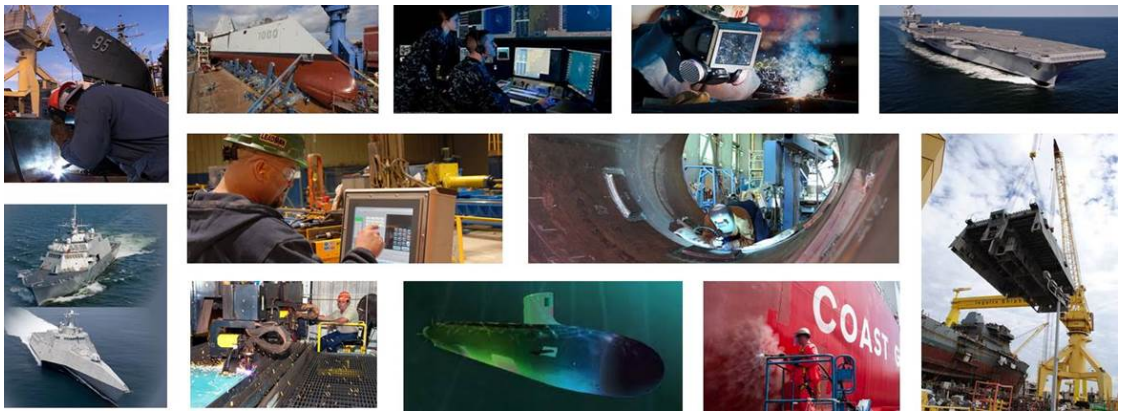
NSRP

National Shipbuilding Research Program

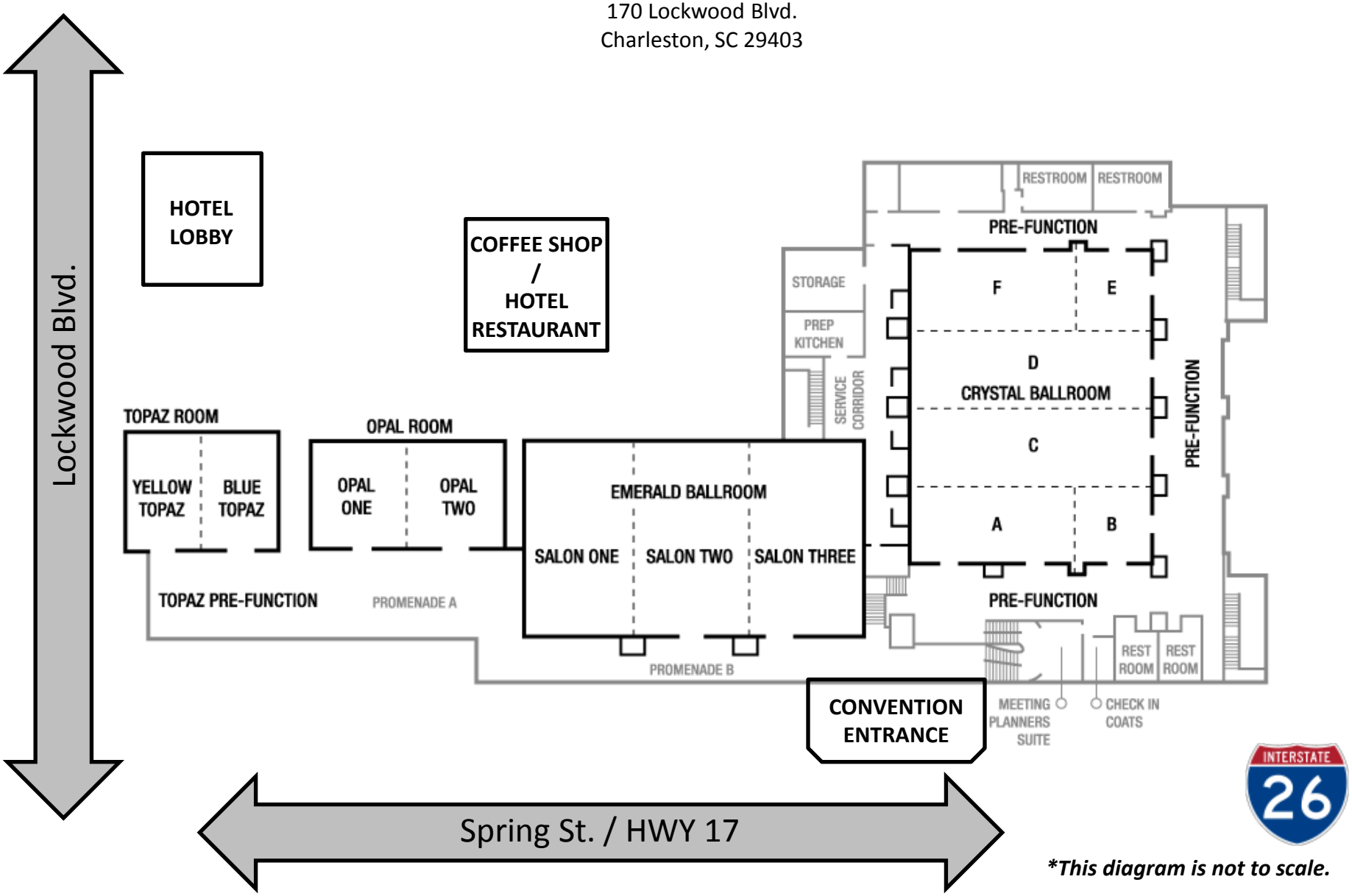
2015 ALL PANEL MEETING

Information Guide



Charleston Marriott Convention Area Layout

170 Lockwood Blvd.
Charleston, SC 29403



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Tuesday, March 10, 2015

Time	
7:00 – 8:00	**CONTINENTAL BREAKFAST** *Crystal BCDE Pre-Function*
8:00	**GENERAL SESSION** *Crystal ABC*
8:00	Welcome and Meeting Overview
8:15	Keynote Address - Richard McCreary, Executive Control Board Chair
8:45	Keynote Address - John Carney; Director, Affordability Initiatives Division and Navy ManTech Program
9:15	Keynote Address - RDML Thomas Kearney, Deputy Commander Naval Sea Systems Command (NAVSEA 06)
9:45	**BREAK** *Crystal BCDE Pre-Function*
10:00	**GENERAL SESSION** *Crystal ABC*
10:00	Businesses Processes State of the Panel - Virgel Smith, Business Processes Panel Chair
10:10	Electrical Technologies State of the Panel - Jason Farmer, Electrical Technologies Panel Chair
10:20	Environmental State of the Panel - Pat Killeen, Environmental Panel Chair
10:30	Information Technologies State of the Panel - Denny Moore, Information Technologies Panel Chair
10:40	Planning, Production Processes and Facilities State of the Panel - Ken Fast, Planning, Production Processes and Facilities Panel Chair
10:50	Risk Management State of the Panel - Thresa Nelson, Risk Management Panel Chair
11:00	Ship Design and Material Technologies State of the Panel - Alicia D'Aurora, Ship Design and Material Technologies Panel Chair
11:10	Ship Warfare Systems Integration State of the Panel - Perry Haymon, Ship Warfare Systems Integration Panel Chair
11:20	Surface Preparation and Coatings State of the Panel - Arcino Quiero Jr., Surface Preparation and Coatings Panel Chair
11:30	Welding Technology State of the Panel - Lee Kvidahl, Welding Technology Panel Chair
11:40	Workforce Development State of the Panel - Anna Bourdais, Workforce Development Panel Chair
11:50	**BREAK** *Lunch will be served 12:00 PM – 1:30 PM*

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Tuesday, March 10, 2015

Time				
	EXPO		**LUNCH**	
12:00	**The NSRP All Panel Meeting Expo will be held in Crystal DEF**		**Boxed lunches will be provided in the Crystal BCDE Pre-Function Space**	
12:30				
1:00				
1:30				
2:00				
2:30	**BREAK** *Topaz Pre-Function and Crystal BCDE Pre-Function*			
	TECHNICAL TRACKS			
	Digital Design & Manufacturing Tools (A) ***Yellow Topaz***	**Digital Design & Manufacturing Tools (B)** ***Blue Topaz***	**Infrastructure & Training** ***Opal Room***	**Ship Production Technologies** ***Crystal ABC***
2:45	Manufacturing Innovation Network - US Citizens Only *Bill Barkman*	Integrated Link Testing *John Mazurowski*	Tubular Solid State Lighting (TLED) - Current Technology and Advantages *Chris Jenson*	Acoustic Machining *Edward Waterman*
3:00				
3:15	CVN Reality Capture - US Citizens Only *Frank DeLar and Jeff Tatum*	In-Service Ship Re-Documentation and Configuration Management *Mark Debbink*	Design for Maintenance Training for the US Ship Design and Shipbuilding Industry *Lisa Hepinstall*	Cold Spray Technology for Shipboard Components *Tim Eden*
3:30				
3:45			Knowledge Preservation Management - US Citizens Only *Scott Gebbie*	
4:00	Ship Checks Using 3-D Laser Scanners - US Citizens Only *Sean Krieger*	Trade Friendly Measurement Techniques *Joe Gross*		Shipfitting Simplified *Kevin Smith*
4:15				
4:30	**ADJOURN MEETING**			

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Networking Social

The 2015 NSRP All Panel Meeting Networking Social will be held at The Rice Mill from 6:30 PM – 8:30 PM.

Please see the Networking Social section of the All Panel Meeting Information Guide for more information.

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2015 All Panel Meeting

AGENDA

Wednesday, March 11, 2015

Time	
7:00 – 8:00	**CONTINENTAL BREAKFAST** *Topaz Room*
8:00	**GENERAL SESSION** *Crystal ABC*
8:00	ManTech - Composites Manufacturing Technology Center Brief; Marty Ryan, Director
8:10	ManTech - Navy Metalworking Center Brief; Daniel Wintersheidt, Director
8:20	ManTech - Electro-Optics Center Brief; David Ditto, Director
8:30	ManTech - Naval Shipbuilding and Advanced Manufacturing Center Brief; Kevin Carpentier, Director
8:40	ManTech - Electronics Manufacturing Productivity Facility Brief; Michael Frederickson, Director
8:50	ManTech - Institute for Manufacturing and Sustainment Technologies; Timothy Bair, Director
9:00	**BREAK** *Promenade B and Crystal BCDE Pre-Function*

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Wednesday, March 11, 2015

Time	TECHNICAL TRACKS			
	Digital Design & Manufacturing Tools (A) *Emerald One*	**Digital Design & Manufacturing Tools (B)** *Emerald Two*	**Modularity & Commonality** *Emerald Three*	**Ship Production Technologies** *Crystal ABC*
9:15	Robust Functional Paperless Paint - Phase II Future State Implementation *Ross Boyd*	DDG Digital Storyboard *Jamie Breakfield*	Development and Application of Standard Hull, Mechanical, & Electrical Modules to Increase Flexibility in Ship Design *Victoria Dlugokecki*	Fiber Optics Installation on Ships *John Mazurowski*
9:30				
9:45		Additive Manufacturing Simulation Tools *Anthony Davenport*	Flexible Infrastructure Track System *Lori Denault and Harold Howard*	
10:00	Fiber Optic Measurement and Shape Sensing (FOMSS) *Mattew DiGioia and Bobby Martinez*			Zero Weld Distortion Arc Welding to Reduce Cost of Ship Construction: Hybrid Induction Welding of Butt and T-Fillet *Jerry Jones*
10:15			Standardized Foundations Database for Combat Systems *T.D. Huang and Michael Harbison*	
10:30		Ship Knowledge Management *Glenn Knowles*		
10:45	Reducing Inspection Costs Using the Latest Digital Inspection Tools *Joseph Walker*			Validation of Analysis Methods for Padeye Attachment Under Dynamic Loading through Destructive Testing *Joshua Reece*
11:00			Flexible Infrastructure Qualification - US Citizens Only *Sara Trawick*	
11:15				
11:30	**LUNCH** *On your own. Please see the recommended restaurants listed in the All Panel Meeting Information Guide.*			

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Wednesday, March 11, 2015

Time	TECHNICAL TRACKS			
	Digital Design & Manufacturing Tools (A) *Emerald One*	**Digital Design & Manufacturing Tools (B)** *Emerald Two*	**Modularity & Commonality** *Emerald Three*	**Ship Production Technologies** *Crystal ABC*
1:00	Mobile Robotics to Increase Welder Productivity and Weld Quality 'Virtual Reality Control (VRC) Mobile Robot' *Jerry Jones*	Digital Shipbuilding *Dennis Jarabak*	Affordable, Model-Based Open-Architecture Radar (AMOR) *Pete Esposito*	Precision Panel Inserts / Thin Panel Distortion Mitigation *Lori Denault*
1:15				
1:30				Cost Saving Comparison in Application of Polysiloxane vs. Silicone Alkyd Topcoats *Peter Ault and Robert Cloutier*
1:45	Welding Simulation Tools (Sequence Optimization) *Anthony Davenport*	Model Based Enterprise / Digital Tapestry *Ben Kassel*	3D Platform - Shore Interface Model Deliverable *Alex Viana*	
2:00				
2:15				All Platform Affordable LED Lighting (APALED) *Jim VanMeter*
2:30	Improved Welder Productivity *Daniel Finke*	Assisted Decision Support System for Outfitting Work Content Palletization *Jeff Schaedig*	Manufacturing Cost Reduction for Littoral Combat Ship Scalable Electronic Warfare System *Pete Esposito*	
2:45				Development of a High Mobility Manufacturing Robot *Jamie Beard and Stephen Canfield*
3:00				
3:15	**BREAK** *Promenade B*			

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Wednesday, March 11, 2015

Time			
	TECHNICAL TRACKS		
	Ship Production Technologies (A) *Emerald One*	**Ship Production Technologies (B)** *Emerald Two*	**Ship Production Technologies (C)** *Emerald Three*
3:30	Pipe Production Automation Methods *Michael Lichtenfels*	Rigging Follow-On Research *Joshua Reece*	Mechanized Cable Pulling *Timothy Freidhoff*
3:45			
4:00		Expanded Adhesive Outfitting *Mark Losset*	
4:15	Robotic Welding of VCS Interim Products and Major Assemblies *Derek McKee*		Improved Topside Non-Skid Removal for VIRGINIA and SEAWOLF Class Submarines *Charles Tricou*
4:30		ClickBond Adhesive Studs *Dan Lupton*	
4:45			
5:00	**ADJOURN MEETING**		

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AGENDA

Thursday, March 12, 2015

Panel Meetings: See Individual Panel Agendas

Panel	Meeting Room
Business Processes	Opal One
Electrical Technologies	Emerald One
Environmental	Crystal B
Information Technologies	Crystal A
Planning, Production Processes, & Facilities	Crystal F
Ship Design & Material Technologies	Emerald Two
Ship Warfare Systems Integration	Opal Two
Surface Preparation & Coatings	Emerald Three
Welding Technology	Crystal C
Workforce Development	Crystal E

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Panel Agendas

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Business Processes Panel Meeting

Charleston, SC

March 12, 2015

AGENDA

Thursday, March 12, 2015 – Opal One

Time	Presentation	Speaker
9:00	**Convene Meeting**	
9:00	Welcome and Introductions	Virgel Smith, Panel Chair
9:15	Leveraging Detail Design Data in Weight Engineering Phase II	Bruce Hays, DRS Technologies
9:45	Shared Manufacturing Drawing Qualifications Requirements	Newport News Shipbuilding
10:15	**Break**	
10:30	Dynamic Change Awareness (DCA)	Greg Carithers, Ingalls Shipbuilding
11:15	Computer Aided Robotic – Welding (CAR-W)	Mark Schaub, Wolf Robotics Mike Davis, Wolf Robotics
12:00	**Lunch (On Your Own)**	
1:00	Extension of OneList	Jeb Baugh, Praeses
1:30	Navy's 3D Virtual Environment	Alex Viana, NAVFAC
2:00	Data Analytics	Patrick Roberts, SSI USA
2:30	Open Discussion on Potential Projects	All
3:00	Future BP Panel Meeting Planning	All
3:15	Final Conclusions	Virgel Smith, Panel Chair
3:30	**Adjourn**	

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Electrical Technologies Panel Meeting

Charleston, SC

March 12, 2015

AGENDA

Thursday, March 12, 2015 – Emerald One

Time	Presentation	Speaker
9:00	**Convene Meeting**	
9:00	Welcome & Introductions	Jason Farmer, Panel Chair
9:15	NSRP Update	SCRA
9:30	Insulated Bus Pipe Testing Update	Rick Worth, NSWCCD-SSES Code 982
9:45	Low Voltage Quick Connector Evaluation	Greg Stevens, Bath Iron Works
10:15	Alternatives to Fiber Optic Connectors	John Mazurowski, Penn State Electro-Optics Center
10:45	**Break**	
11:00	Flexible Interface for Automated Circuit Tester for Level 1 Testing	Darren Brick, Ingalls Shipbuilding
11:30	Safer Inspection of Medium-High Voltage Electrical Panels on Navy Ships	Matt DiGoia, Penn State Electro-Optics Center
12:00	**Lunch (On Your Own)**	
1:30	Materials & Components for Exterior Electrical Connections & Sealing	Darren Brick, Ingalls Shipbuilding
2:00	IEEE 45.5 - Shipboard Electrical Safety	Dennis Neitzel, IEEE 45.5 Chair, AVO Training Institute
2:30	Potential 2015 ETP Project Topics	All
3:30	Chair Report	Jason Farmer, Panel Chair Walt Skalniak, Vice Panel Chair
3:45	Business Meeting	All
4:15	Action Item Review	All
4:30	**Adjourn**	

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Environmental Panel Meeting

Charleston, SC

March 12, 2015

AGENDA

Thursday, March 12, 2015 – Crystal B

Time	Presentation	Speaker
9:00	**Convene Meeting**	
9:00	Call to Order, Review of Agenda, and Introductions	Pat Killeen, Panel Chair
9:15	Chair's Report	Pat Killeen, Panel Chair
9:30	Environmental Regulatory Update	Ian Bennitt, SCA
10:00	Panel Project 1 – Develop a Data Management Application (Emission Tracker) to Reduce Labor and Increase Accuracy in the Regulatory Reporting of Environmental Emissions	Matt Hoffman, CTC
10:30	**Break**	
10:45	Panel Project 2 – Control Technology Comparison for Heavy Metals Removal form Shipyard Storm Water Runoff	Jake White, PE, ECS
11:15	NAVSEA Update	David Kopack, Navy
11:30	Status of Panel	Pat Killeen, Panel Chair
11:45	2016 Whitepaper Project Brainstorming	All
12:00	Business Meeting and Shipyard Roundtable	Shipyards
12:45	Conclusion and Wrap Up	Pat Killeen, Panel Chair
1:00	**Adjourn**	

NSRP | National Shipbuilding Research Program

Information Technologies Panel Meeting

Charleston, SC

March 12, 2015

AGENDA

Thursday, March 12, 2015 – Crystal A

Time	Presentation	Speaker
8:00	**Convene Meeting**	
8:00	IT Panel Business Review	Denny Moore, Electric Boat
8:15	CTC's Innovation Pipeline	Matt Hoffman, CTC
9:00	Enterprise Data Management Using Semantic Technologies	Jeb Baugh, Praeses
9:45	**Break**	
10:00	MBE	Tim Turner, Jotne
10:30	WorkFlow Tracking	Sue Adams, Ingalls Shipbuilding
11:30	**Adjourn**	

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Planning, Production Processes & Facilities Panel Meeting

Charleston, SC

March 12, 2015

AGENDA

Thursday, March 12, 2015 – Crystal F

Time	Presentation	Speaker
8:00	**Convene Meeting**	
8:00	Panel Business and Future Meeting Planning	Ken Fast, Panel Chair
8:30	Model Based Thermal Forming of Plate	Hyunok Kim, EWI
9:00	Click-Bond Fasteners (Review)	Dan Lupton, Click-Bond
9:15	Tools for Tack-Less Fitup (Review	Kevin Smith, Fit Up Gear
9:30	3D Product Model for Ship/Shore Interface	Alex Viana, NAVFAC
10:00	**Break**	
10:30	Thermal Spray Aluminum for Aluminum Corrosion Prevention	Mark Smitherman, CTC
11:15	Computer Aided Robotic Welding (at Business Processes Panel Meeting)	Mark Schaub, Wolf Robotics
12:00	**Adjourn**	

Ship Design & Material Technologies Panel Meeting

Charleston, SC

March 12, 2015

AGENDA

Thursday, March 12, 2015 – Emerald Two

Time	Presentation	Speaker
8:00	**Convene Meeting**	
8:00	Welcome, Introductions	Alicia D'Aurora, Panel Chair
8:15	Major Initiative Team Leader (MITL) Report	David Rice, Newport News Shipbuilding
8:30	Panel Business	Alicia D'Aurora, Newport News Shipbuilding
9:00	2015 Panel Projects: Brainstorm New Topics	All
9:45	**Break**	
10:00	Outfit Attachments on Thin Skin Vessels	Phillip Lloyd, NASSCO
11:00	The Benefits of Using U SeaProtect	Mike Turk, Saint Gobain Michel Robert, Saint Gobain
11:30	**Lunch (On Your Own)**	
12:30	Changing the CAE Analysis Paradigm: MSC Apex	Larry Pearce, MSC Software
1:00	Additive Manufacturing for DoD Applications	Rob Akans, CTC
1:30	Development of Reverse Sensitization Process for 5xxx Series Aluminum on Navy Ships	Mark Philippi, CTC
2:00	Composite Personnel Transport Module (PTM) Shelter for LCACs	Rob Banerjee, NexGen Composites
2:30	**Adjourn**	

Ship Warfare Systems Integration Meeting

Charleston, SC

March 12, 2015

AGENDA

Thursday, March 12, 2015 – Opal Two

Time	Presentation
8:00	**Convene Meeting**
8:00	Panel Chair Introduction
8:15	NSRP Update
8:30	Flexible Infrastructure Panel Project
9:00	Standardized Foundation Project
9:30	Ship Warfare Systems Interface Description
10:00	**Break**
10:15	Ship Specification Review to Identify Technical Gaps between FI and Requirements (NNS)
10:45	Optimization of Design/Manufacturing of Flexible Interface Adapters (NNS)
11:15	Standardizing Warfare System Interfaces to Reduce Integration Costs
11:45	Plans for 2015
12:15	**Closing and Adjourn**

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Surface Preparation & Coatings Panel Meeting

Charleston, SC

March 12, 2015

AGENDA

Thursday, March 12, 2015 – Emerald Three

Meeting Objectives:

- Naval Initiative Updates
- Program Updates
- Current Project Updates

Time	Presentation	Speaker
9:00	**Convene Meeting – Begin VTC**	
9:00	Introduction	All
9:15	Panel Chair's Report	Arcino "Q" Quiero, Jr.; Panel Chair
9:45	NAVSEA 05 Update	Mark Ingle, NAVSEA 05P2
10:30	**Break**	
10:45	NAVSEA 04 / CWP Update	Mark Braza, NAVSEA 04
11:15	Mega Rust Update	Dave Zilber, 3M, Mega Rust Chair
11:30	Final Update – Robust Functional Paperless Paint – Phase II Future State Implementation (PTR – Pete Lockwood)	Ross Boyd, TruQC Megan Strick, TruQC
12:00	**Lunch (On Your Own)**	
12:00	**Steering Committee Working Lunch**	
1:00	ManTech Update	Tom Hite, CTC
1:15	Project Update – Reducing Inspection Costs Using the Latest Digital Inspection Tools (PTR – Mark Toscano)	Joe Walker, Elcometer
1:45	Project Update – Cost Savings Comparison in Application of Polysiloxane vs. Silicone Alkyd Topcoats (PTR – Steve Cogswell)	Bob Cloutier, Bath Iron Works Pete Lockwood, Bath Iron Works
2:15	**Break**	
2:30	SSPC NBPI Update	Mike Damiano, SSPC
3:00	Project Kick-Off – Universal Primer and Surface Preparation Process (PTR – Arcino "Q" Quiero, Jr.)	Mark Losset, Ingalls Shipbuilding

Surface Preparation & Coatings Panel Meeting

Charleston, SC

March 12, 2015

AGENDA

Thursday, March 12, 2015 (Continued) – Emerald Three

Time	Presentation	Speaker
3:30	Project Kick-Off – Partial Blast of Ultra High Solids Coated Tanks (PTR – Bob Cloutier)	Pete Ault; Elzy, Technology Corp.
4:00	Project Kick-Off – Alternative Corrosion Control Methods for Inaccessible Void Spaces (PTR – Steve Cogswell)	Pete Ault, Elzly, Technology Corp
4:30	SP&C Panel Meeting Wrap Up	Arcino “Q” Quiero, Jr.; Panel Chair
5:30	**Adjourn**	

Welding Technology Panel Meeting

Charleston, SC

March 12, 2015

AGENDA

Thursday, March 12, 2015 – Crystal C

Time	Presentation	Speaker
8:00	**Convene Meeting**	
8:00	Welcome, Call to Order	Lee Kvidahl, Panel Chair
8:15	Chairman Report	Lee Kvidahl, Panel Chair
8:30	2014 Panel Projects (3) Summary	Lee Kvidahl, Panel Chair
8:45	Stat of the Art GMAW Equipment for Aluminum	Nick Kapustka, Edison Welding Institute
9:15	Improved GMAW/FCAW on Primer Steel and Aluminum	Nick Kapustka, Edison Welding Institute
10:00	Intelligent Video to Reduce Weld Training Time	Steven Edelson, Visible Welding
10:45	Next Panel Meeting	Lee Kvidahl, Panel Chair
11:00	**Adjourn**	

Workforce Development Panel Meeting

Charleston, SC

March 12, 2015

AGENDA

Thursday, March 12, 2015 – Crystal E

Time	Presentation	Speaker
9:00	**Convene Meeting**	
9:00	Review of Agenda & Introductions	Anna Bourdais, Panel Chair
9:15	Chair's Report	Anna Bourdais, Panel Chair
9:30	2016 Whitepaper Project Brainstorming	All
10:30	**Break**	
10:45	Process for Cross-Panel Collaboration	Ann Franz, NWTC
11:30	**Lunch (On Your Own)**	
1:00	Industrial Human Augmentation System (iHas)	Jamie Mattern, NAVSEA
1:30	Moving Forward Session (Actions, Next Meeting)	All
1:45	Wrap Up	Anna Bourdais, Panel Chair
2:00	**Adjourn**	

NSRP | National Shipbuilding Research Program

Panel Chair Bios



MISSION

- Manage and focus national shipbuilding and ship repair research and development funding on technologies that will reduce the total ownership cost of ships to the U.S. Navy, other national security customers and the commercial sector and develop and leverage best commercial and naval practices to improve the efficiency of the U.S. shipbuilding and ship repair Industry.
- Provide a collaborative framework to improve shipbuilding-related technical and business processes.

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ANNA BOURDAIS

WORKFORCE DEVELOPMENT PANEL CHAIR

As Manager of Learning and Development for Ingalls Shipbuilding, Anna is responsible for developing, implementing, and evaluating training, leadership development, performance management, coaching, mentoring, and organizational development objectives for over 11,000 employees.

Anna also represents Learning & Development in company-wide initiatives and serves as a consultant in human capital and talent management objectives. In addition to her Learning & Development role, Anna also recently served as the HR Business Partner for Gulfport Operations and worked with the leadership team to provide HR solutions that were aligned with and met organizational needs.

With Ingalls, Anna has nearly 16 years of experience including training, organizational development, and HR. She has held a variety of positions with increasing responsibility in technical training, organizational development, and HR roles. Key accomplishments include leading training teams for engineering software, ERP implementations; functional skill development, designing and implementing several leadership development programs, mentoring programs, employee engagement, new HR policies; change management, and creating and implementing a coaching strategy. As a Six Sigma Black Belt, Anna has broadened her HR experience by leading several projects to increase employee retention, increase employee work readiness, and reduce employee issues.

Prior to joining Ingalls, she was a math and science teacher in both private and public schools. Anna received a B.A. in Upper Elementary Education. She also received a M.Ed. and Ph.D. in Curriculum and Instruction, with a concentration in Adult Education and Program Evaluation. She is a certified Senior Professional in Human Resources (SPHR). She is an active member of the NSRP Workforce Development panel. She is also a member of the Society for Human Resource Management (SHRM) and Institute for Corporate Productivity (I4CP).

