NSRP All Panel Meeting 2025 General Session Day 2

26 February 2025

Charleston, SC

NATIONAL SHIPBUILDING RESEARCH PROGRAM™
Taking Shipbuilding and Repair to the Next Level

Welcome & Introductions

Host: NSRP Executive Director, Mark Smitherman

MC: NSRP Technical Manager, Steve Gaschler

NATIONAL SHIPBUILDING RESEARCH PROGRAM™
Taking Shipbuilding and Repair to the Next Level

Logistics

- Fire/Emergency Procedures
- There is Conference Wifi
- Breakfast and Lunch is provided
- Reception this evening 5-7PM

- If you need assistance find an ATI NSRP Member (orange bands)

Anti-Trust Rules

- Regarding your company's and/or your competitor's **product & services**:
  - Do not discuss current or future prices.
  - Do not discuss any increase or decrease in price.
  - Do not discuss pricing procedures.
  - Do not discuss standardizing or stabilizing prices.
  - Do not discuss controlling sales or allocating markets for any product.
  - Do not discuss future design or marketing strategies.

Anti-Trust Rules

- Regarding your company's and/or your competitors' selection of their **supplier companies**:
  - Do not discuss refusing to deal with a company because of its pricing or distribution practices.
  - Do not discuss strategies or plans to award business to remove business from a specific company.

- Regarding your company's and/or competitors' **trade secrets**:
  - Do not discuss trade secrets or confidential information of your company or any other participant.

Agenda Available Online

Scan QR codes with phone. Click link to Event Page. Select Agenda to view or download.

Navy ManTech Program Impacting Key Platform Affordability and Availability

Neil Graf

Manufacturing Technology (ManTech) Program

Code 332

26 Feb 2025

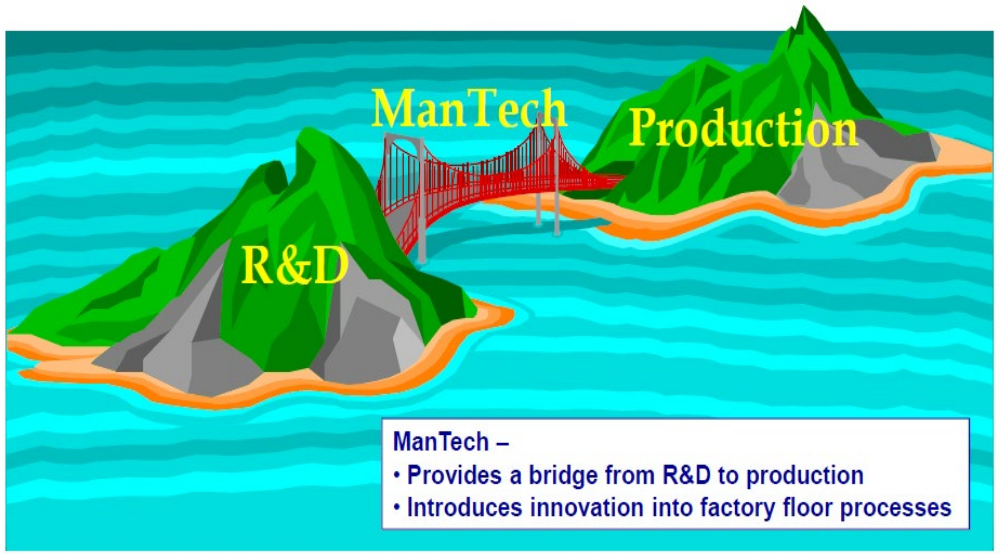
PE 0603680N – Manufacturing Technology (ManTech)

- **Established USC Title 10, Section 4841**

- **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 and improve performance and responsiveness

- **Execution:**
  - ManTech Centers of Excellence (COEs)

- **POCs:**
  - ONR Program Officers / COEs



ManTech Requirements and Restrictions

Requirements (DoD 4200.15, E2.1.3)

- Well-defined DoD requirement for the technology (“Tech Pull”)
- Technology demonstrated in lab environment
- Can be delivered in time to meet the requirement
- Results applicable to more than one weapon system, component, or end item
- Specific plan to transition, implement, and insert results
- Potential for multiple Component-sponsored investments investigated
- Investment not duplicative of other activities, both within and outside ManTech

Restrictions (DODD 4200.15 E.2.2 and other sources)

- Routine application of existing technology
- Investments specifically intended to change an end item's design
- Purchase of off-the-shelf equipment (unless a minor portion of the investment and required to establish the first-case application of the ManTech deliverable)
- Purchase of capital facilities
- Implementation of manufacturing technology beyond the first-case application
- A technology application unique to a single weapon system
- General Technology Development (Tech Pull/No Specific Requirement)
- Materials Development
- Component/system certification or qualification testing
- Technology proprietary to one company

Navy ManTech Organization
Code 33 – Sea Warfare and Weapons Department

Updated: 12 Nov 2024

Legend
- ONR
- Detailee / Tech Support
- Contractor Support

Vacant / Rotating
ONR 33 Department Head

Dr. Jennifer Wolk
Code 332 – Adv Naval Mat'ls and Systems
Division Director

Neil Graf
ManTech Lead / Program Officer
Composites Manufacturing Lead

COR:
- CMTC
- EMTC

ManTech Portfolio Manager:
- Capability Acceleration
- Air Platforms (Affordability)
- Ship Platforms (Affordability)

JDMTP Navy Principal

Paul Huang
Program Officer
Manufacturing Enterprise Lead

COR:
- NSAM
- iMAST

ManTech Portfolio Manager:
- Sustainment

JDMTP AME Subpanel

MII Support (MxD / ARM)

Guest Researcher at NIST

Dr. Jeffrey Farren
Program Officer
Metals Manufacturing Lead

COR:
- CNM

JDMTP Metals Subpanel

NSWCCD Coordination

6.2 Development Lead

MII Support (LIFT)

William Crespo
Program Officer (Acting)
Electronics Manufacturing Lead

COR:
- EMC
- EOC

ManTech Portfolio Manager:
- PEO (IWS)

JDMTP Directed Energy Technical Working Group

Gina Walker
Ellen Reed
Megan Gavarkavich
Stephanie Marsh
Stephen Gilligan
Miranda Fleck
Kassia Rivera
Joana Haizel-Cobbina
Contracts – ONR Code 253

Kelsey Harrison (NAWC-AD)
Stan Ng (NAWC-AD)
Additional Government Support

Sarah Mitchell
Denise Piastrelli
Sabrina Hogan
Karen Brown
Gabe Puente-Lay
Prince Adu-Jamfi
Matt Vincent
Don Szczur
Rob Akans
BCS Allegient Team

Manufacturing Technology Program – FY26 Investment Strategy –

AT A GLANCE

Funding executed in two major areas – (1) Major Acquisition Platform Affordability and (2) Capability Acceleration, in close coordination with acquisition program offices, depots and shipyards, industry, NRE, Navy Labs, and Technical Warrant Holders.

FY26 Investment Strategy

1. Major Acquisition Platform Affordability and Sustainment

2. Capability Acceleration – enhancing / expediting the use of new technologies in the fleet

Thrust Areas			
-	Sustainment Technology	-	Unmanned / Autonomous Vehicle Production
-	Energetics Production Support	-	Directed Energy
-	Advanced Submarine Technology Fabrication	-	Hypersonics Fabrication
-	Future (Major) Acquisition Platform Support	-	ONR Manufacturing Maturation and Transition

WHY IS THIS IMPORTANT

- **Platform Affordability –** ManTech has a significant role in providing cost savings to major acquisition platforms. Close coordination with acquisition program offices and industry ensures implementation on production lines.
- **Capability Acceleration –** ManTech's manufacturing expertise allows for rapid manufacturing maturation to benefit both S&T and acquisition programs to get capabilities to the fleet faster.

COEs – Core Competencies

- **Metalworking**
  - Joining Technologies
  - Metals Manufacturing Processes
  - Robotics and Automation
  - Inspection Technologies
  - Manufacturing Technology / Industrial Base Infrastructure
- **Program Officer: Dr. Jeffrey Farren**

- **Composites**
  - Automated Fiber Placement
  - Out of Autoclave Composites
  - Thick-Walled Composites
  - Vacuum-Assisted Resin Transfer Molding
  - Controlled Volume Molding for High Temp Composites
  - Manufacturing Automation for Polymer Composites
  - Composites for Very Large Format Radomes
- **Program Officer: Neil Graf**

- **Manufacturing & Sustainment**
  - Laser Processing
  - Materials and Composites Processing
  - Manufacturing Systems
  - Systems and Operations Automation
  - Sustainment / Repair Technologies
- **Program Officer: Paul Huang**

- **Shipbuilding & Advanced Manufacturing**
  - Shipbuilding Technology
  - Process / Fabrication Optimization
  - Digital Work Instructions
  - Modeling
  - Spatial Scheduling
  - Inspection Technology
  - Sustainment
- **Program Officer: Paul Huang**

- **Electronics**
  - Automated Packaging
  - RF Technology
  - Wide Band Gap Technology
  - Environmental Issues
- **Electro-Optics**
  - Focal Plane Array & Sensor Technology
  - Fiber Optics & Photonics
  - Image Processing and Inspection Systems
  - Optics and Coatings
  - Lasers and Laser Weapon Systems
  - Laser Micromachining
- **Program Officer: Will Crespo**

- **Energetics**
  - Propellants
  - Munitions
- **Program Officer: Neil Graf; NSWC IHD: Lori Nock**

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

FY26 Planning Cycle
– Top Level –

1.	FY26 Kickoff	Q3 FY24
2.	Acq PM / Industry / COE Candidate Project Generation Mtgs * / ***	
	a. PEO IWS Idea Forum * / ***	Q3 FY24
	b. F-35 Idea Forum / CA Topics * / ***	
	c. Combined Shipyard Idea Forum * / ***	
	d. COE Assignment and Gate	Q3 FY24
3.	Program Officer / COE Candidate Project Review	Q4 FY24
4.	Program Office / PEO / External Stakeholder Review ***	Q4 FY24
5.	FY26 Government Planning Meeting	Q1 FY25
6.	Resolution of Outstanding Questions * / ***	End Q1 FY25
7.	Approved Prioritized Plan per Platform ***	Q2 FY25
8.	Project Proposal Phase *	Q2-Q3 FY25
9.	Proposal Review / Approval	Q4 FY25
10.	Project Initiation (FY26 Projects)	Q1 FY25

* Industry Input
*** PEO / Program Office Input

Stakeholder Engagement

- **Active Engagement:**
  - With Navy stakeholders throughout the year – in planning, project execution and reviews, and affordability assessments
  - With other Navy technical experts (Tech Warrant Holders, ONR / NRE personnel) as well as other Service / OSD manufacturing technology experts
- **Reviews:**
  - Affordability Platform / IPT Reviews (IPTs at least twice per year) – Program Office personnel and industry partners
  - JDMTP Portfolio Reviews (by subpanel annually) – technical experts from Services / OSD
  - ONR Annual Portfolio Reviews (by COE) – technical experts from ONR / NRE

Recent Highlight:
Deep Hole Drilling

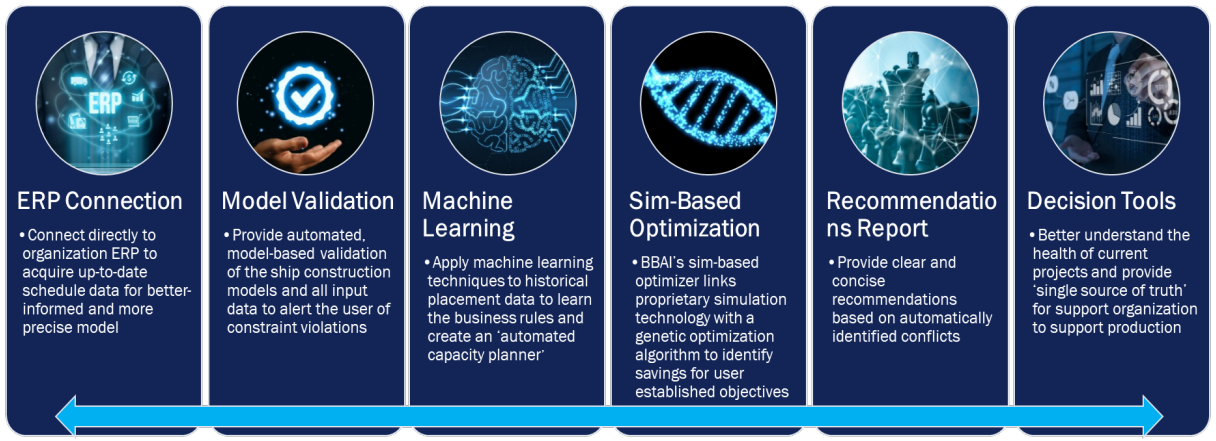
- Developed a prototype tight-tolerance, deep-hole drilling tool
- Reduced Newport News Shipbuilding (NNS) and Bath Iron Works (BIW) labor to drill reduction gear holes by 60%
- Eliminated rework for misaligned holes by 100%
- Reduced maintenance repair costs by 50%
- Implemented in FY24
- Estimated combined five-year savings of $4.5M for both NNS and BIW

Recent Highlight:
Machine Learning and Schedule Optimization

- **Integrate automated schedule optimization and machine learning into "Shipyard AI" to support more robust schedules**
  - Closer centers (shorter overall time spans for blocks of vessels)
  - Enhanced communication with internal supply chain management departments
  - Reduced time required to generate a viable and executable capacity plan
  - Optimized capacity plans with respect to Safety, Quality, Cost, and Schedule
- **Additional ancillary benefit is FMM and other shipyard users will also benefit from updates to the Shipyard AI tool for their process**
- **Project Benefits**
  - Model precision up to >90% for ranking top 5 locations across all instances
  - Model can predict historical locations with >71% precision (Top 1) across all instances
  - 5-year savings:

CVN: $7.25M	VCS: $4.99M	CLB: $3.35M
DDG: $1.96M	LPD: $1.41M	LHA: $1.76M

Incorporate Machine Learning to enhance legacy tool capability to provide rapid, efficient allocation of shipyard resources



Navy ManTech Investment:	Combined 5-year Savings:	Combined 5-year Return On Investment:
$1.99M	$20.7M	10.43

Digital Transformation in Shipbuilding

Issue:

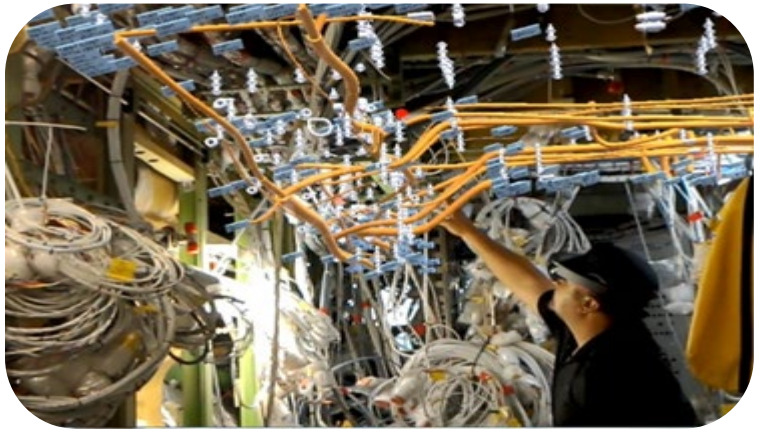
- Manual, paper-driven shipbuilding processes result in inefficiencies and increasing fabrication labor and costs
- Significant improvement with moving to digital workflows

Benefits:

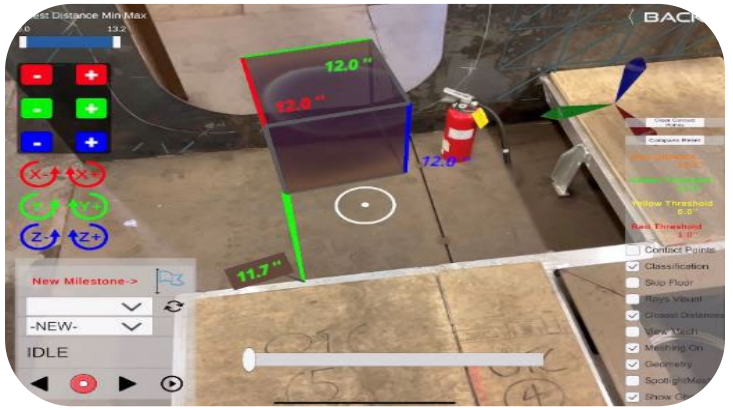
- Newer digital technologies and ship designs generate significant digital data that can be repurposed and reused to optimize construction workflows
- Increased digital thread use established by model-based designs / processes enables future improvements and efficiencies
- Leverage benefits of digital transformation in automotive and aerospace manufacturing by applying relevant tech towards shipbuilding processes

Impact:

- 57 projects since Q1 FY16 (completed and active)
- $70.5M Navy ManTech investment
- Platform cost savings:
  - VCS - $14.8M/hull
  - CVN - $11.2M/hull
  - CLB - $15.0M/hull
  - DDG - $31.5M/hull
  - For Ingalls implementations, additional $26.9M benefits extend to LHA, LPD, and NSC
- **$365.6M in aggregated savings within 5 years of technology implementation**
- $1.55B+ in est. savings over Navy's 30-year build plan



Improved Cable Installation and Testing (S2975) Improving efficiency for installing and testing cable through the use of Augmented Reality



Virtual Load Out Interference Removal (S2899) Integrating mixed reality technologies with as-built ship conditions and CAD product data to detect interferences in real time assessments of equipment load outs or removals to determine minimally necessary rip out requirements.

