

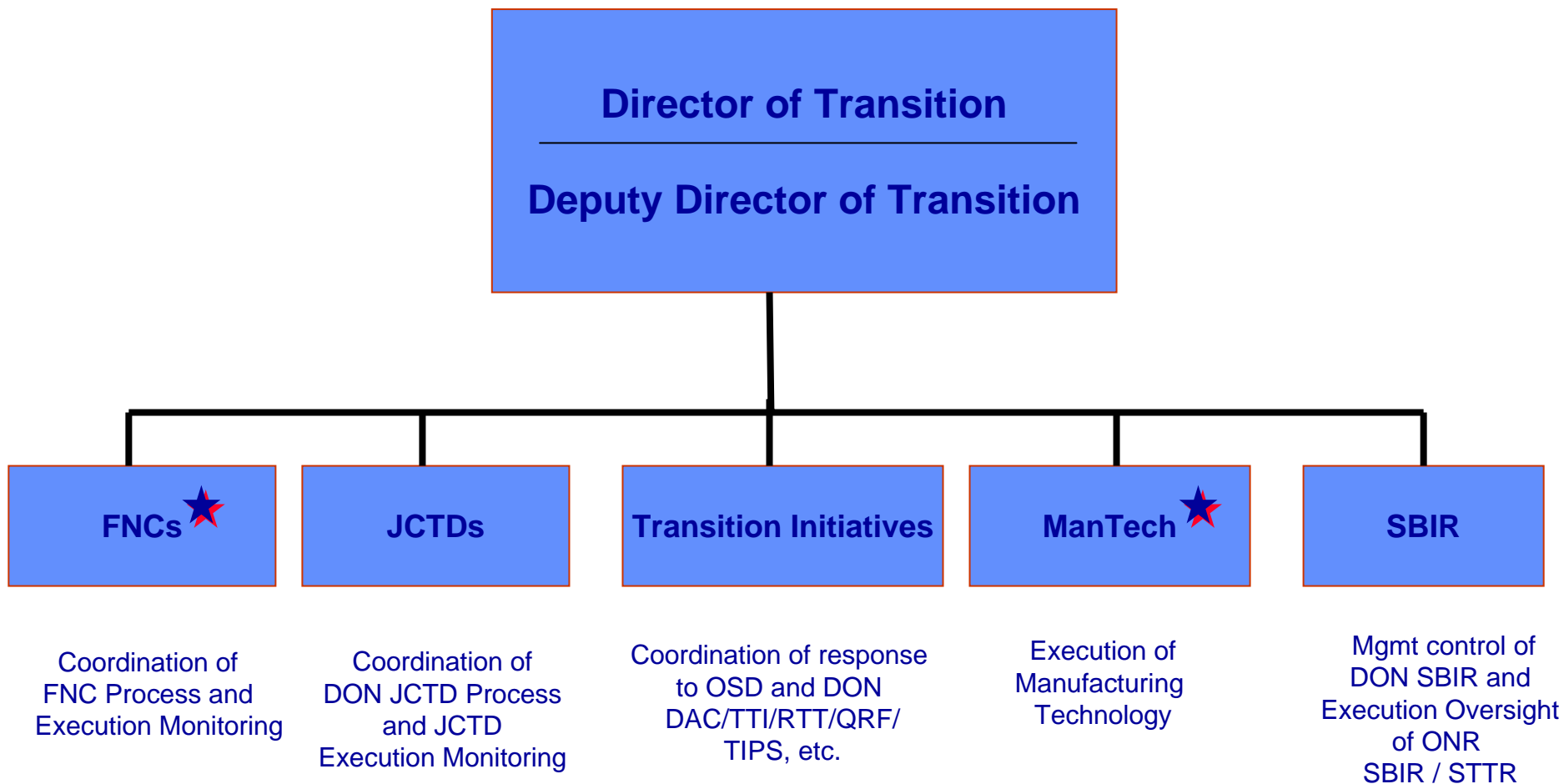
Navy Manufacturing Technology and Affordability Programs