ALICIA D'AURORA

SHIP DESIGN & MATERIAL TECHNOLOGIES PANEL CHAIR

Alicia D'Aurora is a mechanical engineer in the Ship Survivability department at Newport News Shipbuilding (NNS). Currently, she is developing and implementing a proactive obsolescence management process for Ford Class carriers.

Alicia was a key team member on a research and development project that created a packaging concept design to reduce the required shipboard footprint, the cost of environmental tests and increased the flexibility of the integration into the ship. She was involved with the capture and execution of the Consolidated Afloat Networks and Enterprise Services (CANES) program. Alicia was the Platform Integration lead with a team of engineers and designers working to complete the shipboard installation design of the CANES system on US Navy platforms. She has also been the lead system engineering for several large environmental testing programs.

Alicia is currently the Panel Chair for the NSRP Ship Design and Material Technologies Panel. She is a member of the Society of Naval Architects and Marine Engineers (SNAME). Alicia graduated with her Masters of Engineering in System Engineering from the University of Virginia. She earned her Bachelor of Science in Mechanical Engineering from Gannon University.

JASON FARMER

ELECTRICAL TECHNOLOGIES PANEL CHAIR

Jason Farmer currently holds the position of Project Lead for Fiber Optics and Electro-Optical Research in the Advanced Concepts Group within the Engineering Department at Ingalls Shipbuilding. In this capacity he manages resource allocation, budget, schedule, and tasking on projects to develop, improve, and introduce new fiber optic technologies and advanced electro-optical systems on U.S. Navy and Coast Guard ships. In addition, Mr. Farmer oversees the Advanced Technology Laboratory at Ingalls Shipbuilding.

During his time at Ingalls Shipbuilding, Jason has been involved with the evaluation, development, and implementation of various systems on U.S. Navy platforms. He participated in the development and implementation of new, light-emitting diode (LED) bulbs for aircraft warning systems. Jason led a project team sponsored by the ONR ManTech program to improve the performance of fiber optic lighting systems employed in shipboard designs. He later led and participated in panel projects for the National Shipbuilding Research Program (NSRP) to evaluate the use of solid-state lighting systems for shipboard illumination as well as the use of new testing systems for shipboard fiber optic installations. In addition, he has conducted process improvement projects and trade studies to aid in the transition of new technologies and procedures into ship construction.

Jason is currently the Panel Chair for the NSRP Electrical Technologies Panel. He is an active board member of the Pennsylvania State University Electro-Optics Alliance and member of the Society of Naval Architects and Marine Engineers (SNAME). Jason graduated from Mississippi State University as a Bachelor of Science in Electrical Engineering and has completed post graduate work in electrical engineering. He is a Six-Sigma Green Belt Certified Engineer.

KEN FAST

PLANNING, PRODUCTION PROCESSES & FACILITIES PANEL CHAIR

Ken Fast is a Principal Engineer at Electric Boat Corporation. His current work is focused on research and development of advanced manufacturing technologies and technology-enabled process improvements for submarine production and sustainment. As a member of the Software Engineering Group of the IT organization he also works on development of software tools to improve the design-build process. Mr. Fast was the system architect and technical leader for the EVS visualization system used at Electric Boat as the electronic mockup for the Virginia Class submarine program. Over the years he has participated on numerous technology projects sponsored by DARPA, ManTech, NSRP, and internally. Ken grew up building wooden boats in the backyard and is a second generation engineer at Electric Boat. He is a graduate of Worcester Polytechnic Institute with a degree in Mechanical Engineering.

PERRY HAYMON

SHIP WARFARE SYSTEMS INTEGRATION PANEL CHAIR

Mr. Haymon is a Technical Director in the Advanced Concept Group at Ingalls Shipbuilding in Pascagoula, Mississippi. Perry is responsible for identifying and working new programs as they relate to the next generation of surface combatants at Ingalls Shipbuilding. Perry has 21 years of shipbuilding experience primarily in the areas of electrical and combat systems, all at Ingalls Shipbuilding. He has a Bachelor of Science in Electrical Engineering (BSEE).

As a Technical Director Perry's responsibilities include determining the technical organization and objectives for new programs under his oversight, selecting the technical team for executing the programs along with their responsibilities, manage the personal assigned to the programs, function as the primary technical or program lead with the customers at all levels of the new programs, responsible for defining the new programs technical baseline and interface definition, and ensure team wide coordination of design data.

Perry is a member of the Surface Navy Association (SNA) and a US patent holder U.S. patent number 6,729,657.

PAT KILLEEN

ENVIRONMENTAL PANEL CHAIR

Mr. Killeen is the Corporate Director of Environmental Health and Safety for Signal International located in Pascagoula, Mississippi. Pat's corporate responsibilities include all phases of environmental and safety regulatory law compliance, corporate policy development and EHS business strategy composition. Pat has 29 years of Environmental Health and Safety experience, all within the marine fabrication industry.

Pat's professional achievements include development and implementation of a comprehensive facility EHS Management Plan. His team has consistently reduced all emissions released from all Signal operations, virtually eliminated all waterborne releases from the facilities and brought down the OSHA recordable rate of the Signal International facilities, a minimum of 200% below the national average for their industry. Of particular significance, for the past years, Signal's OSHA total recordable rate has been below one (1.0); previously unheard of in the marine fabrication industry.

Pat is a member of the American Society of Safety Engineers (ASSE), a registered Environmental Manager with the National Registry of Environmental Professionals, former Chairman of the Board for the Shipyard Association for Environmental Responsibility, Chairman of the AEU Shipyard Safety Committee, a member of both the Safety and Environmental Committee of the Shipbuilders Council of America, and is currently the chairman of the National Shipbuilding Research Program's (NSRP) Environmental Panel.

LEE KVIDAHL

WELDING TECHNOLOGY PANEL CHAIR

Lee Kvidahl is the Manager of Welding Engineering at Ingalls Shipbuilding in Pascagoula, Mississippi, where he has worked for more than 35 years. Mr. Kvidahl's responsibilities include: investigating and implementing new manufacturing production methods to ensure productivity improvements; training craft and management in welding, materials and inspection technology; managing internally and externally funded research and development programs; justifying and monitoring capital and operation budgets; assisting in developing and preparing proposals for research and development; and providing metallurgical engineering support for the shipyard. Kvidahl has collaborated on the publication of six books in the areas of metals and welding. He is a past president of the American Welding Society. Mr. Kvidahl received a bachelor's degree in Engineering from Stevens Institute of Technology.

STEWART "DENNY" MOORE

INFORMATION TECHNOLOGIES PANEL CHAIR

Mr. Moore has over 40 years' experience at Electric Boat Corporation and previously at BBN in all aspects of scientific software development. His research has focused on development of finite element, and infinite element methods, and on implementing them in software that is readily usable by the community of design analysts. Mr. Moore has a broad range of experience in scientific software development covering the full range of software languages, hardware platforms, operating systems, advanced software concepts, graphical debuggers, source code control systems and CASE disciplines. Past experience in parallel processing algorithms and hardware has included both scaleable and shared memory paradigms.

Most recently, Mr. Moore has been Project Manager for several National Shipbuilding Research Program (NSRP) initiatives, including three Panel Projects and the Modeling and Simulation (M&S) Projects totaling over $4M in funding. The M&S projects support shipbuilding simulation process improvements and analysis automation. The unique approach centers on a flexible design environment at the earliest stages of the ship design cycle; formulating and implementing a more computer-aided engineering approach to ship modeling and simulation. The assignment includes both business and technical coordination of a multi-team partnership.

Mr. Moore started his career at Electric Boat in 1973 as an engineer in Naval Architecture, where he was responsible for structural analysis and design utilizing proprietary analysis software. In addition, he participated in the design of the Land Level Facility pontoon submarine launcher. He continued his career in Purchasing at Electric Boat as Chief of Purchasing Administration responsible for three supervisors and a forty member clerical staff providing document repository, offset printing, data entry, and production of Purchase Orders and interfacing of purchasing computer system with company-wide MIS. In 1982, Mr. Moore joined BBN Technologies as Product Manager of the SARA-2D/3D finite element software responsible for software development, hardware porting, user support, software distribution, documentation, and market development. Development contributions included development of pre- and post-processing capabilities, efficiency improvement, parallelization of the solution subroutine, and implementation of substructuring capabilities. He rejoined Electric Boat in 2002 as a Principal Engineer responsible for development of software projects in structural analysis, structural acoustics, and other scientific disciplines. Mr. Moore has been involved in various company IR&D projects and is currently supporting development and implementation of Integrated Product Data Environments (IPDE) and Computer Aided Engineering applications.

Mr. Moore has a B.S. degree in Civil Engineering from the University of Massachusetts, a M.S. degree in Civil Engineering from the University of Connecticut and a M.B.A. degree from Rensselaer Polytechnic Institute. Mr. Moore has published over 30 technical papers primarily dealing with scientific software, parallel processing, and integrated engineering analysis. He is a member of the Association for Computing Machinery (ACM) and the Society of Naval Architects & Marine Engineers (SNAME).

THRESA NELSON

RISK MANAGEMENT PANEL CHAIR

Thresa Nelson has been with Newport News Shipbuilding (NNS) for 19 years and is presently the NNS Manager, Environmental, Health and Safety at the Kesselring Navy Power Training School in New York. Previous NNS assignments include Manager of Security and Emergency Management and Manager of Health and Safety from 1998-2013. During her tenure in Health and Safety, she provided oversight for all aspects of industrial hygiene and safety in support of the Virginia Class Submarine program, New Construction Aircraft Carriers, Carrier Refueling and Overhaul and numerous other programs and projects. She has been an active member of NSRP for more than 10 years where she actively pursued projects to reduce injuries and illnesses in shipyards. She was also a key member of projects that addressed regulatory impacts to the Industry, including Tagout and Hexavalent Chromium.

Prior to joining Newport News, Thresa was with the firm of Environmental Resources Management (ERM) in Tampa, Florida where she was a Senior Environmental Scientist with specialties in auditing, training, process safety management, hazardous waste management, and emergency response. Thresa is retired from the U.S. Army after serving nearly 32 years as a Chemical Officer (CBRN) with assignments in Europe, Southeast Asia and the United States. Her final assignment was the Emergency Preparedness Liaison Officer between the Virginia State Emergency Operations Center (EOC) and FEMA Region 3 in Philadelphia. Although happiest jumping out of perfectly good airplanes, she also taught Risk Management at the Army Safety Center.

Ms. Nelson received a master's degree in Strategic Leadership from the U.S. Army War College in 2008, a master's degree in environmental science from the University of Kansas in 1993, and a bachelor's degree in Biology from Trinity University in San Antonio, Texas. She is a Certified Safety Professional (CSP) and Certified Industrial Hygienist (CIH).

ARCINO QUIERO JR.

SURFACE PREPARATION & COATINGS PANEL CHAIR

Arcino "Q" Quiero, Jr. currently holds the position of Project Manager within the Manufacturing Engineering and Planning Division at Newport News Shipbuilding (NNS). In this capacity he is responsible for creating strategic relationships within industry and using those relationships to foster the implementation of new technologies within Manufacturing. This includes understanding current manufacturing processes, capabilities, and challenges and searching out or partnering with industry to develop solutions.

During his more than 30 year tenure Arcino has worked to improve NNS' processes and to develop its people. While serving as Blast & Coat's (B&C) Superintendent he initiated an Environmental, Health, and Safety (EH&S) Task Team as a means of ensuring the safety of its employees. As an active member of the National Shipbuilding Research Program (NSRP) SP&C Panel he led a "white paper" project that identified and recommended an alternative coatings system environmental recorder, which led to a change in NAVSEA Standard Item 009-32. Arcino led NNS' Coatings Global Process Team (CGPT) whose charter was to simplify and streamline technical requirements communicated throughout the value stream, engineering down to the deck plate. The results of the CGPT efforts provided enhanced visual technical guidance for the foremen and craft workers. Previous positions held within NNS include Chemist, Quality Improvement Program Administrator, Senior Environmental Engineer, Facility Operations Department Head, and SP&C Value Stream Leader. He has served as NNS' representative to the NSRP SP&C Panel for the past eight years.

Arcino is the NSRP SP&C Technologies Panel Chair, a position he has held since January 2014. He graduated from Hampton University with a Bachelor of Arts in Chemistry and holds Master of Business Administration (MBA) from Old Dominion University. Arcino is Six-Sigma Green Belt Certified.

VIRGEL SMITH

BUSINESS PROCESSES PANEL CHAIR

Virgel Smith is a thirteen year veteran at Ingalls Shipbuilding in Pascagoula, Mississippi. Virgel works in Information Technology and manages the engineering and manufacturing software. Virgel is PMP certified and manages projects that advance technologies and increase digital relationships for engineering operations and material delivery in the shipyard. Virgel has twenty five years of experience using, designing and implementing PDM/PLM strategies and solutions in the shipbuilding and aerospace arenas.

Virgel Smith has worked in an advisory capacity on process improvement for Boeing, Northrop Grumman, Bell Helicopter Textron, NASA, Ingalls Shipbuilding, US Dept. of Energy and others. He served as Development Product Council Chair on the CATIA Operators Exchange for Fluid System Design and is a published author for the American Helicopter Society.

NSRP | National Shipbuilding Research Program

Keynote Speakers Bios



MISSION

- Manage and focus national shipbuilding and ship repair research and development funding on technologies that will reduce the total ownership cost of ships to the U.S. Navy, other national security customers and the commercial sector and develop and leverage best commercial and naval practices to improve the efficiency of the U.S. shipbuilding and ship repair Industry.
- Provide a collaborative framework to improve shipbuilding-related technical and business processes.

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TIMOTHY BAIR

DIRECTOR, INSTITUTE FOR MANUFACTURING AND SUSTAINMENT TECHNOLOGIES

Timothy D. Bair ("Tim") is the Director of ARL's Institute for Manufacturing and Sustainment Technologies. The iMAST mission is to support the U.S. Navy ManTech program as a focal point for the development and transfer of new manufacturing processes and equipment in a cooperative environment with industry, academia, and Navy acquisition and sustainment programs. Before taking over iMAST, Tim was working to extend ARL's reach into Autonomic Logistics, Condition Based Maintenance applications, advanced repair technology and space-based sustainment programs. The Applied Research Laboratory of Pennsylvania State University is a DoD designated University Affiliated Research Center with over 70 years of experience in applying technology and research to solve US Navy and DoD problems. ARL began in 1945 as the Navy's post-WWII brain trust for subsurface warfare in the areas of vessel design and test as well as weapons development. Today ARL's 1200 engineers, scientists and staff support DoD, NASA and various federal agencies as a source of high tech solutions, innovations applied to fill technology and capability gaps and serve as a trusted agent in technology comparison studies. ARL is an Office of Secretary of Defense, DDR&E designated University Affiliated Research Center.

JOHN CARNEY

DIRECTOR, AFFORDABILITY INITIATIVES DIVISION AND NAVY MANTECH PROGRAM

John Carney heads the Navy Manufacturing Technology Program at the Office of Naval Research. His education includes a B.S. in Industrial Engineering and Operations Research and a Master of Engineering Administration, both from Virginia Tech. Mr. Carney began his career in the Shipbuilding Technologies Division of the David Taylor Research Center, now the Naval Surface Warfare Center, Carderock Division. He joined the Office of Naval Research in 1998 and served as the Program manager for several ManTech Centers of Excellence and as ONR's liaison to the National Shipbuilding Research Program. In October 2004, Mr. Carney assumed leadership of the Navy ManTech Program.

KEVIN CARPENTIER

DIRECTOR, NAVAL SHIPBUILDING AND ADVANCED MANUFACTURING CENTER

Mr. Carpentier is a Senior Vice President and manages SCRA Applied R&D's Maritime & Manufacturing Technologies Division. He oversees division operation and all Maritime and Manufacturing programs including the National Shipbuilding Research Program (NSRP) and the Naval Shipbuilding and Advanced Manufacturing Center (NSAM).

NSRP is a Navy-sponsored, industry-led collaboration of U.S. shipyards working together to reduce the cost of building, operating and repairing Navy ships by improving productivity and quality through advanced technology and processes. This program leverages public/private cooperation on R&D efforts that align with its Strategic Investment Plan.

Mr. Carpentier also serves as the NSAM Director, a Center of Excellence of the Navy's Manufacturing Technology program. NSAM works with Navy Program Managers and the shipbuilding and repair community to select, fund and execute projects that reduce the cost and time to build and repair Navy weapons platforms. Transition and implementation are key aspects of the program to maximize the potential return on investment to the Navy.

Prior to joining SCRA, Mr. Carpentier served as an officer in the U. S. Coast Guard for over 24 years, Mr. Carpentier served in a variety of leadership and management positions in engineering and operations both afloat and ashore. His service included program management positions in ship construction, maintenance, logistics, repair and contracting. He completed five seagoing tours including two as Commanding Officer.

Mr. Carpentier was awarded a Bachelor of Science degree in Ocean Engineering from the U.S. Coast Guard Academy, and a Master of Science in Naval Architecture and Marine Engineering from the Massachusetts Institute of Technology. He is a member of the Society of Naval Architects and Marine Engineers and the American Society of Naval Engineers.

DAVID DITTO

DIRECTOR, ELECTRO-OPTICS CENTER

David Ditto is the director of the Penn State Electro-Optics Manufacturing Technology Center (EOMTC). In this role, he is responsible for Center operations, the development, and execution of ManTech projects for the Office of Naval Research. He has been involved in Navy ManTech for 17 years. He has overseen the manufacturing development and implementation of Remote Source Lighting in the LPD and DDG-1000 class of ships, as well as numerous other electro-optic systems utilized on ships, aircraft, missiles, and submarines.

Prior to joining the EOMTC, Mr. Ditto was the Director of Research & Development at Axicon Technologies, Inc. a start-up company developing, manufacturing, and testing innovative gear and drivetrain technologies. Before that he was the Director of Program Management at Contraves USA where worked for 16 years developing inertial guidance test systems and managing projects in electro-optical pointing and tracking systems. While at Contraves, Mr. Ditto led a multidisciplinary team implementing an integrated MRP II system, incorporating manufacturing, finance, inventory, engineering change control, and project management.

Mr. Ditto holds a Bachelor of Science in Electrical Engineering from Ohio Northern University and a Master of Science in Electrical Engineering from Carnegie Mellon University.

MICHAEL FREDERICKSON

DIRECTOR, ELECTRONICS MANUFACTURING PRODUCTIVITY FACILITY

Michael D. Frederickson is the American Competitiveness Institutes' (ACI) Director of the U.S. Navy's Center of Excellence (COE) in Electronics Manufacturing (EMPF). The COE is responsible for supporting the transition of electronics-based manufacturing technologies to improve the affordability and producibility of defense products for the U.S. Navy. Mr. Frederickson graduated with honors from California State University, San Bernardino with a Bachelor of Science in Physics. He has been with the Navy's COE since 1984 and has held numerous engineering and management positions. He has been involved in the development and deployment of advanced process controls for the electronics industry, and holds numerous patents that have been successfully transitioned to the electronics industry in the fields of materials and process control technology and electrochemistry. Mr. Frederickson retired from the Air National Guard with his last position as the Commander of the 122 Logistics Support Flight, Ft. Wayne, Indiana.

RDML THOMAS KEARNEY

NAVSEA 06 ACQUISITION AND COMMONALITY DIRECTORATE

Rear Admiral Thomas Kearney grew up in Dover, New Jersey and enlisted in the Navy in 1978. He was commissioned via the Villanova University Navy ROTC program in 1984 with a Bachelor of Science Degree in Mechanical Engineering. Additionally, he holds a Master's degree in Political Science (International Relations) from Villanova University and is certified as a Level III Program Manager from the Defense Acquisition University.

Prior to command, his sea tours included assignments as a division officer and Navigation Department Head aboard USS New York City (SSN 696); engineer officer aboard USS Henry L. Stimson (SSBN 655 Gold), and executive officer aboard USS Helena (SSN 725), where he conducted deployments and patrols to both the North Atlantic and Western Pacific.

Ashore he served as an NROTC Instructor at Villanova University, executive officer/engineer officer of the Moored Training Ship (MTS 635), Squadron Engineer (Submarine Squadron 7), and as first commanding officer of Pre-Commissioning Unit USS Virginia (SSN 774).

Kearney commanded the USS Alexandria (SSN 757) from June 2003 to December 2005. During this period, his ship was awarded the Battle E for operational excellence; was runner up for the prestigious Battenberg Cup Award for top ship in the Atlantic Fleet; and received the Navy Unit Commendation for operations conducted during the first around the world deployment via the Arctic by a U.S. submarine.

Following command, Kearney entered the Acquisition Professional Community in 2006 and served as the deputy director of the Navy's Test and Evaluation Policy Office (OPNAV N912). He then served as the Foreign Military Sales Program manager in the Undersea Weapons Program Office (PMS 404), and as deputy program manager in the Submarine Acoustic Systems Program Office (PMS 401).

Kearney served as the Program Manager for Undersea Weapons and Targets from October 2009 to October 2012. During this period his program was awarded a Secretary of the Navy Excellence in Acquisition Award and he was the recipient of the 2011 Naval Submarine League's Vice Admiral J. Guy Reynolds Award for Excellence in Submarine Acquisition. He served as vice commander, Naval Sea Systems Command from June 2013 to April 2014 when he established the Acquisition, Commonality, and Expeditionary Warfare Directorate (SEA 06) as a new Directorate within NAVSEA.

His awards include the Legion of Merit (two awards), Meritorious Service Medal (five awards) and various other personal, campaign, and unit awards.

RICHARD MCCREARY

EXECUTIVE CONTROL BOARD CHAIR

Richard McCreary became BAE Vice President and General Manager of the BAE Systems Southeast Shipyards in December, 2011. Richard began work with BAE Systems Southeast as the Vice President, Commercial Business Development for BAE Systems, Ship Repair Division in early 2011 and was responsible for both new construction and ship repair service bookings. Previously, Mr. McCreary was President and CEO of Marinette Marine Corporation in Marinette, WI from 2005 to 2011. In this role, Mr. McCreary was responsible for the P&L performance of the shipyard including bookings, shipyard performance, process improvements and organizational development. Mr. McCreary was actively engaged in the sale of Marinette Marine to the Fincantieri organization by the previous owners, the Manitowoc Corporation, in 2009.

Prior to this position, Mr. McCreary was Executive Vice President of VT Halter Marine in Pascagoula, MS. Mr. McCreary was responsible for estimating, engineering, purchasing, process improvements, administration and risk management. Mr. McCreary was actively engaged, as President of Halter Marine, in the sale of the firm to VT Systems in 2002. Mr. McCreary joined the Halter organization in 1997.

Previously, Mr. McCreary held several positions in both ship and inland vessel transportation management firms throughout the Gulf Coast.

Mr. McCreary has an MBA from the University of Chicago and a BSE in Naval Architecture and Marine Engineering from the University of Michigan. Mr. McCreary is a member of several marine organizations including the Navy League, Society of Naval Engineers, the American Bureau of Shipping, and the United States Coast Guard Foundation among others.

MARTY RYAN

DIRECTOR, COMPOSITES MANUFACTURING TECHNOLOGY CENTER

Mr. Ryan is a Vice President of SCRA, the Advanced Materials Division Lead, and the Executive Director of the Composites Manufacturing Technology Center (CMTC). He is responsible for all Advanced Material programs at SCRA to include Castings, Forgings, Composites, Vanadium, Copper and Military Utility Assessments. In his capacity as CMTC Executive Director, he is responsible for overall center operations including the Center's role in the Navy's needs identification process, the project formulation process, CMTC's technical projects portfolio, technology transfer, consortium maintenance and management, and obtaining additional funding sources. He is also responsible for DAT (Demonstration and Assessment Team) which conducts Military Utility Assessments of new emerging technologies targeted for USMC implementation.

Prior to joining SCRA, Mr. Ryan served as Science and Technology Advisor to Lieutenant General Wallace Gregson, where he managed the R&D and Technology Transition program for Marine Corps Forces in the Pacific. He identified S&T requirements for all Marine Corps forces assigned to the Central and Pacific Commands, to include the Middle East, Asia and the Pacific Rim. He supported Operation Iraqi Freedom and Operation Enduring Freedom through the pursuit, evaluation, development, and successful deployment of technologies to counter the evolving asymmetric threats within the region.

Prior to his assignment with the operating forces, Mr. Ryan served as Deputy NAVAIR Manufacturing Technology Program Manager and then Program Manager in 1999 and 2001, respectively. During this tenor, he worked closely with the ONR ManTech Office and was an active participant in the development of Navy ManTech guidance and processes. He managed the NAVAIR needs identification process, including the initiation, and subsequent coordination, of several CMTC ManTech projects. Mr. Ryan represented PEO interests to ensure initiation and transition of critical technologies to key air weapons platforms. He coordinated all NAVAIR ManTech efforts within the Centers of Excellence to include project monitoring, industry participation, and transition. Mr. Ryan also worked extensively with the DoD Joint Defense Manufacturing Technology Panel and Chaired the JDMTP Sub-Panel on Advanced Manufacturing Enterprises. The panel coordinated the DoD efforts in Intelligent Manufacturing, Supply Chains, Lean Manufacturing, and Benchmarking with the efforts of the DOE, DOC, NASA, and NSF.

Previous employment included eight years as both an electro-optic and materials engineer, where he was the Principal Investigator for NAVMAR Applied Science's developments of laser-optic techniques for characterization of advanced materials. Mr. Ryan utilized these techniques to support ONR and DARPA in the development of piezo-composites, electro-strictive composites, and composites with embedded sensors.

DANIEL WINTERSCHEIDT

DIRECTOR, NAVY METALWORKING CENTER

Dr. Winterscheidt is a Senior Director at Concurrent Technologies Corporation (CTC) and has 28 years of management, technology development, and engineering experience. He has served in various technical and management roles for the Navy Metalworking Center (NMC) for 20 of those years and has been the NMC Program Director since 2003.

NMC was established in 1988 as a Navy ManTech center of excellence to optimize and transition advanced metalworking and manufacturing processes in the U.S. industrial base. NMC works with government and industry partners to reduce weapon system total ownership cost through innovative technology solutions.

In his current role, Dr. Winterscheidt provides strategic and operational direction for NMC, resulting in sustained outstanding program and project performance. Notably, he led the program to achieve >75% implementation rate over the last 10 years and a current return on investment in excess of 7:1 based on probable cost savings. Dr. Winterscheidt also has recruited a high caliber staff that consistently delivers superior results for the Navy ManTech Program.

Before attending graduate school, he served six years in the Navy as a Surface Warfare Officer. Dr. Winterscheidt's technical expertise is in the area of computational fluid dynamics and heat transfer analysis. After completing graduate studies, he performed computational fluid dynamics analysis at the Ohio Aerospace Institute. He joined CTC in 1994 as a process analysis engineer, developing and applying metal casting simulation software.

Dr. Winterscheidt holds a B.S. in Physics from the U.S. Naval Academy, as well as an M.S. and a Ph.D. in Mechanical Engineering from the University of Kansas. He is certified as a Project Management Professional by the Project Management Institute and is a member of the Navy League of the United States, the American Society of Naval Engineers, and the American Society of Mechanical Engineers.

NSRP | National Shipbuilding Research Program

Presenter Bios



MISSION

- Manage and focus national shipbuilding and ship repair research and development funding on technologies that will reduce the total ownership cost of ships to the U.S. Navy, other national security customers and the commercial sector and develop and leverage best commercial and naval practices to improve the efficiency of the U.S. shipbuilding and ship repair Industry.
- Provide a collaborative framework to improve shipbuilding-related technical and business processes.

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PETER AULT

COST SAVING COMPARISON IN APPLICATION OF POLYSILOXANE VS. SILICONE ALKYD TOPCOATS

Mr. Ault has been actively involved in various aspects of corrosion control and materials engineering for over 25 years. He began his career performing coating and corrosion research for the Navy and other clients. In subsequent positions, he managed and trained coating inspectors and managed field and shop coating application businesses. Throughout his career he has studied coatings and corrosion phenomena on a wide variety of structures including ships, bridges, pipelines, storage tanks and historic structures. Since 2006, Mr. Ault has been a principal of Elzly Technology Corporation, an engineering firm which provides coatings and corrosion consulting services to DoD and other clients.

