Navy ManTech Program Impacting Key Platform Affordability

NDIA Briefing

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Overview

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- ManTech Organization
- Navy Manufacturing Portfolio
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- 6.2 – Manufacturing Applied Research
- 6.3 – Manufacturing Technology (ManTech)
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- Summary

ONR Organization

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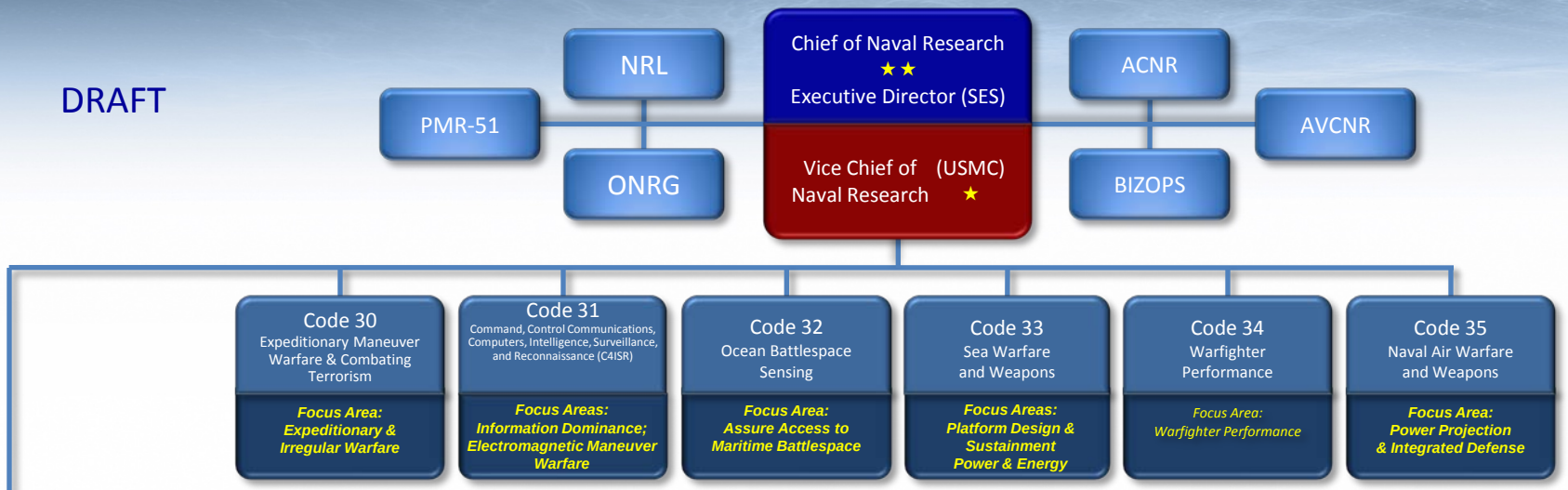


Director of Research (03R)

Discovery & Invention; SwampWorks; Science, Technology, Engineering and Mathematics (STEM)

Director of Technology (03T)