John Carney
Director, Navy ManTech
ONR 03T MT
17 April 2008

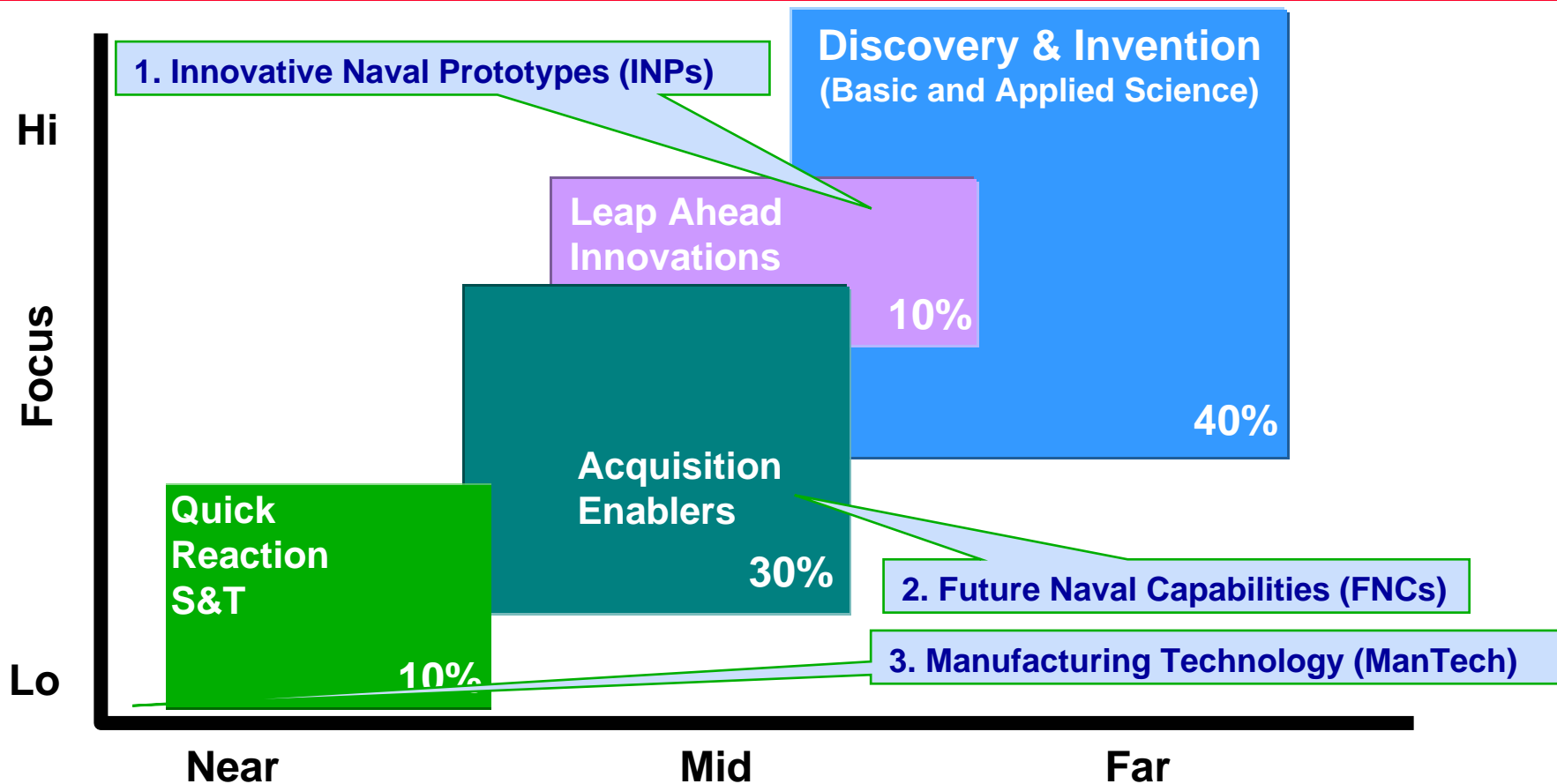


Office of Naval Research 03T Organization





Examples Addressing Manufacturing Early Cross ONR Spectrum



OSD Partnered / Quick Reaction S&T (\$223M, 12%)

Acquisition Enablers (\$655M, 36%)

Leap-ahead Innovations (\$197M, 11%)

Discovery & Invention (\$765M, 41%)