Mr. Ault is an active member of several technical societies including ASNE, SNAME, NACE International, SSPC, ASTM, and NSPE. He is a registered Professional Engineer in New York and New Jersey and holds Coatings Specialist certifications from both NACE and SSPC. Mr. Ault holds a B.S. degree in Mechanical Engineering and an MBA from Drexel University (Philadelphia, PA).

WILLIAM E. BARKMAN

MANUFACTURING INNOVATION NETWORK

Mr. Barkman has an extensive background in the precision manufacturing operations required for the production of nuclear weapons components. He is responsible for the development of machining and inspection systems capable of automated operations in a rigorous manufacturing environment. Mr. Barkman is frequently involved in the development and execution of collaborative partnerships between government, industry and academic entities.

Mr. Barkman has numerous technical publications including a book titled "In-process Quality Control for Manufacturing" (Marcel Dekker, Inc., 1989) and a short course on manufacturing variability. He currently has a Bachelor's Degree and Master's Degree in Mechanical Engineering from Vanderbilt University and a Master's Degree in Electrical Engineering from Tulane University.

DR. JAMIE BEARD

DEVELOPMENT OF A HIGH MOBILITY MANUFACTURING ROBOT

Dr. Beard is the Chief Manager and President of RTT. Dr. Beard received his B.S., M.S., and Ph.D. degrees from Tennessee Technological University (TTU). He was a research associate with the Center for Electric Power while performing his both his M.S. and Ph.D. research. Dr. Beard's research has focused on the development of mobile robotic machines specifically targeted for unstructured or harsh environments and in the development of dexterous manipulators. Dr. Beard has 13 years of experience in the design, development and in-field application of robotic systems.

ROSS BOYD

ROBUST FUNCTIONAL PAPERLESS PAINT – PHASE II FUTURE STATE IMPLEMENTATION

Mr. Boyd is a 2004 graduate of the University of Missouri – Columbia. He has spent the majority of his time since graduation working in the field of logistics and has dedicated himself to improving internal processes and day-to-day operations. Training and qualifications include: OSHA 10-hour construction course; SSPC C-1: Fundamentals of Protective Coatings for Industrial Structures; NACE Level 2 Coating Inspector #31407; Flagger; Haz-Com; CPR; First Aid; Member of Site Improvement Association's Y.E.S., SSPC, NACE, and the Missouri Trucking Association.

JAMIE BREAKFIELD

DDG DIGITAL STORYBOARD

Jamie Breakfield is a Systems Engineer at Ingalls Shipbuilding with twenty-four years of combined design, engineering, manufacturing, and Information Technology experience. Jamie has been active in the NSRP Information Technology Panel for the last three and a half years, and currently holds the position of IT Panel Vice-Chair. He works in the IT Department at Ingalls and is on the External and Special Projects team. Before assuming his current role in IT, he was the Modeling & Simulation Lead within the Advanced Concepts Group. Prior to joining Ingalls Jamie was a Project Engineer for Taylor-Wharton Cryogenics, where he handled a full product line as well as led their engineering department conversion from 2D CAD to 3D CAD. He began his career as a Mechanical Design engineer with Boeing Aerospace, creating 3D equipment layouts for the International Space Station. Jamie received a Bachelor's degree in Mechanical Engineering from Mississippi State University.

DR. STEPHEN CANFIELD

DEVELOPMENT OF A HIGH MOBILITY MANUFACTURING ROBOT

Dr. Canfield is a partner in RTT and a Professor in the Mechanical Engineering Department at Tennessee Technological University. Dr. Canfield received his Ph.D. from Virginia Tech. His research experience is in robot kinematics and dynamics, topological optimization of compliant manipulators, parallel-architecture manipulators, and mechatronics. He has worked in the area of robot modeling, control and development with a focus on mobile robots for NDE inspection in hazardous, unstructured environments and manipulators for high-speed, precision applications. During the past five years he has served as a NASA summer research faculty at the Marshall Space Flight Center, working on the modeling and control of large-scale parallel-architecture and tethered space structures. Dr. Canfield has 50 refereed technical papers in the areas of robotics, dynamics and design

ROBERT CLOUTIER

COST SAVING COMPARISON IN APPLICATION OF POLYSILOXANE VS. SILICONE ALKYD TOPCOATS

Robert Cloutier has been with General Dynamics-Bath Iron Works for thirty-five years, and has worked with every aspect of surface preparation, marine coating applications, specifications, process development, training and inspections. These include the typical abrasive blasting, water jetting operations to the applications of thermal sprayed aluminum, ultra-high solids epoxies, tank linings, underwater hull coating systems. He travels around the United States accomplishing the installation and inspections of shipboard coatings, decking, non-skid and sound damping tiles as well as Corrosion Control audits on US Navy ships.

Certifications include:

- SSPC-NBPI
- SSPC-QCS
- SSPC-C7
- NACE Certified Coating Inspector Level 3
- Thermal Spray applicator/trainer

ANTHONY DAVENPORT

ADDITIVE MANUFACTURING SIMULATION TOOLS

WELDING SIMULATION TOOLS (SEQUENCE OPTIMIZATION)

With over 20 years of experience in engineering and business, Anthony (Tony) Davenport has provided his employers and customers with insights into ways to increase their return on assets and productivity of their people with thorough analysis of products and processes. Simply put, Mr. Davenport helps executive teams (commercial and government organizations) find the important values that allow them to improve their corporation's success through a clear, focused strategy that drives change.

As David Smith, Director of Engineering at WILLCOR states, "Tony has an excellent mind for both engineering and business, is motivated, and is able to use both his education and experience to create, plan, and execute." As mentioned by Mike Malmstem, a former co-worker at MSC Software describes, "Tony was always engaged with the team looking for better processes and messaging to improve our overall performance while keeping the best interests of our customers in mind. Tony is genuinely a good person who you can count one to give his best effort every day."

Technically, Mr. Davenport has a proven record of creating solutions that have helped change the way that aerospace industry performs analysis. As an engineer at Northrop Grumman, Mr. Davenport worked with MSC Software engineers as a customer-developer of MSC Random for performing random dynamic loading for aerospace structures. Today, MSC Random is utilized throughout the aerospace industry for extending the life expectancy of aerospace structures under random loading. In addition, as an application engineer at MSC Software, Mr. Davenport worked with engineers at Danaher Tool Group to develop a Design of Experiment approach with simulation tools to be able to create new designs for hand tools.

As Gene Allen, Engineer at NAVSEA noted, "Tony has a sound understanding of the computer-aided engineering industry from technology development to market adoption. He has demonstrated his ability to apply this knowledge to bring value to customers and others he works with. He speaks very well, with the ability to communicate complex technical information in terms that are comprehensible to a broad audience."

Finally, Mr. Davenport is a founder and President of Chloe's Cause, Inc. A non-profit organization that has raised over $120,000 to help Families and Children with Down Syndrome. Per Vince Fiduccia, Maryland State Director for Best Buddies International stated, "Tony's leadership efforts on behalf of Chloe's Cause are truly changing lives for children with Down syndrome. He is a tireless worker in making the community he lives in better. He truly lives his mission."

MARK DEBBINK

IN-SERVICE SHIP RE-DOCUMENTATION (LASER SCANNING FOR LCM)

Mr. Debbink has over 30 years of design, planning, and manufacturing experience at Newport News Shipbuilding involving Aircraft Carries, Submarine, and Commercial Ships. He is "Process and Tool" lead responsible for development and implementation of CAD/CAM product model functionality and environments. Mr. Debbink is currently the CVN21 Aircraft Carrier transition Team Lead for development and implementation of migration/validation strategies, plans & tools for moving 3D data from DASSAULT CATIA/ENOVIA to new SIEMENS Teamcenter/NX application.

Mr. Debbink is Newport News Shipbuilding's National Shipbuilding Research Program (NSRP) representative as a Major Initiative Team Lead (MITL) for the Business Processes & Information Technologies area. He manages NSRP funded projects for "Product Model Driven Weld Management," "Requirement for a Drawingless Environment," and "Digital Shipbuilding."

FRANK DELAR

CVN REALITY CAPTURE

Frank DeLar is a User Application Liaison III, responsible for all information technology (IT) concerns related to Aircraft Carrier Engineering (CVN Overhaul) at Newport News Shipbuilding. He works directly with division functional managers, program design managers, as well as the director on issues related to IT resources and synchronization. Mr. DeLar also has wide exposure to the user base within the division providing engineering software and hardware support.

A native of Chesapeake, Virginia, Mr. DeLar earned a Bachelor's degree in Computer Information Systems from Saint Leo University and a Systems Engineer Certificate from Old Dominion University. In 2011, Frank was nominated for a Newport News Shipbuilding President's Model (MOE) of Excellence award for Innovation and Technology for Engineering Tools: Printer Integration and Web Page Management.

LORI DENAULT

FLEXIBLE INFRASTRUCTURE TRACK SYSTEM

PRECISION PANEL INSERTS / THIN PANEL DISTORTION MITIGATION

Ms. Denault has over 13 years of experience at CTC in both project management and technical support roles for industry and government clients. She has supported several NMC projects as project manager or deputy project manager, as well as contributed technically to those projects. She has also served as technical lead for a number of other CTC projects involving product and process design and analysis, and materials characterization and selection. Ms. Denault's technical roles have included modeling and analyses to improve maintenance and corrosion issues on the MH60-R helicopter and shipbuilding weld distortion analysis of a representative structure of HSLA-65 and HSLA-100 welded thick plates in support of a welding software package evaluation.

Ms. Denault currently holds a Bachelor's in Mechanical Engineering Technology from the University of Pittsburgh at Johnstown, a Master's in Engineering Management from Robert Morris University, and is a member of the American Society of Mechanical Engineers and ASM International.

MATTHEW DIGIOIA

FIBER OPTIC MEASUREMENT AND SHAPE SENSING (FOMSS)

Matthew DiGioia is a Project Manager and Systems Engineer with 12 years professional experience in technology maturation and implementation within Department of Defense, Robotics, and Aerospace enterprises. In 2011, Mr. DiGioia joined the EOC's Manufacturing Technology (ManTech) Center of Excellence as an Engineering Project Manager and Assistant to ManTech Center Operations. As a ManTech Project Manager, he has initiated and executed several projects involving sensors, robotics, and automation to improve acquisition affordability and enhance platform capability. He has extensive experience developing and analyzing business cases, initiating and managing $MM projects, interfacing stakeholders, and directing cross-functional, multi-institutional teams within a collaborative environment.

First joining the Penn State Electro-Optics Center (EOC) in 2005 as a R&D Engineer in the Sensor Technology Division, Mr. DiGioia worked as Principal Investigator developing and maturing novel sensor payloads, system architectures, and unmanned systems concepts of operation for intelligence, surveillance and reconnaissance (ISR) applications. This applied research and development encompassed component make/buy trades, subsystem analysis and testing, and system/vehicle integration with proof of concept field testing and demonstration of performance in relevant environments.

Prior to the EOC, Matthew worked at the Carnegie Mellon Robotics Institute, Field Robotics Center, as a Staff Engineer on space robotics and aerospace engineering projects. Through his independent contracting efforts, Mr. DiGioia has continued to support CMU's space robotics endeavors, as well as their spinoff company Astrobotic Technology, on various research and analysis tasks/programs associated with space robotics system archetypes, mission architectures, feasibility studies, and proposal planning.

Mr. DiGioia currently holds a Master's in Mechanical Engineering from Carnegie Mellon University and a Bachelor's in Aerospace Engineering from The Pennsylvania State University. He is also a Certified Project Management Professional.

VICTORIA DLUGOKECKI

DEVELOPMENT AND APPLICATION OF STANDARD HULL, MECHANICAL, & ELECTRICAL MODULES TO INCREASE FLEXIBILITY IN SHIP DESIGN

Ms. Dlugokecki is an engineering and management consultant with more than 25 years of experience in ship design and construction. Her consulting career has allowed her to work with many different US shipyards, both big and small on shipbuilding and ship design process improvements. Prior to becoming a consultant, Ms. Dlugokecki was a senior supervisor at NASSCO in the Initial Design and Naval Architecture Department, and an engineer at ABS, working on rule development and quality assurance. She started her career at C. R. Cushing and Co., Inc., where she was able to participate in all aspects of engineering design for various types of commercial and military vessels. She has participated in several successful NSRP projects including Design for Producibility for Mid-Tier Shipyards, Web-Based Planning and Production Engineering Technologies, Weld Shrinkage and Distortion Allowance Data Model for Neat Construction Ship Design Engineering, Design for Maintainability, and Distortion Control Toolbox. Ms. Dlugokecki is currently a team member for the NSRP project Development and Application of Standard Hull, Mechanical, & Electrical Modules to Increase Flexibility in Ship Design and Design For Maintenance Training for the U.S. Ship Design and Shipbuilding Industry.

DR. TIMOTHY EDEN

COLD SPRAY TECHNOLOGY FOR SHIPBOARD COMPONENTS

Dr. Timothy J. Eden joined the Applied Research Laboratory in 1990. He received a BS in Mechanical Engineering from the University of Utah and an MS and Ph.D. in Mechanical Engineering from the Pennsylvania State University. He is currently the head of the Materials Processing Division. Dr. Eden's current research includes development of Cold Spray Technology for corrosion, erosion and wear resist coatings, thermal management, energetic materials, economic modeling and materials restoration and component repair. Dr. Eden received a 2013 Defense Manufacturing Technology Achievement award for Cold Spray Repair of Aerospace Components. He had authored several technical articles and book chapters on Cold Spray Technology. Other areas of research include characterization of high performance steel through material processing, finite element analysis and materials testing, development and processing of high performance aluminum alloys for gas turbines, automotive and UAV engines and armor, processing of ceramic and functionally tailored materials for armor and wear resistance bearings/bushings, tribology, failure analysis, thermal analysis and coatings with improved wear, corrosion and erosion properties.

PETE ESPOSITO

AFFORDABLE, MODEL-BASED OPEN-ARCHITECTURE RADAR (AMOR)

MANUFACTURING COST REDUCTION FOR LITTORAL COMBAT SHIP SCALABLE ELECTRONIC WARFARE SYSTEM

Mr. Esposito is a Senior Systems Engineer with ACI Technologies, Inc. He has over 15 years of experience primarily with the Aegis Weapon System (AWS). Mr. Esposito has served in past lead roles on both the developer and Navy side as a C4I AWS engineer supporting USN, MDA and FMS programs. Previous performance highlights include AWS C4I system design and integration for Lockheed Martin in Moorestown, NJ followed by a role for BAE Systems where he supported The Aegis Techrep Naval Command in both systems engineering and program coordinator roles. Mr. Esposito came to ACI after recently serving as Program Coordinator for Aegis Techrep leading the Aegis Ballistic Missile Defense portion of the USN Aegis Modernization Program. Supporting ONR and Navy ManTech Programs he has served in both system engineering and program coordinator roles for various Radar, EW and Weapon System programs that transition onto the DDG-51, LCS and CVN-77.

DR. DANIEL FINKE

IMPROVED WELDER PRODUCTIVITY

Dr. Finke is a Research Associate at the Applied Research Laboratory, The Pennsylvania State University. He was the Co-Principle Investigator on the DARPA iFAB Foundry and a DARPA AVM project Component, Context, and Manufacturing Model Library project. He was actively involved in the DARPA AVM iFAB Configuring and Exploring the Foundry Trade Space project. In addition, Dr. Finke has experience in applied research and development within the US Navy shipbuilding domain. This experience includes supporting and leading projects that fill technology gaps inherent in large legacy planning and execution systems by developing and implementing custom software tools and specialized manufacturing system analyses supporting the US Navy shipbuilding and the Joint Strike Fighter (JSF) programs. He received his PhD in Industrial Engineering and MS in Industrial Engineering and Operations Research from the Pennsylvania State University and a BS in Industrial Engineering from New Mexico State University. His current research interests include simulation-based decision support, planning and scheduling, heuristic algorithm development and implementation, agent-based simulation and modeling, and process improvement.

TIMOTHY FREIDHOFF

MECHANIZED CABLE PULLING

Mr. Freidhoff is a Senior Mechanical Engineer with Concurrent Technologies Corporation. He has more than 20 years of experience as a Project Manager and Project Engineer and is responsible for successfully developing and implementing numerous technologies that improve a variety of shipyard manufacturing processes. Mr. Freidhoff is the Project Engineer for the Mechanized Cable Pulling project, which is developing power-assist tools to reduce labor and injuries associated with pulling cables on surface ships and the basis of today's presentation. He was the Project Engineer for an NSRP project that developed power-assist tool concepts to improve the cable pulling process. Mr. Freidhoff was the Project Engineer for the Improved Cable Routing Tools project to develop hardware to reduce effort to manually pull cable. He was also the Project Engineer for the award-winning Plate Edge Preparation Improvements and Weld Seam Facing projects, which developed, implemented, and commercialized tools to reduce labor and injuries associated with removing paint and weld reinforcement from deck and hull plates. In addition, Mr. Freidhoff was the Project Manager and Engineer for the Alternative Brazing project, which implemented and commercialized a tool to reduce brazing labor shipboard.

His background also includes engineering and management roles related to powder metallurgy processing, hybrid electric vehicle design and testing, and general shipbuilding.

Mr. Freidhoff currently holds an Associate's Degree in Mechanical Engineering Technology from Pennsylvania State University, a Bachelor's Degree in Mechanical Engineering Technology from University of Pittsburgh, and is a Certified Powder Metallurgy Technologist.

JOE GROSS

TRADE FRIENDLY MEASUREMENT TECHNIQUES

Mr. Gross is currently working in Accuracy Control engineering at Electric Boat. While engaged in a planning function he is also working with measurement software data. The department uses Spatial Analyzer and photogrammetric software. Mr. Gross has graduated from Lean Six Sigma green belt training and has completed multiple projects at this time.

As a Green Belt Mr. Gross has completed an extensive project involving the outsourcing of the reactor aft bulkhead lead shielding. He is the Integrated Planning and Design Environment Team Center lead for Accuracy Control and the Man Tech Project Lead for project S2250 Trade Friendly Measurement Techniques. He is also the department lead for training in Team Center for thirty engineers and is transitioning to the Ohio Class Replacement team.

MICHAEL HARBISON

STANDARDIZED FOUNDATIONS DATABASE FOR COMBAT SYSTEMS

Mr. Harbison is a Structural Engineer working at Ingalls Shipbuilding in distortion control and analysis, ship design change implementation for reducing distortion, and research projects aimed at improving the quality and reducing the cost of ships built at Ingalls. Mr. Harbison earned a Bachelor's degree in Civil Engineering and a Master's degree in Structural Engineering from the University of Delaware.

LISA HEPINSTALL

DESIGN FOR MAINTENANCE TRAINING FOR THE U.S. SHIP DESIGN AND SHIPBUILDING INDUSTRY

Ms. Hepinstall brings more than 25 years of business and transformation management experience to her role as President of Hepinstall Consulting Group, Inc. Her areas of expertise include Lean Strategy Development and Deployment, Project-focused Lean Implementation for Complex Project Environments, Design-For Production Implementation, Industrial Engineering, Change Management, Work Flow Management, Lean Business Process, and Continuous Improvement through Lean Six-Sigma. Prior to starting Hepinstall Consulting Group, she spent 10 years leading change in the Shipbuilding and Ship Repair Industry. Ms. Hepinstall continues to be active in the National Shipbuilding Research Program, where she has served on the Major Initiative Lead Team from its inception in 1998 to 2003. Her NSRP accomplishments comprise of successfully leading multiple lean-focused research projects designed to increase the competitiveness of the Shipbuilding and Ship Repair industry.

HAROLD HOWARD

FLEXIBLE INFRASTRUCTURE TRACK SYSTEM

Harold Howard is a Structural Designer with Newport News Shipbuilding in the Flexible Infrastructure (FI) Program Office. FI is a new technology designed to provide the capability to mount equipment without the use of hot-work, and provide the ability for rapid space reconfiguration and late technology insertion. Mr. Howard has led the structural effort to develop FI Technology by working with extruders to improve the manufacturing process for the components of the system. He has also worked with machine shops to optimize the machining process to meet the required tolerances of the final components. Much of his effort has been working closely with NAVSEA Tech Warrant Holders to perform Shock Testing required to gain qualification to install the system aboard US NAVY ships. Mr. Howard has worked on several ONR projects to reduce acquisition cost by investigating alternate materials and installation methods to reduce the acquisition cost without reducing the capability or flexibility of the FI System. He has over 25 years of shipbuilding experience which includes both Surface Ships and Submarines, and currently holds the position of FI Program Office Structural\ Outfitting Lead.

DR. T.D. HUANG

STANDARDIZED FOUNDATIONS DATABASE FOR COMBAT SYSTEMS

Dr. Huang has 32 years naval and commercial shipbuilding experiences. In the early 1980s, as one of the primary ship structural engineers at Avondale Shipyards, he was responsible for hull structural analysis, survivability, and overseeing hull structural design and construction for all contracts, including five 609-ft Whidbey Island-class dock landing ships – LSD 44-48, sixteen Henry J. Kaiser-class fleet replenishment oilers–TAO 187 and three SL-7 commercial containerships hull conversion into U.S. Navy TAKR class roll-on/roll-off (RO-RO) ships. The Avondale team's successful completion of LSD contract led to a follow-up award for four additional LSD CVs 49-52. In the 1990s, Dr. Huang led Avondale's hull structural design for the construction of the 420-ft Polar Icebreaker Healy, one of the largest and most technologically advanced icebreaking ships for the Coast Guard, and the Navy's 452-ft T-AGS 45 oceanographic research ship and four 188-ft coastal mine hunters. Employing advanced composite, non-magnetic materials in the dangerous mission of detecting waterborne mines, these mine hunter ships were one of the world's largest all-composite ships during that time. In mid-1990, he was the hull structural team lead in the construction of seven 950-ft Bob Hope-class sealift RO_RO ships. In the late 1990s through 2000s, he led Avondale's hull structural team in the design construction of the eleven new Navy's San Antonio-class amphibious ships LPD-17.

In the commercial shipbuilding arena, Dr. Huang has been one of the pioneers in the double-hull tanker design and construction in the U.S. since early 1990s after Exxon Valdez oil spill incidence in Alaska in March 1989. He led Avondale hull structural design team for modifying four 680-ft product carriers for American Heavy Lift (AHL) Shipping Co. The construction work started in mid-1990 by cutting the existing ships in two at the stern where the pilot house is located, building four new double-hulled fore-bodies, and then reconnected to the existing stern sections, which were refurbished and modernized. During mid- to late 1990s, Dr. Huang was leading the Avondale hull structural design team again in the construction of five 900-ft long, 150-ft wide, 125,000 DWT crude oil tankers for ARCO Marine based on American Bureau of Shipping (ABS) Safe Hull and Dynamic Loading Approach (DLA) design criteria.

In response to Navy's initiative on reducing the total ownership cost (TOC) in July 2002, Dr. Huang has started to focus on producibility to improve lightweight hull production processes. He has pioneered numerous best practices for modern naval ship construction and has been honored with a number of awards: Best Technology Paper Award from Northrop Grumman Corporation in 2003 and 2005, respectively, Value Engineering Award from the U.S. DoD in 2010, and Elmer Hann Award from the Society of Naval Architects and Marine Engineers (SNAME) in 2007 and 2013, respectively. Dr. Huang holds an M.S. from Ohio State University and a Ph.D. from Tulane University, both in Structural Engineering. He is a licensed Professional Engineer in the States of Ohio and Louisiana and a member of the SNAME and American Society of Civil Engineers.

DENNIS JARABAK

DIGITAL SHIPBUILDING

Mr. Jarabak has over 30 years of systems, industrial and project management experience in engineering and manufacturing at NNS. In his current position of Information Systems Project Manager, he serves as the Risk and Opportunities Manager and Data Model Technical Team Lead with responsibility for program risk analysis and technical evaluation as part of the PLM NeXt software implementation project on the Ford Class Carrier program.

Within engineering Mr. Jarabak has led or has been a team member on projects linking engineering, manufacturing and information technology processes, including lead for requirements development for the NSRP Product Model Weld management project, and project manager for CATIA software enhancements for engineering and waterfront processes.

Prior to moving to the engineering division Mr. Jarabak held various positions with increasing responsibility in the manufacturing division at NNS. He was instrumental in the evaluation, procurement and introduction of discrete event simulation software at Newport News Shipbuilding, playing a critical role in several simulation projects including the evaluation of throughput, and equipment analysis; capacity analysis for shop and platen loading; and build sequence analysis. He has been involved in numerous manufacturing and process improvement teams and projects throughout the value stream including submarine sub-module planning, numerical control machine operations, equipment cost justification, bar coding, and overhaul material control and tracking,

Mr. Jarabak received his Master's of Engineering Management from George Washington University, Washington, DC, and his B.S. in Industrial Engineering from The University of Pittsburgh, Pittsburgh, PA. He is a certified in Lean techniques, and a certified Project Management Professional from the Project Management Institute.

CHRIS JENSON

TUBULAR SOLID STATE LIGHTING (TLED) - CURRENT TECHNOLOGY AND ADVANTAGES

Mr. Jenson is the Director of Engineering at Energy Focus, Inc. Mr. Jenson holds a B.S. in Chemistry from the University of Utah, an M.S. in Chemistry from the University of California at Berkeley and an M.B.A. from the University of Houston. Mr. Jenson has more than 23 years of R&D and engineering experience in the chemical and lighting industries. After joining Energy Focus, Inc., Mr. Jenson led the development of technology, designs, applications, processes and equipment to support the company's growing energy efficient lighting solutions business. In addition Mr. Jenson has been the principle investigator or has managed several Federal research contracts spanning military and civilian technologies. He holds over 10 patents covering a wide array of technologies.

Prior to joining Energy Focus, Inc., Mr. Jenson worked at Rohm and Haas Company as a research and process chemist for 10 years. As part of his efforts there, he conducted research and development to bring acrylic based large core optical fiber to commercial application.

In his current position, Mr. Jenson is responsible for providing business and technology leadership for Energy Focus, Inc. He works directly with the executive team to develop the appropriate technology vision and strategy. His focus is moving current R&D products into growth opportunities in the LED lighting marketplace, particularly in military applications. He is responsible for defining and developing streamlined processes for the creation and delivery of product solutions. He serves as an agent for change within the company.

DR. JERALD E. JONES

MOBILE ROBOTICS TO INCREASE WELDER PRODUCTIVITY AND WELD QUALITY 'VIRTUAL REALITY CONTROL (VRC) MOBILE ROBOT'

ZERO WELD DISTORTION ARC WELDING TO REDUCE COST OF SHIP CONSTRUCTION: HYBRID INDUCTION WELDING OF BUTT AND T-FILLET

Dr. Jones is the President and CTO of EnergynTech. Inc. He has a Ph.D. in Metallurgical Engineering, and a Ph.D. in Mathematics and Computer Science (ABT). Dr. Jones was on the faculty of the Colorado School of Mines for seventeen years. During that time he was the Deputy Director of the Center for Welding Research, and, later, the Director of the CSM Center for Artificial Intelligence.

Dr. Jones started the American Welding Society Technical Committee (A9) "Computerization of Welding Information" and he Chaired that committee for six years, publishing two ANSI Standards. He has published more than 150 technical papers and has 17 patents, he is also co-author of 3 books. He has received the AWS Awards for Outstanding Engineering Educator and for Innovation in Welding Technology.

He has held positions of Visiting Researcher at the National Bureau of Standards, Fracture and Deformation Division, at the Rocky Flats Nuclear Weapons Facility, and at the U.S. Army Construction Engineering Research Laboratory, and he was Visiting Research Scientist at the Ford Research Laboratory and earned both the 1995 and 1996 Ford Technical Achievement awards, as well as developing two new manufacturing technologies both of which were put into production at Ford facilities. Over the past four decades he has been a keynote speaker and invited lecturer in the United States, Canada, Mexico, Europe, and Japan on the subject of advanced planning and control technology for robotic and automated manufacturing processes and equipment.

BEN KASSEL

MODEL BASED ENTERPRISE / DIGITAL TAPESTRY

Ben Kassel is a mechanical engineer at the Naval Surface Warfare Center, Carderock Division. He has worked with 3D CAD as a user, system manager, and applications developer in mechanical engineering and early stage ship design. Recent projects include the development of the distributed systems object model for a Navy developed product model database; development of CAD test cases; long term retention of product model data; and providing product data integration and exchange guidance to the NAVSEA Technical Policy and Standards Group. Current interests are the development and implementation of the technologies which will foster a product model centric culture across the entire Naval Sea Systems Command.