Electric Boat, Newport News, Ingalls, and Bath Iron Works - Partners in Digital Transformation

Navy ManTech's Sustainment Efforts

- **Advance cutting-edge repair and sustainment technologies to maximize the readiness and resilience of Navy systems**
- **Prioritize flexibility to ensure responsiveness to critical needs**
- **Execute sustainment strategy through the following:**
  - Affordability Efforts are focused on reducing acquisition cost but many also impact sustainment
  - Capability Acceleration efforts to deliver capability to the warfighter more rapidly
  - Repair Technology program located at iMAST – portfolio of ManTech / RepTech projects with naval shipyards, air and Marine Corps depots, and industrial base focused on improving depot maintenance processes and reducing availability span times

COE Affordability Project – Large Diameter Ball Valve Improvements

- Current coating on large diameter submarine seawater valve balls fails prematurely, resulting in calcareous deposits from marine growth, high operating torque conditions, and emergent repairs at significant cost
- Developing a life-of-boat ceramic coating that can be applied to both in-service and new construction valve balls
- New ceramic coating is expected to result in a total estimated life-cycle cost savings of >$100M for VCS and CLB, with additional savings for other submarine classes possible

VCS Seawater System Large Diameter Ball Valve Improvements

Sustainment Efforts Completed by Navy ManTech

Realtime Locating System (S2799 – VCS, CLB; 26,100 hrs. or $3.4M/5-yr)

Rapid Auto Technology Evaluation (A2785 – F-35; 80,000 hrs. or $10.4M/5-yr)

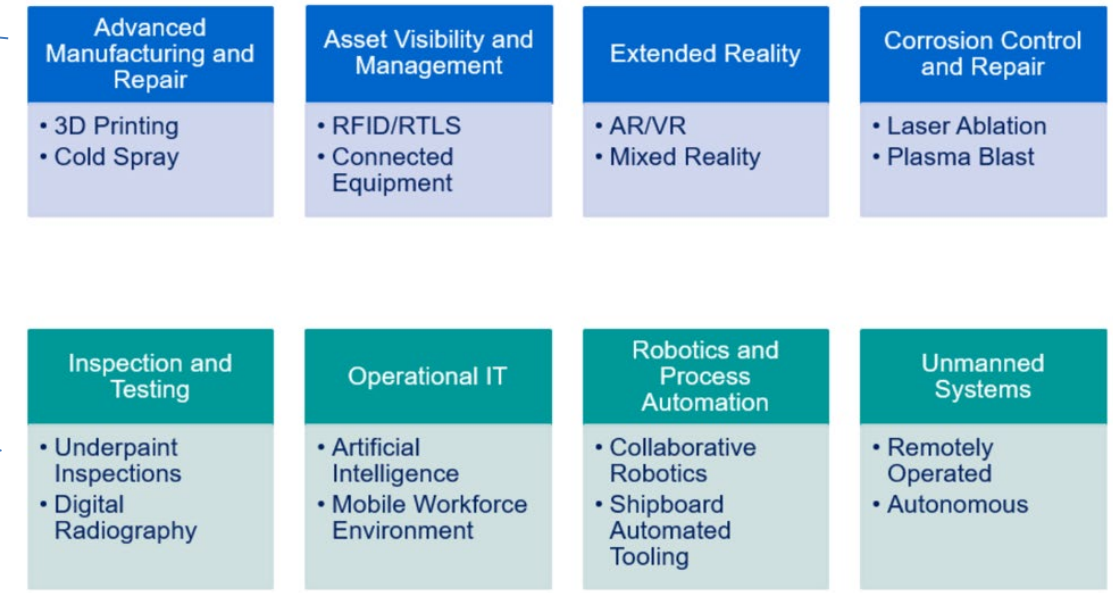
Improve Cable Installation and Testing (S2975 – DDG; LHA; LPD; 58,400 hrs. or $7.6M/5-yr)

Virtual Load Out (S2899 – DDG, VCS, CLB; 26,900 hrs. or $3.5M/5-yr)

Digital Data for Next Generation Measurements (S2699 – DDG, VCS, CLB; 99,200 hrs. or $12.9M/5-yr)

Modern Shipbuilding Manufacturing (Q2924 – VCS, CLB)

Yard Wide Simulation (S2891 – DDG; 223,000 hrs. or $29M/5-yr)



Automated Laser Coating Removal (A2960 – F-35; 34,600 hrs. or $4.5M/5-yr)

Underwater Hull Inspection (DDG, VCS, CLB; $TBD)

Optimized Layout Process (S3008 – DDG, LHA, LPD; 23,300 hrs. or $3.03M/5-yr)

Geospatial CLIC (M2726 – CVN, VCS, CLB; 33,100 hrs. or $4.31M/5-yr)

Non-contact Metrology (S2662 – VCS; 17,600 hrs. or $2.3M/5-yr)

Point Cloud Conversion for Detailed Design (S2978 – DDG, VCS, CLB; 55,600 hrs. or $7.24M/5-yr)

Production Engineering Efficiency (S3009 – DDG, LHA, LPD; 74,600 hrs. or $9.7M/5-yr)

Machine Learning for Schedule Optimization (S2959 – CVN, VCS, CLB, DDG; 153,800 hrs. or $20M/5-yr)

Robotic Valve Cladding Cell (S2832 – VCS, CLB; 104,600 hrs. or $13.6M/5-yr)

Automated Interior Scan, Blast and Paint (S2817 – DDG, VCS, CLB; 80,700 hrs. or $10.5/5-yr)

- **Specific technology focus areas obtained from NAVSEA 04 brief (ShipTech 2024)**
- **Identified recent NSAM efforts aligned to sustainment focus areas with expected labor and cost savings**

Navy ManTech
Repair Technology (RepTech) Program

- **RepTech, a subset of Navy ManTech managed by the iMAST COE, aids the Navy with life-cycle cost reduction in support of shipyards and DON depots across the Navy's repair enterprise: NAVSEA, NAVAIR, MARCOR**
- **Develops and transitions new and emerging technologies that reduce repair/maintenance costs, reduce turnaround time for critical sustainment activities, eliminate unsafe work practices, and augment an aging, as well as inexperienced workforce**
- **Coordinates with Navy ManTech COEs, the joint depot community, DoD industrial activities, industry, PEOs and university laboratories to improve sustainability, reliability and system availability**

Stakeholders:
PMS 392, PMS 396, PEO Carriers F-35 JPO, USMC

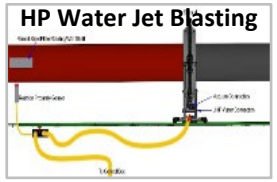
Platforms Supported:
VCS, CLB, CVN, F-35, CH-53, LAV, JLTV

Depot Locations:
PNSY, PSNSY, NNSY, PHNSY, MDMC-Albany, NAVAIR FRC E, SE, SW

RepTech Working Group (RWG):
Representatives of NAVSEA 04, NAVAIR COMFRC, and MARCOR SYSCOM

Projects Active and Recently Completed:

- RT2837 Submarine Large Diameter Ball Valve Improvement
- RT2923 Laser Ablation for NAVAIR
- RT2992 Powder Blown Laser Directed Energy Deposition Repair
- RT2998 SPEE3D for Rapid, Low-Cost Additive Manufacturing
- RT3025 Laser Ablation of Armored Vehicles
- RTR3029 CFOAM Tooling for Aviation Composites
- RT3049 Modernizing Shipchecks to Enable the Digital Twin (FY25 new start)
- RT3050 Health Management Enabled POTS-PATS (FY25 new start)
- RT2964-2 S51 Motor Generator Rewind Optimization – Phase 2 (completed)
- RT2914 Shopfloor Control at USMC Albany Depot (completed)
- RTR3019 SHT Hole Removal and Plug Replacement Improvement (completed)



Annual Funding: $2-3M/year

Major Benefit:

- Fleet Readiness
- Reduction in life-cycle costs

Life-Cycle Affordability:

- Est. future 5-year cost reduction ~$150M

Cost Avoidance:

- Improved efficiency and schedule – faster delivery to warfighter
- Reduced material erosion
- Hands-on training and Migration Plan for existing systems
- Repair components that do not have existing repairs
- Reduction of hazardous waste generated
- Reduction of consumables (chemicals and PMB, sanding pads)
- Reduction of worker injuries

Want More Information?

- **Visit Navy ManTech and COE Booths Here at NSRP APM**
- **Pick Up Information Sheets Here at NSRP APM**
- **Contact COE or Program Officers**
- **Attend Defense Manufacturing Conference 2025**
  - **17-20 November 2025**
  - **Orlando, FL**

Backup

Industry Role

Active industry participation also critical for success

- **Participate in annual planning effort with COEs**
  - Identify manufacturing issues COEs can help address
  - Scope out / refine candidate projects
  - Provide input to ManTech planning deliverables
  - Provide input to Project Plan
  - Ensure commitment to implement - identify implementation requirements and identify resources
  - Help develop project Technology Transition Plan (TTP)

- **Obtain management signature on Technology Transition Plan (TTP)**

- **Execute project with COE**
  - Execute per Project Plan
  - Participate in project meetings / discussions as required

- **Participate in semi-annual Program Reviews**
  - With COE, brief project

Program Office Role

Active Program Office participation critical for success.
ManTech, alone, cannot ensure implementation.
Need ONR / COEs / industry / Program Office all working together

- **Participate in annual planning effort**
  - Motivate relevant industry partners to participate
  - Participate in planning process - pre-screen candidate projects for applicability, implementation potential, and cost savings potential (Jul-Dec timeframe)
  - Provide Program Office ranking/approval of candidate projects (Jan-Feb timeframe)
- **Review and sign project Technology Transition Plans (TTPs)**
- **Participate in portfolio Affordability Assessment process and provide PO concurrence twice annually**
- **Participate in semi-annual Program Reviews**
  - Help coordinate and review portfolio
  - Provide Program Office Implementation Risk Assessment info real-time after each project is reviewed
  - Hosted approx. 50% at COEs / 50% industry
- **PO technical representatives participate in project meetings / discussions as required**

Manufacturing a New Paradigm

Dr. Jennifer Wolk
ONR Code 332
Advanced Naval Materials and Systems Division Director

ACCELERATING TO THE NAVY & MARINE CORPS AFTER NEXT


“What the future Navy will be like, we cannot say as yet.”
Chief of Naval Operations Fleet Admiral Chester Nimitz

Naval Research Enterprise

Organizational Milestones

1946

ONR London Office created to survey, assess, and report on European Science and Technology

Office of Naval Research (ONR) established

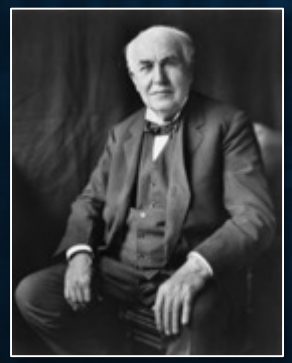
1993

ONR becomes a 6.1-6.3 organization

2009

ONR Global designated as an Echelon II Command reporting to CNR

1920 1930 1940 1950 1960 1970 1980 1990 2000 2010 2020



July 2, 1923

Naval Research Laboratory (NRL) established at the recommendation of Thomas Edison

1974

ONR's first international office outside of Europe is established in Tokyo

2003

Naval Fleet/Force Technology Innovation Office and International Field Office merged to form **Office of Naval Research Global (ONR Global)**

2022

NavalX designated as an Echelon II Command reporting to CNR

ONR is headquartered in Arlington, VA sponsoring facilities in the US and abroad.

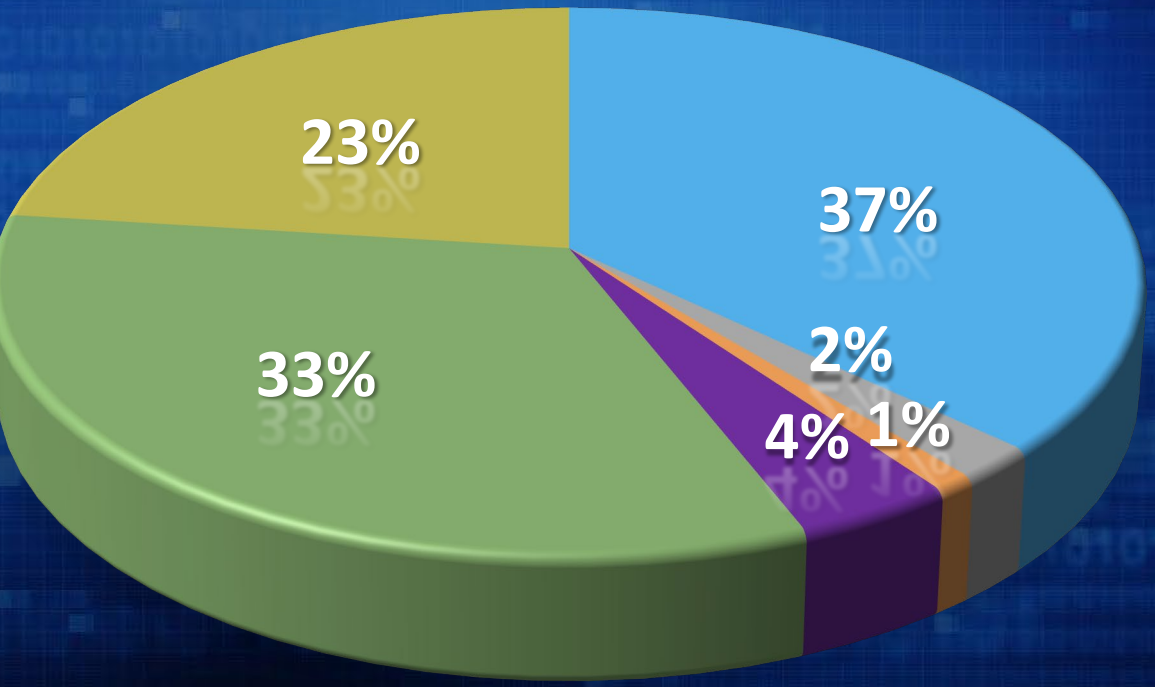
NRL is headquartered in Washington, DC with four field sites in the U.S.

ONR Global is headquartered in London with 19 locations over five continents.

The Naval Research & Development Establishment (NR&DE)

The Naval Research Enterprise

ONR Portfolio Investment



- 6.1 Basic Research
- 6.2 Applied Research
- 6.3 Advanced Technology Development
- 6.4 Advanced Component Development and Prototypes
- 6.6 Management Support
- 6.7 Operational System Development

ONR Research Portfolios

Command, Control, Computing, Communications, Cyber, Intelligence, Surveillance, Reconnaissance and Targeting

Sea Warfare and Weapons

Warfighter Performance

Ocean Battlespace Sensing

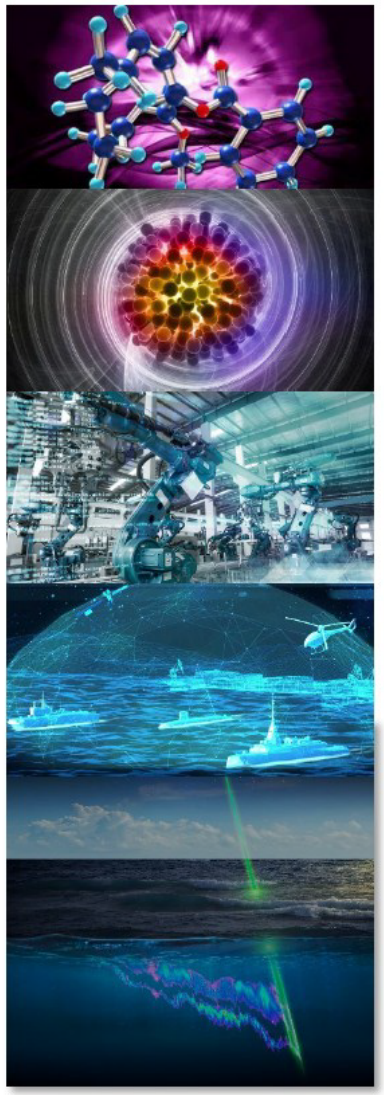
Naval Air Warfare and Weapons

Sea Warfare & Weapons

Sea Warfare & Weapons Focus Areas

Develop and deliver knowledge, talent, and technologies that enable unconstrained Naval missions

Delivering What is Needed / Where it is Needed / When it is Needed



Materials - *enable mission capabilities through multifunctional materials*

Objective: provide integrated multi-functional material systems that are self-aware and self-adjusting for the Department of Navy by employing a function-driven material discovery and design approach.