Innovative Naval Prototypes (INP) Overview

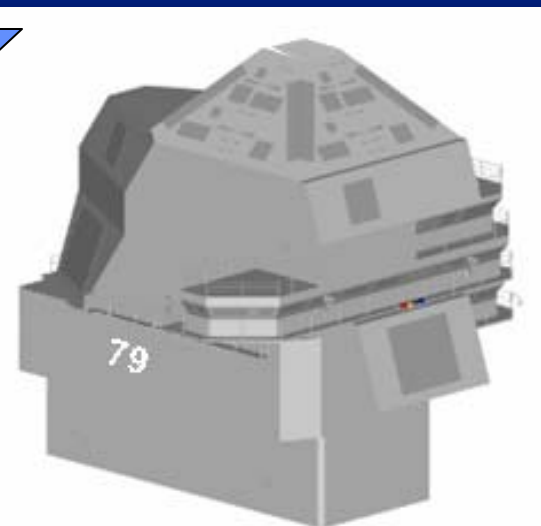
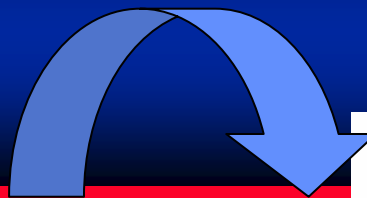
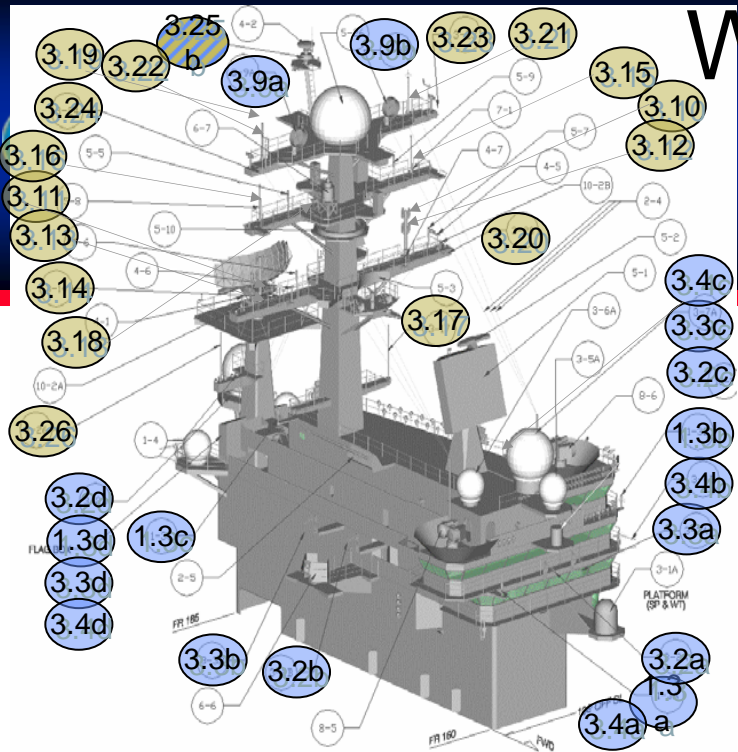
- Investments planned with critical mass to achieve a level of maturity suitable for transition within 4-8 years
- Likely disruptive
- A primary goal is to move the risk from Acquisition (Billions of \$\$) back to S&T (Millions of \$\$)
- Higher technological risk than Future Naval Capabilities
- INPs are approved by the Navy Corporate Board (Assistant SecNav Research Development Acquisition, Vice Chief of Naval Operations, Assistant Commandant of the Marine Corps)
 - **INPs with a technology focus:**
 - Electromagnetic Rail Gun
 - Free Electron Laser
 - Integrated Topside
 - **INPs with a capability focus:**
 - PLUS
 - Seabasing
 - Tactical Satellite



Integrated Topside Vision

- **Dominate the RF spectrum**
- **Enable innovation through a RF Open Architecture (hardware and software)**
- **Create affordable systems that are scalable across platforms**

What is Integrated Topside?