GLENN KNOWLES

SHIP KNOWLEDGE MANAGEMENT

Mr. Knowles has over 30 years of experience at Electric Boat. He has worked in Life Cycle Engineering and Hull Planning Yard for the past 15 years. In his current position he is responsible for OHIO Replacement and Future VIRGINIA Class submarine sustainment. In this capacity he is required to develop cost effective solutions for design that will reduce operational and support costs of future classes or blocks of submarines. He was responsible for overseeing the life cycle cost reductions ideas for the Block IV VIRGINIA Class Reduced Total Ownership Cost Reduction program. His organization is also responsible for Human System Integration and Maintenance Planning.

Mr. Knowles is responsible for the development of Electric Boat's Vision for how post-delivery submarine customers to obtain ship design disclosure from a 3D product model. The vision entails using a common portal to obtain no only ship design disclosure by accompanying logistics technical documentation. He is also developing the requirements and capability to provide this data on board operational submarines.

Mr. Knowles is also the Program Manager for Electric Boat Hull Planning Yard. In this capacity he oversees the OMNIBUS contract that all Government activities use to modernize and maintain OHIO, portions of SEAWOLF and VIRGINIA Class submarines. This job function completes the life cycle circle to ensure the future designs and tools support submarine operation and maintenance.

Mr. Knowles started in the Component Engineering department of Electric Boat working development of various components such as Reverse Osmosis and Air Conditioning plants for submarine applications.

Mr. Knowles has a Master's of Science in Mechanical Engineering from the University of Connecticut and a Master's of Science in Business from Rensselaer Polytechnic Institute.

SEAN KRIEGER

SHIP CHECKS USING 3-D LASER SCANNERS

Sean Krieger is a research & development engineer at The Applied Research Laboratory Pennsylvania State University, a position he has held for over 15 years. He has managed and actively participated in award winning Navy shipyard and depot maintenance and repair engineering projects including the Naval Submarine and Carrier Propulsion Shaft Machining Cycle Reduction project and the Submarine Vertical Launch System Laser Cladding repair project. The latter being the first portable laser cladding repair system implemented in the United States and in a shipyard.

Mr. Krieger began his career in 1989 as a production and combat systems engineer at the Naval Undersea Warfare Center until 1996 when he transferred to the Commander Submarine Force Pacific Fleet, Maintenance and Logistics Office, in Pearl Harbor, Hawaii. In 1998 he moved to Washington DC to work in the Fleet Logistics office at Naval Sea Systems Command's Virginia Class Submarine Program office. Mr. Krieger left NAVSEA in 1999 to take his current position at Penn State University.

Mr. Krieger has received Letters of Commendation and Appreciation from NAVSEA, NAVAIR, & MARCOR Systems Commands, The NUWC Commander's Award, NUWC Production Engineering Total Quality Award, and NUWC Award for Excellence. He has briefed both Chief of Naval Operations' ADM Vern Clark and ADM Frank Kelso on existing projects he was managing.

Mr. Krieger has a Bachelor's degree in Industrial Engineering (Cal Poly University) and Master's degree in Engineering Management (University of Massachusetts). He has written several papers and technical reports regarding Navy maintenance and repair technologies.

RICK LEWIS

KNOWLEDGE PRESERVATION MANAGEMENT

Upon graduation from the University of Tennessee, Rick Lewis began his career in Computer Systems development and management at The Rust International Engineering Company – Oak Ridge Operations (ORO). Rising through the software development and management ranks, Mr. Lewis eventually became the Computer Services Manager of Rust International-ORO. He joined the Y-12 National Security Complex in 1990. He has held several managerial positions within Information Technology (IT) and is now the Director of IT Mission and Programs Support for Consolidated Nuclear Security (CNS). Mr. Lewis manages software development and implementation projects at the Y-12 National Security Complex and the Pantex Plant in Amarillo, Texas. His organizational oversight includes Factory Floor Automation, Manufacturing Systems, Facility Management and Sensor Systems, Geographic Information Systems (GIS) Tools and Applications, Emergency Management Systems, Computer Simulation and Visualization, Manufacturing Process Modeling, and Enterprise Knowledge Preservation and Management.

MICHAEL LICHTENFELS

PIPE PRODUCTION AUTOMATION METHODS

Mr. Lichtenfels has over 15 years of engineering experience and has provided key design and manufacturing process solutions on several recent NMC projects, including LCS Sliding Door Improvements, Improved Cable Routing Tools, Norfolk Naval Shipyard Bilge and Tank Maintenance Platform, all of which delivered advanced manufacturing solutions. He is currently managing the Pipe Production Automation Methods project and lead engineer on the Hull Production Automation Methods and Sonar Dome Manufacturing Improvements projects. Mr. Lichtenfels was also the lead engineer for a contract with Applied Thermal Sciences to supply a topside Berm and Personnel Safety Barrier panel system to Bath Iron Works, which was installed on DDG 1000. This project implemented the technology that was developed under NMC CVN 78 LASCOR panel development projects and resulted in the project team receiving the 2008 Defense Manufacturing Technology Achievement Award. He holds a BS in Mechanical Engineering from the University of Pittsburgh at Johnstown.

MARK LOSSET

EXPANDED ADHESIVE OUTFITTING

Mr. Losset works in the Advanced Concepts Group at Ingalls Shipbuilding. His primary responsibility is to identify and develop materials technology in support of coatings, corrosion control, composites, and related manufacturing processes.

Mr. Losset earned a Bachelor's Degree in Chemistry from Millsaps College and a Bachelor's Degree in Chemical Engineering from Mississippi State University. He also has an MBA from William Carey College, attended the Tuck Executive Leadership Program at Dartmouth College, and is a Registered Professional Engineer.

At Ingalls Shipbuilding Mr. Losset manages technical projects including Independent R&D, Contract R&D, and support for Small Business Innovative Research (SBIR) partners. He is active in the National Shipbuilding Research Program (NSRP) and has served as the Technical Lead on multiple Major Projects. He has been an invited technical speaker at conferences sponsored by the NSRP, The Composites Consortium, the Society for the Advancement of Materials and Process Engineering (SAMPE), Navy ShipTech, the Defense Manufacturing Conference (DMC), and the University Of Southern Mississippi School of High Performance Polymers.

Previous employment includes broad experience in engineering, product development, and business development. He was Business Development Manager for FAR Research in Palm Bay, Florida where he developed new business in pharmaceutical intermediates and polymer additives. He held a number of technical and management positions at First Chemical Corporation, Pascagoula, Mississippi where he developed a line of new products used as polymer additives, agricultural intermediates, and pharmaceutical intermediates.

DAN LUPTON

INTRODUCTION TO CLICK BOND'S ADHESIVELY BONDED FASTENERS

Dan Lupton has been working for Click Bond, Inc. for 8 years after retiring from US Coast Guard and US Marine Corps Aviation. He specializes in the marine and offshore industry for Click Bond, Inc.

DEREK MCKEE

ROBOTIC WELDING OF VCS INTERIM PRODUCTS AND MAJOR ASSEMBLIES

Mr. McKee has worked at the Electric Boat Corporation for the past 5 years. He is currently working as a Mechanical Engineer for Electric Boat's Design Build Group. He works closely with the Welding Engineering Department and focuses on the improvement of welding and inspection processes. Mr. McKee is currently a Co-Project Lead for the Robotic Welding of Interim Products MANTECH task and provides assistance for several others. He is trained as a Lean Six Sigma Black Belt tasked with leading many process improvement projects including mechanized welding and improved inspection techniques. Prior to working with the design build group Mr. McKee worked in the Groton Shipyard's Construction Engineering Group. He was responsible for ship construction activates, design revisions, and providing immediate corrective actions for non-conformances in order to support ship construction schedules.

In 2010 Mr. McKee earned a Bachelor's of Science in Mechanical Engineering and in 2014 a Master's of Science in Mechanical Engineering from the University of Rhode Island (URI).

BOBBY MARTINEZ

FIBER OPTIC MEASUREMENT AND SHAPE SENSING (FOMSS)

Bobby Martinez is a Metrology Technician for Newport News Shipbuilding. Mr. Martinez joined the Metrology team through The Apprentice School six years ago. His responsibilities have expanded from measurements and data analysis to include production planning and continuous improvement initiatives. He has since graduated from The Apprentice School and is continuing his education at Christopher Newport University pursuing a B.S. in Computer Engineering.

During his career as a Metrology Technician at Newport News Shipbuilding, Mr. Martinez has worked with various data collection instruments as well as utilizing a number of different data analysis techniques. Currently, Mr. Martinez's role with the department is to ensure the surveying environment is conducive for the equipment and the surveyors.

JOHN MAZUROWSKI

FIBER OPTICS INSTALLATION ON SHIPS

INTEGRATED LINK TEST SYSTEM

Mr. Mazurowski has thirty years of experience in the development of microwave, millimeter wave, optical, and photonic devices. He joined the Penn State Electro-Optics Center (EOC) in January 2005.

During this time he has led key research projects in photonics and fiber optics, ranging from the physical layer (connectors, fiber and cable), development of photonic devices, fiber optic sensors, and in optical network development using Dense Wavelength Division Multiplexing (DWDM). His strategic interests include photonics packaging / manufacturing, DWDM architectures, sensor networks, photonic integration, and low cost optical communications. Previously Mr. Mazurowski held positions at Corning Incorporated, General Electric, and Harris Corporation.

Mr. Mazurowski has over forty publications and presentations relating to solid state materials and photonics, and holds two patents in the areas of optoelectronics. He is a senior member of the IEEE, a member of the IMAPS International Technical Committee, the chair of the SAE AS-3A fiber optic applications committee, and a member of the SAE WDM LAN and Fiber Optics Sensors committees.

Mr. Mazurowski graduated from Syracuse University with a Master's in Physics.

JOSHUA REECE

RIGGING FOLLOW-ON RESEARCH

VALIDATION OF ANALYSIS METHODS FOR PADEYE ATTACHMENT UNDER DYNAMIC LOADING THROUGH DESTRUCTIVE TESTING

After serving 9 years in the U.S. Navy's submarine force, Mr. Reece earned his Bachelor's of Science in Structural Engineering from the University of California, San Diego in 2008. He arrived at NASSCO in 2009 where he began working in the Initial Design and Naval Architecture (IDNA) group as a mass properties analyst. While at NASSCO, Mr. Reece has performed various engineering functions including concept design mass properties analysis, ship launching calculations, ship inclining calculations, and rigging analysis.

Mr. Reece is currently working towards his Master's Degree in Structural Engineering at San Diego State University.

JEFF SCHAEDIG

ASSISTED DECISION SUPPORT SYSTEM FOR OUTFITTING WORK CONTENT PALLETIZATION

Mr. Schaedig has 20 years of experience in the shipbuilding industry. Since joining NASSCO in 1995 he has held key positions in Engineering, Planning, and Production. The focus of his career has been the introduction and development of new technologies into these three areas. Although many of the projects have been computer-based in nature, Mr. Schaedig has spent a significant amount of time on the shop floor and deck plates integrating the technology into a real world environment.

Mr. Schaedig is currently the Project Technical Lead for the Assisted Decision Support System for Outfitting Work Content Palletization NSRP project, and actively serves in the NSRP as an Assistant Lead for the Business Processes and Information Technologies Major Initiative.

KEVIN SMITH

SHIPFITTING SIMPLIFIED

For the past 6 years I have been assisting numerous companies in the Ship and Barge Industry with the task of fitting. Throughout my travels always keeping in mind safety, versatility, and feasibility of the tools I come across or develop with Fit Up Gear. I have travelled abroad to places such as China, Korea, and throughout Scotland and Western Europe to see how they utilize special tools to do what I consider a very difficult job.

JEFF TATUM

CVN REALITY CAPTURE

Jeff Tatum is an Engineering Manager, responsible for electrical systems related to Aircraft Carrier Engineering (CVN Overhaul) at Newport News Shipbuilding. He works directly with planning and program managers to provide engineering products to execute modifications and repairs to In-service Carriers.

A native of Henry, Virginia, Mr. Tatum earned his Bachelor's Degree in Electrical Engineering from Virginia Tech and his MBA from Averett University. In 2014, he was nominated for a Newport News Shipbuilding President's Model (MOE) of Excellence award for Operational Excellence to improve safety, quality and schedule performance for electrical tag outs.

SARA TRAWICK

FLEXIBLE INFRASTRUCTURE QUALIFICATION

Mrs. Trawick has worked at Ingalls Shipbuilding for the last seven years. In her role as engineer, she has worked in the area of noise and acoustic analysis and testing, design integration, and vibration testing on various platforms including LHA, LPD, DDG, and NSC Ship Classes. She also plays a key role in the testing of shipboard systems for noise and vibration during Ship Builder Trials. She is now heavily involved in more shock related tasks within her group.

Mrs. Trawick worked on the ManTech Improved Stud Fixturing Process project in which her responsibilities included supporting the development of multiple test plans and procedures, managing schedules, coordinating the activities of several different groups within the shipyard and completing shock testing and reporting. Her current project is the NSRP RA entitled Flexible Infrastructure Qualification. She serves as project lead and her duties include developing the test plan, managing the schedule and coordinating all activities pertaining to the project.

Mrs. Trawick received a Bachelor's Degree in Physics from the University of South Alabama and her Master's in Engineering Management from Ohio University.

CHARLES TRICOU

IMPROVED TOPSIDE NON-SKID REMOVAL FOR VIRGINIA AND SEAWOLF CLASS SUBMARINES

Mr. Charles Tricou has more than 20 years of experience developing low-environmental-impact corrosion control and mitigation technologies for the Navy. He has extensive experience in paint removal and surface preparation technologies for thick and thin metallic and composite substrates. Mr. Tricou currently holds a Master's in Theoretical and Applied Mechanics and a Bachelor's in Engineering Mechanics from the University of Illinois at Urbana-Champaign.

JIM VANMETER

ALL PLATFORM AFFORDABLE LED LIGHTING (APALED)

Jim VanMeter is the Senior Project Manager for this effort having influence over all aspects of the design and project. He is the leader of the comprehensive management plan. He will directly guide our risk mitigation strategies and any advanced technological additions. He will lead the Preliminary Design Review and all subsequent design reviews. He will oversee the manufacturing of the fixtures. He will ensure that all testing requirements are met. He will be the main technical contact to NSRP, and generated all price/budgetary information. He will create and revise the thermal design to ensure reliability and robustness along with. He is a Mechanical Engineer and Senior Product Manager at Energy Focus Inc. He is a graduate of the University of Akron. He has over 25 years of experience in Engineering and Product Development in diverse industries representing both domestic and international products. He will act as the Light Source and Thermal Lead for this project.

ALEX VIANA

3D PLATFORM-SHORE INTERFACE MODEL DELIVERABLE

Mr. Alex Viana is the Deputy Program Manager for the Facilities Integrated Product Support Program at Naval Facilities Engineering Command Headquarters. His focus is working with NAVSEA submarine and surface ship acquisition programs in harmonizing weapon platform and shore interface design for effective life-cycle supportability. He led the successful implementation of a Navy enterprise 3D virtual environment to conduct product model based enterprise visualization and collaboration techniques to improve the quality and pace of decision making processes between Lead Design Yards and NAVSEA acquisition program staffs. Mr. Viana received his Bachelor's of Science in Ocean Engineering from the Florida Institute of Technology and his Master's of Science in Engineering Management from the George Washington University.

JOSEPH WALKER

REDUCING INSPECTION COSTS USING THE LATEST DIGITAL INSPECTION TOOLS

Mr. Walker is Vice President of Elcometer Inc. and is responsible for the strategic direction, sales, and technical support for Elcometer within North America. In addition, He serves as a member of the Board of Governors of the Society for Protective Coatings (SSPC), served as Vice Chair of NACE International's Committee for the IMO Coating Technical File, and is also a contributing author to NACE International's Marine Coating Inspection Handbook.

Mr. Walker represents Elcometer on several Paint and Coatings Technical committees including ASTM, PCI and SSPC. Having 18 years of experience in protective, industrial, and powder coating inspection, he strives to stay abreast of the most cutting-edge advances in coating and inspection. His continued commitment to the importance of having first-hand experience in many market segments within the coatings industry affords him a diverse perspective on which to draw from. Mr. Walker is the author of numerous papers and articles on coating inspection with an emphasis on paperless quality control.

EDWARD WATERMAN

ACOUSTIC MACHINING

Mr. Waterman has 32 years of experience at Electric Boat, starting as an outside machinist apprentice and becoming a supervisor after six years. As a supervisor for fifteen years, he split his time between Groton, CT and Quonset Point, RI. Mr. Waterman then joined the Design/Build Team where his role was to work with engineering and design personnel to ensure that their products were designed to preferred manufacturing and outfitting methods while taking safety, quality, cost, schedule and sustainability into consideration.

During his time at Electric Boat, Mr. Waterman has participated in many special assignments which has given him a broader knowledge of shipbuilding experience and has had him travel to many different manufacturing and shipbuilding facilities while developing excellent relationships with machinery vendors and the US Navy.

NSRP | National Shipbuilding Research Program

Presentation Abstracts



MISSION

- Manage and focus national shipbuilding and ship repair research and development funding on technologies and processes that will reduce the total ownership cost of ships for the U.S. Navy, other national security customers and the commercial sector and develop and leverage best commercial and naval practices to improve the efficiency of the U.S. shipbuilding and ship repair Industry.
- Provide a collaborative framework to improve shipbuilding-related technical and business processes.

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DIGITAL DESIGN & MANUFACTURING TOOLS

ADDITIVE MANUFACTURING SIMULATION TOOLS

GENERAL INTEREST

ESI North America is currently being sponsored by the DARPA Open Manufacturing project and various members of the European Union to develop simulation methods for additive manufacturing (AM) of metals. This presentation will provide an overview of the AM projects, their challenges and successes.

In order to enrich the understanding of weld pool physics and the layering build that is part of an additive manufacturing process, ESI NA has leveraged its 30+ years of metals morphology finite element simulation as validated, foundational components for new software solutions. ESI's ACE+, SYSWeld, and ProCast serve as stepping stones for progressive algorithms in additive manufacturing. Outcomes from the ESI NA AM project have yielded potential definitions of why defects occur in AM and how they can be corrected.

Forms of Additive Manufacturing have been around since humans developed a method for joining metals components through energy transfer (circa 5th century BC). Ask any shop floor worker in ship building and they will tell you that additive manufacturing is just "a fancy way of doing welding".

Today, the evolution of man-in-the-loop methods for automation of three dimensional part builds has rapidly changed over the last 10 years with the advent of 3D Printers. Part complexity has gone from coalescing common shapes and joints with a weld bead toward hard to imagine complex shapes that take on very specific purposes. The phrase, "if you can imagined it, it can be built" is suddenly being sung by design engineers at the concern of structural engineers (and aircraft pilots).

In trying to stretch the limits of 3D printing, the Department of Defense has been charging forward with an expectation to produce repeatable, structurally viable printed complex 3D components made from metals to provide methods for in the field, one-off fixes for existing systems. Rapid Certification of flight worthy hardware has been an ultimate goal of aircraft programs – print and fly components. The challenges are immense as flight worthy hardware requires a clearly defined process that guarantees parts will not break within predefined timeframes. Understanding the defects that can occur during the Additive Manufacturing process is a challenge as metals are morphed from solid powder to liquid to solid parts in rapid, real time on a layer by layer basis. Localized cooling and heating occurs at a tremendous rate which may cause metals to have defects and unwanted behaviors. Utilizing simulation tools with defect predictive capabilities helps engineers and machine operators in determining the best process to utilize in the additive manufacturing build to provide a high probability of minimal defects with maximum life expectancy of the printed part.

PRESENTED BY: ANTHONY DAVENPORT

ASSISTED DECISION SUPPORT SYSTEM FOR OUTFITTING WORK CONTENT PALLETIZATION

NSRP RESEARCH ANNOUNCEMENT PROJECT

The planning of outfit parts into discrete packages of work, or pallets, for an entire ship is a considerable process in both duration and man hours, typically requiring a large ramp-up in department size at the beginning of a contract and an equally large draw-down near the end of the planning cycle. Because much of the planner guidance is rule-based and repeatable, there is the potential to assist the planner in the palletization decision-making process through automation of straightforward palletization rules and/or the application of guiding "wizards" for more complex situations where manual intervention is required that lead the planner through the process and utilize automated actions based on user input.

The objective of the Assisted Decision Support System for Outfitting Work Content Palletization project is to investigate assistance/automation opportunities in relation to the palletization process, develop a solution, and implement the system with the goal of automatically palletizing and/or assisting in the palletization process of half (50%) of the outfit parts, while preserving or improving the quality of the output product. The implementation of assistance/automation opportunities would greatly improve the performance of the detailed planning function by reducing labor cost and improving quality and consistency of the output product.

PRESENTED BY: JEFF SCHAEDIG

CVN REALITY CAPTURE

MANTECH NSAM PROJECT

Traditional shipcheck operations involve significant travel, labor and material cost. Newport News Shipbuilding has evaluated application of present laser scanning technologies to potentially improve cost and schedule associated with fleet modernizations. NNS has transitioned reality capture processes into production on CVN 73 RCOH planning activities.

Key drivers are constricted defense budgets and a need to improve engineering output quality related to fleet overhauls, repairs and service life extensions. One barrier to quality design output is the lack of accurate as-built configuration data.

Data resulting from traditional shipcheck operations is subject to human error and becomes a foundation for outdated design processes. Engineering product quality is heavily dependent upon accurate shipcheck data. Management of design space is manually derived. System interdependencies are reliant upon constant coordination and interaction between disciplines which further drives up cost in planning and execution.

Hardware technology advancements include improved safety, speed, accuracy and ability to capture color. Software technology advancements include ability to register multiple scans plus remove redundant data while scans are achieved. These advances provide immediate data visualization which is particularly valuable in capturing complex geometry of a Navy ship.

NNS successfully demonstrated these new technologies as a viable substitute for manual shipcheck during advanced planning efforts on CVN 73 RCOH. Where line of sight is not possible, NNS tested utilizing hand held infra-red technologies to evaluate effectiveness of augmentation.

Results of NNS accomplishments include development of processes supporting transition. By virtue of the CVN 73 prototype, NNS is developing a comprehensive understanding of reality capture limitations for each design discipline. With this knowledge and developing technology NNS is positioned to drive development and further reality capture to full potential in fleet modernization applications. Furthermore, NNS is utilizing reality capture data as tool for improving production planning and execution activities. NNS is accomplishing these goals by making reality capture data readily consumable on desktop as well as mobile devices.

PRESENTED BY: FRANK DELAR AND JEFF TATUM

DDG DIGITAL STORYBOARD

MANTECH NSAM PROJECT

The DDG Digital Storyboard project will develop the process, and produce a pilot demonstration, for providing a digital work package to the craftsmen for construction. Digital Storyboarding is the process of providing information by interactive digital screens into the hands of the craftsman, which enables visualization of the ship compartment as designed, and provides instructions regarding construction. The existing work package is paper-based, and includes engineering drawings, planning bills with sequencing, material requirements, special instructions, and quality control checklists. The Digital Work Package will include product sequence and assembly visualization, manufacturing instructions, material lists, quality control checklists, any other special instructions or related information as necessary, and will be provided to work package consumers electronically on a mobile device.

PRESENTED BY: JAMIE BREAKFIELD

DIGITAL SHIPBUILDING

NSRP RESEARCH ANNOUNCEMENT PROJECT

This project seeks to explore and evaluate a number of discreet shipbuilding enterprise processes that are fundamental to and exist in support of much of the detailed work required in ship design and construction. Successful completion of this research will advance industry understanding of the needs of participants in the shipbuilding enterprise as they further implement and take advantage of high technology design and management tools.

A fully digital Shipbuilding environment offers many efficiency and cost saving benefits to the shipbuilder but also introduces significant change to the way we do business. This paradigm change creates a production user acceptance risk which must be mitigated during the transition from a paper based to an electronically based digital environment. A major component in the transition from a paper based environment to a digital environment is the elimination of the long standing 2D drawing which is used as the design disclosure configuration management based standard. The project will also evaluate the impact of drawing elimination on work instructions and the shop floor craftsmen.

The overall goal of this project is to determine how to best leverage the 3D Product Model to support integrated Design, Planning, and Manufacturing for an effective Shipbuilding Data Environment.

The Project Team will improve and integrate current 3D Product Model activities with new processes and tool functionality, to include:

- Defining discrete views for Design, Planning, and Manufacturing & Execution Data in the 3D Shipbuilding Data Environment.
- Defining data privileges by stakeholder roles.
- Identifying Product Manufacturing Information (PMI) requirements and data flow between the product model and deck plate, including a consistent format for the delivery of digital work instructions.
- Establishing an information data architecture to support digital Shipbuilding. Determining the CAD and ERP master/slave relationships for Product Model data and work instructions.
- Developing a transition change management strategy to move trades from a 2D drawing to a digital environment.

PRESENTED BY: DENNIS JARABAK

FIBER OPTIC MEASUREMENT AND SHAPE SENSING (FOMSS)

MANTECH ELECTRO-OPTICS CENTER PROJECT

Current shipyard position registration devices for moderate accuracy applications (0.5" to 0.1") – such as locating, studs, piping and conduit runs – can be bulky, time-consuming to set up and operate, complex, and costly, requiring expensive equipment and subject-matter experts to operate. Rework is common for studs, many being reworked several times before being within accepted tolerance. Distributed fiber optic sensing techniques transform an optical fiber into a flexible cable that measures its own shape and position in 3D space. This shape sensing optical fiber provides a new tool for use in shipyards for accurate measurement and position registration in hard-to-reach, non-line-of-sight applications. A Fiber Optic Measurement and Shape Sensing (FOMSS) system, developed by Luna Inc., provides a user friendly, adaptable and ruggedized measurement tool to relieve man-hour investment in set up, rework, and downtime associated with dimensional control applications. Under this ONR ManTech project executed by the Penn State Electro-Optics Center, Luna refurbishes, upgrades, and ruggedizes a prototype FOMSS system with optimization and first article testing at Newport News Shipbuilding (NNS) to characterize utility in shipbuilder layout and measurement applications.

FOMSS is enabled by a fiber-optic interrogator capable of interrogating thousands of sensors simultaneously, a cost-efficient manufacturing process for fiber-optic sensor arrays, with cable configurations and algorithms permitting accurate registration and measurement of cable position. The novelty of the FOMSS system comes from its accurate real-time position registration with a single free-moving cable attached to a mountable reference box with data acquisition chassis operated via laptop. FOMSS ease of deployment and use is particularly advantageous for non-line-of-sight, close range, layout and verification applications. Significant cost avoidance is projected for several shipbuilder applications including locating tile studs, cable/light hangars, wireways, and piping runs where FOMSS absolute positional accuracy is well matched to the moderate, 0.5" tolerances. By using FOMSS, the time to execute these jobs is projected to be 20%-30% less, providing significant cost savings to the shipbuilder and the Government. Additional utility and efficiencies will be explored within machinery installation, pipe shop departments, small welding fitter shops, and fabrication shops.

Work has begun to refine the FOMSS system for shipbuilder utilization including refurbishing the system firmware/SW to the latest product revision, developing the software interface supporting ease of use, ruggedizing the system to meet operational requirements, and characterizing system utility and applicability in shipbuilder construction environments (alpha testing). Efficiency/rework cost savings will be validated and Penn State EOC shall investigate additional transition scenarios within the defense manufacturing base.

The end result is a robust, field portable, accurate measurement system which provides improved performance and substantial cost savings with applicability to a variety of shipyard manufacturing processes and operational conditions. Upon successful completion of the project, the intent is for the FOMSS system to be implemented and actively utilized in shipyard practices; the characterized beta unit remaining with NNS for use in construction of Virginia Class Submarines and Aircraft Carriers. Upon completion of the ManTech project, a commercial product will be produced and made available to all shipyards and other industries with similar requirements.

PRESENTED BY: MATTHEW DIGIOIA AND BOBBY MARTINEZ

IMPROVED WELDER PRODUCTIVITY

MANTECH IMAST PROJECT

Welding at shipyards remains a large cost-driver in the construction of US Navy ships. This is particularly evident with the VIRGINIA Class Submarine (VCS), where there are hundreds of thousands of structural weld joints per boat. Shipyard welders must complete a thorough series of checks at the start of their daily shifts prior to actually performing welds. This shift startup includes getting proper

assignments from shop supervision, checking out the correct weld wire, verifying their qualifications and setting up the work to be completed. Because these activities often require supervisor approval prior to starting work, and supervisors are responsible for several welders per work area, there are potentially significant delays prior to a welder actually achieving arc time.