Technology Maturation Portfolio; Leap-Aheads; Quick Reaction S&T

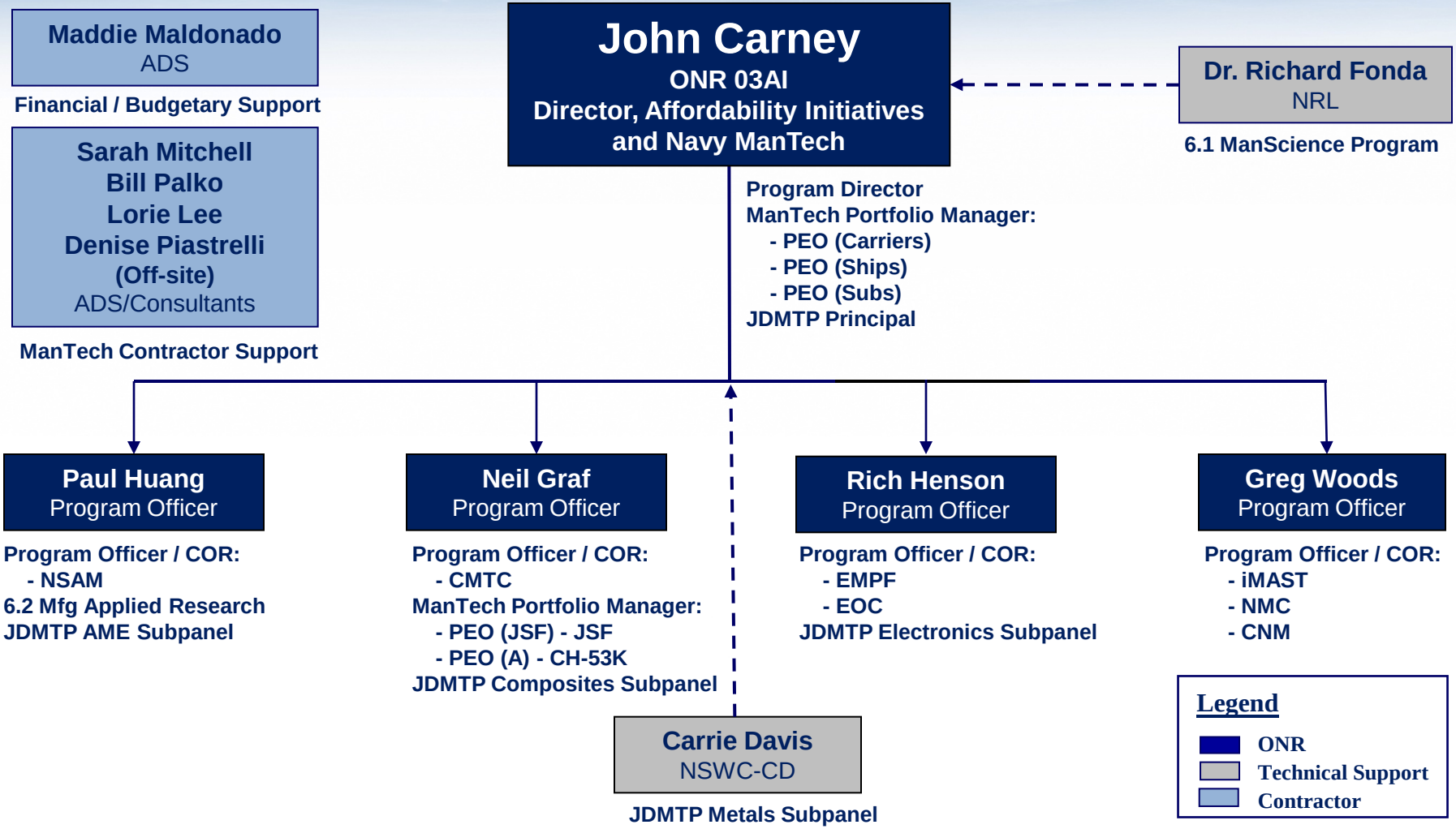
The nine S&T Focus Areas cut across all departments