Power & Energy - *Naval missions unconstrained by power and energy*

Objective: provide revolutionary, game-changing capabilities in power & energy generation, storage, distribution, thermal management, and control.

Manufacturing - *resilient intelligent manufacturing for Naval missions at all sizes and time horizons*

Objective: provide advanced manufacturing technologies from design to sustainment utilizing a foundation of manufacturing science and technology to accelerate development and deployment.

Ocean Science and Technology - *enable asymmetric advantage in all environments*

Objective: provide applied ocean science and technologies to advance naval missions in the maritime environment.

Naval Engineering - *reliably create effects anytime and anywhere*

Objective: provide scientific and engineering foundations to fully exploit physical phenomena and virtual environments.

Undersea Lethality - *unconstrained undersea lethality*

Objective: ensure asymmetric capabilities to reliably create and counter undersea lethal effects.

Manufacturing

Dr. Jenn Wolk

Manufacturing - *resilient intelligent manufacturing for Naval missions at all sizes and time horizons*

Objective: provide advanced manufacturing technologies from design to sustainment utilizing a foundation of manufacturing science and technology to accelerate development and deployment.

Challenges:

- How do you manufacture to scale from a microchip to a platform in the time frame and rate that you need it - *integration with design tools*
- How do you increase manufacturing resiliency – *scale problem*
- How do you make a high fidelity lifecycle model - *integration with design tools*

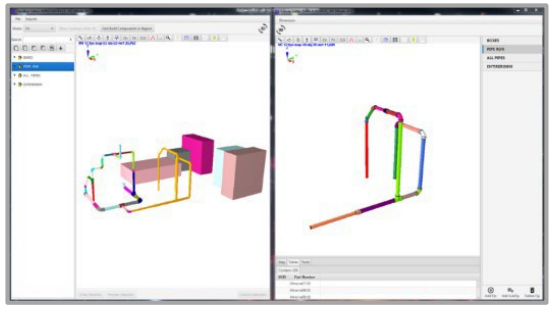
Research Areas
Manufacturing Focus Area

ManTech
- Advanced manufacturing enterprise technologies
  - Digital thread/ digital twin, AI/ML
- Composites and non-metallic materials
  - Coatings, insulation, transparencies
  - Polymers
  - Ceramics
- Electronics and Electro-optics
- Energetics
- Metalworking
  - Welding, castings, forgings, processing
  - Automation, and robotics

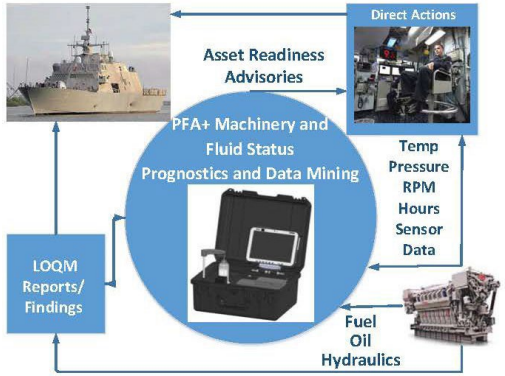
Sustainment Technologies
- Condition based maintenance (CBM)
- Corrosion control technologies
- Repair technologies

Manufacturing S&T
- Materials and processes for additive manufacturing
  - Processing at multiple scales
  - In-line sensing and analysis
  - Tools for confident performance prediction and rapid qualification
- Manufacturing capability acceleration

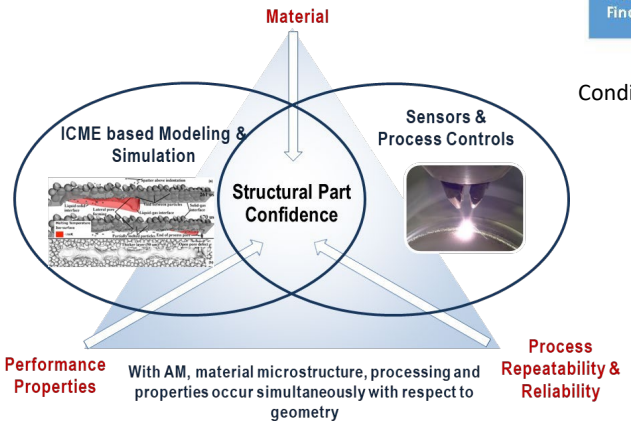
Robotic Shaping of Steel Plates for Shipbuilding



Model Based Build Plan for Shipbuilding Optimization

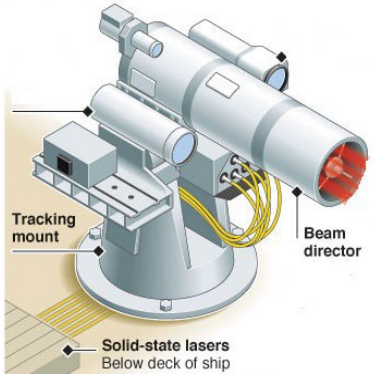


Condition based maintenance from fluid analysis

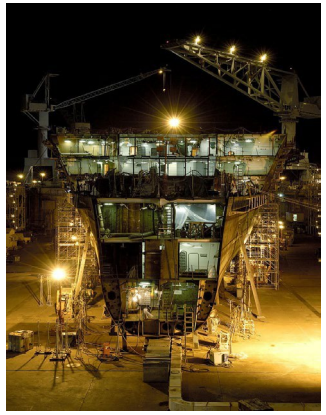


Cold Spray Repair

Multi-scale metamorphic manufacturing technology demonstrated for production of conical forms with drag-reduction riblet features for UUV applications



Developing Manufacturing Processes for Key High Energy Laser Components

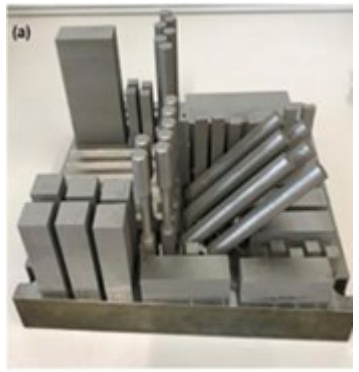


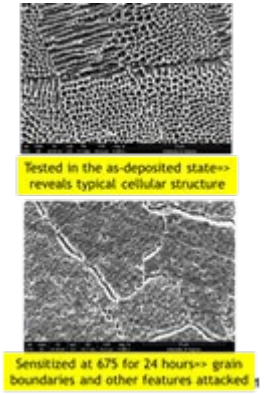
Shipbuilding construction

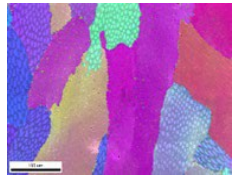
Research Areas
Materials Focus Area

Research Areas:

- Acoustic transduction materials and devices
- Computer-aided materials design
- Benign antifouling and fouling release materials
- Corrosion science and corrosion control technologies
- Dielectric materials and films
- Electrochemical materials
- Functional polymeric and organic materials
- Materials and processes for additive manufacturing
- Materials for thermal and chemical extremes
- Nano-engineered materials
- Non-destructive evaluation and prognostics: advanced sensors and technologies
- Nonlinear physics
- Organic photovoltaics
- Polymer matrix composites
- Propulsion materials
- Structural metals
- Water treatment/reduction and analysis

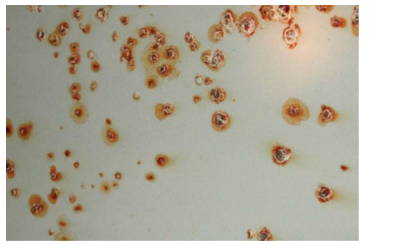




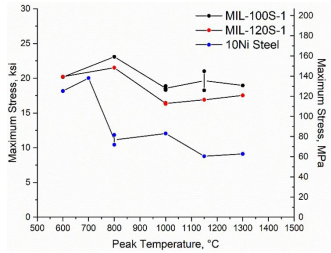


AM 316L, Near Center of Build

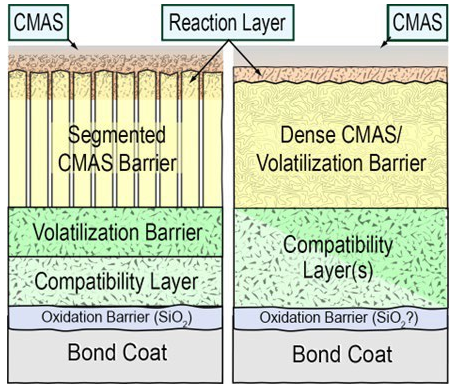
Corrosion is pervasive for almost every Navy/USMC asset in potential operational/mission environments.



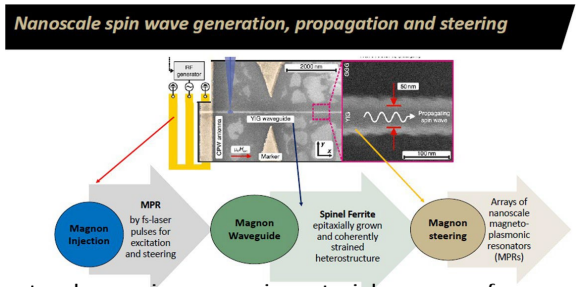
Coating showing about 5% breakdown



New 10%Ni weld consumable being developed at NSWC-CD shows significant decrease in weld metal residual stress relative to legacy naval weld metals.



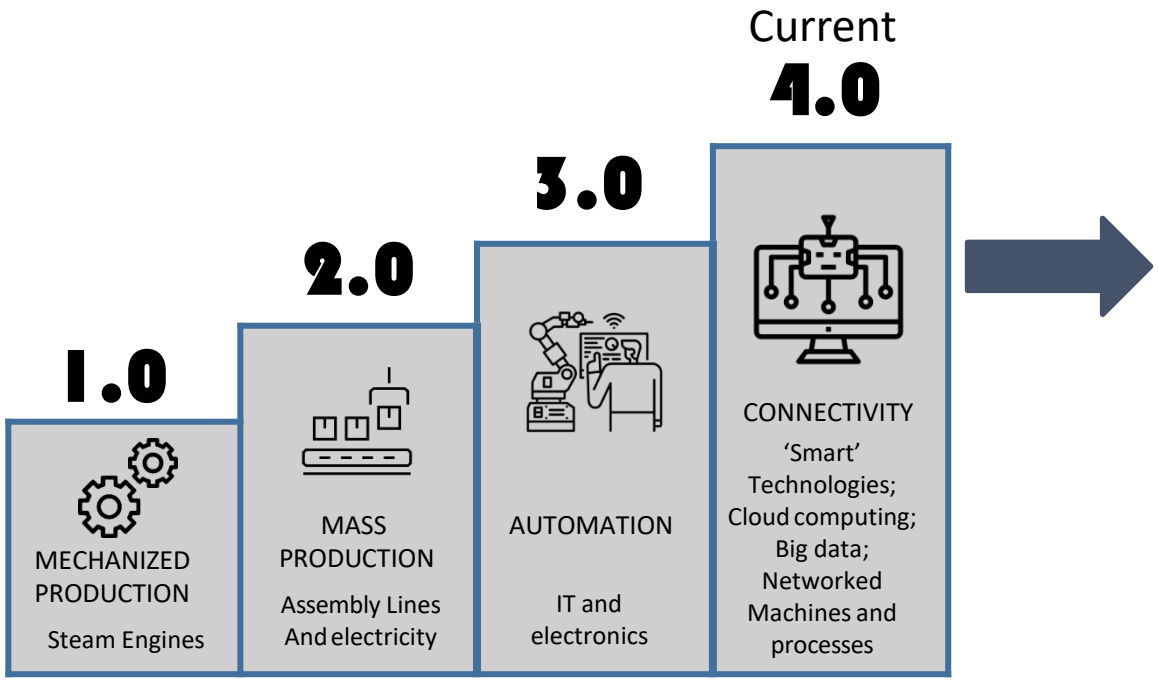
HPT Stage 2 Nozzle (vane), Airfoil



A magneto-plasmonic-magnonic material response for generating and transporting spin waves without dissipation for fast chip-based logic and memory.