The objective of this project was to reduce the time required to initiate the daily welding activities and use the same technology to mitigate potential Wrong Weld Wire (WWW) violations. The project team focused on leveraging state-of-the-art welding equipment technology as well as enabling electronic access to information required by the welders to develop and test a prototype "Smart Welder" system. This system will help to reduce the time it takes welders to begin their work shift startup while still meeting strict "Zero Tolerance" policies for weld completion and quality.

GDEB's "Zero Tolerance" policy is aimed at achieving 100% compliance to weld specifications with no rework while increasing welder arc time by improving daily start-up tasks. The results of this project ensure that welders meet specifications prior to actually completing welds. Additionally, this project will automate the numerous manual "checks and balances" that are required to ensure procedure compliance which will improve productivity.

There are estimated to be over 400 welders at GDEB that spend time preparing to weld their work assignments. It is currently assumed that the average welder will work on 2 assignments each workday. It is estimated that 0.4 hrs/day will be saved on the welder's initial startup, 0.1 hr/day will be saved on subsequent startups, and each welder will improve their productivity by 0.2hr/day with the successful implementation of the proposed welding system. The estimated cost savings of this project is $2.49M per VCS hull.

Note: This project was led by the Center for Naval Shipbuilding Technology (CNST) with portion of the work performed by the Institute for Manufacturing and Sustainment Technologies (iMAST).

PRESENTED BY: DR. DANIEL FINKE

IN-SERVICE SHIP RE-DOCUMENTATION (LASER SCANNING FOR LCM)

NSRP RESEARCH ANNOUNCEMENT PROJECT

The goal of this project is to reduce ship total ownership cost (TOC) to the Navy by radically re-engineering the in-service Ship Check process.

This project builds and tests a digital process that will provide cost effective Product Life Cycle Support for in-service ships. This digital process will replace existing manual processes currently performed during ship checks and provide an as-configured 3D Product Model for ship in-service maintenance.

The project supports the NSRP's new Strategic Investment Plan (SIP) focus area "Increased application of Digital Technologies" by providing a digital ship check process.

The project team will leverage and integrate with the ongoing Newport News Shipbuilding (NNS) PLM NeXt 3D Shipbuilding Data Environment development activities. This project will be devoted to the more efficient creation and management of in-service ship configuration by:

- Efficient creation and management of in-service ship configuration scanned & optical data.
- Match ship configuration scan geometry to 3D product model parts catalog using geometry recognition technology.
- Compare the Ship 3D Design product model with the scanned in-service Product model.
- Provide a current configuration in-service 3D product model for use in downstream maintenance and modernization activities.
- TOC reduction through reduced man-hours, reduced schedule time, and improved quality.
- Output products will support downstream Digital Shipbuilding processes and data exchange.
- This technology and process may be extended to additional ship classes utilizing a 3D Shipbuilding Data Environment.

The proposed process goes beyond current ship check surface scanning processes which do not have a 3D model as an integrated output product.

PRESENTED BY: MARK DEBBINK

INTEGRATED LINK TEST SYSTEM

MANTECH ELECTRO-OPTICS CENTER PROJECT

Shipboard cable testing has increased in difficulty to the point where certification measurements may take tens of thousands of hours. Today's electrical connector pin count exceeds one hundred pins. Complex tests now include compliance with data protocols, high frequency measurements in the millimeter wave regime, measurements directly related to safety, fiber optic measurements, insulation resistance, and wire swap testing. A significant part of ship harness test cost is related to data transcription errors, and dealing with complicated test requirements that can only be executed by a specialist.

The project team is comprised of collaborating engineers from Huntington Ingalls Newport News, Penn State Electro-Optics Center, DIT-MCO International, and General Dynamics Land Systems. The mission of the project is to reduce the cost of testing electrical, RF, and Fiber Optic cables in Navy ships. This project will finish in 2015 and transition into a flexible product line useable in multiple defense platforms.

The design and fabrication of the prototype ILTS system is now complete. The system design fulfills the original list of over 500 separate requirements. The modular system is meant to work within tight quarters and communicate over data networks to acquire link information, acceptance criteria, and to store test results. Additional measurement parameters may be added, and the network interface may be adjusted to be compatible with custom database structures or data storage locations. The intent is to form a supply chain which is able to adopt specific product requirements into the modular cable test system.

The modular test units are compact, with a weight of less than twenty pounds. They contain a tablet with test software, and a test hardware unit that is specific to the type of test: a) electrical switches and a digital multi-meter, b) RF sources and power meters, or c) fiber optic sources and photodetectors. The remote unit operator interface provides the location for the test, the test algorithm, the requirement, the result, and possibly specific instructions for diagnosis. Test results are transmitted to a database from the remote units while they are connected.

One project risk that the team has observed is in fixturing to the large variety of connector types aboard ships. Even though shipboard connector definitions are known, the potential for use of hundreds of connector types within a single platform is not presently limited. Help is on the way through an existing National Shipbuilding Research Program (NSRP) project, or subsequent ManTech work on the down-selection of connector types.

PRESENTED BY: JOHN MAZUROWSKI

MANUFACTURING INNOVATION NETWORK

GENERAL INTEREST

The MIN concept leverages unique federal capabilities, including the Department of Energy's years of experience protecting nuclear weapons information, in a public-private partnership to produce a secure collaboration environment for the development of the innovations needed to reinvigorate U.S. manufacturing operations in sectors such as national defense, power generation, medicine, materials, transportation, communications, cyber security, etc. This public-private partnership integrates manufacturing resources from industry, academia, and the government, in a safe, secure, and open data-structure environment that accommodates a wide variety of manufacturing processes and challenges.

PRESENTED BY: WILLIAM E. BARKMAN

MOBILE ROBOTICS TO INCREASE WELDER PRODUCTIVITY AND WELD QUALITY 'VIRTUAL REALITY CONTROL (VRC) MOBILE ROBOT'

NSRP PANEL PROJECT

NSRP has been investing heavily in several new technologies, including: Virtual Reality Welding Trainer, advanced camera technology for video information for welding; mobile robot systems including the RTT Crawler; and advanced welding methods and processes including the Hybrid Induction Arc Welding process. This project is intended as a demonstration of a technology that will utilize all of the NSRP investments to significantly increase welder productivity, and improve weld quality. In addition to these direct benefits, is the on-going, and growing, problem of a shortage of trained and highly capable welders – which is predicted to grow significantly in the next decade.

Welder productivity is limited by several issues, including: 1) The welder must use a manual torch which is limited in current capacity and light enough for a human to carry and manipulate throughout a 8 or 10 hour shift; 2) welder speed is limited by the ability of the welder to move him/herself along the weld joint, often bending over or sitting; 3) Uncomfortable positions in which the welders anatomy gets fatigued. 4) Heat and bright light from the arc, fumes from the weld, outdoor environments (heat, cold, rain, wind, etc.). Basically, welder productivity is limited by the basic human anatomy limitations.

The approach is to replace the human anatomy with a mobile machine, but keep the highly skilled human "in-the-loop". This is only now possible with several recent advances in technology, some of which have been funded by NSRP – this project will serve to multiply the return on investment by NSRP. In fact, this project is only possible and economically feasible because of the investment made by NSRP. It will serve to demonstrate to member shipyards and the Navy, a significant breakthrough in welding technology, based on the NSRP commitment to versatile, advanced technology development. An RTT mobile robot is relatively small, very maneuverable, capable of operating in all positions on a steel surface with the magnetic tread wheels, and can move at speeds of up to 160 inches per minute (13+ feet per minute). If outfitted with a 3 axis small robot arm, the resulting system is capable of all of the motions of a welding torch that a human can perform.

The "human-in-the-loop" is a highly skilled welder, who will have the VirtualWelder Training System as the robot control human-machine interface. The VirtualWelder captures motion, in 3D, that the human holding the torch makes. This data is fed to the RTT robot via high speed digital communications (wired, or RF). The human welder can be sitting in a small climate controlled cab (e.g., similar to a cab on a John Deer farm tractor) – completely comfortable. This system removes all of the productivity limitations. Given the proper training, the human-in-the-loop can learn to utilize his/her already acquired skills in torch manipulation – but at a much faster weld

travel speed. The heavy duty welding torch on the robot is capable of handling the very high current necessary to weld much faster. In the agricultural industry, farmers who have significant lifetime skills no longer have to retire because of the physical demands of their profession. Instead, semi-robotic equipment capable of planting, weeding, feeding, and finally harvesting crops can operate semi-autonomously using "human-in-the-loop" computer assisted robotics. It should be possible for this human/machine welding system to produce welds at 4X + the speed of a manual welder – without the fatigue caused by the welding activity itself.

The presentation is a progress report on the NSRP Panel Project which is developing an initial prototype system. Such Collaborative Robots are called "COBOTS". The COBOT Welder has been assembled and has completed several electronic, mechanical, and software modifications. It is now an operational prototype. Additional modifications, and several software upgrades are planned during the remainder of the project period, as well as testing in typical shipyard environments.

The COBOT Welder has an advanced real-time weld quality monitoring system "ArcSentry" which collects data on multiple channels at speeds up to 20 kHz. This enables the quality reporting system to provide accurate, real-time information to the welder/operator concerning weld size and shape, weld discontinuities, and compliance with codes and standards. In addition, the virtual reality environment in which the welder/operator controls the system, can provide real-time feedback to help prevent overwelding, for example – which is a common and costly problem for the shipbuilding industry. When outfitted with the new Hybrid Induction Arc Welding process equipment, the system is expected to have the ability to weld at speeds of 60+ inches per minute – a 4X+ improvement in welder productivity.

An advanced ultra-high dynamic range welding video imaging system, developed in part with funding from NSRP, provides the welder/operator with a view that would not be available to him/her even if they were right at the welding site, instead of in a climate controlled cab hundreds of feet away. The use of the Oculus Rift 3D Imaging Goggles, can provide a significantly enhanced, Virtual Reality augmented 3D image of the welding process. A system is planned to be available at the All Panel meeting to demonstrate the COBOT Welder technology for attendees to watch in operation and even control themselves.

PRESENTED BY: DR. JERRY JONES

MODEL BASED ENTERPRISE / DIGITAL TAPESTRY

GENERAL INTEREST

The world is moving toward the model based environment. Is the end of drawings in sight? For many industries the answer is yes, but in the shipbuilding industry the signals are mixed. The first half of this session will be an overview of the perspective the DoD ManTech Advanced Manufacturing Enterprise subpanel has toward the model based enterprise and digital tapestry. The second half will be a discussion about how we can increase the visibility of Navy shipbuilding product model issues to the subpanel.

PRESENTED BY: BEN KASSEL

REDUCING INSPECTION COSTS USING THE LATEST DIGITAL INSPECTION TOOLS

NSRP PANEL PROJECT

The method of measuring and recording Dry Film Thickness (DFT) readings in Standard Item 009-32 references methods and data recording techniques that do not incorporate the latest features of modern inspection instruments. In this study, a side comparison for three test methods (one legacy and two of the latest developments) used to evaluate DFT in ballast tanks and other painted surfaces will be performed. These methods will be evaluated for:

- Completion Time
- Data Accuracy
- Data Processing

A committee comprised of paint and coating QA/QC Managers from HII-Newport News, BAE Systems Southeast Shipyards, HII-Ingalls, NASSCO - Earl Industries, and Elcometer will provide trained inspectors to:

- Perform a DFT inspection of a seawater ballast tank or other painted areas according to the current practice of each facility.
- Perform the same inspection using the scanning technology
- Perform the same inspection using the new inspection device

This presentation will review some of the preliminary findings of this project and discuss some of the preliminary results.

PRESENTED BY: JOSEPH WALKER

ROBUST FUNCTIONAL PAPERLESS PAINT – PHASE II FUTURE STATE IMPLEMENTATION

NSRP PANEL PROJECT

This project will update the existing Robust Functional Paperless paint software system that has been designed to populate the Navy Standard Item 009-32 appendices. The original project's focus was on the User Interface and the functionality for those using the software on the deck plates. This follow-up project will focus on the areas identified in the Future State of Navy Maintenance Painting project by implementing features which take advantage of the paperless technology in the QA process such as: electronic event notification, auto-flagging out of spec conditions, automating Non-Conformance reporting and resolution, providing quality control reports for contractor process improvement, and making as-needed improvements to the data collection and reporting process.

PRESENTED BY: ROSS BOYD

SHIP CHECKS USING 3-D LASER SCANNERS

MANTECH IMAST PROJECT

Puget Sound Naval Shipyard & Intermediate Maintenance Facility (Puget) engineering and artisan personnel currently access numerous compartments on nuclear ships and submarines in order to document them for engineering planning, upgrades and repairs in advance of major availabilities. These advance planning visits called "Ship Checks" are pre-drydock evaluations currently conducted several months ahead of the planned docking, and rely on manual tools including cameras, paper, clipboards, tape measures and pencils. Gathering the detailed metrology and configuration information required for conducting the refurbishment upgrades and corrective or preventative maintenance demands many hours of engineering reconciliation time on archaic CAD systems comparing out-of-date drawings of mechanical piping, valves and components with hand measured data acquired during the ship's ship check visit. This process often requires iterative ship check processes needing approximately 600 hours to document, validate, and plan for the work at the shipyard.

This project developed a Ship Check procedure using three dimensional (3D) metrology laser scanners. IMAST worked with Puget Sound and the Naval Surface Warfare Center Ship Systems Engineering Station (NAVSSES) to develop the new Ship Check procedure using CAD, reverse engineering, and video visualization software.

The NSRP presentation of the Ship Checks project will focus on the requirements established, the solution set provided and the project lessons learned.

PRESENTED BY: SEAN KRIEGER

SHIP KNOWLEDGE MANAGEMENT

NSRP RESEARCH ANNOUNCEMENT PROJECT

Ship's force currently accesses and retrieves logistics documentation and logistics product data from multiple shipboard systems, while underway. Updates to the logistics documentation/products are distributed on periodic basis by the cognizant Design Agent. Access and retrieval of needed information is labor-intensive, paper-intensive, and prone to error since the data retrieved may not be the latest revision.

The Ship Knowledge Management System will provide the technology to visualize the product model and the associated technical data for the analysis of shipboard problems and the design of on-board solutions. It will also convey configuration changes and on-board changes back to the Design Agent.

This functionality will be delivered to ship's force via an intuitive graphical user interface, offering the 3D product model in a neutral format (ISO Standards).

PRESENTED BY: GLENN KNOWLES

TRADE FRIENDLY MEASUREMENT TECHNIQUES

MANTECH NSAM PROJECT

This document will define the evaluations and testing to be performed on three selected commercially available metrology technologies, to determine their individual acceptability prior to GDEB QP initiating any procurement(s). Testing will be performed at GDEB QP with appropriate participation by GDEB, Accurex, Creaform, Leica (or representative), CNST/NSAM, and ARL/Penn State personnel. The intent of the testing is to thoroughly examine the feasibility, trialability and relative advantage of using one or multiple of the alternative technologies over the currently used inspection methodology. The test is not intended to be a full test of the integrated Trade Friendly metrology system – however all interfaces of the respective technology alternative(s) should be thoroughly tested during this trial. Each task below has an organization identified for primary responsibility. While all team organizations are expected to observe/participate in these evaluations, the primary organization is expected to make sure that necessary preparations are complete to enable performance and quantifiable evaluation of the particular test results. Proper preparation is essential for an efficient and meaningful test. Acceptance/failure of each test may be determined on-site, during the test period or determined after the testing is completed. Any discrepancies will be noted and steps to address any non-compliances (if necessary) will be documented. In addition, the responsible organization will be expected to document the test results within 2 weeks of each test conclusion. The Project Lead, Joe Gross, GDEB, will compile the testing results and distribute it as necessary.

PRESENTED BY: JOE GROSS

WELDING SIMULATION TOOLS (SEQUENCE OPTIMIZATION)

GENERAL INTEREST

ESI North America is has been in the weld simulation business for over 30 years. Products such as SYSWELD and Weld Planner help shipbuilders around the world determine how to coalesce joints while improving material strength and minimizing weld induced distortion. This paper will provide insight into the weld sequence optimization process.

Shipbuilding has been scientific art form managed by shop floor “grey beards” since the earliest boats on record hit the rivers in Egypt during the 4th century. With the shipyard work force demographics in the US dominated at the extremes – very experienced, retirement-age engineers at one end and inexperienced, new to welding at the other end, there has been a need for ease-of-use, numerically driven tool that can assist in improving the decision making of weld sequencing on the shop floor to minimize rework.

ESI NA has developed a demonstrator that can be used today to help in optimizing weld sequences to reduce distortion and rework. It is not the final answer to weld solutions, but a great start. With additional funding and support, the process can be quickly moved into a wizard-driven interface that can be utilized by shop floor engineers. Feedback at the presentation and at the exhibit area is welcome.

PRESENTED BY: ANTHONY DAVENPORT

INFRASTRUCTURE & TRAINING

DESIGN FOR MAINTENANCE TRAINING FOR THE U.S. SHIP DESIGN AND SHIPBUILDING INDUSTRY

NSRP RESEARCH ANNOUNCEMENT PROJECT

Bollinger Shipyards, Inc. is joined by team members General Dynamics Electric Boat, BAE Systems Southeast Shipyards, Marinette Marine Corporation, Hepinstall Consulting Group, Inc., Tedesco Consulting, LLC, and Victoria Dlugokecki in the shipyard-led, collaborative research NSRP project entitled "Provide Design for Maintenance Training to U.S. Ship Design and Shipbuilding Industry." This project will deliver a 4 day comprehensive training course to be held in 7 regional locations. The target audience includes U.S. Ship Designers, Acquisition Program Managers, Technical Warrant Holders, Cost Estimators, Ship Modernization Representatives, Shipbuilders, and Ship Owners. The scope of the project is to develop and implement a DFM training program that will accelerate the learning process of ship design stakeholders in support of both Navy and Commercial Ship Program. The training will promote DFM solutions to reduce the cost of life cycle maintenance associated with maintaining ship structure, tanks, mechanical and propulsion systems, piping and other distributive systems, electrical systems, weather deck areas, habitability areas, and communication/navigational equipment. The training curriculum will focus on design-induced process issues that drive the cost of ship repair, such as inaccessibility, lack of standardization, misaligned maintenance strategy, lack of understanding the operating and maintenance environment, and inefficient equipment testing and diagnostic processes to name a few.

The objective of this project is to enable widespread dissemination and implementation of Design for Maintenance principles and the extensive ship repair best practices and cost deduction opportunities that were identified and developed through the NSRP "Reduction of Total Ownership Costs Through Application of Design for Maintenance and Repair Methodologies" Project. This project has the potential to fundamentally impact ship life cycle maintenance cost by enabling design and specification decisions to minimize the non-value added activities inherent in the current ship repair process. Without a focused training program on the "Application of Ship Design for Maintenance Practices" that leverages the recently collected extensive DFM body of knowledge, designers will continue to be limited by "trial and error" learning techniques, and at best, independent research effort will be repeated on every ship design project. This project will accomplish the following objectives:

- Inject "DFM-Thinking" into the U.S. Ship Design Community.
- Educate key stakeholders in the Ship Acquisition Process on DFM Design Rules and Life Cycle Cost Reduction Opportunities.
- Provide training on all the DFM Tools developed under the previous RA (Total Ownership Cost Template, Cost Benefit Analysis Template, and Design For Maintainability Database).
- Deliver DFM training materials and instructional guide to U.S. shipyards, government representatives, design agents, and maritime colleges to perpetuate an expanded program of DFM learning opportunities across the industry.

The DFM Training Sessions will be held in Washington DC, Norfolk, Lockport, LA, Marinette, WI, San Diego, Seattle, and Groton, CT. starting in April 2015.

PRESENTED BY: LISA HEPINSTALL

KNOWLEDGE PRESERVATION MANAGEMENT

GENERAL INTEREST

In response to a 2004 Defense Nuclear Facilities Safety Board (DNFSB) inquiry regarding knowledge capture and preservation, a Y-12 KPM team was established to:

- Implement phased Knowledge Management Program Action Plan
- Utilize multi-organization technical team to define program
- Capture new process footage and leverage existing process capture materials for critical operations
- Film interviews of subject matter experts and experienced employees at all levels (e.g., managers, supervisors, technicians, machinists, etc.)
- Provide a web-based delivery system that will facilitate training, support process restart efforts, and facility modernization
- Institutionalize a formal KPM Program

PRESENTED BY: RICK LEWIS

TUBULAR SOLID STATE LIGHTING (TLED) - CURRENT TECHNOLOGY AND ADVANTAGES

GENERAL INTEREST

The presentation is an overview of LED technology, advantages and market development for LED based general lighting products. LED technology has progressed by leaps and bounds over the past 10 years. The 2014 Nobel Prize in Physics was awarded for the blue LED, focusing the world view on the advances in the field. The LED longevity, performance, availability and price are reaching levels that make LEDs viable contenders for general lighting applications. Performance levels have increased from 20 lumens per watt to over 150 lumens per watt over the past few years making LEDs a powerful means of saving energy on a large scale. Available LED products, A type bulbs for incandescent replacement and linear arrays for fluorescent replacement are making significant headway into the general lighting market. Adoption of the technology is accelerating and creating a large array of products of varying quality. A set of specifications can help guide the buyer to the higher quality products.

Installation of LED devices as replacements for incandescent bulbs and fluorescent tubes is a means of saving money through reduced energy alone. Additional considerations are lower maintenance and less waste heat generation. LEDs can deliver a light spectrum more similar to ambient sunlight, reducing possible physiological effects from the spiked spectral distribution delivered by most fluorescent lighting products.

The lighting market is accepting LED technology. Installations of tubular LED products have been done in schools, military bases, commercial buildings, office spaces and many other locations.

PRESENTED BY: CHRIS JENSON

SHIP PRODUCTION TECHNOLOGIES

ACOUSTIC MACHINING

MANTECH NSAM PROJECT

EWI's recently patented AcousTech™ Machining Technology is based on the integration of high power ultrasonic energy with conventional metalworking tools. The AcousTech™ Machining Module transmits high frequency longitudinal vibrations through the longitudinal axis of a cutting tool, producing a reciprocating action of the tool tip similar to the operation of a hammer drill within conventional drill bits. Ancillary vibrations are isolated from the machine's spindle, or supporting structure, through a unique tool holder design, which is interchangeable with common spindle platforms. The application of high energy ultrasound reduces total operating forces by as much as 50%, thereby improving tool life while increasing material removal rates.

A particular drill and drilling process at General Dynamics Electric Boat (EB) has been targeted as a candidate for implementation of this new technology. Years of refining the drilling process has led to decreased cost and improved quality; however, AcousTech™ Machining represents an opportunity for additional benefits, including lower operating forces, increase feed rates, improve chip extraction, and more.

PRESENTED BY: EDWARD WATERMAN

ALL PLATFORM AFFORDABLE LED LIGHTING (APALED)

NSRP RESEARCH ANNOUNCEMENT PROJECT

The entire breadth of shipbuilder's lighting needs are best served by the Solid State Lighting (SSL) upgrade generated in this project which has been encouraged by 3 strong Naval references. This solution becomes the only way to achieve instant cost avoidance and still upgrade to SSL lighting while being compatible with the existing Navy SSL solution. After saving money upfront, shipyards can then expect a total cost reduction as they construct it, and then neatly deliver this savings mechanism on to the Navy. This effort will ensure all Shipbuilders will never change a light bulb and always enjoy energy bill savings. This effort will produce a complete product line for use by all shipbuilders. The products will be qualified and ready for use on all platforms. The proposed NSRP project utilizes the IntelliTube lamp from the Navy SSL Retrofit Solicitation and Award2) and builds a new fixture set around it with additional benefits to the shipbuilder. The design will reduce cost, complexity, wiring, size, and weight of the lighting fixtures. The APALED fixtures replace the most prevalent general lighting fixtures on Navy ships: two foot fluorescent fixtures. The core innovation of APALED is optimizing LED lighting for new ship construction. This involves mechanical and optical advancements as well as electronic improvements.

PRESENTED BY: JIM VANMETER

COLD SPRAY TECHNOLOGY FOR SHIPBOARD COMPONENTS

MANTECH IMAST PROJECT

Puget Sound Naval Shipyard and the Intermediate Maintenance Facility (PSNS & IMF) provided a hydraulic actuator body that had corrosion damage on the sealing surfaces of an internal bore. The actuator body was made from Al 6061. Using a high pressure Cold Spray system, a process was developed to deposit Al 6061 powder to repair the corrosion damage. The process parameters were developed on test coupons. Once the required adhesion strength and porosity levels were achieved, the Cold Spray repair was performed

on a test article that had the same dimensions and geometry as the hydraulic actuator body. The internal bore surfaces were approximately 100 mm in diameter with a depth of nearly 200 mm, and were sprayed using a 45-degree nozzle that was 65 mm in length. The test article was sectioned and the microstructure of the coating was examined. The repairer process was approved and the hydraulic actuator body was repaired. Test coupons, sprayed at the same time the actuator was repaired were tested to verify the process was producing coatings that met the required property requirements. The repaired actuator body was returned to service. The average adhesion strength of the coating was 71.4 MPa which exceeded the minimum required adhesion strength on of 69 MPa. Adhesion strength was measured following ASTM C633.

PRESENTED BY: DR. TIMOTHY EDEN

COST SAVING COMPARISON IN APPLICATION OF POLYSILOXANE VS. SILICONE ALKYD TOPCOATS

NSRP PANEL PROJECT

Polysiloxane coatings are a relatively new chemistry that offers an alternative to polyurethane and silicone alkyd finish coatings for ships, offshore structures, and other industrial maintenance applications. Polysiloxane topcoats for ship exteriors offer the Navy a more durable finish coat than current silicone alkyd coatings. In depot maintenance, they can be installed at a lower cost than the legacy silicone alkyd system. However, these same cost advantages are not recognized during new ship construction.

The National Shipbuilding Research Program Surface Preparation and Coatings Panel (SPC) has completed a project to identify cost advantages for polysiloxane topcoat based on activities and build sequences which are relevant to new ship construction. In addition to reducing installed cost, polysiloxane topcoats should offer the Navy life-cycle cost savings. However, there are challenges that need to be overcome in order to fully recognize the benefits of this more durable coating throughout the ship life cycle. These challenges include implementation of cleaning procedures, improving color-matching, and developing materials that are more practical for application by ships' forces. The NSRP project included workshops for Navy, shipyard, and industry participants on these life-cycle related issues.

PRESENTED BY: PETER AULT AND ROBERT CLOUTIER

DEVELOPMENT OF A HIGH MOBILITY MANUFACTURING ROBOT

NSRP RESEARCH ANNOUNCEMENT PROJECT

Every year, millions of man hours are spent performing work in enclosed ship compartments. This work is among the most labor intensive, dangerous and least touched by automation (and productivity) as any performed. This work depends on highly skill laborers to perform much of the manufacturing tasks primarily in a manual fashion. While this workforce is highly skilled in their craft, many of the productivity enhancements associated with new technologies in robotics, embedded processing and software applications have not been applicable to this group. The automated or robotic system we propose will augment existing compartment workers and significantly improve productivity and safety.

RTT and its partners, Ingalls, BAE Systems, NASSCO, Miller Welds, TennTech and MetaVision seek to develop and demonstrate a High Mobility Manufacturing Robot (HMMR) capable of operating in ship compartments. This system will be lightweight and portable (<40 lbs). The HMMR will be able to transition over obstacles and between the floor, walls and ceiling in a ship compartment while carrying tooling. It will operate in horizontal, vertical and inverted orientations.

The project is structured in three phases to progressively develop and implement the proposed HMMR concept. These phases span the tasks of; Phase 1: surface prep on compartment floors with minimized operator input, Phase 2: mechanized fillet welding on panel lines using stiffeners, and Phase 3: remote operator in confined compartments. Each phase has a primary customer/need, an associated technology demonstration and a standalone business case. Taken together, these involve a wide number of shipyard stakeholders.