The two Directorates manage cross-cutting programs

Basic & Applied Research

Future Naval Capabilities
Quick Reaction
Disruptive Technologies

Navy ManTech Organization



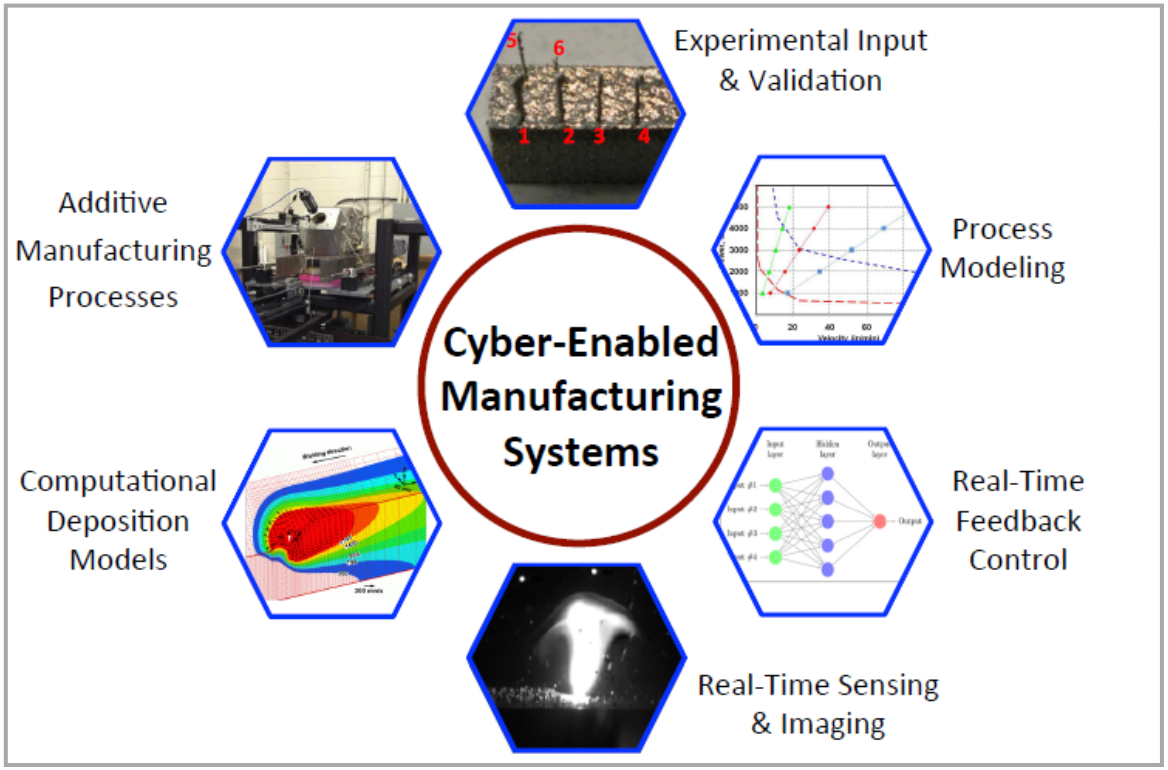
Navy Manufacturing Portfolio

Vision: Integrated approach from S&T basic research through industrial base preparedness (6.1 through 6.3) to address manufacturing and affordability in manufacturing for DoN systems

6.1 – Manufacturing Science	6.2 – Mfg Applied Research	6.3 - Mfg Technology (ManTech) Program
Novel manufacturing technologies and control methods to produce critical new and replacement parts on-demand – Cyber-Enabled Manufacturing Systems for Direct Digital Manufacturing (CeMS-DDM)	Scale-up and development of emerging manufacturing process innovations for product-related S&T programs (FNCs) to reduce cost of fielding new capabilities – Azimuth and Inertial MEMS Disk Resonator Gyros – Additive Manufacturing	Acceleration of manufacturing technologies to reduce total ownership costs for DoN systems. Focused on acquisition cost reduction for 5 key acquisition platforms.
Dr. Richard Fonda, NRL	**Paul Huang, ONR**	**John Carney, ONR**
Budget: $0.725M	**Budget:** $0.931M	**Budget:** $56.7M

6.1 – Manufacturing Science (ManScience) 2014 BAA

- **2014 BAA: Cyber-Enabled Manufacturing Systems (CeMS)**
- **Objective:**
  - Develop scientific foundation required to improve manufacturability of metallic components using additive manufacturing
  - Minimize unintended variations in AM processes, product quality, and production throughput, or enable purposeful variations to tailor properties on a local scale
- **Projects:**
  - Complementary projects selected to span the needs for real-time process control and defect detection in additive manufacturing