E. Marinero-Purdue U.

Manufacturing the Future



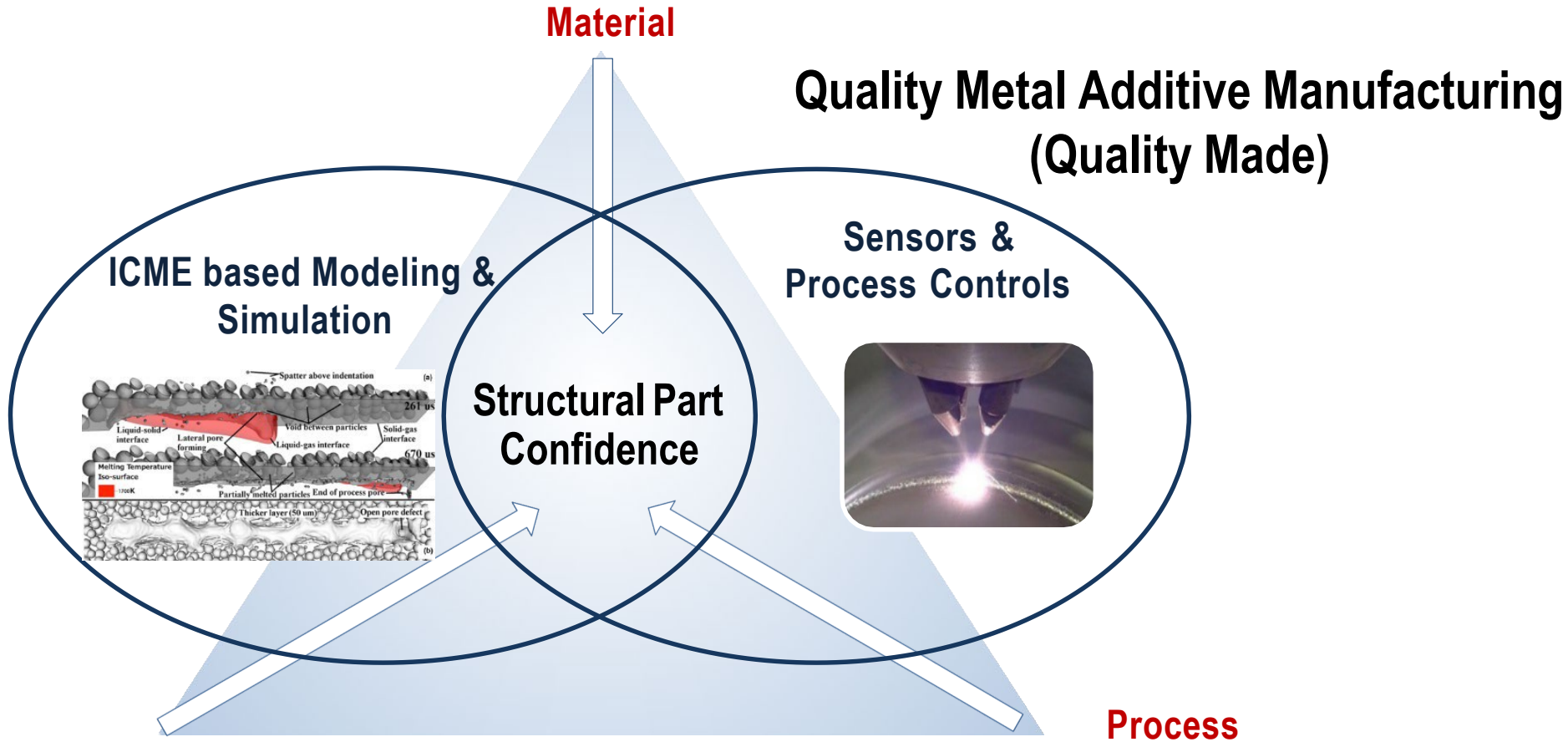
5.0

Man-Machine cooperative learning/optimization in smart manufacturing

Technology → Value

Navy S&T to capitalize on Industry 5.0 and beyond
High Mix/High Volume

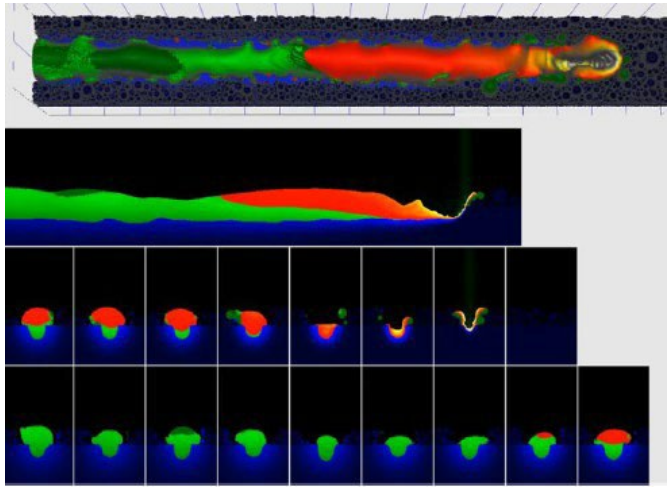
Changing the Qualification Paradigm



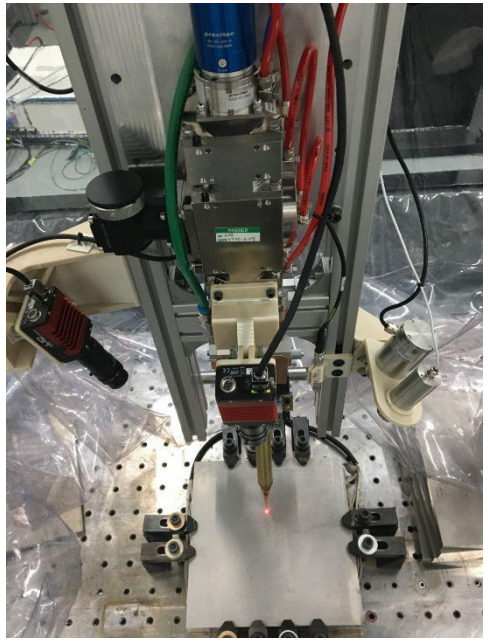
Informing Qualification

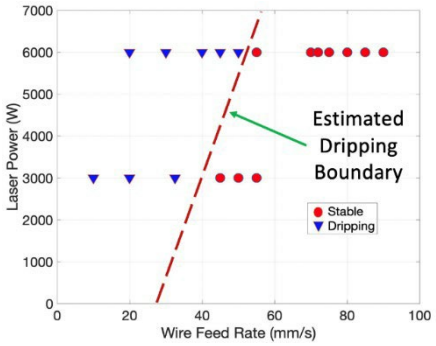
Process

Models

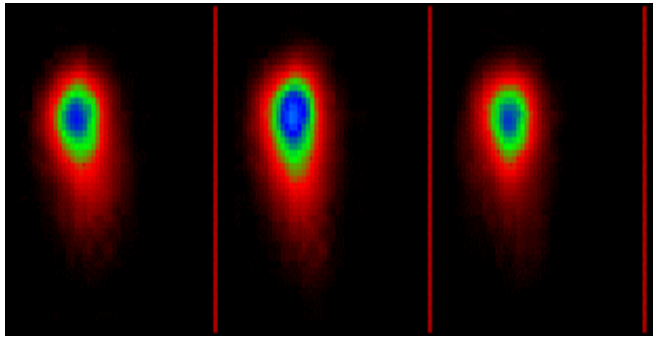


- Local, detailed insights
- Subsurface
- Length & solidification behavior





Sensors

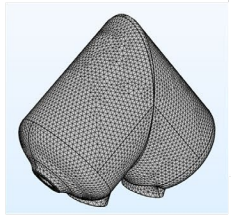


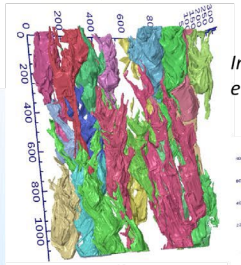
- Rapid, simple insights
- Isolate shifts in process
- Stability

Implementing Additive Manufacturing

Rowenhorst (6356)

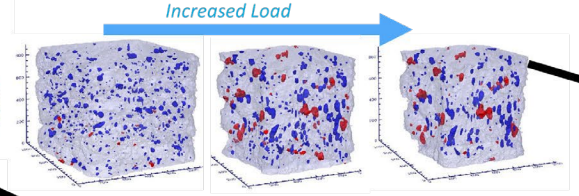
Advanced 3D characterization links complex grain shapes and defect populations to processing history

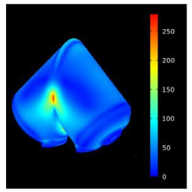




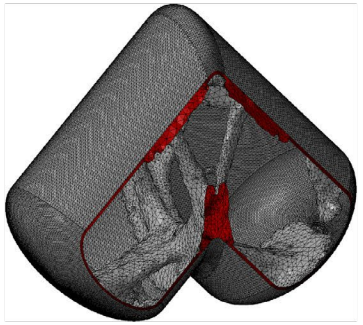
NRL RS^{3D} AM Grain Structures

In-situ CHESS synchrotron X-ray tomography examines defect evolution under plastic strain.



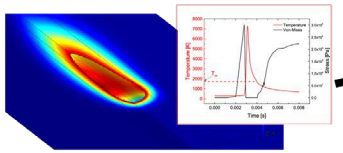


Microstructure/processing informed top-op/performance model

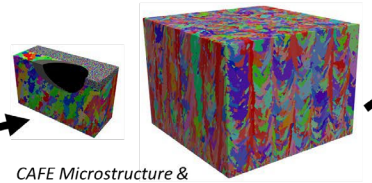


Topology optimized design:
10% more mass
250% increase in total allowable pressure.

Michopoulos et al (6394)



AM path dependent thermo-mechanical modeling

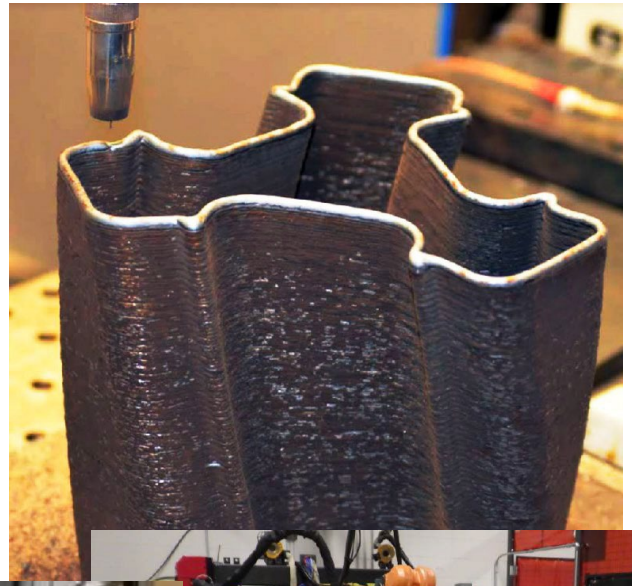


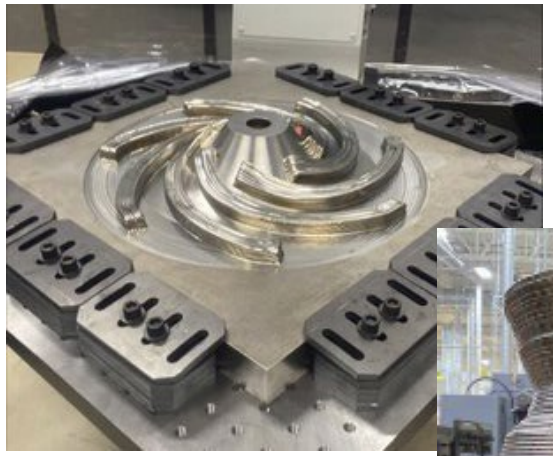
CAFE Microstructure & Crystal Texture modeling

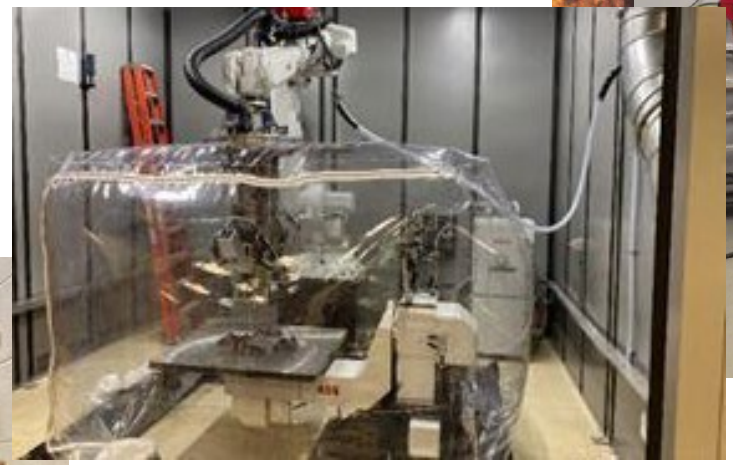
Taferra (6353)

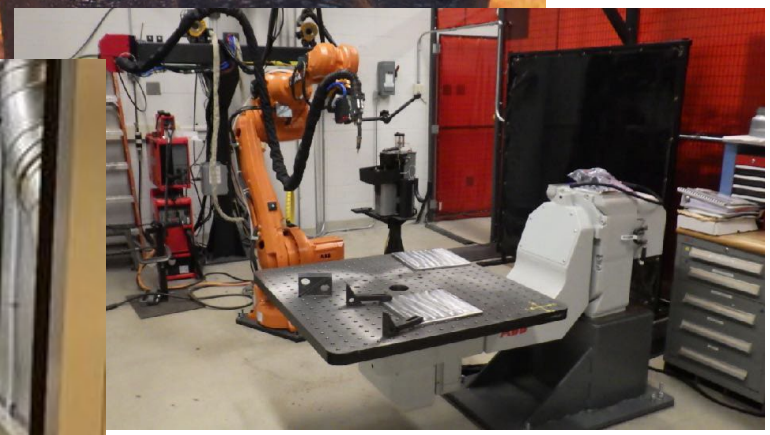
Multi-physics models informed and validated with characterization predict performance.

Michopoulos et al (6394)









Navy ManTech Program

Naval Shipbuilding and Advanced Manufacturing (NSAM) Center of Excellence

Daniel Reed, Executive Director

Prepared under ONR Contract N00014-24-D-7001 as part of the Navy ManTech Program

NSRP All Panel Meeting
25 February 2025

Background

Mission: Identify, develop, and facilitate the deployment of advanced manufacturing technologies, to U.S. shipyards and other industrial facilities producing and supporting sustainment activities of naval platforms. These advanced shipbuilding and manufacturing technologies will help reduce the cost and time to build and sustain key naval platforms.

- ATI's Virtual COE Model: Deliver the best value to the Navy by:
  - Employing our proven successful virtual center model
  - Identifying, developing, and executing comprehensive research and development efforts to address critical needs in construction and repair of key U.S. Navy platforms
  - Teaming with Navy OEMs, industry experts, and the best technology providers
  - Driving state of the art solutions from the best available sources to implementation on target platforms

Relationships

NAVY MANTECH

Stakeholders

Platform OEMs

INGALLS SHIPBUILDING
A Division of HII

BIW GENERAL DYNAMICS Bath Iron Works

Newport News Shipbuilding

GENERAL DYNAMICS Electric Boat

FINCANTIERI MARINETTE MARINE

LOCKHEED MARTIN

Technology Providers

LINCOLN ELECTRIC

ARC SPECIALTIES
AUTOMATED MANUFACTURING SYSTEMS

SIEMENS

HEXAGON

DELTA SIGMA COMPANY

BIGBEAR.AI

FARO

NAVAL SHIPBUILDING AND ADVANCED MANUFACTURING CENTER OF EXCELLENCE
NSAM CENTER

NSAM Center Structure

Mr. Paul Huang
Program Officer

Requirement definition
and prioritization
Strategic leadership

NSAM Leadership:

Program oversight, project development & execution, and administrative, financial, & contract management


Daniel Reed
Executive Director


Robert Mashburn
Technical Director


Melissa Frady
Business Manager


Wade Hedges
Contracts Manager

Technical Consultants

- Steamboat Road Consulting
- Vicki Dlugokecki
- Lee Kvidahl
- Dale Orren

Contracting Team

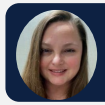
7 Subcontract Administrators

Resource Network

Platform OEMs

- FMM
- GDBIW
- GDEB
- HII – Ingalls
- HII – NNS
- Lockheed Martin

Technology Providers
Universities


Nikki Crosby
Program Admin


Scott Truitt
Project Manager


George Hinerman
Project Manager


Robert Conley
Project Manager

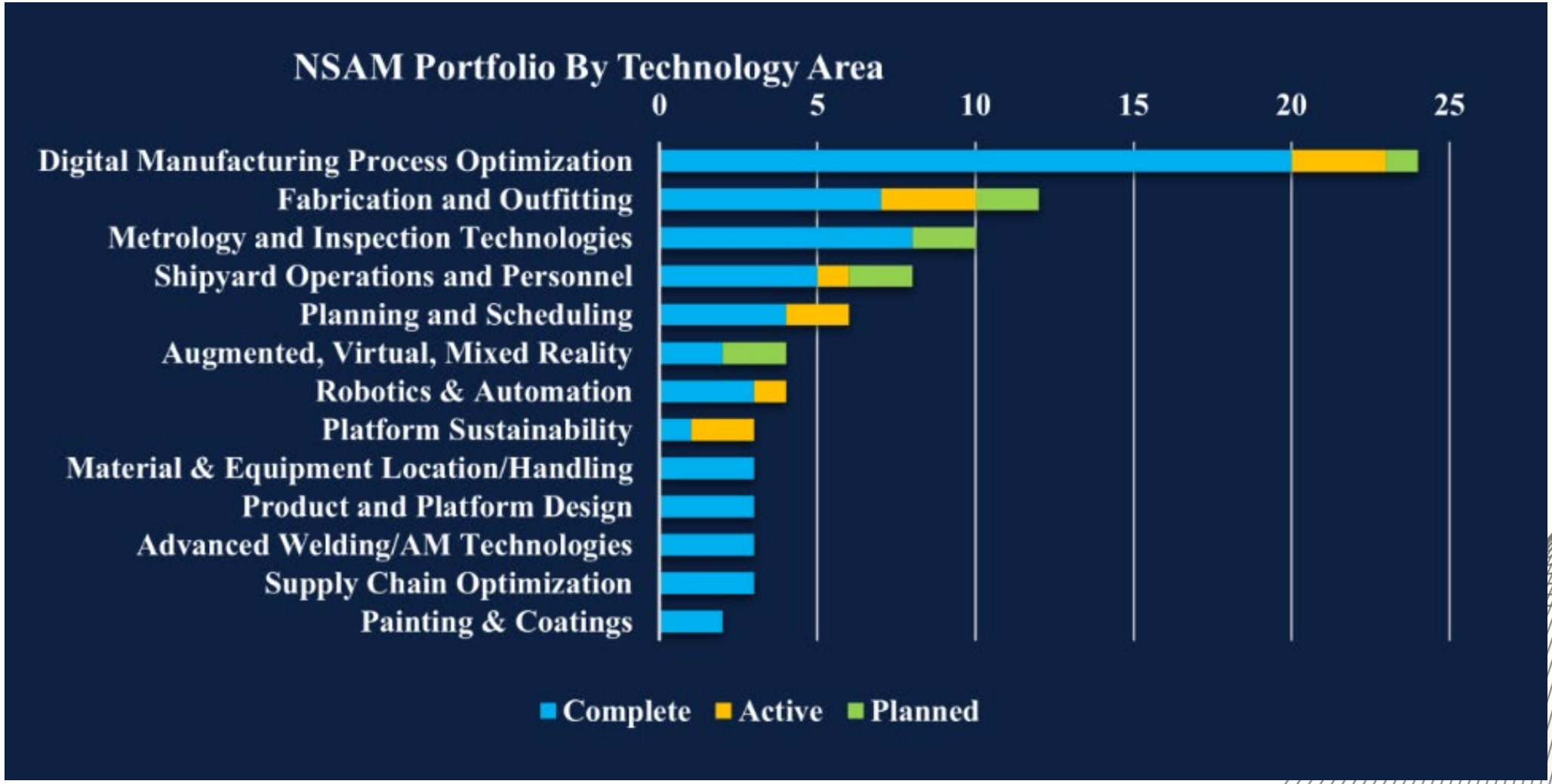

Chelsea Nugent
Project Manager


Steve Gaschler
Project Manager


Brittany Johnson
Project Manager

NSAM Program Team: Technical oversight, milestone tracking, status reporting, risk management, invoicing review and approval, and project closeouts

NSAM Technology Areas

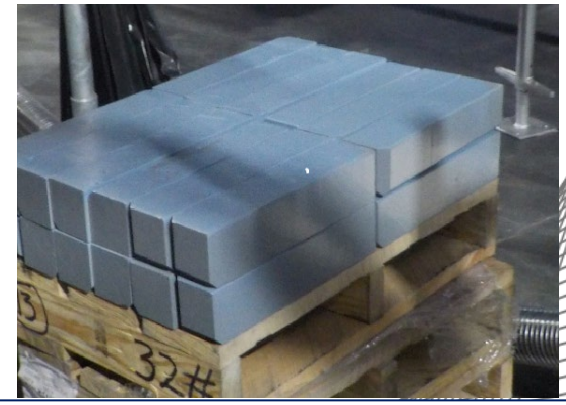


Improved Lead Bay Packing (S2926)