This presentation will summarize the Phase 1 portion of this effort. The Phase 1 deliverable provides a means to mechanize and automate buffing operations in compartments. The operator will set up the HMMR with buffing tool and place it in the desired compartment. Once initiated, the HMMR will traverse the compartment in a simple spiral motion using sensor-based wall-following to cover the floor. By mechanizing and automating the operation, the operator's time is significantly decreased while reducing the need for the operator to be inside the compartment during operation. Initial efforts will implement buffing on the floor, future efforts will enable wall buffing. The presentation will cover key design aspects, features and capabilities of Phase 1 HMMR. A summary of laboratory and in-field testing and implementation of the system will be presented. Finally, the presentation will conclude with a discussion of potential long-term implementation within the shipbuilding environment. This project is supported in part with development funds from NSRP.

PRESENTED BY: DR. JAMIE BEARD AND DR. STEPHEN CANFIELD

EXPANDED ADHESIVE OUTFITTING

NSRP RESEARCH ANNOUNCEMENT PROJECT

This project will expand applications for adhesive outfitting beyond specifically tested and approved items by developing design rules for adhesively bonded studs. The rules will follow NAVSEA criteria for the use of adhesives and will be based on tests conducted by this project that establish allowable loading based on failure modes. Initial consideration will be given to lightweight items weighing less than 100 pounds using adhesives and mounting hardware with documented performance. The design rules will consider all applicable NAVSEA requirements and will identify any changes to ship specifications required for implementation.

PRESENTED BY: MARK LOSSET

FIBER OPTICS INSTALLATION ON SHIPS

MANTECH ELECTRO-OPTICS CENTER

Fiber optic communication systems are widely used on US Navy ships and Coast Guard Cutters for data communication of high performance electronic systems. These systems enable rapid data transfer between end-user equipment and play a vital role in the operation of mission critical equipment. The signal density of new ship designs is exponentially increasing and metrics associated with first-time quality indicate that rework is impacted with the increased growth and complexity of these systems. Of special concern is the increase in data rates and the associated use of single mode optical fiber. Performance of the fiber optic network is highly dependent on proper installation, including tools and processes used throughout the ship's construction cycle.

This project was focused on improving manufacturing processes that support an increase in first time quality of optical fiber installations. Four areas were emphasized:

- Logistics of optical fiber installation in the shipbuilding environment, where deck access is scheduled tightly.
- Methods of cable handling and deployment in the midst of metalworking and metal finishing operations.
- Connection methods including in situ connector assembly and fusion splicing, and specifically link budget concerns caused by systematic switchover between the two.
- Trials of connector assembly improvements using newer tools.

Improvements in process performance in compliance with project metrics show that the project was a success. In addition, other projects in cable installation were benchmarked, and favorable results were used.

PRESENTED BY: JOHN MAZUROWSKI

IMPROVED TOPSIDE NON-SKID REMOVAL FOR VIRGINIA AND SEAWOLF CLASS SUBMARINES

MANTECH IMAST PROJECT

To protect sailors, nonskid coatings are applied to the specialized hull treatment (SHT) coating used on Navy submarines. In order to remain effective, these nonskid coatings are periodically refreshed. During nonskid removal and reinstallation operations, the Navy attempts to retain these SHT coatings. Currently, shipyards remove nonskid from SHT using hand sanders, disc grinders and abrasive blasting. These methods are slow, dirty and have the propensity to damage the underlying coating.

ARL, in conjunction with UHP (Ultra-High Pressure) equipment supplier Terydon Inc. developed process and equipment to remove nonskid from SHT at ~ 200 ft2/hour. The equipment utilizes an innovative, patented planetary-motion style nozzle carrier system. It is marketed under the trade name 'EpiJet'. The planetary motion arrangement creates the control necessary to rapidly remove nonskid without damaging the underlying coatings.

ARL performed removal and process optimization studies using the EpiJet on rip-out areas on in-service assets. ARL used the equipment to remove multiple (i.e., 2-3) layers of aged nonskid without causing damage to the underlying substrate. Using the EpiJet, it is possible to remove 100% of the nonskid in a single pass without causing damage to SHT. Given a 16" wide cleaning path and forward speed of 30" per minute, the instantaneous removal rate is ~200 ft2/hour. For comparison, the estimated removal rate using hand-sanders and grinders is ~ 7 ft2/hour. The equipment is flexible and can be used for both cleaning of nonskid and nonskid coating removal from steel. The design is also scalable to achieve coating removal rates several times that already achieved.

This presentation summarizes the findings to date, presents the theoretical background of the machine and process, and describes design changes being incorporated into of the 2nd second generation device.

PRESENTED BY: CHARLES TRICOU

INTRODUCTION TO CLICK BOND'S ADHESIVELY BONDED FASTENERS

GENERAL INTEREST

Click Bond, Inc. is a pioneer in the research and development of adhesive-bonded fasteners. These fasteners are used extensively in the aerospace industry and are now being specifically designed for the Marine and Offshore industry. A special collection of Click Bond fasteners designed specifically for the Marine environment has also received approval from the American Bureau of Shipping (ABS) and Lloyds.

Click Bond's all-new product line-up sets the benchmark for high-performance adhesive-bonded fasteners. Constructed of durable, marine-grade, stainless steel that provides strong, watertight, corrosion-resistant attachments, Click Bond fasteners help enhance structural integrity by eliminating the need for welding or drilling.

Click Bond fasteners are attached using structural adhesives that are resistant to fuel oils, hydraulic fluids, and provide a chemical barrier that inhibits galvanic corrosion. All Click Bond fasteners include an installation fixture that holds the fastener in place under positive pressure while the adhesive cures. This ensures optimal joint strength, bond-line consistency, and reliability of the fastening system.

Use Click Bond fasteners to:

- Reduce costs by eliminating: Hot work (welding)
- Gas freeing of fuel and storage tanks
- Fire watch
- Repairing holes/leak paths in composite and metallic bulkheads
- Fastener replacement caused by galvanic corrosion between hardware and ship structure
- Maximize design and work sequence flexibility
- Minimize rework
- Facilitate and simplify repairs at sea

Click Bond's adhesive-bonded fastening system successfully passed extensive testing for use on US Navy vessels. Testing included: shock and vibration, fluid immersions, as well as accelerated aging in a salt water environment.

Manufacturing design, review approvals, and part certification by ABS & Lloyds ensure high-quality products that endure rigorous marine environments, as demanded by the industry.

PRESENTED BY: DAN LUPTON

MECHANIZED CABLE PULLING

MANTECH NAVY METALWORKING CENTER PROJECT

In ship construction, the installation of electrical cable, or cable pulling, is an expensive, labor-intensive, and injury-prone operation. The current shipboard method is accomplished by cable pulling teams that manually grip and pull the cables through the cableway. The Navy Metalworking Center (NMC) is leading a project team to develop easy-to-use, lightweight, portable power-assist tools to reduce effort, time, and injuries associated with routing cables. The tools are being designed to pull cables that are 1.5 to 2.25 inches in

diameter. The tools may be used to pull an entire cable or portions of the cable through intermediate distances until routing the full length of cable. This presentation will discuss the project technical approach, the prototype tool development progress, and preliminary shipboard testing at Ingalls Shipbuilding.

The project is being executed by an Integrated Project Team consisting of the LHA Program Office (PMS 377), CVN 79/80 Program Office (PMS 379), Ingalls Shipbuilding, Newport News Shipbuilding, NAVSEA 05Z, and NMC.

PRESENTED BY: TIMOTHY FREIDHOFF

PIPE PRODUCTION AUTOMATION METHODS

MANTECH NAVY METALWORKING CENTER PROJECT

With several thousand pipe welds on Navy ships, even a slight reduction in manufacturing time can result in significant cost savings. The majority of the pipe fitting, welding and brazing tasks at Ingalls Shipbuilding are performed manually, with limited assistance from mechanized and automated tools. The Navy Metalworking Center (NMC) is leading a Navy ManTech project to investigate and develop portable mechanized tools and automation techniques to improve pipe fitting and welding on several naval platforms, including the LHA(R), LPD, and DDG Classes, as well as the U.S. Coast Guard's National Security Cutter. This presentation will outline the project technical approach, the pipe production processes and requirements identified for investigation, and describe the prototype tools being developed and automation technologies being pilot tested at Ingalls.

The project is being executed by an Integrated Project Team consisting of the LHA Program Office (PMS 377), Ingalls Shipbuilding, the Naval Surface Warfare Center Carderock Division, and NMC.

PRESENTED BY: MICHAEL LICHTENFELS

PRECISION PANEL INSERTS / THIN PANEL DISTORTION MITIGATION

MANTECH NAVY METALWORKING CENTER PROJECT

Ship designs are increasingly calling for wider, thinner, longer and higher-strength plates, which are subject to plate distortion issues occurring during panel line fabrication. Ingalls Shipbuilding identified thin plate procurement and cutting; insert fit-up and welding; and panel line improvements as three leading problem areas for thin plate distortion issues. Improvement to these areas is expected to reduce plate distortion and avoid significant rework that affects budget and schedule throughout shipbuilding fabrication. Mitigation of these thin plate issues has been identified as a high priority in addressing ship affordability.

This presentation will provide an overview of three Navy Metalworking Center (NMC) Office of Naval Research (ONR) Manufacturing Technology (ManTech) projects that employed Integrated Project Teams (IPTs) to address the issues with thin plate procurement and cutting, insert fit-up and welding, and panel line improvements. The presentation will first cover thin plate fabrication issues and the development of a revised procurement specification, as well as plasma cutting evaluations and developed cutting guidelines. Next, the presentation will cover identified weld process improvements for welding "thick" inserts into "thin" panels, and the development of trimming tools to improve the fit of thin plate components. Lastly, the presentation will cover panel line recommendations developed to address challenges in the panel line fabrication related to excessive distortion, wide weld joint gaps, sub-optimal welding

performance, excessive weld repairs and low throughput rates. The projects' IPTs included Ingalls Shipbuilding; the DDG 51 Program Office; Naval Surface Warfare Center, Carderock Division – Code 611; The University of New Orleans, School of Naval Architecture and Marine Engineering; ArcelorMittal – Burns Harbor; and ESAB Cutting Systems.

PRESENTED BY: LORI DENAULT

RIGGING FOLLOW-ON RESEARCH

NSRP RESEARCH ANNOUNCEMENT PROJECT

The scope of this project is to perform basic research related to lifting attachment devices used for ship construction. The emphasis will be to perform full-scale or near-full-scale structural tests of lifting components with several application methods practical to structure similar to actual ship structure. Of particular interest is to capture the effects of different loading scenarios, for various padeye shapes and alignment configurations.

There are three distinct phases of the project, each one year in duration. Phase 1 consists of testing stiffened and un-stiffened elements as well as weak axis loading. Of concern in this phase is local plate buckling and capacity of padeyes in out-of-plane loading, as well as stresses in cantilever padeyes. Phase 2 investigates the response of padeyes with different plate thickness to internal structure thickness, internal stiffened brackets, internal connection under padeye, double plate padeye, and padeyes of different shapes. Phase 3 involves structural testing of padeyes made from different materials than steel, including Aluminum, Bronze and Nickel. These tests will be performed dynamically under different loading angles. All three phases of the project involve prediction analyses, structural testing and post-test analyses, as well as reporting results. Analysis will include hand calculation as well as the detailed nonlinear FEA.

The outcome of this research project will include the raw data and results of the tests performed, the calculation techniques used, and any finite element modeling conducted, including recommendations regarding the future work and analysis on specific padeye type or configuration. The results of physical testing in conjunction with calculations performed and finite element models created will be used to create valuable references, specific to padeye lifting attachments, available to rigging engineers throughout the industry.

PRESENTED BY: JOSHUA REECE

ROBOTIC WELDING OF VCS INTERIM PRODUCTS AND MAJOR ASSEMBLIES

MANTECH NSAM PROJECT

The U.S. Navy and General Dynamics Electric Boat (GDEB) have a joint initiative to reduce the construction cost of the VIRGINIA class submarine (VCS). The Navy ManTech Program is participating in this initiative with specific focus on improving manufacturing processes for ship construction.

Operations personnel involved with the production of VCS structural fabrications have identified structural welding as a major contributor to construction costs. Major fabricated structural assemblies have been broken down by product structure and defined as either "part family" (PF), "interim product" (IP), or "major product" (MA) assemblies. These candidates include assemblies, such as manufactured Tee and I assemblies, small foundations, tank internals, bulkhead structures, main propulsion foundations, and inserts and penetrations. Preliminary assessments have identified opportunities to improve the accuracy of weld preparations, component assembly and fit-up, welding processes, and equipment, as well as increased use of fixtures, positioning, automation, and mechanization.

The goal of this project is to determine the overall steps and requirements for development and implementation of a modular construction approach using robotic welding techniques for the VCS part family and interim product subassemblies. Electric Boat will survey the industry for alternate methods and equipment that support the VIRGINIA contractual requirements; review and select solutions for prototyping activity and from this work, develop and issue an implementation plan with a refined business case.

This technology, once implemented, could potentially save an estimated $551K per VCS Hull. These savings will result from enabling discrete planning of welding small assemblies within existing planning systems and increasing the percent of the first time quality. While the project focuses specifically on improvements benefiting the VCS, the same benefits described here can apply to all U.S. Naval ships.

CNST is a Navy ManTech Center of Excellence, chartered by the Office of Naval Research (ONR) to identify, develop and deploy in U.S. shipyards, advanced manufacturing technologies that will reduce the cost and time to build and repair Navy ships.

PRESENTED BY: DEREK MCKEE

SHIPFITTING SIMPLIFIED

GENERAL INTEREST

1. Brief History of Fitting
2. Fitting while Reducing Scars and Burs.
3. Eliminating Scars and Burs with Non Welded Fitting Aids

We will explore fitting with tools that are being used by major Korean shipyards along with other unique non welded fitting options that are now available.

PRESENTED BY: KEVIN SMITH

VALIDATION OF ANALYSIS METHODS FOR PADEYE ATTACHMENT UNDER DYNAMIC LOADING THROUGH DESTRUCTIVE TESTING

NSRP PANEL PROJECT

The application of padeye attachments as lifting aids to ships structure is standard practice, and the failure behavior of the pin end of steel padeyes under load has been the subject of both experimentation and theoretical analysis. Attachment point failures, however, are still experienced in the shipbuilding industry and not all can be attributed to material defects or human error. This project proposes to expand on work completed during the 2012 NSRP panel project “Validation of Analysis Methods for Padeyes through Destructive Testing” and continue to investigate the padeye attachment to ship structure interface.

PRESENTED BY: JOSHUA REECE

ZERO WELD DISTORTION ARC WELDING TO REDUCE COST OF SHIP CONSTRUCTION: HYBRID INDUCTION WELDING OF BUTT AND T-FILLET

NSRP RESEARCH ANNOUNCEMENT PROJECT

From the earliest use of arc welding in ship construction, weld distortion has been a very costly problem, causing panels to be out of fairness, and excessive fit-up discrepancies throughout the ship. Millions of man-hours have been expended fighting to get components to fit properly, and straightening decks and bulkheads, even hulls. Dozens of concepts have been tried to reduce weld distortion, but the fundamental physics of arc welding itself is the culprit, and cannot be changed.

The problem is that the welding arc is a thermal radiator, so things that are closer to the arc get the hottest, while portions of the weld which are farther away, or have an obstruction blocking the thermal radiation, remain relatively colder. For a butt weld, basically the "top" of the weld bead closest to the arc plasma will be hotter than the "back" of the weld at the joint root which will be colder. As the weld cools, the hotter regions experience a greater degree of thermal shrinkage, which results in a distorted component.

What has been needed, is a second, non-radiating, independently controlled, heat source. Lasers have been used, but the cost and relatively small power available from a laser heat source is no match for the electric arc plasma. Most arc welding power supplies are capable of 20-40 kW of energy output. In addition, Dr. Charlie Shaw measured the temperature of the core of a welding arc plasma at approximately 35,000° K. Heat transfer by radiation is proportional to the temperature difference between the arc plasma and the ambient temperature metal, raised to the fourth power. Thus, the overwhelming radiative energy transfer from an arc is difficult to counter balance.

The Hybrid Induction Arc Welding (HIAW) process utilizes one or multiple 35 kW induction power source(s), which is fully capable of counter balancing the heat from the welding arc. In addition, the induction heating process occurs inside of the metal, rather than being an external heat source. Consequently, by the use of advanced inductor designs, it is possible to heat the parts, which are being welded, in the areas least affected by the welding arc plasma energy. This precision placement of energy at strategic locations, can counter-balance the arc heating, and thus, eliminate distortion. Scientists at EnergynTech invented this new welding process seven years ago, and successfully demonstrated it in the laboratory. During the time since that invention significant work has gone into the development and engineering of practical equipment which is capable of producing welds in ordinary shop and factory environments. It was one of the primary goals of this project to create welding procedures, and to demonstrate those procedures on large scale welds on the order of those made in the construction of ships.

The first phase of the project created procedures for producing butt seam welds on large steel plates, similar to the welding of seams in a typical shipyard panel line. Two separate procedures were developed and demonstrated for two different plate thicknesses. In each case full size steel plates were butt welded with virtually zero angular distortion and longitudinal distortion. Typically, thinner plate is more susceptible to distortion, but the thinner (3/8" thick) plate demonstration produced about the same amount of distortion as the thicker (5/8" thick) plate.

Baseline welds were produced using the typical Submerged Arc welding process. These welds were cut in cross section both transverse and longitudinally to the weld seam. A computer measurement system was used to generate the baseline data which was used for the comparison to evaluate the Hybrid Induction Arc Welds. In each case the amount of distortion reduction was significantly more than the 50% reduction goal of the project.

Samples were removed from Hybrid Induction Arc welds, and test specimens machined from those samples. The specimens were sent to an independent laboratory for testing. All of the required mechanical tests were conducted to verify that the welds met the American Bureau of Shipping weld requirements. Additional fracture toughness tests were conducted to determine if the welds produced using this new process would meet the NAVSEA requirements. All of the tests conclusively showed no detrimental effect of the induction

heating and the welds were shown to be acceptable . The final test was to produce a butt seam weld joining two full size steel plates of thickness 3/8 inch. The weld was conducted with all six of the project participant shipyards represented, as well as the project PTR. The resulting weld met all welding requirements, and produced a welded joint with virtually no weld distortion. The full size steel plates lay flat in the longitudinal direction along the full length of the weld, and there was no discernible angle across the weld joint along the full length of the weld.

The kick off meeting for the project second Phase was held the last week in January. The Phase II project will concentrate on T-Fillet welds. A major problem with the joining of stiffeners to panels in shipyard panel lines is the distortion created, that causes the panel to exceed the out-of-fairness allowable. When this occurs, straightening must be done, to bring the deck, bulkhead, or hull panel into within the allowable fairness standard. Initial welds produced for phase II, have shown a significant reduction in distortion – sufficient to insure that the panels will meet all fairness requirements.

PRESENTED BY: JERRY JONES

MODULARITY & COMMONALITY

3D PLATFORM-SHORE INTERFACE MODEL DELIVERABLE

GENERAL INTEREST

The goal is to establish a Product Model Design Data Deliverable Specification to facilitate and improve platform-shore interface design assessments for aircraft carriers, surface combatants, submarines, and other US Navy ships early in the platform acquisition process, and enable similar efficiencies over the platform's life cycle. DOD and Navy policy and guidance requires the Weapon Platform Acquisition Program Manager to define, evaluate and document shore interface and shore facilities requirements and assess associated program risk. This includes developing plans for providing any unique or new facilities, any facilities modifications, and any interim facilities required to meet Initial Operating Capability (IOC) and support lifecycle sustainment for the Platform. The Naval Facilities Engineering Command (NAVFAC) is the Navy's Technical Authority for shore facilities planning, design and construction and has a requirement to collaborate with Naval Sea Systems Command (NAVSEA) Ship Design Managers and Product Support Managers to consume and utilize the most authoritative platform design data to effectively ascertain and inform on design impacts/risks to shore infrastructure. NAVFAC has developed and deployed a standards-based 3D virtual Navy installation environment (SPIDERS 3D) across the Navy Marine Corps Intranet (NMCI) enterprise to effectively assess platform design models in a geo-spatially accurate context with notional Navy shore interfaces (e.g. dry docks, maintenance and operational piers).

There is a need to create a more efficient platform design alternative review process and standardize the format for platform design data. The proposed approach is to apply known industry standards for 3D model formats and ship part assembly data definitions, and use those standards-based formats to evaluate ship design alternatives in a collaborative web-based enterprise 3D environment. The results would enable ship designers and the US Navy to build repeatable processes that result in more efficient and timely design analysis cycles.

PRESENTED BY: ALEX VIANA

AFFORDABLE, MODEL-BASED OPEN-ARCHITECTURE RADAR (AMOR)

MANTECH ELECTRONICS MANUFACTURING PRODUCTIVITY FACILITY PROJECT

The current Littoral Combat Ship (LCS) radar system solutions have posed various challenges to the U.S. Navy. Both LCS currently use foreign-built and –supported Volume Search Radars (VSR). Lockheed Martin (LM) uses the EADS TRS-3D radar and Austal uses the Saab Sea Giraffe radar. These solutions do not provide the technical data the Navy requires for performance and radar system modeling, vital for a new surface combatant platform. Also, these current systems have not met the desired affordability objectives. The initial intent of this project was to provide the Navy with an open-architecture radar that would meet the Navy's current LCS requirement for a low cost, upgradeable system. Directed sources for both a custom-designed solution and a COTS solution were investigated. This ManTech effort has developed the following technologies, using the Thales–designed, Exelis-produced and-supported AN/SPS-76 radar as a proof-of-concept basis: (1) An Intelligent Technical Data Package (ITDP), with full Government Purpose Data Rights, (2) Modular, COTS-based RF packaging at the component level, which will insure rapid upgradability in reaction to emerging technology or threats, and (3) Hardware-in-the-Loop simulation of the Radar system and its environment, as well as the expected threats it will have to counter. The capabilities developed on this project provide the Navy with the capability to rapidly react to emerging threats and/or incorporate new technologies, precluding the need for complete system replacement or lengthy and costly major design upgrades.

This project will insure the cost reduction of the current LCS radar system by approximately 20 percent through open competition for a GFE radar solution which will fit into the existing radar's top side and below decks available footprint. The results of this effort may be applied for use on the Navy's Small Surface Combatant program as well as the USCG Offshore Patrol Cutter program. It could also be

considered as a replacement for the AN/SPN-43 radar on large-deck amphibious platforms and carriers for associated impact and cost savings. The competition is expected to yield a radar system which fully meets the LCS mission requirements at an acquisition savings of ~ $1M per hull.

PRESENTED BY: PETE ESPOSITO

DEVELOPMENT AND APPLICATION OF STANDARD HULL, MECHANICAL, & ELECTRICAL MODULES TO INCREASE FLEXIBILITY IN SHIP DESIGN

NSRP RESEARCH ANNOUNCEMENT PROJECT

Bollinger Shipyards, Inc. is joined by team members, HII—Ingalls, BAE Systems Southeast Shipyards, IMECO, U.S. Joiner, Ship Architects, Inc., Hepinstall Consulting Group, Inc., Gatekey® Engineering, Inc., and Victoria Dlugokecki, P.E., to deliver low-cost ship design "plug and play" standardization solutions through the development of modularized hull, mechanical, and electrical (HM&E) design modules. This project will provide the US Shipbuilding Industry, HM&E community and the Navy/Coast Guard an initial set of Standard HM&E Ship Design Modules and a proven methodology for the industry to work together to produce design modules that are Navy/ABS compliant, based on Design for Affordability (DFA) and Human Factor Engineering Principles. It will leverage interface control methodologies to enable an implementation-focused delivery of pre-engineered products.

Traditionally, ship owners and ship program offices approach ship design from a "custom-fit" perspective in which each aspect of the ship is designed from scratch. This approach results in lengthy design and build cycles, costly design changes, build strategy "work-arounds" to accommodate long-lead materials, and escalating shipbuilding costs. In addition, the HM&E community currently experiences lengthy design and build cycles which increase costs to shipbuilders. Ultimately, these actions result in higher costs of ships and systems to customers (Navy/Coast Guard/Commercial buyers).

Basic tenants of lean manufacturing are to reduce the number of parts required and to identify commonality between parts so they may be used interchangeably on various platforms. The Navy realizes the significant benefits that can be derived from standardization of various ship platforms ship platforms, as demonstrated by the recently formed Standardization group under NAVSEA N6. The Navy continues to leverage the successes of past standardization initiatives, such as the Virginia Class Submarine Program Standardization efforts, the OASIS C4I Modularity project, Virtual Shelf, and past NSRP sponsored projects—which have assisted in reducing both the number of standard components as wells as the parts that make up the components. To continue to meet the needs of its customer base, the US Shipbuilding Industry, together with its customers, must align our knowledge base to develop and implement standard HM&E ship modules using Design for Affordability (DFA) principles that will result in reduced Design Lead Time and overall Ship Construction and Maintenance Cost.

The overall objective of this project is to provide the US Shipbuilding Industry an initial set of 'Standard Ship Design Modules' and a proven methodology for the industry to work together to produce future design modules that are Navy/ABS compliant, based on Design for Affordability (DFA) and Human Factors Engineering (HFE) Principles.

The specific goals of this project are posed as follows:

- To deliver a set of pre-engineered standard ship products that includes performance specifications, concept, functional, and detailed design elements to the U.S. Shipbuilding Industry.
- To develop and gain consensus of standard interfaces to use in the design of the standard ship modules.
- To apply Design for Affordability (DFA) principles to ensure affordability of the design modules produced.
- To apply Human Factors engineering principles to promote ergonomic build and operating processes.
- To develop a step-by-step methodology that enables repeatability of the design process.
- To facilitate stakeholder "buy-in" early in the process through collaborative design workshops with shipbuilders, suppliers and Navy Commonality Program.

This project is planned to be accomplished in two phases over a twenty-four-month period. The first phase concentrates on developing standardized processes, rules, and guidelines to govern the design of the HM&E modules, along with developing the functional, detailed, and 3D product model design of accommodations and habitability focused spaces. The second half of the project focuses on HM&E modules for machinery spaces, along with dissemination of the project results to industry.

PRESENTED BY: VICTORIA DLUGOKECKI

FLEXIBLE INFRASTRUCTURE TRACK SYSTEM

MANTECH NAVAL METALWORKING CENTER PROJECT

The Flexible Infrastructure (FI) Track System is a series of aluminum tracks mounted to the ship structure to enable equipment to be mounted without the use of hot work, as well as to rapidly rearrange the space to meet changing missions. The current large aluminum alloy track extrusions (tracks) are difficult and costly to manufacture resulting in high machining costs, high component reject rates, long lead times and difficulty in competitively bidding the manufacture of the components. Evaluation and improvement of the design and manufacturing of the track components were necessary to reduce the acquisition cost of the FI Track System.

This presentation will provide an overview of a Navy Metalworking Center (NMC) Office of Naval Research Manufacturing Technology (ManTech) project that improved the manufacturability of the FI Track System. The presentation will cover the development of a two-piece track design that can now accommodate multiple surface ship platforms due to the nature of the system design. The presentation will also discuss the validation of the improved system, including analysis, prototype development, and installation and validation testing. Installation improvements resulting from the new design currently under evaluation will also be discussed. This project's Integrated Project Team includes PMS 379; Naval Surface Warfare Center, Carderock Division; Newport News Shipbuilding; NAVSEA; and NMC.

PRESENTED BY: LORI DENAULT AND HAROLD HOWARD

FLEXIBLE INFRASTRUCTURE QUALIFICATION

NSRP RESEARCH ANNOUNCEMENT PROJECT

Our customers are continuously looking for ways to save money on future contracts. With the increase in procurement and ownership costs and declining budgets, it is increasingly difficult for the Navy to affordably procure and maintain ships for the duration of their service life. With the rapid pace of technology change and evolving threats, enhancing the mission capability of our navy ships is necessary to meet the operational demands that are expected in the near future. Flexible infrastructure is an innovation that will allow for cost savings by way of reconfiguration of compartments. It introduces modularity, scalability and commonality in our ships. This will allow maximum service life and the ability to update the combat systems equipment to keep pace with the rapid advancements in technology with ease and affordability.