Current State of The Art	Integrated Topside
Overcrowded	Combined apertures (multi-function, multi- beam)
Poor performance due to blockage and EMI	Optimally placed apertures, integration of RF functions to control EMI
Expensive to acquire and maintain	Reduced acquisition and total ownership cost
Significant Size, Weight and Power requirements (SWaP)	Significantly reduced SWaP

RF functions simultaneously share apertures and signal processing
 Topside continually optimized to meet highest priority needs



Integrated Topside (INTOP) Objective

- **Develop and demonstrate an integrated, multi-function, multi-beam top-side aperture construct that has:**
 - **A scalable family of EW, RADAR (not high power) & communications capability to support multiple classes of ships**
 - **Modular open RF design (apertures and electronics) to facilitate best of breed technology and cost effective upgrades**
 - **Shared apertures for multiple functions**
 - **Software defined functionality**
 - **Cost effectiveness up front and over the life cycle**
 - **Increased operational capability**
 - **Spiral development to reduce risk and costs and have high probability for transition of technology to the fleet**



Future Naval Capabilities (FNCs) Overview

- **The FNC Program:**
 - Composed of Enabling Capabilities (ECs) which develop and deliver quantifiable products (i.e., prototype systems, knowledge products, and technology improvements)
 - In response to validated requirements
 - For insertion into acquisition programs after meeting agreed upon exit criteria within five years
- **ECs**
 - Currently aligned with four of the pillars of Naval Power 21 (Sea Shield, Sea Strike, Sea Base, and FORCEnet)
 - Additional group for crosscutting technology improvements (Enterprise and Platform Enablers) for operations and maintenance cost savings

**Aligns requirements, acquisition, Fleet, and S&T Communities
to increase impact of S&T investment**



FNC Overview (cont)

Keys to Transition

- S&T passes mature technology to acquisition into development and production programs
- Agreement must exist on the maturity and readiness at the stage this happens (Technology Transition Agreement or TTA)
- Key components agreed upon in a TTA:
 - Description of Product
 - Completion/Transition Year
 - Level of Risk (Technology Readiness Level)
 - Demonstration of TRL
 - Exit Criteria

Transition Commitment Level (TCL)					
Strength of Transition Commitment	Years remaining in approved S&T development program				
	1	2	3	4	5+
A TTA Level A - Committed Fully executed final TTA, including integration strategy. Transition funding programmed.	A1	A2	A3	A4	A5
B TTA Level B - Working Detailed Exit Criteria, Acquisition Program Initiated, Transition TRL established, Proposed Transition Budget, PE Line identified/targeted	B1	B2	B3	B4	B5
C TTA Level C - Initial Initial Exit Criteria, Target Acquisition Program Identified and Program Manager is working with interest as technology is developed, PE Line identified/targeted, Key stakeholders identified	C1	C2	C3	C4	C5
D No TTA IPT and TOG commitment.	D1	D2	D3	D4	D5

Annual Transition Assessment

FNC Product: K/Ka/Q-Band Phased Array																																													
<ul style="list-style-type: none"> • EC Number/Title: FNT-FY04-08: Advanced Communication for FORCENet • EC Manager: Adrian Eley / 311 / 703 588 2812 / aleya@onr.navy.mil • Gap Number/Title: Gap 15 - Ubiquitous, Secure Communications and Network Infrastructure • FY& TRL Start - Stop: FY03 (TRL 3) - FY05 (TRL 6) • Acquisition Program: SSN 600 and Trident Modernization, PEO C4I and Space, PMW 173, Ruth Youngs Law • Resource Sponsor: N77 and N76/DOO Design Agent (Raytheon) • Transition Status: Signed TTA PMW 173 Transition FY05 • Deliverables: Ka/Q-band transmit arrays, K-band Receive Array design utilized by OXX 																																													
<table border="1"> <thead> <tr> <th>Funding</th> <th>PE Number</th> <th>FY05</th> <th>FY06</th> <th>FY07</th> <th>FY08</th> <th>FY09</th> <th>FY10</th> <th>FY11</th> </tr> </thead> <tbody> <tr> <td>S&T #3-6.3</td> <td></td> <td>\$2,500</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>00W313V Project X0740</td> <td>\$10.1M</td> <td>\$16.7M</td> <td>\$34.0M</td> <td>\$34.0M</td> <td>\$13.9M</td> <td></td> <td></td> </tr> <tr> <td>Transition (\$46.5)</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>										Funding	PE Number	FY05	FY06	FY07	FY08	FY09	FY10	FY11	S&T #3-6.3		\$2,500								00W313V Project X0740	\$10.1M	\$16.7M	\$34.0M	\$34.0M	\$13.9M			Transition (\$46.5)								
Funding	PE Number	FY05	FY06	FY07	FY08	FY09	FY10	FY11																																					
S&T #3-6.3		\$2,500																																											
	00W313V Project X0740	\$10.1M	\$16.7M	\$34.0M	\$34.0M	\$13.9M																																							
Transition (\$46.5)																																													
<p>Assessment: Cost: ● Schedule: ● Technical: ● Transition: ●</p> <p>Comments/Issues:</p> <ul style="list-style-type: none"> • Both the K and Q band arrays had technical difficulties which required schedule slip, resulting in a yellow score above. • There are two major risks for the Q band array: cost and performance. However, Q band arrays can be developed at cost less than \$100 million, successful transition of K&Q band arrays, utilization on program. • Both the K and Q band arrays are under for production. Schedule and cost designs are being used for AICAD program. 																																													
<p>*S&T Cost/Schedule/Technical</p> <p>Green: S&T On Track for Delivery Yellow: Identified Delivery Issues/Risk but Manageable Red: S&T Delivery Unlikely or at High Risk</p>					<p>*Transition</p> <p>Green: Adequate Funds Programmed Yellow: Funds Planned/PT Committed Red: No Funding Plan</p>																																								
<p>* Requires recommendation on continuation in comments box.</p>																																													