PEO	Shipyard Lead	Project Status	Cost Savings
Subs (PMS 450/397)	General Dynamics Electric Boat	Completed	$15.4M 5-year 8.96 5-year ROI

Objective

- Develop a new process for delivering the lead bricks to the appropriate location on the hull section.
  - Minimize human interaction with lead
  - Minimize physical strain from lifting and extended cycle times
  - Reduce overall cycle time for this activity



Lead bricks to load into submarine

Approach

- Define current / Future State
- Requirements definition
- Market Survey
- Execute Virtual Simulation Test Plan
- Vendor Selection
- Develop prototype system
- Physical demonstration test

Prototype solution

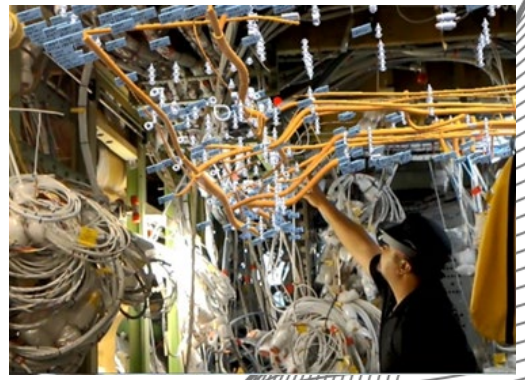
Improved Cable Installation and Testing (S2975)

PEO	Shipyard Lead	Project Status	Cost Savings
Ships (PMS 400D)	HII-Ingalls	Active	$7.6M 5-year 5.3 5-year ROI

Objective

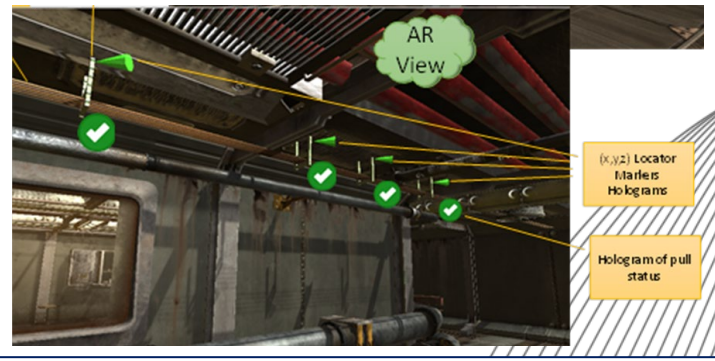
- Improve performance of shipboard cable plant manufacturing and installation.
  - Improve first time yield (FTY) of cable plant fabrication and focus on improvements to sensitive cable media, including coaxial and optical cable types.
  - Make updates to specific cable installation and testing requirements as needed.
  - Evaluate and test an Augmented Reality Cable Installation system in a shipboard environment.

Boeing AR System



Approach

- Evaluate Cable Installation Materials / Processes
- Evaluate Augmented Reality (AR) Technology
- Conduct Initial Proof of Concept testing
- Pilot Cable Installation Materials and Processes
- Develop New Technical Requirements
- AR Technology Demonstration



Shipboard Cable Routing AR example

Point Cloud Conversion to Detail Design (S2978)

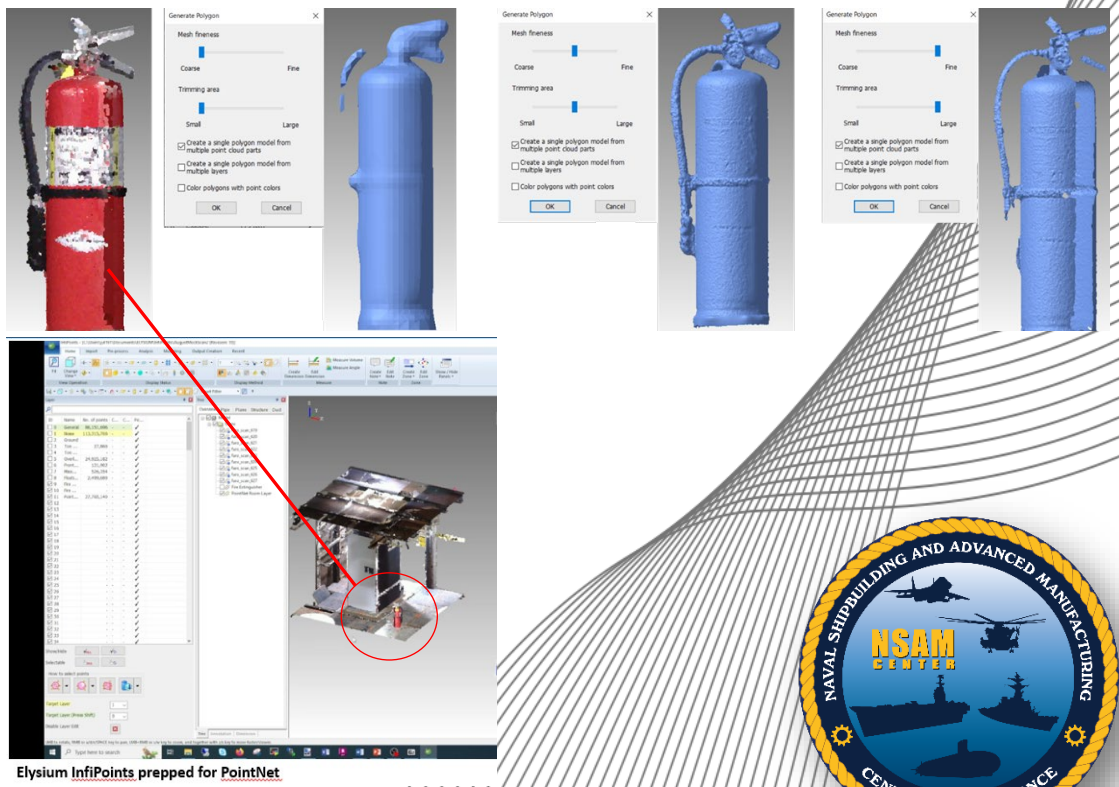
PEO	Shipyard Lead	Project Status	Cost Savings
Ships (PMS 400D)	General Dynamics Bath Iron Works	Active	$7.2M 5-year 2.39 5-year ROI

Objective

- Develop machine learning software tools to automate the creation of 3D CAD model arrangements from point cloud data which can then be manipulated, attributed, used for interference checking, and subsequent development of 2D technical drawings.

Approach

- Define current / future state
- Requirements definition & concept design
- Architecture & development plan
- Develop point cloud prototype
- Iterative user assessment to finalize software 100%



Elysium InfiPoints prepped for PointNet

Point Cloud Conversion Proof of Concept

NSAM Project Focus

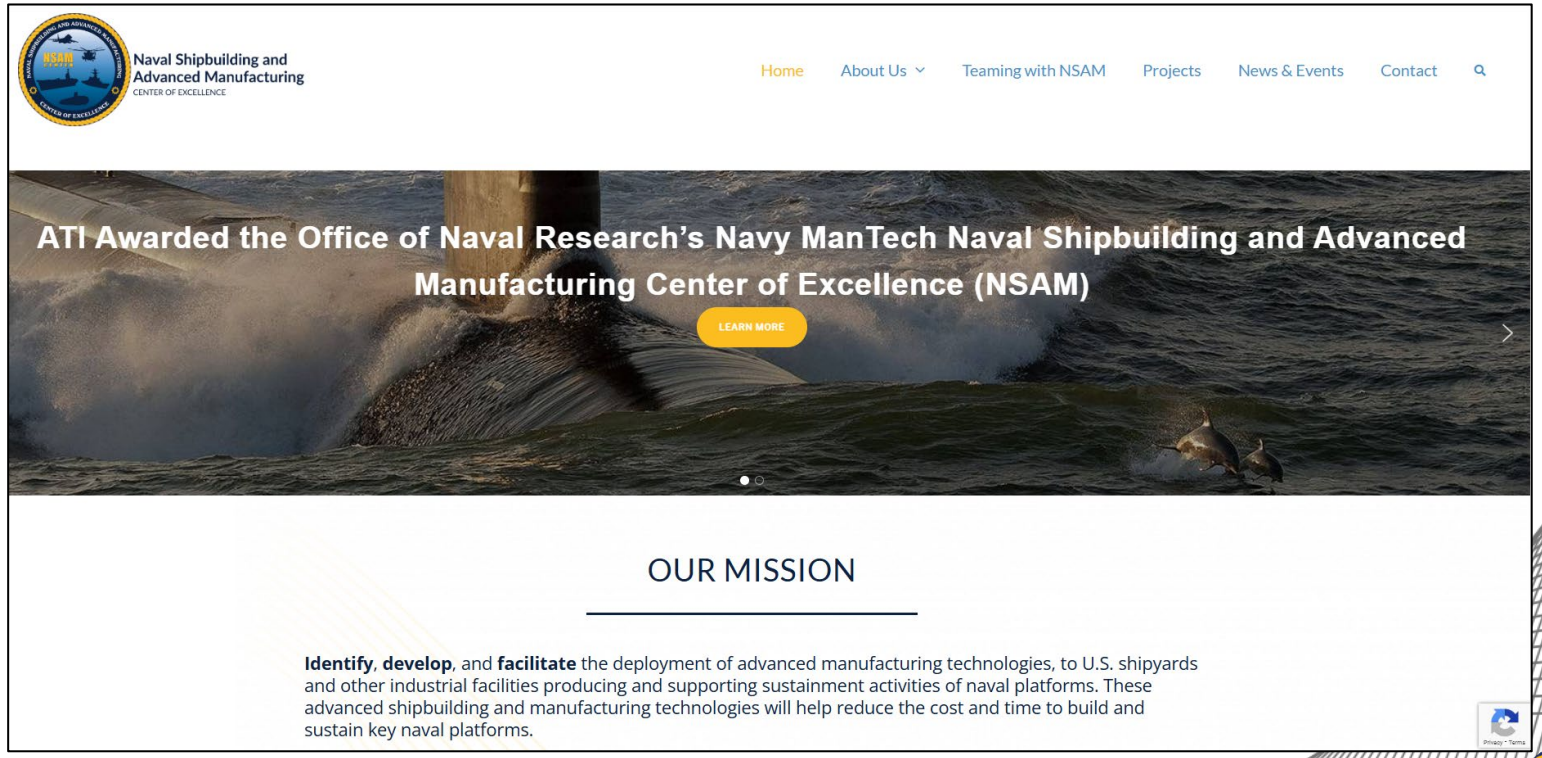
- Advance the state of the Model Based Enterprise in Navy platform manufacturing
- Implementing major innovations in manufacturing technology
- Automating labor intensive and critical processes
  - Improving safety, quality, and productivity
- Adapting new production methodologies to maintenance, repair, and overhaul needs
- Accelerate the capabilities of the Navy
  - Get new and better equipped ships in the water earlier
  - Support on-time delivery of sustainment activities

Contact Information

Executive Director
Daniel Reed
(843) 760-3361
daniel.reed@ati.org

Technical Director
Bobby Mashburn
(843) 760-3499
robert.mashburn@ati.org

http://nsam.ati.org




NAVAL SHIPBUILDING AND ADVANCED MANUFACTURING
NSAM
CENTER
CENTER OF EXCELLENCE

Navy ManTech Program

Electro-Optics Center

NSRP All Panel Meeting

March 25, 2025

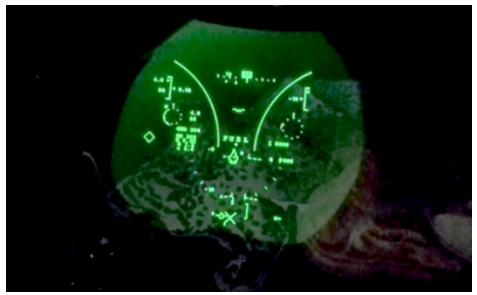
Andrew Trageser, Director
(724) 295-7000, x7013
abt1@arl.psu.edu

EOC Introduction

PennState Electro-Optics Center

The Electro-Optics Center (EOC) was established at Penn State University in 1999 as one of the Navy ManTech program's Centers of Excellence (https://www.arl.psu.edu/eoc/).

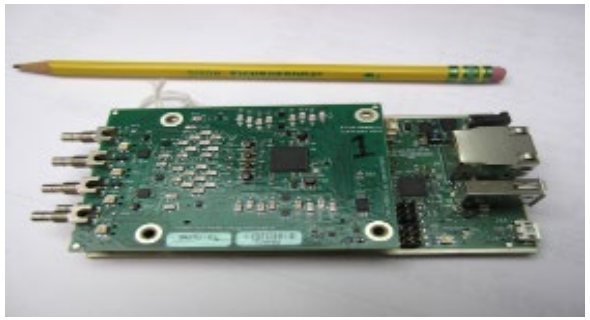
EOC operates within the Electro-Optics and Electronics Division of the Penn State Applied Research Laboratory

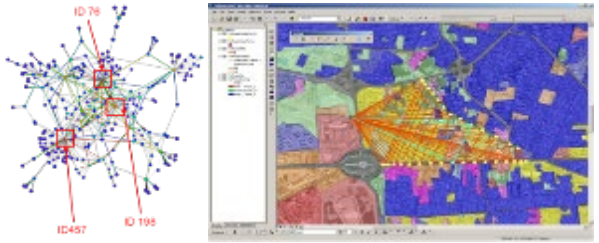


Mission: To transition new electro-optics technologies and applications to Navy-selected focus platforms, through strong technical interactions with DoD and its industrial base, demonstrating acquisition cost savings, lifecycle cost savings, and accelerating capabilities to the warfighter.

Applied Research Laboratory

Our Mission





- Serve as a university center of research excellence and advanced capabilities for *mission critical science and technology* and related DoD applications – over 1,400 employees, 850,000 sqft physical plant
- Champion the *transition of advanced technology* in support of national security
- Provide *cost-effective, innovative, and independent technical expertise* in support of DoD programs and objectives
  - ***Our Products: Critical Research and Development and People***
- Contribute to the *education, research, and service* mission of The Pennsylvania State University

- University Park, PA
- Reston, VA
- National Bus. Pk, MD
- Keyport, WA
- Groton, CT
- Freeport (Northpointe), PA (directed energy & EO)
- Freeport, PA (textured ceramics, elect. mat.)
- Warminster, PA (PNT research and T&E)
- Key West, FL

Public, Non-Profit, and Non-Proprietary – TRL1/2 - TRL 7/8

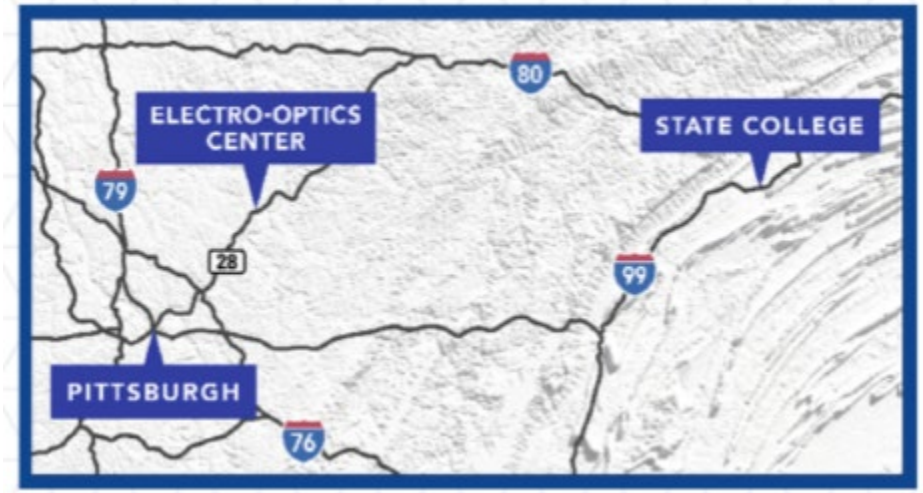
PennState Applied Research Laboratory

arl.psu.edu

EOC Facility and Labs

PennState Electro-Optics Center

- Northpointe Industrial Park, Freeport, PA
- 45,000 sq. ft.
- High Energy Laser Effects Laboratory
- Materials Evaluation Lab and Cleanroom
- Fiber Optics and Photonics Laboratory
- Spectroscopy Lab
- Environmental Test Laboratory
- Optical Coating and Characterization Clean Room
- Optical Assembly and Testing Lab
- Infrared Testing Lab
- Drone Testing Lab
- Crow's Nest



84

EOC Technical Thrusts

PennState Electro-Optics Center

- Manufacturing *of* Electro-Optics
  - Sensors, Fiber Optics, Interconnects, Electronics Materials, Lasers, Optics and Windows → Photonic Masts, Tracking Systems, Lighting, Laser Weapons, etc.
- Manufacturing *Using* Electro-Optics
  - Metrology, Inspection, Vision Systems, Augmented Reality, New Sensor Techniques, Drone and Robotics Applications
- Manufacturing Systems
  - Supply Chain Analysis, Modeling and Simulation, Risk Management, Industrial Base Assessments, Technology Obsolescence Management

EOC Support of Directed Energy

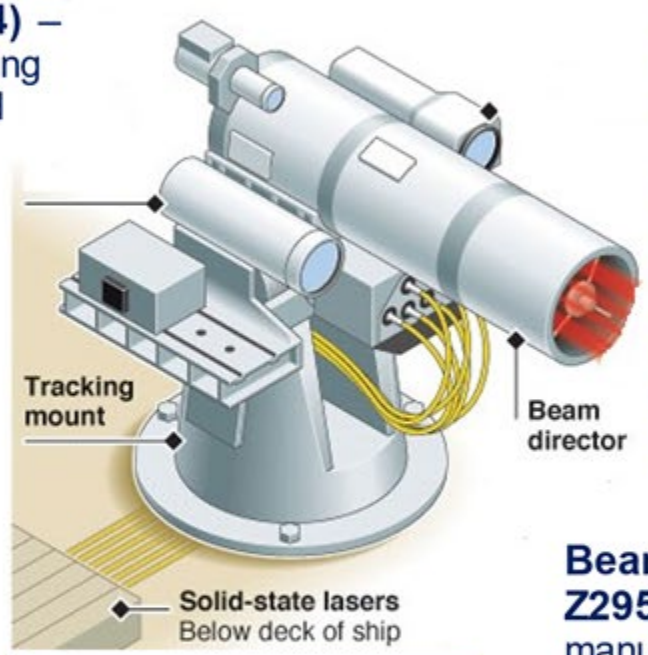
PennState Electro-Optics Center

High Energy Laser (HEL) Systems Roadmap *Developed DoD-wide roadmap to drive HEL manufacturing investments to ensure production readiness for future Programs of Record*

High Energy Laser Optical Coating Reliability Improvement (S2884) – Improves HEL coating quality, enabling increased laser power and improved product yield.

