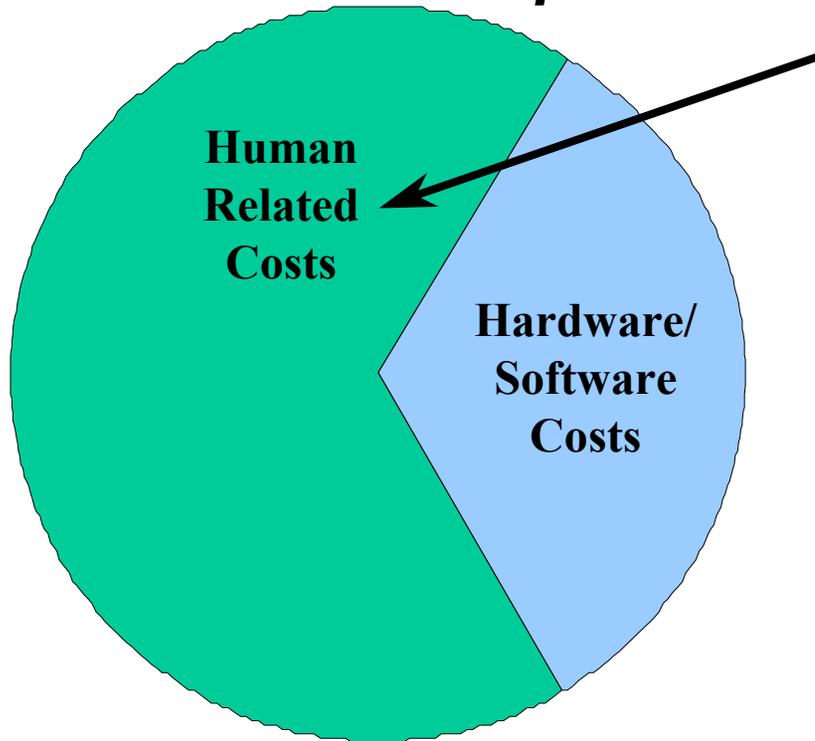
## Technical Authorities Status:

- 2 in place (Network and Machinery Control)
- 2 vacant (IC and Navigation)

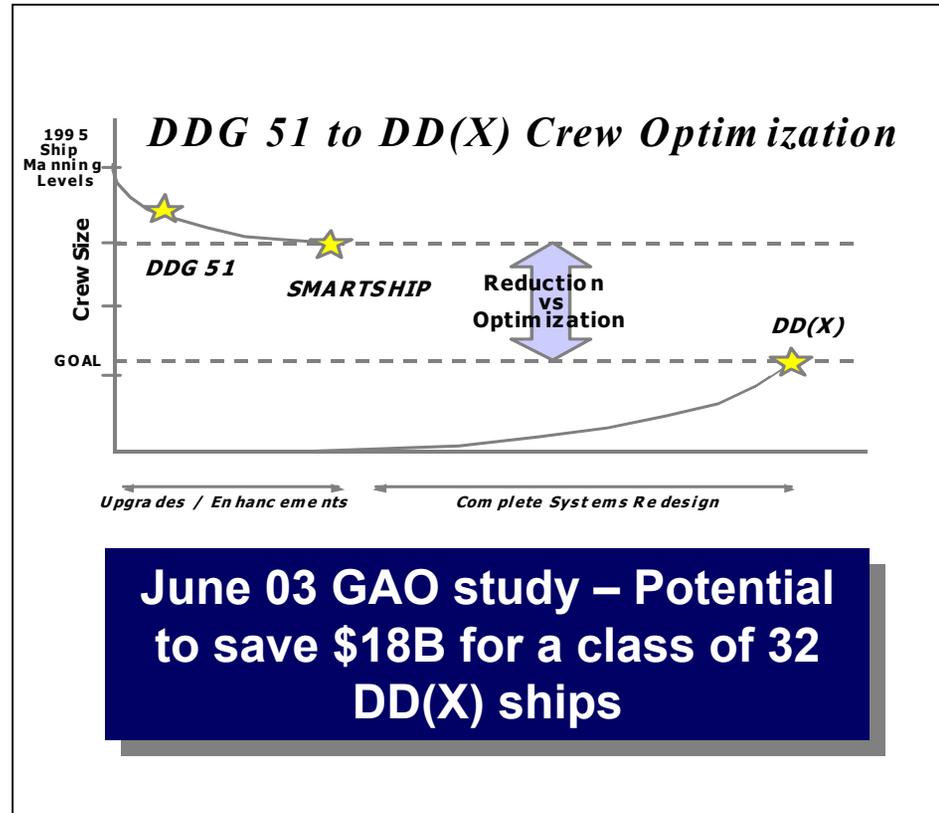
Cost To Rework ICAN on USS REAGAN \$16-18M Initial  
 Total Long Term Cost \$30M