Transition is the responsibility of all stakeholders



FNC Project Highlight

Affordable Common Radar Architecture

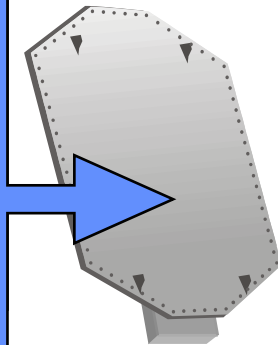


Objectives

- Common scalable architecture for:
 - USMC HELRASR/USAF KMDS
 - Integrated SPN-43, SPS-48, SPS-49 retrofit.
- Emphasize scalability and open architecture for procurement and life cycle affordability

S&T Design Issues

- Affordable OA core relevant to afloat & expeditionary systems
- Extended reliability by design
- Address permanent and near-land use prohibitions from spectrum loss
- Address mid-latitude ducting limitations
- Fixed or rotator TBD depending upon procurement and life-cycle costs
 - If rotator, address Doppler resolution limitations
- ECCM
- High resolution for NCID and closely spaced objects
- Affordable scalable architecture meeting joint needs



Budget (\$M)

	FY09	FY10	FY11	FY12	FY13	Total
ACRA	2.75	7.26	8.25	5.39	3.3	26.95

AFFORDABLE, RELIABLE, MOBILE



Manufacturing Technology (ManTech) Overview

- **Mission:**

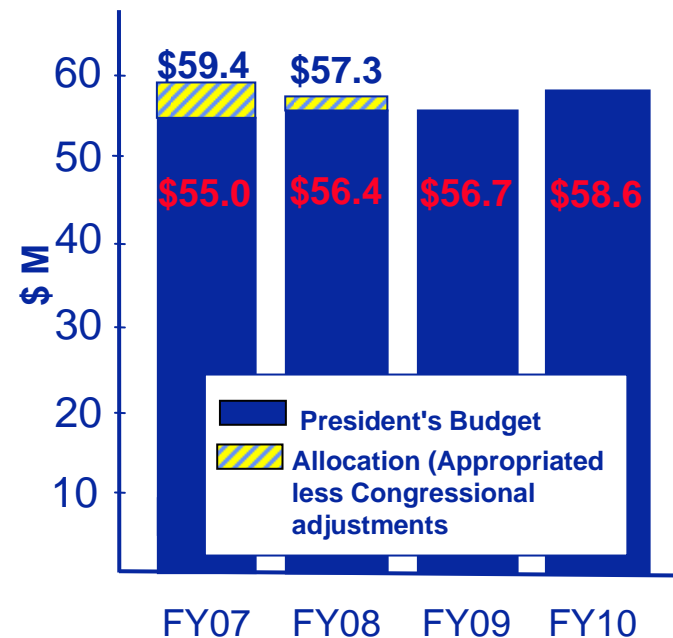
- Develop enabling manufacturing technology -- new processes and equipment -- for implementation on DoD weapon system production lines
- DoD 4200.15 states investments should:
 - Transition emerging S&T results to acquisition programs
 - Improve industrial capabilities in production, maintenance, repair and industrial base responsiveness
 - Advance manufacturing technology to reduce cost, improve performance, and responsiveness