6.1 – ManScience 2017 FOA

- **2017 FOA: Additive Manufacturing Alloys for Naval Environments**
- **Objective:** Design, develop and optimize new metallic alloy compositions for AM that are resistant to the effects of the Naval / maritime environment.
- **Schedule / Process:**
  - Proposals in 15 Feb
  - In review
  - Expect some start-up funds in FY17
  - Full implementation in FY18

6.2 – Manufacturing Applied Research

- **Objective:** Scale-up development of emerging manufacturing process innovation for product-related S&T programs from the Future Naval Capabilities portfolio to reduce cost of fielding new capabilities.
  - FNC and ManTech jointly develop criteria and identify potential candidates
- **Completed projects:**
  - Multi-Band Fiber Optic Cable Manufacturing Technology (EOC)
  - Fuel Cell Producibility (NMC)
- **Projects currently underway:**
  - Azimuth and Inertial MEMS Disk Resonator Gyros (EMPF)
  - Development of Additive Manufacturing Processes for Corrosion Resistant Alloys (iMAST)
  - Submarine Coatings (iMAST)

6.3 -- Manufacturing Technology (ManTech)

- **Mission:** Industrial Preparedness
  - Development of 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
- **Funding (PE 0603680N):**
  - FY16 $57.1M
  - FY17 $56.7M
- **Execution:**
  - ManTech Centers of Excellence (COEs)
- **POCs:** ONR Program Officers / COEs

ManTech Investment Strategy

- **Addressing affordability (acquisition and life-cycle)**

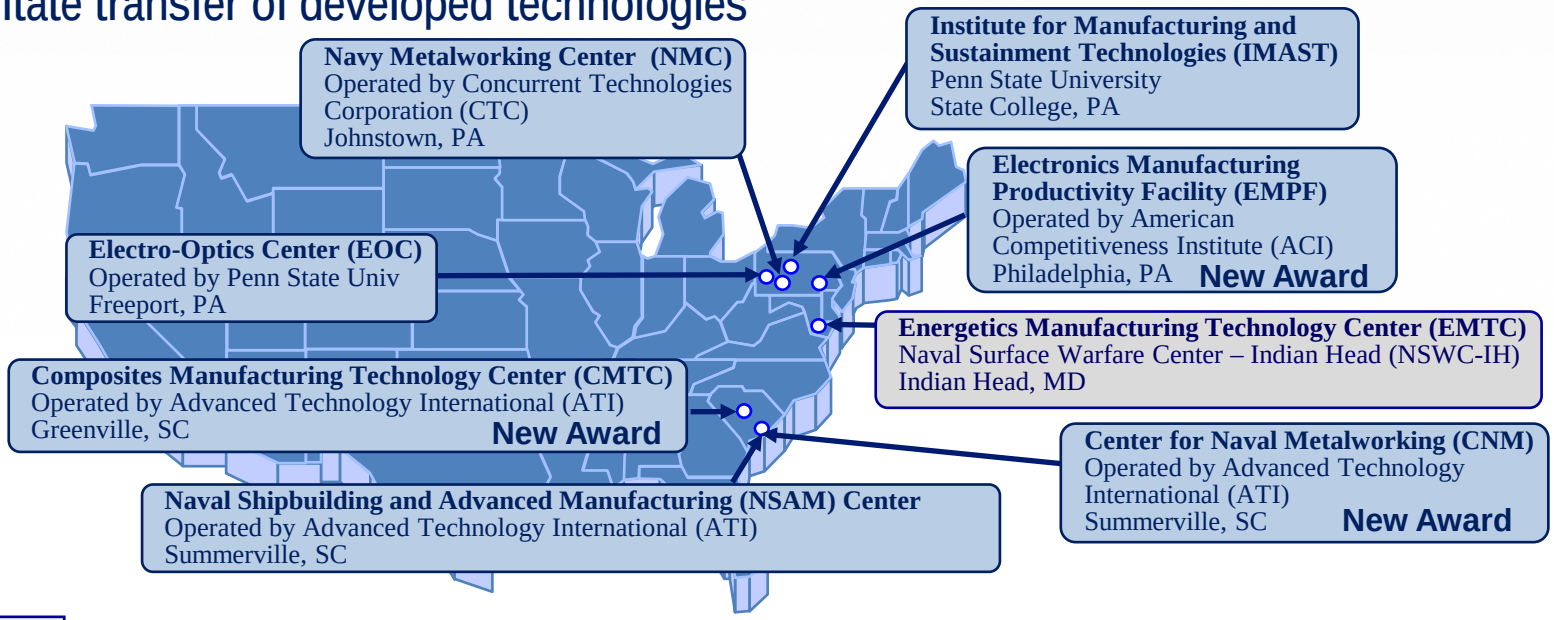
Affordability Initiatives									
	**PEO (Subs)** *VIRGINIA COLUMBIA*		**PEO (Ships)** *DDG 51 Class*		**PEO (Carriers)** *CVN 78 Class*		**PEO (JSF)** *F-35*		**PEO (A)** *CH-53K*