# Human Systems Integration Business Case

## Total Ownership Cost



Human Related Costs Usually ~ 67% of Total Ownership Costs



June 03 GAO study – Potential to save \$18B for a class of 32 DD(X) ships

- HSI applied early in system design
  - Reduces Operational Cost
  - Improves operational performance
  - Enhances maintainability

**HSI Technical Authority = Standards, Tools, Processes & Engineering Discipline**



# Roadmap: TECHNICAL AUTHORITY and SYSTEMS ENGINEERING

## Resource Sponsor Breakout (Average \$ / year)

	N43	N75	N76	N77	N78	N70
Human Systems Integration \$5M						
Certification \$40.8M						
Future Fleet Capabilities \$20.2M						
Mission Capability Systems Engineering \$6.7M						
Embedded Interoperability Engineering \$9.7M						
In-Service Submarine Systems Engineering \$3.6M						

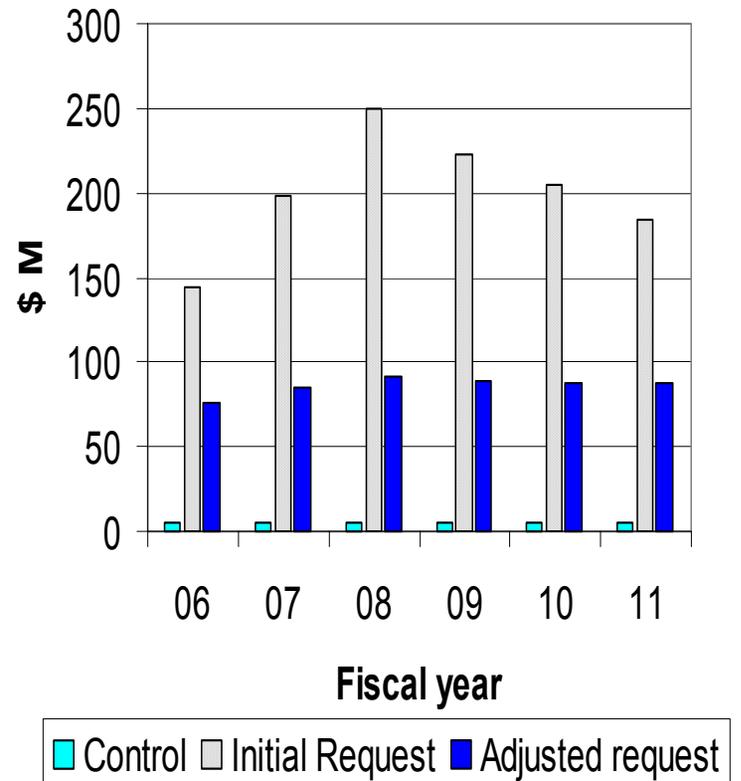
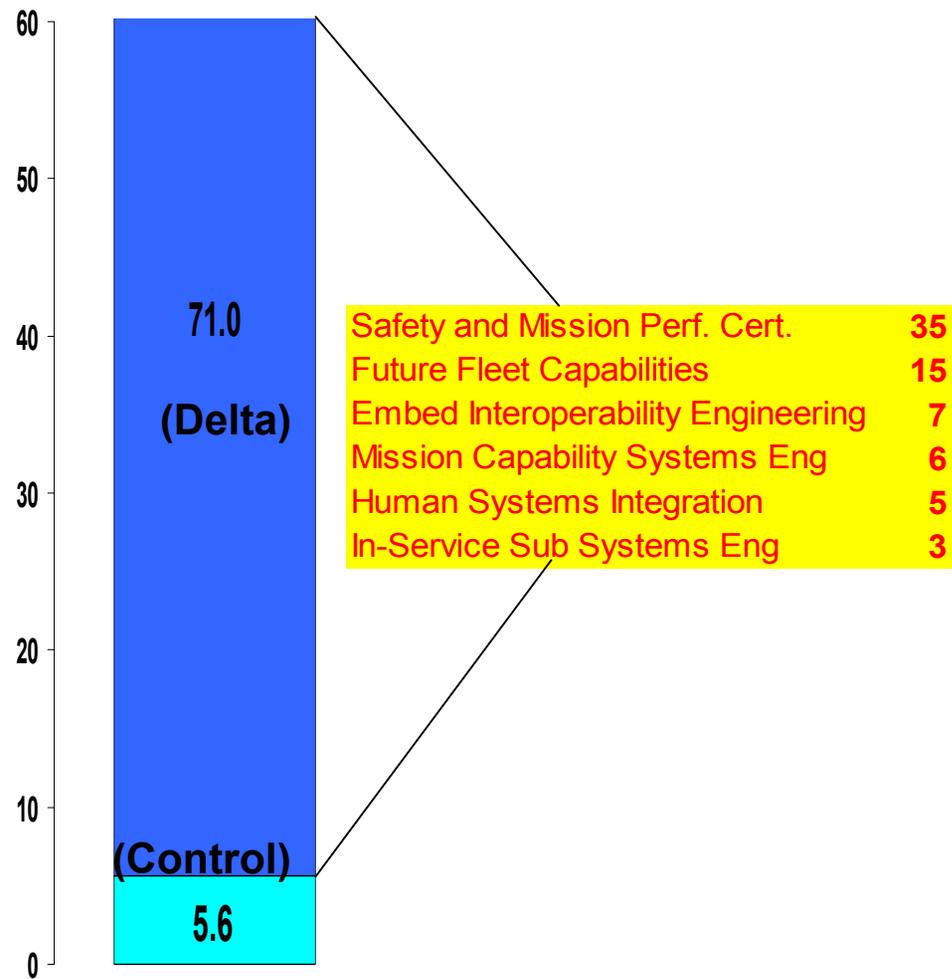
## PEO Breakout