- **Budget:**

- Stable at approx. \$60M

- **Execution:**

- **Nine Centers of Excellence (COEs)**
 - 8 Contracted, 1 Government



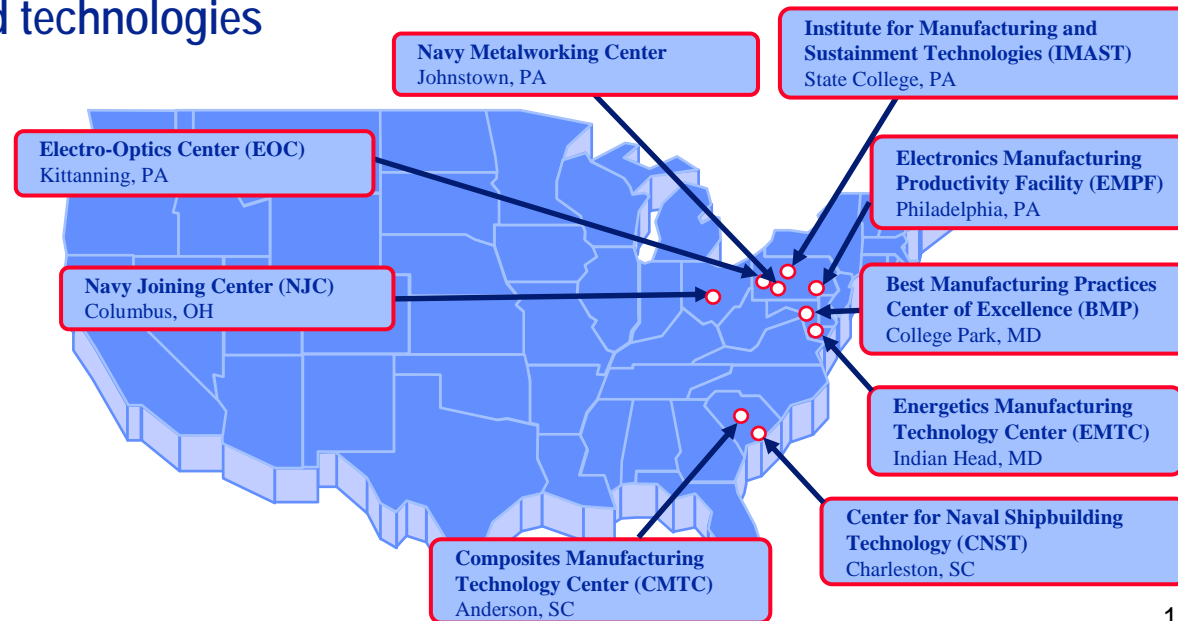


ManTech Overview (cont)

Execution

Navy ManTech is executed through nine Centers of Excellence (COEs):

- Execute projects; manage project teams
- Serve as corporate expertise in technological areas
- Collaborate with acquisition program offices / industry to identify and resolve mfg issues
- Develop and demo mfg technology solutions for identified Navy requirements
- Provide consulting services to Naval industrial activities and industry
- Facilitate transfer of developed technologies





ManTech Overview (cont)

FY09 Investment Strategy

- **Focused Shipbuilding Affordability Initiatives**
 - Concentrate resources on few high priority naval platforms for maximum benefit
 - Working with Program Offices and industry to select and execute projects to reduce acquisition cost
 - Acquisition Program Office prioritizes projects for platform portfolio
 - Platform IPTs oversee platform portfolios (ONR, COEs, Program Office, industry)

Primary Emphasis - Affordability



PEO (Ships)
DDG 1000



PEO (Carriers)
CVN 21



PEO (Ships)
LCS



PEO (Subs)
SSN



PEO (Ships)
LPD 17
DDG 51



PEO (T)
F-18 Family
EA-18G



PEO (IWS)
Missiles
Weapons
Munitions



PEO (W)
N-UCAS



LCS Build Strategy (LCS)

- **LCS Program Office asked ManTech for suggestions for improving acquisition process for Littoral Combat Ships**
 - Recommendation - LCS bidders be required to include a Build Strategy in proposal
- **LCS Program Office agreed and requested that ManTech develop -**
 1. Draft build strategy requirements that could be included in the LCS solicitation and
 2. Evaluation criteria that the Navy could use to assess strategies submitted
- **CNST teamed with First Marine International (internationally recognized leader in providing specialist services to marine industry) to develop requested documents**
 - Delivered to ONR and **forwarded to LCS Program Office on 10 Jan 08**