Production Fabrication of Optics for HEL Weapon System (S2834) – Increases large mirror throughput by ten - fold. Two mirrors provided for HELIOS system spares.

HEL Coating Contamination Mitigation (Z2953) – Reduces catastrophic HEL optical coating failure in the field using mirror inspection and data driven maintenance processes.



"Z" projects are executed by Navy ManTech in collaboration with OSD ManTech.

Laser Quality Spinel Optics (Q2790) – Delivers high strength, high clarity IR windows for DE and ISR sensor applications.

Production of Multilayer Dielectric Gratings for Laser Weapon Systems (S2909 and Z2962) – Develops independent tools to evaluate industry HEL gratings for specification compliance and increased laser power.

Beam Director Manufacturing (S2956, Z2954, SP2966) – Establishes design -for-manufacturing methods and tools for the industrial base, addressing Navy need for compact and agile high-power laser beam directors.

Oversight from PEO IWS, DoD Labs, IBAS, and JDMTP Directed Energy Working Group

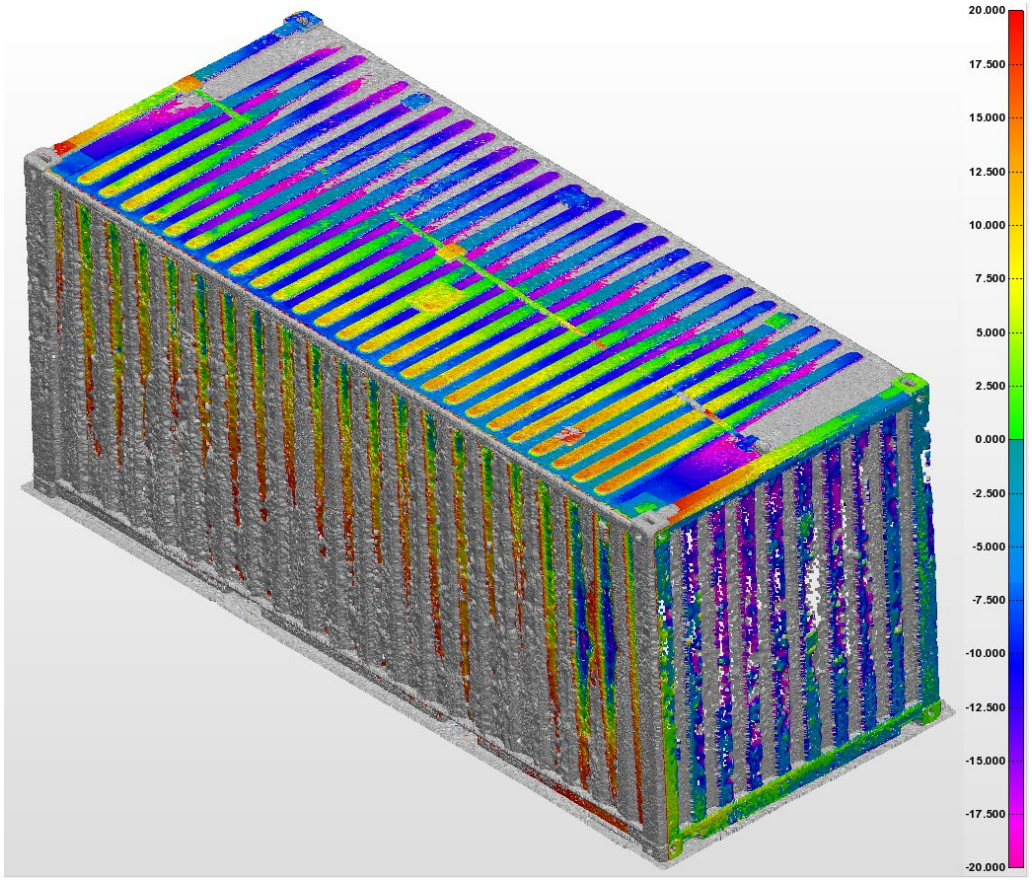
EOC Supporting PEO-IWS SPEIR

PennState Electro-Optics Center

PennState Electro-Optics Center

S2828 Automated Metrology for Structural Assembly

- Automated “heat map” of deviations from a large standoff distance
- Optimal point cloud collection for large structures
- Minimal use of targets



EOC Key Staff and Contact Info

PennState Electro-Optics Center

Director
Andrew Trageser
(724) 295-7000, X7013
abt1@arl.psu.edu

Technical Director
Robert Sobek
(724) 295-7000, x7014
rds23@arl.psu.edu

ManTech Business Manager
Chrissy Spehar
724-295-7000, x7172
cmb5474@arl.psu.edu

ARL Penn State Deputy Director
Head, Materials and Manufacturing Office
Dr. Mark Traband
814-865-3608
mtt1@arl.psu.edu

Navy ManTech Program

Center for Naval Metalworking (CNM)

Mark Snider, Director

Prepared under ONR Contract N00014-22-D-7004 as part of the Navy ManTech Program
Document Control Number (DCN): 2025-1-22-531; Approval Date: 02/18/2025

NSRP All Panel Meeting
February 2025

Background

Mission: Identify, develop, and facilitate the deployment of potential solution sets, in this case that of metalworking or related manufacturing technologies, to domestic shipyards, factories, and other industrial facilities to reduce the cost and time to build and repair key naval and defense platforms and systems.

- ATI's Virtual COE Model: Deliver the best value to the Navy by:
  - *Employing our proven successful virtual center model*
  - *Teaming with Navy OEMs, industry experts, and the best technology providers*
  - *Driving state of the art solutions from the best available sources to implementation on target platforms*

CENTER FOR NAVAL METALWORKING

Stakeholders, Partners & Results

Results:

- Transition Rate **73%**
- Over **$600M** in Projected Navy Cost Savings (Completed & Active Project Portfolio)
- 22 Active Projects (8 additional in development)

Navy ManTech
can depend on a continuation of highly relevant research projects with widespread implementation from...

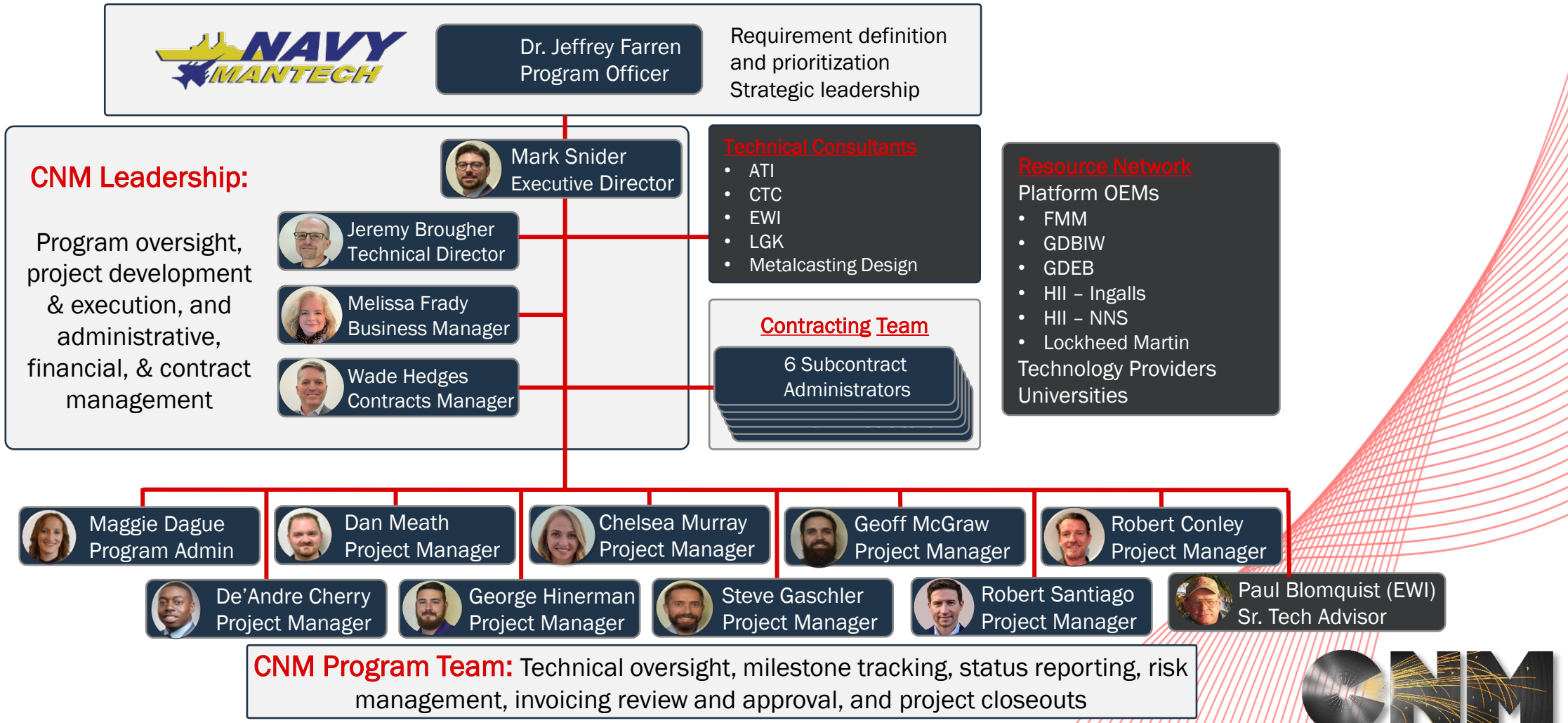
An Established Center
with unparalleled experience in program management and efficient technical, contracting, and financial operations

Strong Stakeholder Relationships
across Navy commands, laboratories, and funders with related interests and projects

Collaboration with Key OEM
shipyards and avionics system integrators and their supply chains

Diverse Tech Providers
with expertise across all primary and secondary focus areas

Center Structure

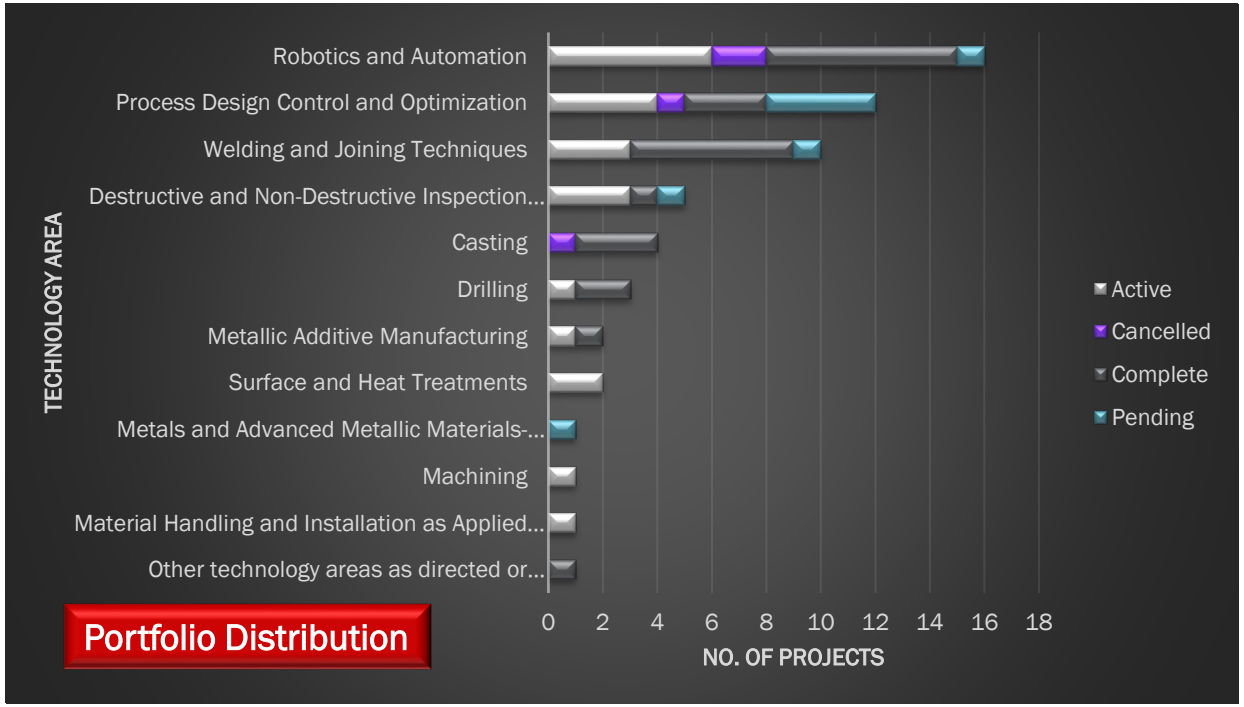


CENTER FOR NAVAL METALWORKING

CNM Technology Areas

Primary:

- Primary Metalworking and Related Manf. Processes (Casting, Forging, Rolling, Machining, Drilling, etc.)
- Metals and Advanced Metallic Materials-Based Systems
- Welding and Joining Techniques
- Robotics & Automation



Secondary:

- Metallic Additive Manufacturing
- Surface and Heat Treatments
- Metal Manufacturing Process Modeling and Simulation
- Process Design Control and Optimization
- Destructive and Non-Destructive Inspection (NDI) Technologies
- Material Characterization and Testing
- Metallic to Non-Metallic Joining and Interface Issues
- Application and Removal of Coatings, Paints, and Similar Treatments for Metallic Substrates
- Metal Matrix Composites
- Material Handling and Installation
- Ceramics and Ceramic Matrix Composites
- Other technology areas as directed or approved by the ManTech Program Office

CENTER FOR NAVAL METALWORKING

Fitting Aid Tools

PEO	Shipyard Lead	Project Status	Cost Savings
Ships (PMS 397 & PMS 450)	General Dynamics Electric Boat	Complete	$6.73M (5-Year) RoI = 5.85

Objective

- Eliminate or minimize the need to fabricate, weld, cut, and grind numerous temporary fitting attachments
- Investigate span time reduction potential

Approach

- This project utilized state-of-the-art fitting aids to increase throughput in the fabrication of steel components to meet the demands of the submarine platforms currently fabricated at GDEB
- This project researched and validated commercial off-the-shelf fitting aids as well as designed, prototyped, and evaluated custom fitting aids to produce accurate submarine components using Navy-required plate materials.
- All fitting aid tool designs were found to be effective at reducing

(**right**) – Removal step project was developed to eliminate (grinding temporary attachments);
(**below**) Two (2) beast foot fitting aids replacing ~80 temporary fitting aids

CENTER FOR NAVAL METALWORKING

Robotic Process for Installing Hull Inserts

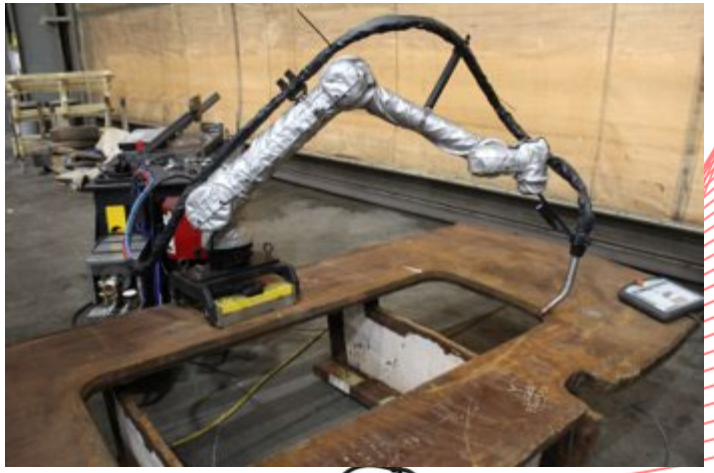
PEO	Shipyard Lead	Project Status	Cost Savings
Submarines (PMS 397 & PMS 450)	General Dynamics Electric Boat	Complete	$17.7M (5 year) ROI = 1.90

Objective

- Develop a robotic hull insert installation system that will increase cut and weld quality and reduce cut and weld labor hours.
- Introduce a paradigm shift that will allow the user to bring the robot to the part.
- Develop a repeatable and predictable process that consistently produces X-ray quality results.