- **Investment Strategy focused on largest DoN acquisition programs as determined by:**
  - Total acquisition funding
  - Stage in acquisition cycle (remaining years of acquisition)
  - Platform cost reduction goals
  - Cost reduction potential for manufacturing

ManTech - making a significant impact on affordability, highlighted by recent implementations and cost savings

Centers of Excellence

- Executed through Centers of Excellence (COEs)
  - Execute projects; manage project teams
  - Collaborate with acquisition program offices / industry to identify and resolve mfg issues
  - Develop and demo mfg technology solutions for identified Navy requirements
  - Facilitate transfer of developed technologies



Focus on Implementation

- **ManTech, alone, cannot ensure implementation …**
  - Need ONR / COEs / industry / Program Office all working together
- **Technology Transition Plans (TTPs) for each project**
  - Upfront agreement by all parties as to required actions / responsibilities from technology development through implementation (includes required resources for implementation)
  - Signed by Navy ManTech, COE Director, Industrial Facility Management, Program Office, and, if appropriate, the government technical authority
- **Implementation Risk Assessment / Management Process**
  - Recognize risks to implementation upfront and assess / manage through project execution
  - Risks discussed during Program Reviews to ensure ManTech on same page as acquisition / industry stakeholders

ManTech goal is technology implementation

IPTs and Affordability Assessments

- **IPT for each Affordability Initiative**
  - Reps from Navy ManTech, the platform Program Office, and industry
  - Conduct Program Reviews to coordinate and review portfolio: progress of projects and continued likelihood of transition / implementation

- **Affordability Assessments (estimate of total savings per hull)**
  - Have acquisition Program Office-approved process for assessing cost savings of current ManTech portfolio
  - Assess both acquisition and life-cycle savings semi-annually

- **Recognized Cost Savings (by Shipyard)**
  - Recognized savings/hull for projects in portfolio that have either implemented to date or are in the process of implementing
  - Measurement of progress against estimated total savings per hull
  - Submitted by the applicable shipyard annually
    - Will be expanding to air Affordability Initiatives in future

FY18 Planning Cycle

1.	ManTech Investment Strategy Guidance	Jun 2016
2.	Acquisition PM / Industry / COE Discussions & Project Generation ***	Jun-Nov 2016
3.	ManTech Program Office Approval	15-16 Nov 2016
4.	Program Office Prioritization and Approval	17-31 Jan 2017
5.	Approved Prioritized Plan per Platform	1 Feb 2017
6.	Project Proposal Phase	Feb-15 Jul 2017
7.	Proposal Review / Approval	15 Jul–Sep 2017
8.	Project Initiation (FY18 Projects) ***	Oct 2017

*** Industry Involvement

Affordability Initiative Examples

VIRGINIA Class Submarine Affordability Initiative

Navy ManTech Portfolio Specifics:

- Current portfolio of approx. $86M
- Projected acquisition savings: $48.6M/hull
  - Cost savings to date: $35.7M/hull
  - 41 implemented projects per Electric Boat (1/2017)
- Projected class maintenance/repair cost savings: $100+M