Build Strategy should:

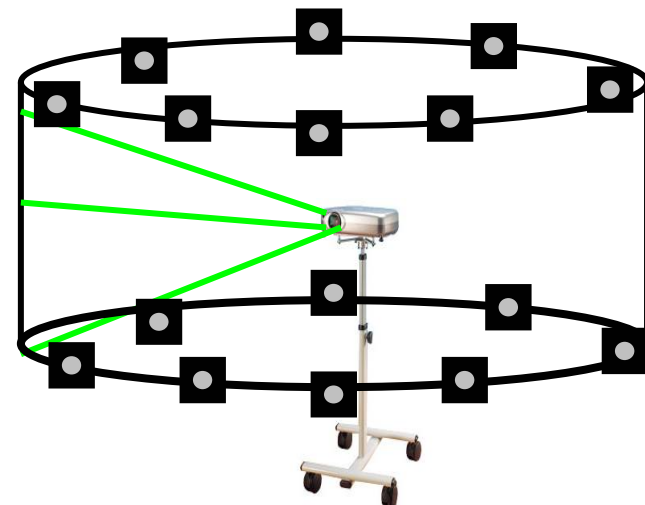
- Describe how the ship is going to be built:
 - Block and unit definition
 - Outfit module definition
 - Interim product definition
 - Assembly methods and processes
- Demonstrate that there are sufficient resources to the build the vessel as described:
 - Labor, facilities and infrastructure
- Demonstrate that the shipyard has the capability to carry out project as proposed:
 - Realistic schedule
 - Alignment of resources to schedule
 - Material acquisition plan
- Describe overall plan:
 - From principal product breakdown and supply chain plans to test and commissioning plans

Done properly, build strategies will reduce cost by matching the production approach to the shipyard process capabilities and will reduce risk to Navy and industry



ManTech Project Highlight Laser Image Projection (VCS)

- **Goal:** Automate the layout of attachments during early outfitting
- **Benefits:**
 - Automate layout process
 - Eliminate paper templates and string measurements wherever possible
- **Background:**
 - Technology made possible by EB's One-Stop tool, developed under CNST's Product Centric project
 - One-Stop enables extraction of attachment data from EB's 3-D Product Model
- **Impact**
 - Partially implemented on Hull 781 (8 cylinders)
 - ~2000 hangers (~4000 studs) for Electrical & HVAC attachments
 - 2,910 hours saved (**~84% savings**) on partial use
 - \$650,000 saved per hull (conservatively estimated at \$65/hour)
 - **Project cost (\$622K) re-couped in one hull**
 - Additional application being evaluated



Retro-reflective targets placed on already marked ship's grid system points can be used to position projection system.



Projector marks center-point location of stud (green laser light dot). Technician punch-marks & labels attachment point on face of frame flange.



ManTech Project Highlight HSLA-115 Eval / Implementation (CVN)

• Background:

- CVN 78 requires improved performance and higher strength for reducing weight and to meet application requirements
- Implement HSLA-115 at higher strength level and acceptable protection, toughness, welding and structural performance for weight reduction and increased factors of safety

• Payoff:

- Potential weight savings of 100 - 200 long tons per hull for one application
- Cost neutral to \$1M savings impact anticipated
- Reduced top-side weight, lower center of gravity 0.2-ft
- Potential for additional future applications that require high strength and toughness

• Achievements:

- NAVSEA / PMS 378 issued official letter to NGNN approving the use of HSLA-115 in baseline design and requiring successful completion of this project
- NNS Management and Technical Review Board (TRB) officially approved incorporation of HSLA-115 into CVN 78 design (2 Nov 2007)