Approach

- Defined requirements for system and weld procedure development.
- Developed functional specifications, simulation test plan and physical test plans.
- Prototypes were selected, built and designed to robotically layout/locate, cut, bevel, grind and weld hull penetrations and mating inserts.
- Demonstrated robotic hull installation processes using the prototype system in the shipyard.



Portable Welding Robot

PEO	Shipyard Lead	Project Status	Cost Savings
Submarines (PMS 397 & PMS 450)	General Dynamics Electric Boat	Complete	$12.23M (5 year) ROI = 1.62

Objective

- Investigate, develop, and prototype a portable robotic welding solution that reduces welding labor hours and increases weld quality.
- Decrease manufacturing span time for major assemblies.
- Define requirements for weld procedure qualifications.
- Develop a repeatable and predictable welding process.

Approach

- Defined application criteria and candidate assemblies for welding.
- Developed functional specifications and test plans were created.
- Selected prototype system design to evaluate welding process.
- Welding parameters were developed on the robot prototype and welding parameters were successfully validated through execution of the qualification support test plan.

CENTER FOR NAVAL METALWORKING

Robotic Blending of Large Diameter Internal Piping (Pipecrawler)

PEO	Shipyard Lead	Project Status	Cost Savings
Submarines (PMS 397 & PMS 450)	General Dynamics Electric Boat	In Process	$8.7M (5 year) ROI = 2.75

Objective

- Design and build a Prototype Develop a prototype system with the ability to:
  - Enter ~2-inch small access points
  - Expand to the working pipe diameter about 12-inches
  - Navigate to the intended work location
  - Perform minor blending and grinding operations

Approach

- Identify system requirements and research potential vendors with relevant experience to achieve project objectives.
- Develop test procedures and design a mockup for prototype evaluation.
- Design and build a prototype system that aligns with all project objectives.
- Test the prototype using established test procedures and mockups, evaluating its performance against the baseline criteria.

CENTER FOR NAVAL METALWORKING

Multi-Function Shipbuilding Robot

PEO	Shipyard Lead	Project Status	Cost Savings
Ships (PMS 400)	HII-Ingalls	In Process	$5.52M (5-Year) RoI = 4.21

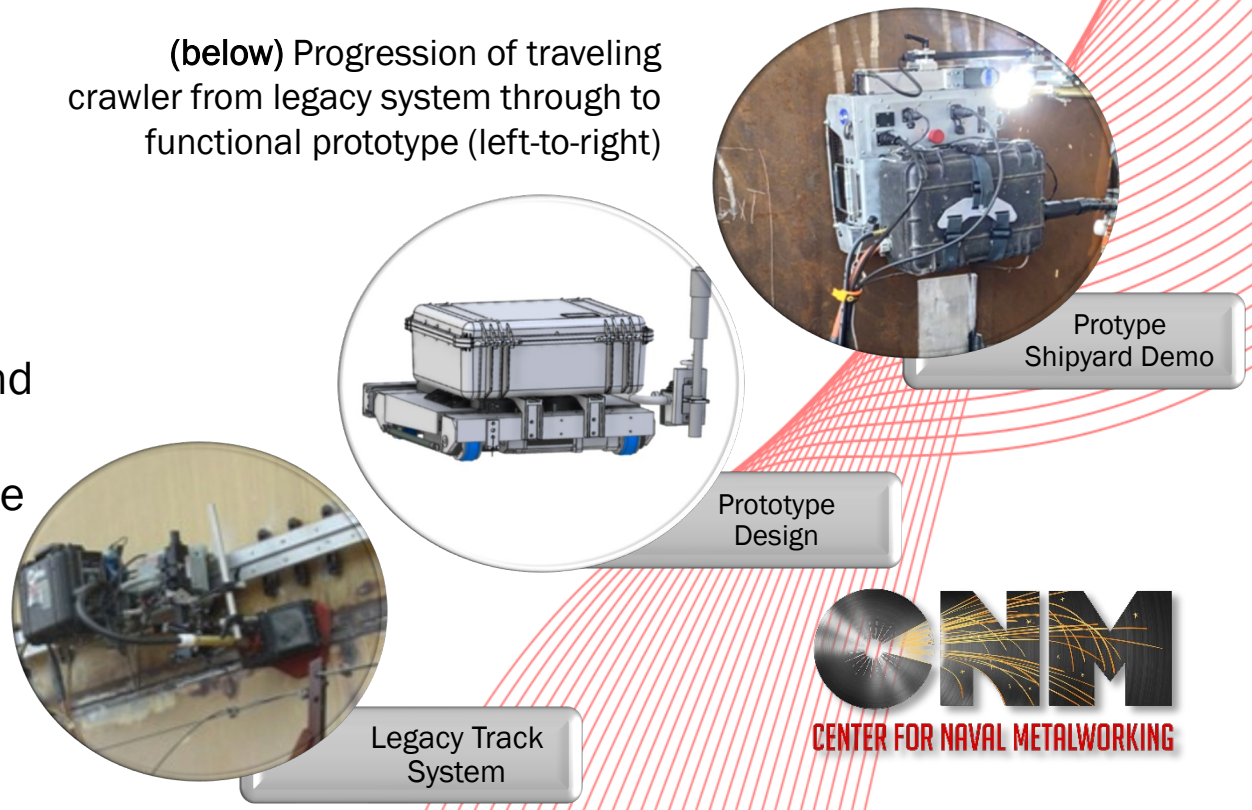
Objective

- Reduce labor hours required to erect scaffolding and track welding set up
- Decrease labor hours needed to weld erection joints by 50%
- Decrease hours needed to rework and re-inspect welds by 50%

Approach

- Evaluate baseline process to identify areas for influence and improvement
- Down select COTS vendors from market survey to determine which technology best fit objective potential
- Verify functional prototype met all system requirements via lab verification testing
- Complete shipyard verification testing of prototype in shipyard to validate business case

(below) Progression of traveling crawler from legacy system through to functional prototype (left-to-right)



CENTER FOR NAVAL METALWORKING

CNM Project Focus

- Advancing the state of the art for metallic materials
- Implementing major innovations in joining technology
- Automating labor intensive and critical processes
  - Improving safety, quality, and productivity
- Developing robust, repeatable, and scalable metallic additive processes
- Adapting new production methodologies to maintenance, repair, and overhaul needs
- Always looking to accelerate the capabilities of the Navy
  - Get new ships in the water earlier
  - Support the innovative vessel concepts of the future Navy

CENTER FOR NAVAL METALWORKING

Contact Information

Director
Mark Snider
(843) 760-3239
mark.snider@ati.org

Technical Director
Jeremy Brougher
(843) 760-3578
jeremy.brougher@ati.org

Program Admin
Maggie Dague
(843) 760-3302
maggie.dague@ati.org

https://cnm.ati.org/

The TEAM

CNM is a government/industry/academia partnership. Organizations and individuals from a variety of disciplines are engaged as needed to solve technical challenges and improve manufacturing processes.

The MISSION

CNM will identify, develop, and deploy metalworking and related manufacturing technologies to reduce the cost and time to build and repair key naval platforms and other relevant industries.

The MODEL

CNM is a Navy ManTech Center of Excellence, with single point contracting through ATI. Teamed with the Edison Welding Institute (EWI), CNM provides robust capabilities to address the DoD manufacturing industrial base , including state-of-the-art metalworking labs and deep expertise in key technology areas. From virtual project management to innovative prototypes, CNM delivers tailored solutions.

CENTER FOR NAVAL METALWORKING

CENTER FOR NAVAL METALWORKING

Navy ManTech Program

Institute for Manufacturing and Sustainment Technologies (iMAST)

NSRP All Panel Meeting

February 25-27, 2025

Chris Ligetti
Director
(814) 865-7619
cxl300@arl.psu.edu

Dan Finke
Technical Director
(814) 865-5178
daf903@arl.psu.edu

Chrissy Spehar
Business Manager
724-295-7000 x 7172
cmb5474@arl.psu.edu

PennState Applied Research Laboratory

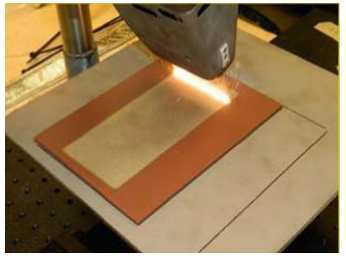
IMAST
INSTITUTE FOR MANUFACTURING AND SUSTAINMENT TECHNOLOGIES

iMAST Introduction

IMAST
INSTITUTE FOR MANUFACTURING AND SUSTAINMENT TECHNOLOGIES

Institute for Manufacturing and Sustainment Technologies (iMAST) was established at ARL in February 1995 as one of the Navy ManTech program's Centers of Excellence (https://www.arl.psu.edu/imast/).

iMAST is a matrix organization executing ONR ManTech projects using ARL Materials and Manufacturing engineers and staff.



iMAST provides a focal point for the development and transition of cost saving ***Manufacturing Technology*** innovations, processes, hardware and software. Eligible platforms include CVN, VCS, CLB, DDG, FFG, and F-35.

iMAST supports the Navy with life cycle cost reduction projects within the ***Repair Technology*** (RepTech) program in support of shipyards and DON depots across the Navy's repair enterprise; NAVSEA, NAVAIR, MARCOR.

iMAST supports ***Capability Acceleration*** projects aimed at maintaining the Navy's technical superiority. Projects include new combat capability and sustainment initiatives with OEM's, public and private yards.

iMAST Technical Thrusts

IMAST
INSTITUTE FOR MANUFACTURING AND SUSTAINMENT TECHNOLOGIES

- iMAST areas of expertise cut across all of ARL Penn State's Materials, Manufacturing, and Sustainment competencies
- Specific areas of expertise include:

- **Materials Science and Applications**
  - Advanced Manufacturing Process Development
  - Materials Characterization
  - Coatings for Extreme Environments
- **Materials Engineering**
  - Design, Modeling, and Analysis
  - Polymer Composites
  - High Performance Materials and Process Development
- **Systems Engineering and Rapid Prototyping**
  - Specialized Hardware
  - Manufacturing Modeling and Planning
  - Uncrewed Systems
  - Embedded Systems
- **Applied Sustainment Technologies**
  - Health Management Systems
  - Information/Enterprise Systems
  - Supply Chain Engineering

Repair Technology (RepTech) Program

IMAST
INSTITUTE FOR MANUFACTURING AND SUSTAINMENT TECHNOLOGIES

- **Objectives:**
  - Apply emerging technologies to improve the capabilities of the repair community and the affordability of repair facilities
  - Reduce duplication of effort in RepTech-related R&D through coordination with other funded programs, to include but not limited to: NSRP, Maritime Industrial Base (MIB), and SBIR/STTR
  - Transition technology to the Navy's repair and sustainment Organic Industrial Base and develop plans for implementation
- **Goals:**
  - Reduce or avoid costs associated with existing repair, maintenance, and sustainment activities within the US Navy and Marine Corps Industrial Base
  - Reduce turnaround time for critical sustainment activities, including maintenance overhauls and availabilities, modernization upgrades, remanufacturing, and capability resets
  - Eliminate unsafe maintenance and sustainment activities associated with cumbersome work practices

Repair Technology (RepTech) Program

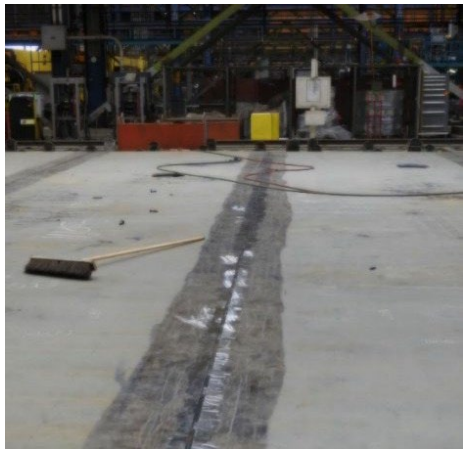
IMAST
INSTITUTE FOR MANUFACTURING AND SUSTAINMENT TECHNOLOGIES

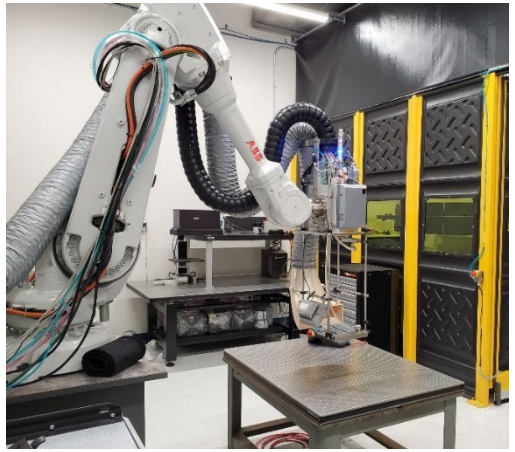
- **RepTech Working Group (RWG):**
  - Created to develop a coordinated approach to identify repair capability improvement requirements for the Navy and Marine Corps and select projects that best meet the objectives and goals;
  - Principals from NAVSEA 04XT, NAVAIR COMFRC, USMC LOGCOM
  - Includes ONR Program Officer, iMAST Leadership, and project principal investigators
- **Additional RepTech Participation:**
  - NAVSEA 04 shipyards and 05T, NAVAIR Fleet Readiness Centers (FRCs), Marine Depot Maintenance Command
  - Navy's Regional Maintenance Centers (RMCs)
  - Non-Navy Ex-officio Members (US Army, US Air Force, OSD, etc. – as directed by ONR Program Officer)
  - Private shipyards building major Navy platforms (CVN, VCS, CLB, DDG, FFG, F-35)
  - Private shipyards conducting repair and sustainment on Navy surface and amphibious platforms
  - Other Navy ManTech Centers of Excellence

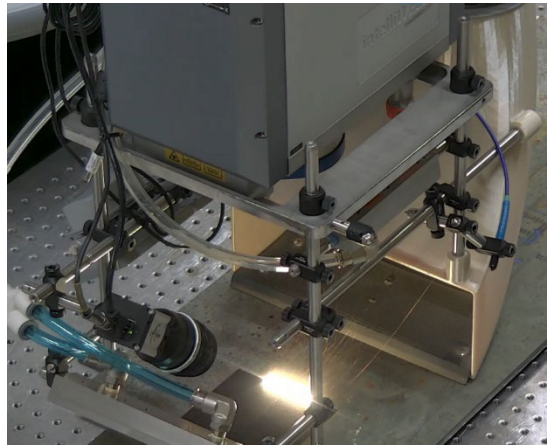
S2823 Laser Ablation of PCP from HSLA Steel

IMAST
INSTITUTE FOR MANUFACTURING AND SUSTAINMENT TECHNOLOGIES

- **Issue**: Pre-Construction Primer (PCP), must be removed prior to welding. Current methods, including grit blasting and handheld or walk-behind grinders, are laborious, dangerous, and can cause material erosion
- **Objective**: Develop and test a laser ablation removal process that will reduce the time to strip PCP, limit impact to the steel substrate, and reduce labor and consumable costs
- **Achievements**: Developed, tested and optimized a 1 kW, pulsed fiber laser by IPG Photonics to remove PCP in various conditions. Testing, per Technical Warrant Holder guidance, was completed in Oct 2024. Draft letter of approval being prepared for LA of PCP in Structural Fabrication and Assembly facility at NNS.
- **Benefits/Payoff**: $14-17M five-year savings for SFA applications