Flexible Infrastructure is a system of systems that will provide capabilities for rapid installation, reconfiguration, and modernization of equipment without the use of "hot work". You eliminate the fire-watches, welding setup and break down time, cutting, grinding, patching insulation, and repainting. It is also a one-time cost over the lifecycle of the ship. The benefits are that it maximizes time for technology development prior to equipment installation during construction outfitting; meaning if the customer upgrades equipment planned for installation in a compartment at the last minute, with FI this does not pose a problem. This in turn allows for less rework and less adjustment of the schedule.

The author presents an overview of a current NSRP RA project intended to shock qualify all structural elements of FI as well as many non-structural elements as space and time allows. All aspects of the project will be presented and outlined based on where the project currently stands. Future tasks not yet completed will also be discussed. The overall outcome the project team wishes to accomplish is to be able to utilize FI across multiple platforms for the betterment of all ships.

The goal of the project is to provide our current shipyard with the following benefits:

- Develop a test plan complete with adequate test specimens that mimic ship board conditions and uses
- Test above test specimens on a heavyweight shock testing barge
- Qualify as many structural FI elements as possible

PRESENTED BY: SARA TRAWICK

MANUFACTURING COST REDUCTION FOR LITTORAL COMBAT SHIP SCALABLE ELECTRONIC WARFARE SYSTEM

MANTECH ELECTRONICS MANUFACTURING PRODUCTIVITY FACILITY PROJECT

There is an urgent need for enhanced Electronic Warfare (EW) capability for Littoral Combat Ship (LCS). Under the concept of commonality, leveraging the Surface Electronics Warfare Improvement Program (SEWIP) Block 2 will result in a cost saving scaled EW system solution (SEWIP Lite). The proposed EW system will be designed to fit on both LCS variants. The focus is to reduce acquisition cost without proportionally reducing performance and exceed performance of existing LCS EW systems through a competition based search to incorporate industry best-of-best in manufacturing and production of system subassemblies / hardware resulting in reduced cost. This project will produce the following deliverables to the Navy: (1) a complete advanced technical data package (TDP) including production level drawings with detailed specifications and developmental design data to support a full rate production competition, (2) a reduced Block 2 model for proof of concept, customer evaluation, and a level of requirement and technical measure checkout, and

(3) manufacturing technology integration of identified subassemblies for cost reduction including MMIC technologies in the millimeter wave down converter, tuner technology, new filter substrates, new RF fiber optic design, automated test processes, common chassis and a replacement common processor system.

SEWIP Lite will provide a variant independent EW system that meets LCS mission requirements and performance objectives, as well as improving the capability offered by current systems. SEWIP Block 2 will also benefit for the identified cost savings in manufacturing will be directly applicable through the common architecture. The insertion of advanced technology will result in a collateral benefit of cost reduction across all of SEWIP, which is planned for over 150 ships (including DDG 51 and CVN 78) for future savings in acquisition and life cycle cost savings. In addition, the U.S. Coast Guard will benefit from this effort because they have chosen to implement SEWIP Lite on the Offshore Patrol Cutters. The overarching payoff is that while maintaining performance objectives set forth in the requirements document resulting from the Scalable EW Architecture for LCS ManTech Program, the cost will be reduced by an estimated $1M.

PRESENTED BY: PETE ESPOSITO

STANDARDIZED FOUNDATIONS DATABASE FOR COMBAT SYSTEMS

NSRP PANEL PROJECT

In recent years, ship designers have been compelled to incorporate lighter, thinner steel structures to reduce topside weight, improve fuel economy, and enhance mission capacity. As a result of "light weighting" in Navy ships, ship design has dramatically increased the use of various local reinforcements, such as deck inserts or ring stiffeners, in foundation designs to satisfy the design requirements for supporting machinery, consoles, and weapon systems among others. In addition to operational loading requirements, most of these foundations must also be designed to satisfy shock, vibration and other combat system requirements.

While the same piece of equipment is often used multiple times, each piece has a uniquely designed foundation and will require a separate analysis. Computer modeling and Finite Element Analysis (FEA) have improved accuracy and allowed for lighter weight foundation designs but the high numbers of unique foundations, as well as changes which necessitate a new analysis, still create a large workload for engineers. Additionally, in cases where the customer wants the "latest and greatest" equipment on-ship, the relevant design details for the equipment may not be known until late in ship erection where outfitting costs are higher.

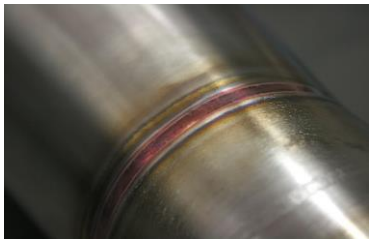
Funded by National Shipbuilding Research Program (NSRP) in December 2013, this project is to develop the infrastructure for a database of standard foundations and to determine the potential return on investment of its use by using a small pilot group of foundations. In addition to the infrastructure and pilot database, a database template will be available for use by other groups to help create their own database. By standardizing foundations, there are significant savings to be gained by reducing the duplicated work within a ship class, across multiple ship classes, and in future ship design. Standardized foundations will provide design specifications to assist vendors for advanced product development and allow for more outfitting to be done in earlier stages of construction.

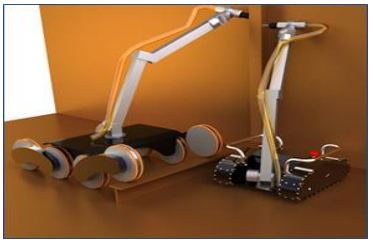
To date, the project team has developed a comprehensive list of the design features and requirements for the pilot group of foundations, the user functionality and requirements have been established for the database, and the pilot database for LHA 6 has been developed. In addition to the database development, the team has spent significant time devoted to helping gather information across the multiple contracts in development to identify the easiest and most beneficial standardization opportunities when they appear. Our goal is to reduce the number of unique foundations on LHA from 2,560 to fewer than 1,000 and to expand a similar reduction to other naval surface combatants.

PRESENTED BY: DR. T.D. HUANG AND MICHAEL HARBISON

NSRP | National Shipbuilding Research Program

Expo Abstracts





MISSION

- Manage and focus national shipbuilding and ship repair research and development funding on technologies and processes that will reduce the total ownership cost of ships for the U.S. Navy, other national security customers and the commercial sector and develop and leverage best commercial and naval practices to improve the efficiency of the U.S. shipbuilding and ship repair Industry.
- Provide a collaborative framework to improve shipbuilding-related technical and business processes.

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ALL PLATFORM AFFORDABLE LED LIGHTING (APALED)

NSRP RESEARCH ANNOUNCEMENT PROJECT

The entire breadth of shipbuilder's lighting needs are best served by the Solid State Lighting (SSL) upgrade generated in this project which has been encouraged by 3 strong Naval references. This solution becomes the only way to achieve instant cost avoidance and still upgrade to SSL lighting while being compatible with the existing Navy SSL solution. After saving money upfront, shipyards can then expect a total cost reduction as they construct it, and then neatly deliver this savings mechanism on to the Navy. This effort will ensure all Shipbuilders will never change a light bulb and always enjoy energy bill savings. This effort will produce a complete product line for use by all shipbuilders. The products will be qualified and ready for use on all platforms. The proposed NSRP project utilizes the IntelliTube lamp from the Navy SSL Retrofit Solicitation and Award and builds a new fixture set around it with additional benefits to the shipbuilder. The design will reduce cost, complexity, wiring, size, and weight of the lighting fixtures. The APALED fixtures replace the most prevalent general lighting fixtures on Navy ships: two foot fluorescent fixtures. The core innovation of APALED is optimizing LED lighting for new ship construction. This involves mechanical and optical advancements as well as electronic improvements.

ALTERNATIVES TO FIBER OPTIC CONNECTORS

NSRP PANEL PROJECT

Fiber optic connectors are meant for situations where frequent mate / demate is required. In Navy ships, present fiber optic link margin could be reduced if fewer connectors were used; the connector loss and its instability would be reduced. Fusion splicing is a useful alternative due to reduced installation cost and low stable optical loss (one tenth connector loss), but few cable restoration methods and splice enclosures are available for shipboard use. The existing Navy approved splice enclosures are large and require additional mounting structure. Commercially available splice enclosures are smaller and provide flexibility in mounting. Recent DoD SBIR projects have developed new cable restoration techniques directed toward rugged environments. The goal of this project is to increase the number of situations where fusion splices can be used, by identifying acceptable splice methods, cable restoration methods, and splice enclosures.

AUTOGENOUS PIPE WELDING

NSRP PANEL PROJECT

Autogenous gas tungsten arc welding (GTAW) offers opportunities to reduce build time and the cost of ship construction by performing full-penetration welds in a single-pass, therefore, eliminating the time to bevel pipes and deposit multiple weld passes. The objective of this project was to develop a technical and business case for the successful use of autogenous GTAW for ship piping systems. Autogenous welding was compared with current shipyard manual GTAW pipe welding practices, and it was estimated that the use of autogenous GTAW can reduce pipe welding time by approximately 35%.

Autogenous GTAW trials performed during this project demonstrate the ability of the process to successfully weld Type 304L stainless steel pipes that represent many of the piping systems that are welded during ship construction. Welds had complete weld joint penetration and were acceptable when examined in accordance with the visual, liquid penetrant, and radiographic requirements of U.S. Navy ship construction standards. Previous work has demonstrated that autogenous welds also meet the mechanical properties required for procedure qualification. This project demonstrates that autogenous GTAW can produce sound welds over the range of variations in weld joint fit-up conditions that are representative of those that may be encountered in the production of ship piping systems. Similar success is expected for other types and grades of stainless steels, as well as carbon steel pipe.

CONTROL TECHNOLOGY COMPARISON FOR HEAVY METALS REMOVAL FROM SHIPYARD STORM WATER RUNOFF

NSRP PANEL PROJECT

The goal of this project was to test the ability of various adsorbent and mechanical filtration materials to decrease heavy metal concentrations, specifically Copper (Cu) and Zinc (Zn), in storm water runoff and determine the most cost effective control technology. Six (6) control technologies were chosen for this project - three (3) adsorbent materials and three (3) mechanical filtration materials. Testing was conducted at representative manufacturing production areas including two (2) production bays and a slurry blasting pit where fabrication and sandblasting operations are conducted. The participating shipyard for this project was Huntington Ingalls, Inc. – Ingalls Shipbuilding Division, Pascagoula Operations (Ingalls). The project also investigated the impact on Total Suspended Solids (TSS) and pH, commonly included parameters in NPDES water permit limitations and the overall removal efficiency of each sampled constituent. The adsorption materials were tested against general mechanical filtration methods to determine the impacts of simply removing metal-laden sediment from storm water runoff. This project was intended to provide interested shipbuilding members with data that may assist with lowering storm water contaminant levels while optimizing removal efficiencies and controlling costs.

Throughout the project, Environmental Compliance Services, Inc. performed a variety of tasks and work activities including installing control systems, sampling effluent storm water, and analyzing constituent concentrations for each control system technology. Concluding the project, a final report was prepared detailing the site evaluation and final control system deployment configuration(s), an analysis of pre- and post- control analytical results of measured constituent (Cu, Zn, pH, and TSS) concentrations for each control technology and removal efficiencies, a summary of initial and long-term adsorption (or constituent removal) efficiencies for each control technology, and a comparison of the cost effectiveness of each control technology.

The presentation will highlight an overview of the project and provide final results. The results presented will include removal efficiencies and cost effectiveness of each control technology.

COST SAVINGS COMPARISON IN APPLICATION OF POLYSILOXANE VS. SILICONE ALKYD TOPCOATS

NSRP PANEL PROJECT

This project will compare the Polysiloxane coating systems to current new construction specifications for cost effectiveness and durability during extended shipyard industrial environment exposure; and provide test data relative to the three major coating manufacturer's coatings. It will also assist the NSRP community in adopting polysiloxane technology by facilitating information sharing sessions and compiling guidance documents as part of the project final report.

DESIGN FOR MAINTENANCE TRAINING TO U.S. SHIP DESIGN AND SHIPBUILDING INDUSTRY

NSRP RESEARCH ANNOUNCEMENT PROJECT

The objective of this project is to enable widespread dissemination and implementation of Design for Maintenance principles and the extensive ship repair best practices and cost deduction opportunities that were identified and developed through the NSRP "Reduction of Total Ownership Costs Through Application of Design For Maintenance and Repair Methodologies" Project. The scope of the project is to develop and implement a DFM training program that will accelerate the learning process of ship design stakeholders in support of both Navy and Commercial Ship Program.

The training will promote DFM solutions to reduce the cost of life cycle maintenance associated with maintaining ship structure, tanks, mechanical and propulsion systems, electrical systems, weather deck areas, habitability areas, and communication/navigational equipment. The training curriculum will focus on design-induced process issues that drive the cost of ship repair, such as inaccessibility, lack of standardization, misaligned maintenance strategy, lack of understanding the operating and maintenance environment, and inefficient equipment testing and diagnostic processes to name a few. The target audience for this training includes U.S. Ship Designers, Acquisition Program Managers, Technical Warrant Holders, Cost Estimators, Ship Modernization Representatives, and Ship Owners.

This project will deliver a 4 day comprehensive training course to be held in 7 regional locations (Washington DC, Norfolk Area, Northeast, Gulf Coast, San Diego Area, Seattle, and Marinette, WI).

Team Members include:

- Bollinger Shipyards, Inc. (Prime)
- General Dynamics Electric Boat
- BAE Systems Shipyards Southeast
- Marinette Marine Corp
- Hepinstall Consulting Group, Inc.
- Victoria Dlugokecki, P.E
- Tedesco Consulting

DEVELOPING A HIGH MOBILITY MANUFACTURING ROBOT FOR SHIP COMPARTMENTS

NSRP RESEARCH ANNOUNCEMENT PROJECT

Every year, millions of man hours are spent performing work in enclosed ship compartments. This work is among the most labor intensive, dangerous and least touched by automation (and productivity) as any performed. This work depends on highly skill laborers to perform much of the manufacturing tasks primarily in a manual fashion. While this workforce is highly skilled in their craft, many of the productivity enhancements associated with new technologies in robotics, embedded processing and software applications have not been applicable to this group. The automated or robotic system we propose will augment existing compartment workers and significantly improve productivity and safety.

RTT and its partners, Ingalls, BAE Systems, NASSCO, Miller Welds, Tennessee Tech and MetaVision seek to develop and demonstrate a High Mobility Manufacturing Robot (HMMR) capable of operating in ship compartments. This system will be lightweight and portable (<40 lbs). The HMMR will be able to transition over obstacles and between the floor, walls and ceiling in a ship compartment while carrying tooling. It will operate in horizontal, vertical and inverted orientations.

The project is structured in three phases to progressively develop and implement the proposed HMMR concept. These phases span the tasks of; Phase 1: surface prep on compartment floors with minimized operator input, Phase 2: mechanized fillet welding on panel lines using stiffeners, and Phase 3: remote operator in confined compartments. Each phase has a primary customer/need, an associated technology demonstration and a standalone business case. Taken together, these involve a wide number of shipyard stakeholders.

This presentation will summarize the Phase 1 portion of this effort. The Phase 1 deliverable provides a means to mechanize and automate buffing operations in compartments. The operator will set up the HMMR with buffing tool and place it in the desired compartment. Once initiated, the HMMR will traverse the compartment in a simple spiral motion using sensor-based wall-following to cover the floor. By mechanizing and automating the operation, the operator's time is significantly decreased while reducing the need for the operator to be inside the compartment during operation. Initial efforts will implement buffing on the floor, future efforts will enable wall buffing. The presentation will cover key design aspects, features and capabilities of Phase 1 HMMR. A summary of

laboratory and in-field testing and implementation of the system will be presented. Finally, the presentation will conclude with a discussion of potential long-term implementation within the shipbuilding environment. This project is supported in part with development funds from NSRP.

DEVELOPMENT AND APPLICATION OF STANDARD HULL, MECHANICAL & ELECTRICAL MODULES TO INCREASE FLEXIBILITY IN SHIP DESIGN USING DFA PRINCIPLES CONTROL NO. RFP14-07

NSRP RESEARCH ANNOUNCEMENT PROJECT

Bollinger Shipyards, Inc. is joined by team members, HII—Ingalls, BAE Systems Southeast Shipyards, IMECO, U.S. Joiner, Ship Architects, Inc., Hepinstall Consulting Group, Inc., Gatekey® Engineering, Inc., and Victoria Dlugokecki, P.E., to deliver low-cost ship design "plug and play" standardization solutions through the development of modularized hull, mechanical, and electrical (HM&E) design modules. This project will provide the US Shipbuilding Industry, HM&E community and the Navy/Coast Guard an initial set of Standard HM&E Ship Design Modules and a proven methodology for the industry to work together to produce design modules that are Navy/ABS compliant, based on Design for Affordability (DFA) and Human Factor Engineering Principles. It will leverage interface control methodologies to enable an implementation-focused delivery of pre-engineered products.

Traditionally, ship owners and ship program offices approach ship design from a "custom-fit" perspective in which each aspect of the ship is designed from scratch. This approach results in lengthy design and build cycles, costly design changes, build strategy "work-arounds" to accommodate long-lead materials, and escalating shipbuilding costs. In addition, the HM&E community currently experiences lengthy design and build cycles which increase costs to shipbuilders. Ultimately, these actions result in higher costs of ships and systems to customers (Navy/Coast Guard/Commercial buyers).

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The overall objective of this project is to provide the US Shipbuilding Industry an initial set of 'Standard Ship Design Modules' and a proven methodology for the industry to work together to produce future design modules that are Navy/ABS compliant, based on Design for Affordability (DFA) and Human Factors Engineering (HFE) Principles.

The specific goals of this project are posed as follows:

- To deliver a set of pre-engineered standard ship products that includes performance specifications, concept, functional, and detailed design elements to the U.S. Shipbuilding Industry.
- To develop and gain consensus of standard interfaces to use in the design of the standard ship modules.
- To apply Design for Affordability (DFA) principles to ensure affordability of the design modules produced.
- To apply Human Factors engineering principles to promote ergonomic build and operating processes.
- To develop a step-by-step methodology that enables repeatability of the design process.
- To facilitate stakeholder "buy-in" early in the process through collaborative design workshops with shipbuilders, suppliers and Navy Commonality Program.

This project is planned to be accomplished in two phases over a twenty-four-month period. The first phase concentrates on developing standardized processes, rules, and guidelines to govern the design of the HM&E modules, along with developing the functional, detailed, and 3D product model design of accommodations and habitability focused spaces. The second half of the project focuses on HM&E modules for machinery spaces, along with dissemination of the project results to industry.

FLEXIBLE INFRASTRUCTURE – LOW COST ALTERNATIVES FOR SHIPBOARD FALSE FLOOR DESIGN AND CONSTRUCTION

NSRP PANEL PROJECT

The Flexible Infrastructure (FI) concept of physical open Architecture addresses the requirement to reconfigure designated ship spaces quickly and efficiently. Practices for modernizing ship systems without FI require a significant amount of industrial work such as electrical system shut down and tag out, hot-work, and removal and re-installation of ventilation and foundations within the affected space. Upgrading equipment to respond to the rapid rate of technology obsolescence or changing mission requirements involves considerable ship down time and operational interference to ship's company. FI technologies developed for the CVN 78 class, backfit onto CVN 68 class, and planned for DDG and LHA ships provide solutions that support reconfiguration needs while not compromising ship configuration and capabilities. FI technologies provide the primary inspiration for this project.

False decks are typically used on Navy ships where high concentrations of cables or other services must pass through a compartment that has equipment installed or requires manned operations such as combat centers and electronics spaces. Current methods for constructing false decks involves extensive hot work (welding, cutting, grinding) and fabrication labor. The resulting installation is fixed to the equipment arrangement of the space at the time of installation and no flexibility is provided for reconfiguring the space without scrapping the false floor and building a new one. While the existing Flexible Infrastructure technologies address these problems, FI is a high value product whose investment is repaid over a ship's life cycle. This project seeks to use FI concepts to develop lower cost false deck designs. These will have reduced value and reduced acquisition cost as compared with the existing CVN 78 flexible infrastructure.

Hilti North America offers a variety of products that may allow the construction of a lower cost false deck. This is primarily done using modular components that can easily be cut and fastened to fit a specific deck layout. While this type of false deck is not presently used on US Navy vessels, it has been used in other applications, such as on the UK's Queen Elizabeth class aircraft carrier and commercial offshore applications. This project will investigate whether this type of false deck can meet US Navy requirements and provide cost reductions where a false deck is necessary but programmatic concerns prevent application of a fully flexible solution.

FLEXIBLE INFRASTRUCTURE – TWO PIECE DECK TRACK DESIGN AND QUALIFICATION

MANTECH NAVY METALWORKING CENTER PROJECT

The Flexible Infrastructure (FI) Track System is a series of aluminum tracks mounted to the ship structure to enable equipment to be mounted without the use of hot work, as well as to rapidly rearrange the space to meet changing missions. The current large aluminum alloy track extrusions (tracks) are difficult and costly to manufacture resulting in high machining costs, high component reject rates, long lead times and difficulty in competitively bidding the manufacture of the components. Evaluation and improvement of the design and manufacturing of the track components was necessary to reduce the acquisition cost of the FI Track System.

The Flexible Infrastructure (FI) Two-Piece Track System display will highlight the two solutions that were developed as part of a Navy Metalworking Center (NMC) Office of Naval Research (ONR) Manufacturing Technology (ManTech) project that improved the manufacturability of the FI Track System. The display will show how a two-piece track design can now accommodate multiple surface ship platforms based on the nature of the system design. The presenters at the display will be available to discuss the validation of the

improved system, including analysis, prototype development, and installation and validation testing. Installation improvements resulting from the new design that are currently under evaluation will also be discussed. This project's Integrated Project Team (IPT) includes PMS 379, Naval Surface Warfare Center, Carderock Division (NSWCCD), NNS, NAVSEA and NMC.

FLEXIBLE INFRASTRUCTURE QUALIFICATION

NSRP RESEARCH ANNOUNCEMENT PROJECT

Our customers are continuously looking for ways to save money on future contracts. With the increase in procurement and ownership costs and declining budgets, it is increasingly difficult for the Navy to affordably procure and maintain ships for the duration of their service life. With the rapid pace of technology change and evolving threats, enhancing the mission capability of our navy ships is necessary to meet the operational demands that are expected in the near future. Flexible infrastructure is an innovation that will allow for cost savings by way of reconfiguration of compartments. It introduces modularity, scalability and commonality in our ships. This will allow maximum service life and the ability to update the combat systems equipment to keep pace with the rapid advancements in technology with ease and affordability.

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The author presents an overview of a current NSRP RA project intended to shock qualify all structural elements of FI as well as many non-structural elements as space and time allows. All aspects of the project will be presented and outlined based on where the project currently stands. Future tasks not yet completed will also be discussed. The overall outcome the project team wishes to accomplish is to be able to utilize FI across multiple platforms for the betterment of all ships.

The goal of the project is to provide our current shipyard with the following benefits:

- Develop a test plan complete with adequate test specimens that mimic ship board conditions and uses
- Test above test specimens on a heavyweight shock testing barge
- Qualify as many structural FI elements as possible

FLEXIBLE INTERFACE FOR AUTOMATED CIRCUIT TESTER FOR LEVEL 1 TESTING

NSRP PANEL PROJECT

The current approach for level two testing of shipboard circuits (i.e., short circuits, open circuits, insulation resistance, and miswires) is a manual process which is time consuming and can be costly. Further, when manually testing there is no evidence that the cable was tested correctly or whether it actually passed. Automated cable testers have great potential for efficient use in testing of installed shipboard cables; however, the numerous connector interfaces that exist on Navy ships due to lack of standardization and the lack of effective flexible interface solutions currently available are impediments to the widespread use of automated cable testers on U.S. Navy ships.

The overarching objective of this project is to resolve the issue of adapting the automated tester to cables on U.S. Navy ships to perform level two cable testing in order to identify potential wiring problems prior to system level testing.

Project participants proposed a number of interface concepts, and these concepts were evaluated in order to down select a subset of concepts which ultimately resulted in prototypes being manufactured for further evaluation. The concepts developed have potential of being adapted as effective solutions to facilitate increased use of automated cable testers for level 2 cable testing on U.S. Navy ships. A live demonstration was conducted in December 2014 to show that the developed products have potential to meet expectations.

HIDEP WELD T-FILLET AND BUTT WELD DEVELOPMENT: A LOWER COST METHOD TO REDUCE WELD DISTORTION AND INCREASE WELDING PRODUCTIVITY

NSRP RESEARCH ANNOUNCEMENT PROJECT

The HiDep welding process is Hybrid Induction Arc Welding (HIAW), in which a high power induction heating system is operated in tandem with one or more welding torches. The application of induction heating as an independently controlled heat source from the welding arc offers several advantages:

The first advantage is distortion control – distortion is caused by the differential heating of the welding arc. When the weld cools, the areas closest to the radiating heat from the arc plasma have received more heat and shrink more than areas further from the arc, which creates weld distortion. By applying induction heating, a thermal balance can be achieved such that all of the weld is equally heated. The result is that when the weld cools, it shrinks uniformly, eliminating most of the distortion. This reduces the need for costly straightening of ship modules and improves ship fit-up reducing the cost and schedule delays caused by less than adequate fit-up.

The second advantage is productivity – by heating the edges of the weld to the melting point before the arc arrives, less of the arc energy is required. Much more of the arc heat is utilized to melt the welding electrode, which allows the welding speed to be increased. The increased welding speed increases welding productivity and reduces scheduling delays.

The third advantage is cost reduction – the hot edges of the weld fuse with the filler metal to form a weld more easily and quickly. The welding arc can penetrate deep into very narrow weld grooves substantially reducing the amount of filler metal needed, and reducing the likelihood of incomplete fusion defects in the weld joint sidewalls. Cost reduction is two-fold, less filler metal is used to make a weld, and less costly and time consuming weld joint preparation is required.

Phase I of the project was to develop equipment that could be used in a shipyard to make HiDep welds, and then to demonstrate the welding of butt joints in thicker steels and also thinner steels with the process. All of the goals of the Phase I project have been met, including the demonstration of the process, weld cross-section and mechanical testing, and comparison of the distortion using HiDep with baseline Submerged Arc Welds. Weld distortion reduction and welding speed increase exceeded the project goals. The weld shape and properties met shipbuilding requirements. The equipment is reasonable cost and easily maintained in shipyards.

The Phase II project has recently started, with the goal to parallel the work of the Phase I project, for T-Fillet weld joints. Preliminary results for the Phase II project show promise, indicating that it will be possible to reduce distortion and also improve productivity by using HiDep for T-Fillet welds.

The booth will have examples of HiDep welds, and provide information about the process, including testing results and photographs of large steel plates welded during the Phase I project.

IMPROVED GAS METAL ARC WELDING (GMAW) ON PRIMED STEELS AND ALUMINUM

NSRP RESEARCH ANNOUNCEMENT PROJECT

Aim of the project is to develop improved parameter sets for shipyard applications of Pulsed Gas Metal Arc Welding (GMAW-P) to allow higher quality and higher speed welding of aluminum, and primer-coated steels. This project is needed because equipment manufacturers do not provide help in these shipyard-specific areas, due to the relatively low-volume of equipment sales to shipyards. A more thorough approach is needed. The heart of this project is the ability of many modern inverter-type GMAW power supplies to provide precise control of parameters. The project has used high-cycle pulsation to provide enhanced cathodic cleaning for primed steel and aluminum, resulting in higher speeds and higher quality welds at lower heat input, reduced distortion and minimal rework.

INSTITUTE FOR MANUFACTURING & SUSTAINMENT TECHNOLOGIES (IMAST)

MANTECH CENTER OF EXCELLENCE

The Applied Research Laboratory, a U.S. Navy University Affiliated Research Center located at The Pennsylvania State University, will feature its Institute for Manufacturing and Sustainment Technologies (iMAST), a U.S. Navy Manufacturing Technology Center of Excellence sponsored by the Office of Naval Research. iMAST will feature information on its laser processing, mechanical drive transmission, advanced composites, materials processing, complex systems monitoring, and manufacturing systems technologies. iMAST will also address its unique U.S. Navy Repair Technology program.

INSULATED BUS PIPE

GENERAL INTEREST

High Temperature Insulated Bus Pipe (HTIBP) is a rigid, high voltage distribution product that has been used in land-based applications for many years in Europe. The commercial version of IBP has also been successfully installed and operated on many commercial cruise and foreign Navy ships. These products use an inner solid copper or aluminum conductor surrounded by an epoxy resin encased by an outer stainless steel shell that is touch safe. The product is capable of distributing power at greater densities than conventional cable technologies. As much as 8000 amps per phase and up to 100 kV rated IBP is available.