Extended affordability focus to COLUMBIA Class Submarine (CCS)

Won 2013 DOD Value Engineering Achievement Award

- Letter of appreciation from HON Frank Kendall, USD (AT&L) – Jun 2014
- Presented to ONR ManTech, VCS Production Cost Reduction Team (PMS 450), and Electric Boat – Oct 2014

Annual Navy ManTech Budget returned with yearly VCS cost savings of >$60M

VCS Implementations

Recognized Cost Savings/Hull to Date

Composite Material Substitution	$/Hull
• Lightweight Composite Bow Access Covers	$0.01M
• Composite Manufacturing Technology for Marine Impeller	$0.40M
• Composite Manufacturing Technology for Reduced Cost Sail Cusp	$0.05M
• Reduced Cost Impeller	$0.27M
• VCS Main Ballast Tank Grates	$0.40M
• Lower Cost Composite Fairings and Array Support Plates	$0.22M

Manufacturing Enterprise Improvements	
• Design for Production Process Improvements	$3.60M
• Improved Production Engineering Management Tools	$0.68M

Focused Process Improvements	
• Damping Material Application Improvements	$0.72M
• Improved Hull Fabrication and Assembly Welding	$0.20M
• Structural Fabrication Welding Improvements	$0.10M
• Sheet Metal Processing Improvements	$0.09M
• Steel Casting Optimization	$0.22M
• Pipe Preparation and Welding Methods	$0.58M
• Large Diameter Pipe Process Improvements	$0.33M
• Optimization of Blasting Operations	$0.29M
• Pipe Assembly Installation Improvement Methods	$0.60M
• Lead Installation Process Improvements	$0.33M
• Improved Welder Productivity	$2.50M
• Robotic Welding of VCS Interim Products	$1.22M
• Additive Manufacturing for Shipbuilding Applications	$0.20M

Recognized Cost Savings > $35.7M/hull

41 projects implemented or in process of implementing (acquisition / life-cycle)

(GD Electric Boat Spreadsheet – Jan 2017)

VCS Implementations (cont)
Recognized Cost Savings/Hull to Date

Improved Inspection Methods	$/Hull
• Laser Image Projection	$0.53M
• Metrology for Automated Hull Layout	$0.48M
• Automated Fiber Optics Link Test and Evaluation	$0.06M
• SHT Debond Detector	$0.35M
• Trade Friendly Dimensional Techniques	$1.73M
Outfitting Process Improvement	
• Outfitting Process Improvements	$5.00M
• Sequencing and Scheduling – Outfitting	$0.75M
• Efficient Environmental Controls for Painting Operations	$0.41M
Improved Material Distribution	
• VCS Material Management	$5.40M
• VCS Material Flow Processes and Technology	$1.55M
Facility Work Flow Improvement	
• VCS Pipe Shop Process Re-engineering	$1.20M
• VCS Outfitting Tooling and Processing	$0.74M
• Cladding Work Cell for Submarine Manufacturing	$0.23M
• Small Weldments Optimization Cell	$0.40M
• Product Centric Facility Design	$0.79M
Improved Business Practices	
• Supply Chain Management Benchmarking Study	$0.05M
• Web-Based Welding Procedure Approval System	$0.98M
• VCS Supply Chain Technology Review	$2.05M
Life-Cycle Only Projects	
• Supply Chain Management Benchmarking Study	
• Web-Based Welding Procedure Approval System	

Joint Strike Fighter (JSF) Affordability Initiative

Background:

- Official start 2010
- Very close coordination between Navy ManTech / JPO
- Joint Navy, Air Force and OSD ManTech collaboration

Navy ManTech Portfolio Specifics:

- Investment: $41.8M to date (31 projects)
- FY17 / FY18 planning cycles in work in coordination with F-35 JPO

Credited Cost Reduction (JPO):

- Projected $800M savings for DoD aircraft on $35M Navy investment (through 2015)
  - $400K per aircraft over production buy (JPO letter from RADM Mahr – Nov 2015)

The partnership between the F-35 Program Office and the Navy ManTech Office is producing real benefits that will improve affordability of near-term production units. We look forward to increasing our collaboration for continued improvements in acquisition and life-cycle affordability.