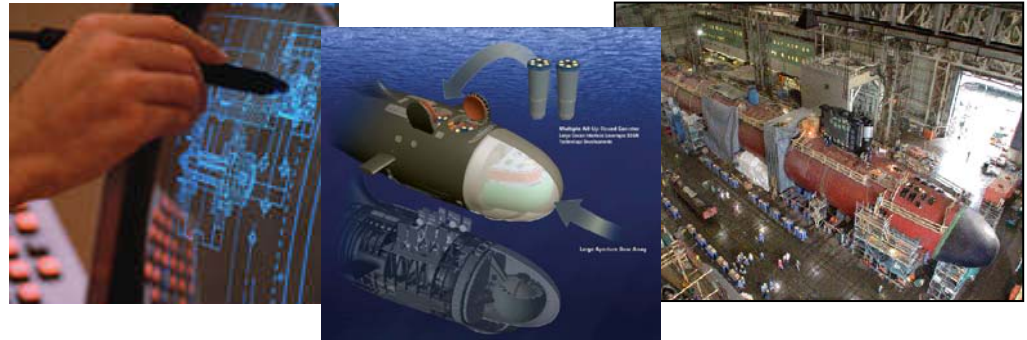




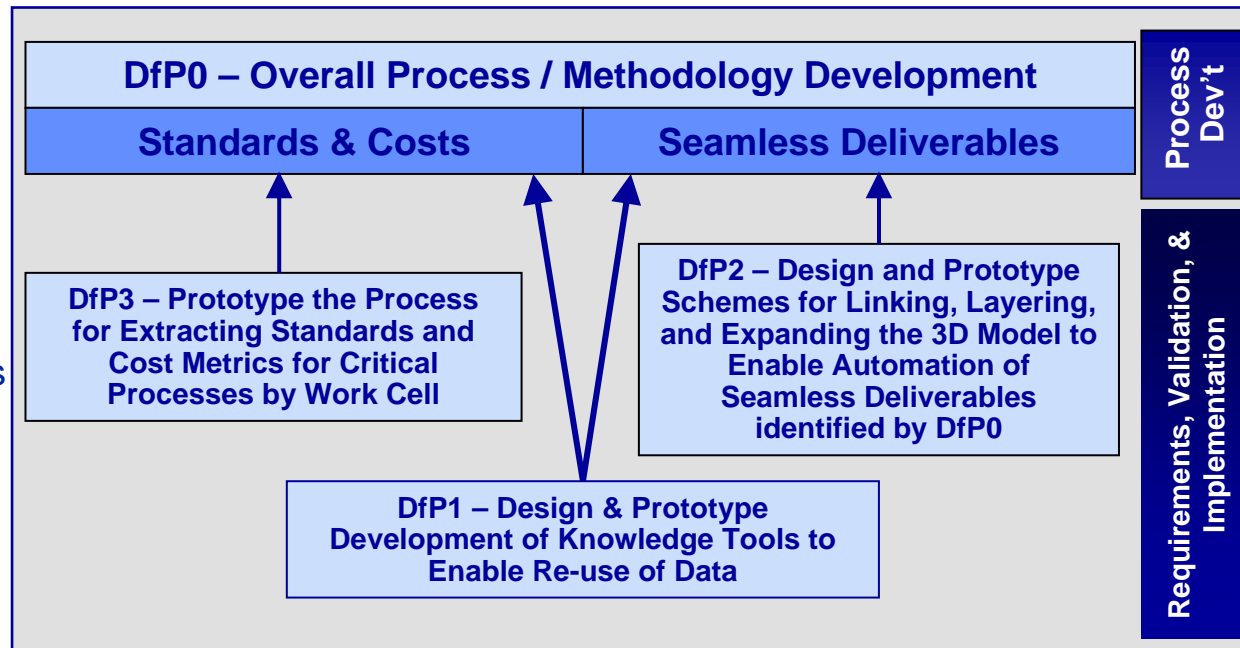
ManTech Project Highlight

Design for Production (DfP) Projects (VCS)

- **Goal:** Develop and implement Design for Production (DfP) techniques for VIRGINIA Class submarine construction cost reduction
- **Background:**
 - 4 inter-related DfP projects at Electric Boat
- **Payoff:**
 - Reduced design costs
 - Improved configuration management
 - Ability to consider design alternatives based on mfg costs
 - Standardized best mfg practices for re-use in design
 - Improved build sequencing
 - Reduced construction costs
 - **Total est. cost savings of \$4.8M/hull**



Identifying design / process drivers to reduce construction costs





Summary

- **Affordability is a key Navy theme**
- **Navy Science and Technology programs starting to address affordability and manufacturability**
- **Affordability needs to be addressed while developing next generation capability**
 - Affordability as part of the technology development concept (open systems, modular)
 - Difficult to insert affordability once technology has been developed
- **Navy ManTech addressing shipbuilding affordability**
 - High return on investment from areas such as Design for Production and Outfitting Process Improvement