RT2837 Submarine Large Diameter Ball Valve Improvement

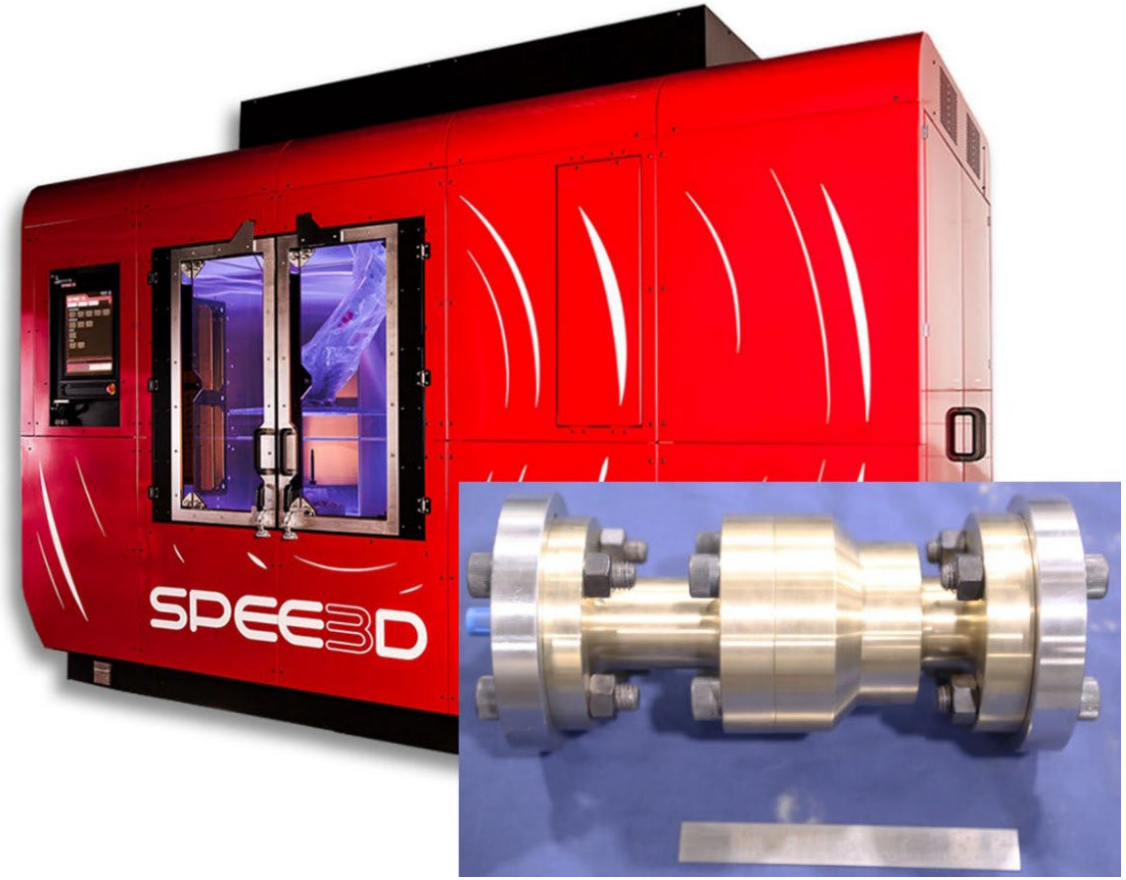
IMAST
INSTITUTE FOR MANUFACTURING AND SUSTAINMENT TECHNOLOGIES

- **Issue**: Coating on large diameter submarine seawater valve balls is failing prematurely, causing increased torque, seat swelling, loss of lubricity, and calcareous deposits from marine growth. Damage to the surface finish of the valve ball coatings can result in emergent repairs at significant cost
- **Objective**: Identify and validate potential candidate coatings, process parameters and sealants to improve ball valve life-cycle performance in Navy submarines
- **Achievements**: Conducted spray trials to optimize parameters for required thickness, adhesion, and surface roughness. Currently completing durability cycle testing at GDEB. Draft letters recommending approval for use on new construction VCS and CLB underway.
- **Benefits/Payoff**: >$100M five-year savings VCS and CLB

RT2998 – SPEE3D for Rapid, Low Cost Additive Manufacturing of Navy Components

IMAST
INSTITUTE FOR MANUFACTURING AND SUSTAINMENT TECHNOLOGIES

- **Issue**: Shrinking casting supply chain is resulting in longer lead times and higher cost for casting parts. Delays in returning Navy ships to service can cost over $100K/day
- **Objective**: Develop an additive manufacturing process for Navy casting alloys using the SPEE3D cold spray system and transition the developed process to the Navy and/or supporting industry partners
- **Achievements**: Developing optimized spray and heat treat process that is meeting or exceeding cast properties for NAB and 70/30 CuNi. Exercising process for NAVSEA selected components and emergent fleet needs
- **Benefits/Payoff**: >$4M five-year savings for limited set of components



S2963 – Predictive Maintenance II – Industrial Internet of Things (IIoT)

IMAST
INSTITUTE FOR MANUFACTURING AND SUSTAINMENT TECHNOLOGIES

- **Issue**: Shipyards have critical path manufacturing assets that have the potential to experience catastrophic failure despite preventative maintenance programs, directly resulting in unnecessary asset repair costs, lost production time, and rework.
- **Objective**: Implement advanced machinery health monitoring technologies for critical equipment to enable condition based maintenance to improve production of US Navy submarines
- **Achievements**: An investigation of wireless sensing technology was conducted to down select to vendor that met critical cybersecurity requirements. A pilot was conducted, collecting data from wireless accelerometers, liquid level and current sensors. Demonstrations were provided to internal GDEB management as well as participants from the broader Navy shipbuilding and repair community in 3Q FY2024
- **Benefits/Payoff**: >$7M five-year savings with opportunity for growth with expanded implementation

Thank you, and enjoy the 2025 NSRP All-Panel Meeting!

Navy ManTech Program

Composites Manufacturing Technology Center (CMTC)

Leslie Hill, Deputy Director

Prepared under ONR Contract (N00014-21-D-7001) as part of the Navy ManTech Program

NSRP All Panel Meeting
26 February 2025

Background

- Mission: Identify, develop and deploy advanced manufacturing technologies that will reduce the cost, time to build/repair and/or increase performance of Navy platforms.
- CMTC's Virtual COE Model: Deliver the best value to the Navy by:
  - *Teaming with industry experts and the best technology providers*
  - *Driving state of the art material solutions from the best available sources to implementation on target platforms*
  - *Bringing technology developments from labs/FNC/SBIR programs to the warfighter in as broad of a way as possible.*

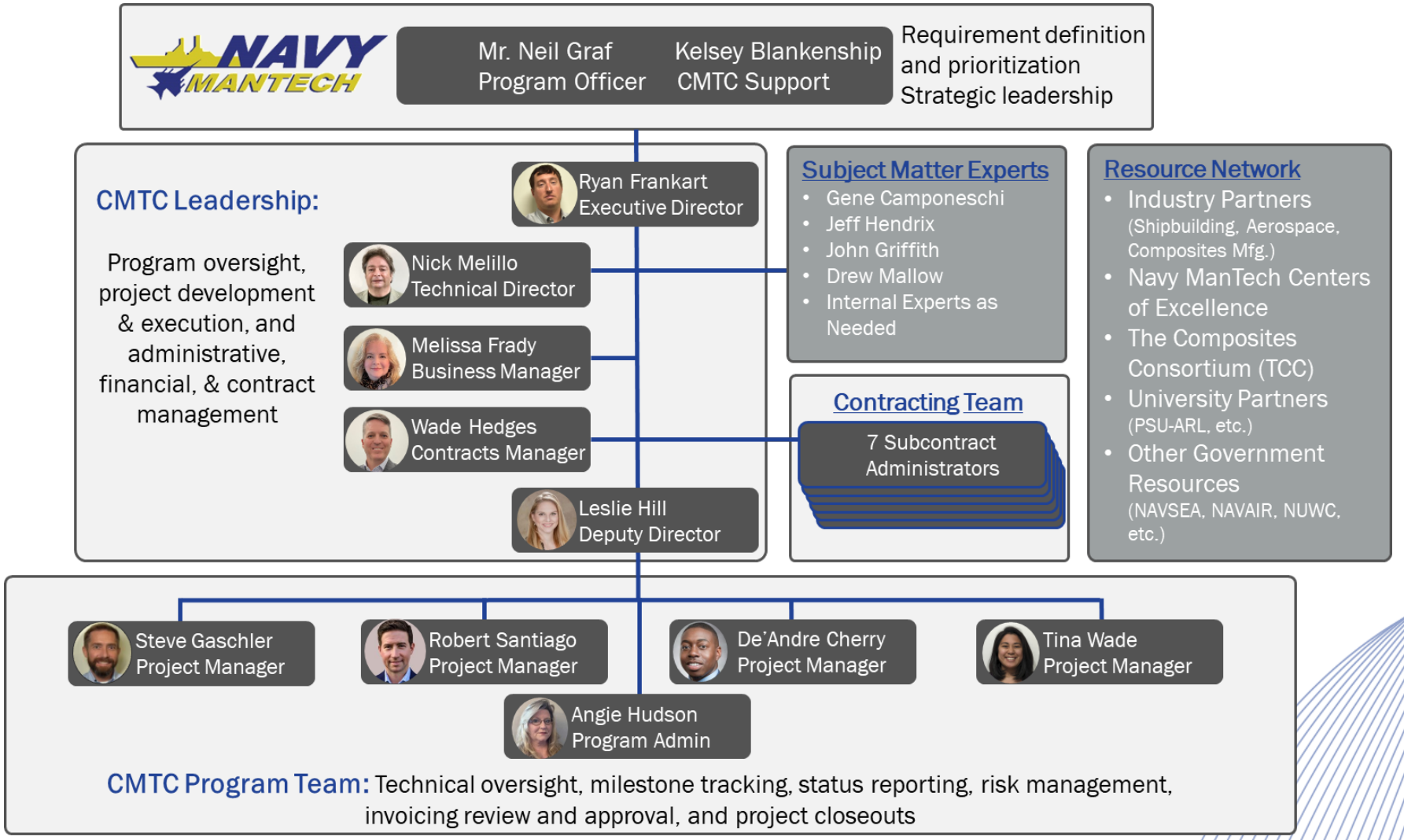
Stakeholders, Partners & Results

CMTC - 5 Year Results from FY23

- Transition Rate of 65%
- 8 Active Projects (14 more *in development*)

Stakeholders	Platform OEMs

Center Structure



Composites Manufacturing Technology Center

CMTC Technology Areas

- **Composites and Advanced Materials**
  - Fiber-reinforced polymeric (organic) resin composites
  - Ceramic-matrix, metal-matrix, and carbon-carbon composites
  - Graphite, glass, and polymeric fibers as well as alternate reinforcements
  - Coating materials and treatments
  - Engineering plastics and similar materials
- **Complex Structures and Design**
  - Composite “internal” stiffening core materials such as foam, ceramic, balsa wood, polymeric or metallic honeycomb
  - Composite “external” stiffening concepts such as hat and blade stiffeners and methodologies to manufacture them
  - Materials for radomes and other electrical applications
  - Pourable filling, shaping, and fairing materials
  - Adhesives, adhesive bonding, and related technologies
- **Testing and Inspection**
  - Mechanical, physical, chemical, thermal, and/or electrical testing
  - Quality assurance/advanced non-destructive evaluation
  - Modeling and simulation, (i.e., cure modeling, finite element analysis, etc.)
- **Processing and Automation**
  - Process analytics
  - Robotic or automated processing of the above materials (i.e., drilling, machining, etc.)
  - Polymeric additive manufacturing technologies
  - Repair technologies
  - Sealant, coating, and filling materials technologies, including mixing, application, and removal
  - Engineering plastics and similar materials related processes (thermoforming, sanding/polishing, etc.)
  - Chemical technology and environmentally-safe practices for composite materials and manufacturing processes

Insulating Materials

PEO	Shipyard Lead	Project Status	Cost Savings	Application
Carriers	HII – NNS	In Progress	$20M - $50M Per Hull	Condensation Control
Ships	HII – Ingalls Bath Iron Works	Phase 1 Complete	$10M Estimated Over 5 Years	Fire / High Temp / Valve Bodies

Objective

Identify insulating material systems with potential applicability to Navy ships and perform evaluations to determine suitability.

Approach

- Conduct market research to identify the best insulating materials system candidates for use in Navy applications
- Perform material testing to evaluate suitability
- Develop manufacturing methods for new materials systems
- Demonstrate reduction in fabrication and installation time/eliminate rework

Foam Fill

PEO	Shipyard Lead	Project Status	Cost Savings
Subs	HII - NNS	Implementing	25% reduction in manufacturing and installation

Objective

Develop and assess multiple foam filling techniques and compare to baseline process. Demonstrate highest probability candidates and assess performance to spec maintaining form, fit and function in targeted applications.

Approach

- Review historical manufacturing data
- Identify alternate foam manufacturing processes
- Create test plans, execute tests and collect data
- Make recommendations to reduce cost

Composites Projects Opportunities

- High On the Ship/Too Heavy for Personnel Lift
- Below Waterline
- Curved or Doubly Curved
- High Amounts of Touch Labor (Automation)
- Failing Due to Vibration or Corrosion (Internal or External)
- Integrated Weapons Systems – Multi Platform Support
- Use of Exotic Metals (Corrosion)
- Surface Preparation / Coatings
- Radomes

Contact Information

Executive Director
Ryan Frankart
(864) 646-4529
ryan.frankart@ati.org

Deputy Director
Leslie Hill
(864) 646-4505
Leslie.hill@ati.org

Technical Director
Nick Melillo
(843) 760-3580
nick.melillo@ati.org

Program Administrator
Angie Hudson
(864) 646-4515
angie.hudson@ati.org

Composties Manufacturing Technology Center (https://cmtc.ati.org)

THE PROGRAM

CMTC is an Office of Naval Research (ONR) Center of Excellence. The program develops improved manufacturing processes for composite-based components and facilitates technology transfer to resolve manufacturing and repair issues identified and prioritized by the Navy's Program Executive Offices, other DoD services and industry.

THE ENTERPRISE

CMTC is a virtual enterprise connecting ONR, prime suppliers, university researchers, and small businesses. Industry and academia compete for projects individually or in partnerships. Project teams are assembled and dissolved as needed. This virtual center approach keeps costs low and ensures that ONR gets the best technology from the best sources.

HOW IT WORKS

CMTC issues calls for new project concepts on behalf of ONR. Any company or team of companies can submit project concepts. CMTC works with proposers to refine concepts and ensure alignment with DoD challenges. This process leads to formal technical and cost proposals. ONR evaluates proposals and selects sources. CMTC awards projects and work begins.

http://cmtc.ati.org/

EMC | ELECTRONICS MANUFACTURING CENTER

NAVY MANTECH

NSRP All Panel Meeting 2025
Navy ManTech Center-of-Excellence

ELECTRONICS MANUFACTURING CENTER

John Mazurowski, EMC Director

PennState
Applied Research Laboratory

EMC | ELECTRONICS MANUFACTURING CENTER

MISSION

NAVY MANTECH

The core mission and function of the EMC is to identify, develop and facilitate the transition of electronics manufacturing technologies to reduce the cost and time to deploy electrical and electronic (digital and analog) systems as well as the supporting power storage and distribution infrastructure to Naval ships, aircraft, submarines, and unmanned systems.

SCOPE

- Manufacturing technology
- Semiconductor devices
- Vacuum electronics
- Passive components
- Integrated circuit technologies
- MICs and MMICs
- Interconnections
- Compound semiconductors
- Wide bandgap semiconductors
- Manufacturing / assembly
- Nanoelectronics
- Power electronics
- Trusted electronics hardware
- Resilient electronics hardware
- Thermal management
- MEMS
- Packaging technology
- Non hermetic packaging
- Tamper proof / resistant
- Energy storage / distribution
- RF directed energy weapons
- Vetronics manned / unmanned
- Precision timing and navigation
- Microwave electronics
- Emerging technologies
- Sustainment / Obsolescence
- COTS integration
- U.S. industrial base
- Supply chain integrity
- Counterfeit detection
- Detection embedded viruses
- Detection of cyber threats
- System Integration

PROJECTS

NUMBER	EMC PROJECTS
S2987	SEWIP Block 3 Transceiver Affordability (Ken Freyvogel)
S3003	Manufacturing of Advanced Textured Ceramics (Dr. Mark Fanton)
S3004	Improving Common Sonar Transformer Affordability (David Rearick)
S3020	AN-SPY-6(V) Radio Frequency Head Mfg Improvements (Ken Freyvogel)
SP3024	Carbon Nanotube Cathode Applications (Tim Kennedy)

TEAM

John Mazurowski
EMC Director

Ken Freyvogel
EMC Technical Director

Chrissy Spehar,
EMC Business Manager

Melissa Castilyn EMC
Contracts Administrator

OFFICE OF NAVAL RESEARCH SPONSOR TEAM

- William Crespo, Program Officer
- Dr. Olivia Aul
- Dr. Luis Valentin-Marrero
- Russell Meadows
- Reggie Hope
- Don Szczur

Penn State Applied Research Laboratory
Materials and Manufacturing Office
Electro-Optics & Electronics Division
Electronics Manufacturing Center
http://emc.psu.edu