Amanda Gentry, F-35 Blueprint for Affordability and Science and Technology Lead, Oct 2014

Project Highlights

VCS Project Highlight
Composites for VCS Submarine Sail

Performed by Composites Manufacturing Technology Center (CMTC)

Goal:

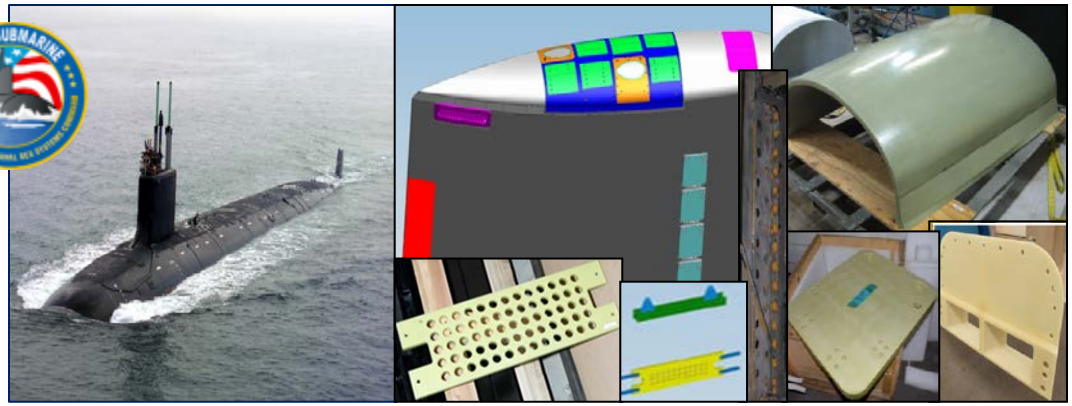
- Develop composites technology for doubly-curved steel VCS sail sections to reduce acquisition and maintenance costs
  - Current sections difficult to fabricate and corrode frequently in harsh underwater environment.

Warfighter Impact / Payoff:

- Total Cost Savings: $3.5M/hull total
  - $1.8M/hull acquisition / $1.7M/hull maintenance

Implementation:

- Implemented VCS 2014 / anticipated implementation on CCS



Project Highlight
Efficient Identification of Plate Defects

Goal:

- Develop 3-D inspection technologies to reliably and repeatedly identify surface defects on steel plates in a shipbuilding environment
  - CVN 78, DDG 51 and LHA class ships

Warfighter Impact / Payoff:

- Total Cost Savings:
  - $3.5M cost reduction over a five-year period for CVN 78 Class at NNS
  - $650K cost savings over a five-year period for DDG 51 and LHA Class at Ingalls

Implementation:

- On track: HII-Newport News (3rd qtr FY17) / HII–Ingalls (1st qtr FY18)

Performed by Navy Metalworking Center (NMC)

Project Highlight
Robotic Welding for VCS Interim Products

Goal:

- Reduce welding costs for part family and interim product and major product assemblies by increasing the number of joints that can be welded using robotics
- Targeting 30% reduction in weld hours

Warfighter Impact / Payoff:

- Total Cost Savings: $1.2M/hull

Implementation:

- Electric Boat (Quonset Point) – implementation 4th quarter FY15

Performed by Naval Shipbuilding and Advanced Manufacturing Center (NSAM)

Project Highlight
Mfg Cost Reduction for Scalable EW System

Goal:

- Reduce cost while maintaining performance objectives set forth in the LCS EW System/ Subsystem Specification
  - Block 2 architecture cost reduction of $1M
  - Realized through commonality with the DDG 51 SLQ-32(V)6 system

Warfighter Impact / Payoff:

- Target cost goal: $3.2M per EW System

Implementation:

- Drawings transferred to Navy
- Under evaluation for Future Frigate

Performed by Electronics Manufacturing Productivity Facility (EMPF)