	AIR	C4I	CV	IWS	LMW	SHIP	SUBS
Human Systems Integration							
Certification							
Future Fleet Capabilities							
Mission Capability Systems Engineering							
Embedded Interoperability Engineering							
In-Service Submarine Systems Engineering							

***Funding is Spread Across Many Sponsors and PEOs***



# FY06 Shortfall Detail & FY06 – FY11 Funding Profile (\$M)





# What do you get for the money?

## Human Systems Integration

- **Human Performance Metrics**
  - “Total System” Performance Testing and Certification
  - Operator/Maintainer Workload Benchmarks
  - Acquisition Program HSI Assessments
  - Training Measures of Effectiveness
- **Alignment with SEA Warrior**
  - Skill Objects traceable to NMETLs and System Design
- **FRP---Improved Warfighting Readiness**
  - SHIPMAIN Modernization HSI Certification
  - Integrated Battle Force Training Tool
  - Differential Training in support of new systems introduction
  - C5I HSI Assessment and Certification

***70% Reduction in DD(X) Crew Size:  
\$18B Total Ownership Cost Savings***



# What you get for the money?

## Ship Design, Integration and Engineering

- **Certification Of Safety And Mission Performance**
  - Update standards and tools to certify safety and mission capability
  - Transformational capability in high-speed ship/craft design for 10-30-30 War Fighting CONOPS.
  - Standardized interfaces for ship systems and rapid reconfiguration.
  - Cross platform system engineering in key performance areas of ships and submarines.
- **Future Fleet Capabilities:**
  - Future ship and submarine concepts and validation tools
  - Optimal payload and sensor module configurations
  - Revitalize design, engineering education, innovation and research.
  - Development and demonstration of Unmanned Surface Vehicles.

***Increased Productivity in Certifying Ship Acquisitions  
Reduces Cost and Time (i.e. VIRGINIA versus SEAWOLF:  
2 years earlier and ~\$250M less)***



# What do you get for the money?

## Warfare System Engineering

- **Analyze allocation of Naval/Joint/Coalition Requirements**
  - JBMC2 Roadmap; Capability Area Reviews to USD AT&L
- **Define and develop today and future capability based architectures**
  - Critical to achieving CJCS 6212.01C Joint Interoperability Certification Net-Ready Key Performance Parameter (KPP)
  - SEA Shield; SEA Basing Architectures
- **Develop integration standards and metrics**
  - DD(X); CVN(21); LCS
- **Early Platform Integration Testing for Collaborative Engineering**
  - LCS; DD(X); DDG Mod
- **Early Force Level I/O Testing for Collaborative Engineering**
  - OA; IABM integration

***Engineering Interoperability Early in the Acquisition Cycle Saves \$ - Historically Up to 30% in Unanticipated Costs***



# What you get for the money?

## In-Service Submarine Systems Engineering

- **Technical direction from the Technical Authority Warrant Holder**
  - Technically knowledgeable and experienced work force.
  - VA Class, Fly-by-wire Ship Control System Certification, and SSGN VLS
  - Development of Condition Based Maintenance criteria and procedures
- **A robust SUBSAFE and DSS/SOC Program**
- **Revisions to, and development of, key submarine technical documentation**
  - SUBSAFE Manual
    - USS JIMMY CARTER (SSN23) unique systems
    - SSGN Class (with new SUBSAFE equipment)
    - VIRGINIA Class
  - Submarine Fly-by-Wire Ship Control System Requirements Manual

***Knowledgeable Expertise and Up-to-date Documentation Reduces the Time and Cost of Sustaining Safe In-Service Submarines***



# Conclusion

- Technical Authority and Systems Engineering is a requirement for doing smart business in a technically sophisticated Navy.
- Cost to:
  - Sail and operate safely
  - Be a smart buyer and peer of industry
  - Optimally man the Navy in the future
  - Reliably execute the mission the future

***The Minimum Investment to Run the Business***