Implementation Highlight
F-35 Transparency Clean-Up Automation

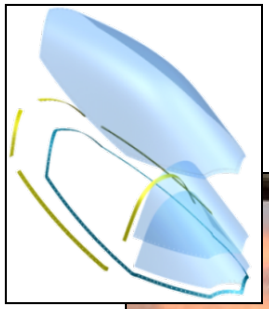
Performed by Composites Manufacturing Technology Center (CMTC)

Goal:

- Develop automated clean-up technology for F-35 transparencies to reduce labor-intensive hand-sanding to remove surface mark-off, light scratches, and orange-peel surface imperfections
  - 2nd ManTech project related to transparencies

Warfighter Impact / Payoff:

- Total cost savings - > $160M on $1.1M investment
  - Eliminates hand sanding and polishing for mark-off and surface preparation
  - Reduces chance of damage to sensitive substrate by hand sanding
  - Reduces amount of highly skilled labor required
  - Reduces process variability



Implementation:

- Transitioned technology FY15; implementation in work
  - System installed at GKN Aerospace Transparency Systems
  - Demonstrated full-scale system meets production requirements

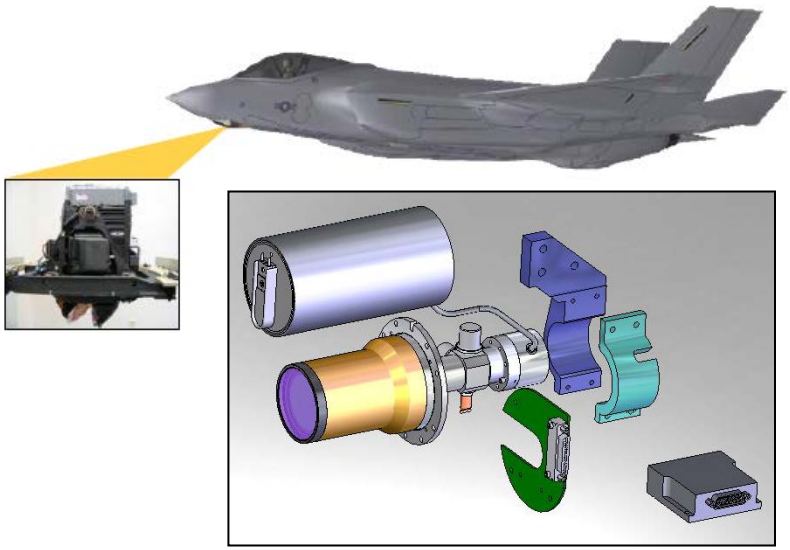
Implementation Highlight
Electro-Optical Targeting System (EOTS) Producibility – Phase I

Performed by Electro-Optics Center (EOC)

Goal:
- Automate manufacturing and improve yield of the F-35 EOTS sensing component, the Integrated Dewar Cooler Assembly (IDCA)
  - Leveraged advances in commercial semiconductor industry (automation of production, handling, and testing) to improve quality, increase capacity, and reduce costs

Warfighter Impact / Payoff:
- Total cost savings – approx. $117M for F-35 JSF Program on $4.62M DMS&T and Air Force investment

Implementation:
- Implemented beginning with LRIP 6 with full realization of benefits by LRIP 8



Follow-on Efforts:
- Phase II – Navy funded ($436K) - active
  - Focal Plane Array Quick Test
  - Dewar Improved Final Vacuum Bake
- Phase III – Air Force funded ($700K) – active
  - Cold Stack Automation
  - Automated Die Cleaning & Inspection

Navy ManTech Web Site

- http://www.onr.navy.mil/en/Science-Technology/Directorates/Transition/Manufacturing-ManTech.aspx
  - Project Book (snapshot of all projects active during past FY)
  - Points of Contact Directory

- **Navigation** – www.onr.navy.mil; click on “03T Transition” under Directorates heading; and click on “Manufacturing Technology”