In October 2004, the New Construction Carrier Program Office, (PMS-378) tasked NAVSSES Code 982 to evaluate commercial IBP products from two foreign vendors. Testing that was performed in FY 2005 provided good results with the exception of flame / heat resistance test. The samples failed to pass the Naval 3 hour Gas Flame Circuit Integrity (GFCI) test. An SBIR and a National Shipbuilding Research Program (NSRP) special project investigated HTIBP. They were unsuccessful at developing products that could pass the 3 hours GFCI. However, recently a German company (with a manufacturing facility established in New Orleans, LA), Telefen GmbH, has developed a 3 phase IBP product that uses high temperature insulation. Telefen offered to deliver a high temperature rated 3 phase IBP to the Navy for 3 hour GFCI testing. The 3 phase sample passed on 18 Nov 2014. Telefen is presently developing the single phase HTIBP (based on Navy provided specs), and will provide the sample to the Navy for GFCI testing, planned for late Feb 2015. If successful, Telefen will produce HTIBP samples for a full Navy certification program approved by the SEA 05 Technical Warrant Holder (TWH).

The objective of this program is to conduct a Navy 3 Hour GFCI test on a sample of the provided single phase HTIBP. Assuming a successful test, discussions with the SEA 05 TWH ensue to determine applicable Navy Certification Tests necessary to certify HTIBP for shipboard application. Then: 1) Perform the determined applicable tests on samples acquired from the vendor, 2) Complete an investigation into maximizing the reliability of the HTIBP connectors, and 3) Complete a business case study for the life cycle cost and potential savings.

The investigation to certify IBP for Navy Shipboard use, started during CVNX era with ONR funding NSWC, Code 982 with goal of avoiding very long and numerous 15KV systems. Since then preliminary studies have shown that the true benefit to the Navy lie in specific, niche applications such as delivering power effectively and affordably to the Dual Band Radar (DBR) on CVN-78 class ships, install where bend radii of power cables are at a premium, for example behind shipboard generators and switchboards and other area constrained spaces such as escape trunks and hatches where electrical cables pass, and potentially in the future to power pulsed duty loads such as rail guns and laser weapons systems. The payoff is significant reduction in weight and volume over cables, supports modular construction, improved survivability, repairability, damage resilience, and eliminates bend radius limits.

LOCKHEED MARTIN'S FORTIS™ EXOSKELETON

GENERAL INTEREST

Whether grinding barnacles off a ship's hull, welding a long section of beam or drilling hundreds of holes in preparation for riveting, repetitive work using heavy hand tools can be physically exhausting. With only a limited time to work on the task before requiring a rest, tool operators run the risk of extreme muscle fatigue. Lockheed Martin's FORTIS™ exoskeleton allows operators to effortlessly support heavy tools, enhancing strength and endurance.

The FORTIS exoskeleton is an unpowered, lightweight exoskeleton that increases an operator's strength and endurance by transferring the weight of heavy loads from the operator's body directly to the ground through a series of joints at the hips, knees and ankles. Originating from Lockheed Martin's exoskeleton research for assisting a soldier with carrying heavy equipment over long distances, the same principles of how the body works and expends energy were applied to exoskeleton development for use in industrial settings.

Allowing heavy tool operators to hold their tools for an extended period of time, the FORTIS exoskeleton is useful for a variety of commercial and industrial maintenance, manufacturing and support operations in civilian and military environments. Lockheed Martin's exoskeleton technologies team will tailor the capabilities of the system to specific needs of customers in any setting.

LOW VOLTAGE QUICK CONNECTOR EVALUATION

NSRP PANEL PROJECT

Currently, Navy ship programs use termination connection blocks in applications that call for stud style terminal blocks, rated for 150 V and greater, for applications that operate nominally less than 50 V. These applications are primarily associated with controls and instrumentation, for such equipment as operator interface units, central control termination boxes, and Input/Output control termination boxes.

The purpose of this project was to determine if there is a more affordable component available that meets applicable requirements, and where the benefits reside by employing such components in an expedited fashion during the installation process. This required an investigation into component performance, materials cost, installation cost, and life cycle support features.

Tasks supporting project goals and objectives included the following:

- Investigate current use of and specifications for quick connectors, referencing commonly used military terminal blocks as baseline
- Generate an evaluation guideline to be used in the selection process of commercially available quick connectors for testing and evaluation
- Generate and execute a test plan that replicates, as close as practical, military specified testing that would pertain directly to the use of and applications for quick connectors

- Evaluate the performance of those quick connector units that are tested against baselines
- Provide characterization, performance assessment details and recommendations for next steps

The results of the project indicate opportunities exist for the use of commercially available quick connectors similar, or in kind, to those investigated and evaluated. More evaluation is necessary and suggested for specific programs, but recommendations include pursuing the approval for use of certain units in military applications per program requirements and qualifications, generation of standards and specifications identifying requirements allowing broad ranging applications for quick connectors for military programs and performing more detailed cost benefit analysis for use of such connectors. First stage testing proved promising, as most units passed shock, vibration and thermal cycle testing based closely on military testing requirements. However, it is likely that the commercially available quick connectors tested in this project would undergo some type of militarizing process to ensure qualification, even though basic design performance suggests military qualification could be possible using existing designs (for many of the products tested). General cost/benefit assessments indicate potential quantitative and qualitative savings associated with the use of quick connectors. Therefore, many options exist, offering a variety of configurations, for the user to pursue for military program application. End users of this information are encouraged to pursue implementation plans..

MATERIALS AND COMPONENTS FOR EXTERIOR ELECTRICAL CONNECTIONS AND SEALING

NSRP PANEL PROJECT

Materials and components used to protect and enclose electrical interconnects on ship exterior surfaces often fail to meet expected service life due to strenuous environmental exposure and physical abuse. This material failure results in a breach in the environmental seal and ultimately leakage may occur leading to corrosion and performance degradation.

This panel project identified and evaluated technologies and installation methods (materials, components, assemblies, and sealants) to extend the life of exterior electrical system installations while preserving electromagnetic interference (EMI) / electromagnetic pulse (EMP) integrity. Results of this effort include recommendations for improvements to the current operating procedures and practices and material substitutions to improve Class B bonding and exterior electrical connections and sealing.

MATERIALS AND COMPONENTS FOR EXTERIOR ELECTRICAL CONNECTIONS AND SEALING (PHASE 2)

NSRP PANEL PROJECT

Electro Magnetic Pulse (EMP) is a growing environmental threat which has potential to endanger the survivability of U.S. Navy surface ships. EMP protection requirements have always been challenging to meet, and historically these requirements have not been met on a ship wide scale. Ultimately a waiver is required from the customer and the ship is delivered to the Navy with noncompliant EMP protection.

System performance begins to degrade after installation is accomplished due to galvanic corrosion which is the reason the Navy established the more stringent requirement for grounding effectiveness. This more stringent requirement has proven to be difficult to meet with current EMP protection methods and installation practices.

The two most susceptible points in an EMP protection system are: 1) the metal to metal connection of dissimilar metals where electrical equipment enclosures interface with the ship structure via bolted connection (i.e., the Class B Bonds that exist in a severe marine environment), and 2) the area where cable shield is exposed to make a shield connection.

These were the focus of a recently completed NSRP Panel Project. Progress was made under the initial panel project in evaluating the performance of class B bond treatments in a salt fog environment. A variety of sealing systems were also evaluated for performance in a salt fog environment as well as for their resistance to a high pressure water stream simulating a deck washdown. Under the second phase, a two level sealing system is being pursued to optimize performance in the challenging topside marine environment. Material evaluations continue in this second phase also with a focus on materials demonstrating resilience with respect to temperature cycling and high and low temperature flexing.

The objective of this initiative is to develop and recommend (for qualification) low cost, high performance sealing methods for EMP protection (with a focus on producibility) with the following benefits expected:

- Improved lifecycle performance
- Reduced system cost
- Simplification of system compared to current methods
- Higher producibility
- Improved material availability

NAVY METALWORKING CENTER

MANTECH CENTER OF EXCELLENCE

For more than 25 years, the Navy Metalworking Center (NMC) has supported the Navy's evolving needs by developing and transitioning innovative metalworking and manufacturing solutions. Currently, NMC's projects are focused on the Navy's mission to reduce total ownership cost and develop solutions that incorporate advanced metalworking, shipyard processes, coatings application and removal, design for manufacturability and advanced metrology and inspection technologies. Since it was established as a ManTech Center of Excellence in 1988, NMC and its government and industry partners have driven advanced manufacturing technologies from research and development to application on Navy and other military weapon systems. NMC is operated by Concurrent Technologies Corporation, an independent, nonprofit organization located in Johnstown, PA.

NAVY SHIPBUILDING AND ADVANCED MANUFACTURING CENTER

MANTECH CENTER OF EXCELLENCE

The Naval Shipbuilding and Advanced Manufacturing Center (NSAM) is a Navy Mantech Center of Excellence, chartered by the Office of Naval Research (ONR) to develop advanced manufacturing technologies and deploy them in U.S. shipyards and other industrial facilities. NSAM's primary goal is to improve manufacturing processes and ultimately reduce the cost and time required to build and repair Navy ships and other weapons platforms. NSAM works closely with the Navy's acquisition community and the defense industry to address manufacturing technology issues that negatively impact efficiency, with respect to both cost and cycle time. NSAM solicits, selects, funds, and manages projects to address these critical and costly issues. The projects are focused on improving construction and repair processes, such as optimizing production practices, increasing the use of robotic manufacturing methods, investigating modular/packaged units, Improving accuracy control, eliminating inefficiencies in material usage, and the using advanced manufacturing tools and technologies across the full range of DoD platforms. NSAM and its predecessor, the Center for Naval Shipbuilding Technology (CNST), have been managed by a small staff that relies on a core group of professionals to provide focused expertise to help identify potential solutions, compare proposed projects with state of the art/industry and validate the technology's return on investment. Looking forward, NSAM will continue to pursue technologies focused on improving the affordability of current Navy acquisition programs. New projects being considered will investigate using modern planning systems, automated fabrication technologies, supply chain improvements, streamlined unit/module flow to and within storage and construction areas, wireless data

management applications, using 3D product models to support production and developing Improved scheduling systems for new, aggressive build strategies.

O-ARMX – OLAD BASED INDUSTRIAL EXOSKELETON

GENERAL INTEREST

The U.S. Navy has issued a research and development contract to BAE Systems for their O-ArmX, which builds on an OLAD exoskeleton and incorporates Equipois' zeroG® arm adapter for use with heavy tools. Made with lightweight, commercial off-the-shelf materials, the O-ArmX is powered by rechargeable 28 volt drill batteries. Use of battery power provides continuous support to the user, even while walking around the shipyard or transferring cumbersome tools to a different workspace.

OLAD minimizes pressure on the wearer's lower back, hips, knees and ankles while improving posture and reducing risk of injury. The system also mimics a user's gait and body movements; supporting equipment weight even in tight, hard-to-reach, confined spaces like those found on dry-docks.

"OLAD is an electromechanical system that offloads equipment burden", said Dr. Adarsh Ayyar, Principal Engineer for BAE Systems. "While using O-ArmX, the wearer feels only a small percentage of the equipment's weight, resulting in decreased body strains."

While the zeroG® arm is not powered, the tool's weight, including the arm, is supported by OLAD and relatively weightless up to 100-pounds, which is more than current requirement.

Through the CTMA program, NCMS is leading the effort to mature and transition exoskeleton technology between the Naval shipyards and suppliers of key components, and has been working closely with Ayyar and his team. Starting in January 2015, O-ArmX will be tested and evaluated for industrial hand-tool applications at the Norfolk Naval Shipyard and Puget Sound Naval Shipyards. These tests will clarify how workers can make the best use of O-ArmX's capabilities and provide the feedback needed to make further enhancements to the system

But Ayyar is looking beyond the shipyard tests in its collaborative efforts with NCMS. "What we are creating is a single base tool that can be used in many applications," Ayyar points out. "NCMS has a broad base and a fundamental focus on commercial markets which is great for O-ArmX," he says. "The exoskeleton in combination with Equipois' zeroG® arm can be used to address multiple problems in commercial and military markets."

Ayyar notes that OLAD is a cutting edge product and while it is still under development, feedback from end-users will provide BAE Systems an opportunity to enhance capabilities and features in the system's design that improve performance and safety. "This is a cooperative process with the Navy, NCMS, Equipois, and BAE Systems, all working in tandem to develop an optimum system," he says.

PENN STATE ELECTRO-OPTICS CENTER

MANTECH CENTER OF EXCELLENCE

Penn State Electro-Optics Center is the premier center for electro-optics manufacturing technology transition serving the US Department of Defense. Penn State EOC reduces acquisition costs of military hardware through improved manufacturing processes, workforce development at all levels, and the introduction of emerging technologies. The EOC has formed a 450+ member alliance of industry, academic and professional organizations, and government resources, called the Electro-Optics Alliance, which helps the EOC to integrate technologies and capabilities to solve electro-optic manufacturing issues.

The Electro-Optics Center is a hybrid between the best components of a university and those of private industry. This relationship allows us access to the university's researchers and scientists, its state-of-the-art facilities and leading edge research. Our staff, comprised primarily of former industry and DoD personnel, exceeds sponsor expectations by combining creative ideas with practical implementation.

At our NSRP booth we will have a demonstration of the Integrated Link Test System, allowing high speed testing of electrical, RF, and optical links in a shipboard environment and export of the test data to a central database.

REDUCING INSPECTION COSTS USING THE LATEST DIGITAL INSPECTION TOOLS

NSRP PANEL PROJECT

This project will perform a side by side study to gather data and provide metrics regarding: completion time, data accuracy, and data processing comparison of two test methods - one legacy and one proposed. Also, two new technologies used to evaluate Dry Film Thickness (DFT) in a typical ballast tank as prescribed in 009-32 will be compared against tools used in the legacy method. The objectives are to quantify efficiencies of each method, quantify the cost savings in inspection time and data transcription, and implement strategy and user guidelines.

ROBUST FUNCTIONAL PAPERLESS PAINT PHASE II, FUTURE STATE IMPLEMENTATION

NSRP PANEL PROJECT

This project will update the existing Robust Functional Paperless paint software system that has been designed to populate the Navy Standard Item 009-32 appendices. The original project's focus was on the User Interface and the functionality for those using the software on the deck plates. This follow-up project will focus on the areas identified in the Future State of Navy Maintenance Painting project by implementing features which take advantage of the paperless technology in the QA process such as: electronic event notification, auto-flagging out of spec conditions, automating Non-Conformance reporting and resolution, providing quality control reports for contractor process improvement, and making as-needed improvements to the data collection and reporting process.

SWAGE PANEL SVR RULE DEVELOPMENT

NSRP RESEARCH ANNOUNCEMENT PROJECT

The goal of all U.S. shipyards as they strive to meet world class standards is to reduce the overall cost of ship design, construction, and life cycle maintenance for all customers. One way to achieve this goal is to continuously research and employ the cost-cutting concepts and practices used in modern ship design and construction across the world. It has been demonstrated that swaged bulkheads weigh less, take less space, and cost less to fabricate than flat stiffened bulkheads. They are formed by pressing light-gage plate in a jig made of nesting pipes to form half-round swages that replace welded stiffeners. The swage geometry can be adjusted to increase rigidity and overall strength.

While swaged bulkheads have progressively become more accepted in non-load-bearing structure on U.S. built commercial ships, their wide spread application in U.S. shipbuilding practice has been slowed by the lack of means for analytically proving the capacities of these configurations in load-bearing situations.

Swaged bulkheads are extensively used by the more advanced shipyards in Korea, Japan and Europe, mostly for non-load bearing internal accommodation bulkheads. Some foreign yards have begun applying swaged bulkheads for load bearing applications as well, realizing significant benefits by using them for all internal bulkheads in the accommodation. While swaged bulkheads have progressively become accepted in non-load bearing locations on U.S. built commercial ships, their wide spread application in U.S. shipbuilding practice has been slowed by the lack of means for analytically proving the capacities of these configurations in load-bearing situations.

In 2005 General Dynamics NASSCO teamed with Herbert Engineering Corp. to investigate the applicability of swaged bulkheads in the superstructure of the T-AKE class of ships being built for the U.S. Navy. Due to the lack of publicly available and reliable data on the suitability of these bulkheads for carrying load, the study limited the extent of the investigation to non-structural accommodation interior bulkheads, and concluded that further analysis is required to assess the potential application of the swaged concept to structural bulkheads.

Following the study's recommendation, and encouraged by the substantial production experience with swaged bulkheads gained during the construction of the PC-1 class of commercial product carriers, in 2010 General Dynamics NASSCO initiated an NSRP Panel Project to validate the ability to obtain analytical results for swaged and stiffened bulkhead configurations subjected to various loads and then compare those results to physical model tests with a goal of developing design information for swaged panels that would help expedite the design and regulatory approval process.

This Panel project was followed in 2011 by a 3 year Research Announcement (Project 2011-459), which provided a body of comprehensive data comparing the calculated and actual strength characteristics of full-size swaged and bulb stiffened bulkheads under in-plane compression load, in-plane lateral load (shear), and out-of-plane pressure load, and develop direct analysis (FEA) and design methodologies for swaged bulkheads as load-carrying structural components. At the close of that project, it was concluded that there is a need to further expand this research, continuing to use large scale physical models and additional swage configurations to develop reliable FEA methodologies for direct analysis of swaged bulkheads, which led to the proposal of this follow-on Research Announcement.

USE OF MOBILE ROBOTICS TO INCREASE WELDER PRODUCTIVITY AND WELD QUALITY

NSRP PANEL PROJECT

One day last November a "COBOT" (i.e. collaborative robot), rang the closing bell at NASDAQ to mark the listing of the first ever robotics industry stock index. This ended a year of significant growth for robots, spurred by new types with more flexibility and adaptability. COBOT's — designed to work alongside humans — are an important part of this trend because they are cost-effective for small to medium size businesses, not just for large businesses. Industrial robots are no longer focused solely on the automotive industry, but are finding jobs in electronics, machining, medicine, food, and shipbuilding

This NSRP project is developing a welding COBOT. It is a mobile robot, able to move around on steel structures using magnetic treads, work in all positions. In addition, this portable system is controlled by a Virtual Reality environment. A skilled welder, wearing the 3D Oculus Rift goggles, controls the robot using a "pendant" welding torch, which is tracked by infrared cameras. The torch on the robot completely duplicates every move that the welder makes with the pendant torch, even though the robot may be several hundred feet away. Using a high speed, ultra-high dynamic range camera, the welder has an even better view of the torch, arc, and weld joint than they would have looking through a standard welding mask.

A skilled welder has a limited lifting capability, while the welding COBOT, can carry a much heavier duty torch which is capable of much higher power levels and can produce welds at up to 4X the speed of manual welding. A digital weld monitoring system provides real-time and post weld quality analysis – and can also provide feedback to a less experienced welder. The resulting improvement in productivity, quality, and weld monitoring/reporting will offer a favorable return on investment for this system, to the shipbuilding industry.

The Virtual Reality Controlled Mobile Welding Robot will be demonstrated and available for attendees to "test drive".

WELDING SIMULATION TOOLS (SEQUENCE OPTIMIZATION)

GENERAL INTEREST

ESI North America is has been in the weld simulation business for over 30 years. Products such as SYSWELD and Weld Planner help shipbuilders around the world determine how to coalesce joints while improving material strength and minimizing weld induced distortion. This paper will provide insight into the weld sequence optimization process.

Shipbuilding has been scientific art form managed by shop floor “grey beards” since the earliest boats on record hit the rivers in Egypt during the 4th century. With the shipyard work force demographics in the US dominated at the extremes – very experienced, retirement-age engineers at one end and inexperienced, new to welding at the other end, there has been a need for ease-of-use, numerically driven tool that can assist in improving the decision making of weld sequencing on the shop floor to minimize rework.

ESI NA has developed a demonstrator that can be used today to help in optimizing weld sequences to reduce distortion and rework. It is not the final answer to weld solutions, but a great start. With additional funding and support, the process can be quickly moved into a wizard-driven interface that can be utilized by shop floor engineers. Feedback at the presentation and at the exhibit area is welcome.

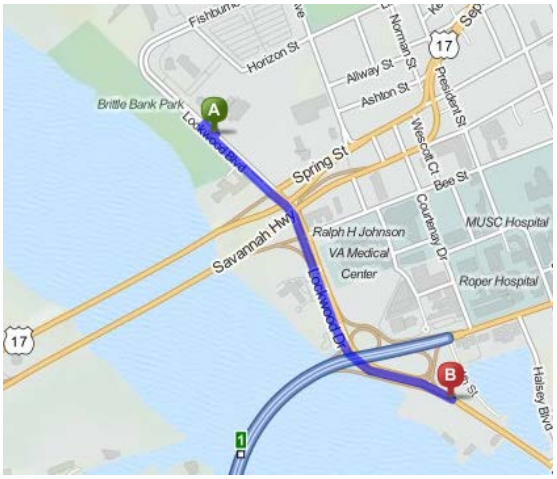
NSRP | National Shipbuilding Research Program

2015 All Panel Meeting

Tuesday, March 10, 2015

Networking Social – The Rice Mill

Location	The Rice Mill 17 Lockwood Drive Charleston, SC 29401
Time	6:30 PM – 8:30 PM
Parking	Parking is available on-site and is provided by NSRP. To ensure you are not charged for parking, you will need to collect a parking voucher from The Rice Mill prior to leaving the venue.
Menu	Heavy Southern Hors D'Oeuvres. Cash Bar *(Please note that **only cash is accepted**, no credit or debit cards.)*
Directions from the Hotel	• Head southwest toward Lockwood Drive • Turn left at the first cross street onto Lockwood Drive • Turn right • Destination will be on the right, next to the right of the marina



NSRP | National Shipbuilding Research Program

Charleston Restaurants



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RESTAURANTS ARE LISTED BY DISTANCE FROM THE CHARLESTON MARRIOTT.

AQUA TERRACE ROOF-TOP BAR

AMERICAN CUISINE

If watching the sun set over Charleston, SC while dining on delicious American fare appeals to you, then you'll love Aqua Terrace. Our rooftop restaurant and bar features creative cocktails and cuisine. It's a great place to gather with friends.

Serves dinner.

LOCATED AT THE HOTEL

SAFFIRE RESTAURANT & BAR

ECLECTIC CUISINE

No need to search along the Charleston waterfront for a memorable dining experience - just step into Saffire Restaurant & Bar, right here in the hotel. Sample eclectic cuisine, complemented by a glass of wine from our extensive collection.

Serves breakfast, lunch, and dinner.

LOCATED AT THE HOTEL

BON BANH MI

VIETNAMESE SANDWICH BAR

We are on a mission to give you a well prepared, thoughtful sandwich. One with the power to single-handedly change the way you think of sandwiches. A sandwich with so much history -- one bite, and you are darn near transported.

Serves lunch and dinner.

LOCATED AT 162 SPRING STREET – 0.6 MILES

HOMINY GRILL

LOWCOUNTRY CUISINE

Located in a Historic Charleston single house, Hominy Grill feels as though it has been open for generations, in fact this landmark has only been dishing up its simple, clean fare since 1996. Combining the traditions of the past with the bounty of land and sea, James Beard Award winning chef/owner Robert Stehling lets the Lowcountry's unique cultural history and flavors guide his cooking.

Serves breakfast, lunch, and dinner.

LOCATED AT 207 RUTLEDGE AVENUE – 1.0 MILES

FIVE LOAVES CAFÉ

SANDWICHES

Five Loaves Cafe is a chef driven concept with a focus on healthy, fresh, and vegetarian friendly foods, as well as being sensitive of gluten free diets and allergies. We are proud to say that all of our chicken is free range, all natural from Tanglewood farms. We use hormone free angus beef, and we partner with local suppliers of pasta, vegetables, nuts and breads to support our community. We strive to accommodate all diets and have a vegetarian friendly menu.

Serves lunch and dinner.

LOCATED AT 43 CANNON STREET – 1.2 MILES

OCTOBACHI

ASIAN GASTROPUB

Tiny eatery with cozy seating & live music offering imaginative rolls & Asian-fusion dishes.

Serves lunch and dinner.

LOCATED AT 119 SPRING STREET – 1.2 MILES

TRATTORIA LUCCA

ITALIAN CUISINE

Tucked away in a quiet corner of downtown Charleston's Elliotsborough neighborhood lies chef Ken Vedrinski's charming Italian eatery, Trattoria Lucca. Inspired by the ancient Tuscan city of Lucca, a place renowned for its olive oils, Trattoria Lucca brings the essence of Italian cuisine to the Lowcountry. Vedrinski changes the dinner menu nightly depending on what the local ingredients inspire him to create that night, or what fresh catch the local fishmonger brings to his doorstep directly from the boat, such as seasonal triggerfish or black bass. The menu features Italian imported cheese and salami, handmade pastas as well as the freshest produce and fresh seafood from the waters surrounding Charleston. At Lucca, one can expect innovative, delicate food that will have you longing for more days after the dining experience.

Serves dinner.

LOCATED AT 41 BOGARD STREET – 1.2 MILES

XIAO BAO BISCUIT

ASIAN CUISINE

Xiao Bao Biscuit - Asian Soul Food - Select dishes from China, Korea, Japan, Taiwan, Thailand and Vietnam prepared locally & inspired by awesome grandmothers everywhere. Menu changes seasonally, with rotating daily specials and family style dinners.

Serves lunch and dinner.

LOCATED AT 224 RUTLEDGE AVENUE – 1.2 MILES

CHEZ NOUS

ELEVATED FRENCH CUISINE

Chez Nous is a small neighborhood restaurant which focuses exclusively on Southern French, Northern Italian and Northern Spanish cuisine. The menu consists of 2-3 apps, 2-3 entrees and 2 desserts and it changes daily. We serve lunch and dinner.

Serves lunch and dinner.

LOCATED AT 6 PAYNE COURT – 1.3 MILES

FUEL CHARLESTON

CARIBBEAN-INFLUENCED CUISINE

FUEL Charleston serves Caribbean influenced cuisine of local fish tacos, house ground burgers, and intriguing, island-influenced entrees. FUEL uses fresh and simple ingredients accompanied by affordable beers, signature cocktails, and unique wines. You won't find items on the menu you can't pronounce, nor will you find ways of cooking that defy the laws of science. Fuel has a tropical setting housed in an old gas station with an indoor/outdoor bar and one of Charleston's largest patios. The ambience strikes a wonderful balance between relaxation and nostalgia. But the best part is the food, which tastes great every time you visit.

Serves lunch and dinner.

LOCATED AT 211 RUTLEDGE AVENUE – 1.3 MILES

LANA RESTAURANT

MEDITERRANEAN CUISINE

Mediterranean flavors are explored through the lens of Southern cooking in a charming setting.

Serves lunch and dinner.

LOCATED AT 210 RUTLEDGE AVENUE – 1.3 MILES

TWO BOROUGHS LARDER

ELEVATED AMERICAN CUISINE

Two Boroughs Larder opened in August of 2011 and is a charming, locally-owned restaurant in Downtown Charleston. Featuring dynamic, seasonal American cuisine and a carefully-curated list of wines and regional beers, The Larder is true to its name offering specialty pantry items and tableware on its shelves.

Cannonborough + Elliotborough: originally two separate boroughs but now considered one, this neighborhood is home to a diverse mix of young professionals, college students and professors, families and artists.

Larder: a cool area for storing food prior to use.

Serves lunch and dinner.

LOCATED AT 186 COMING STREET – 1.4 MILES

BUTCHER & BEE

SANDWICHES

At Butcher & Bee, we lovingly craft sandwiches using time-honored preparation techniques. We source the finest local ingredients the region has to offer, our ever-changing menu is both adventurous and familiar.

Serves lunch.

LOCATED AT 654 KING STREET – 1.5 MILES

CALIFORNIA DREAMING

AMERICAN CUISINE

Voted Best Salad, 12 years running. The Honey Croissants are a must!

Serves lunch and dinner.

LOCATED AT 1 ASHLEY POINT DRIVE – 1.5 MILES

BARSA

SPANISH CUISINE

We are a Spanish tapas restaurant located on Upper King Street [the corner of King and Line Streets]. We serve everything from small plates to paellas perfect for any size group. We have plenty of free parking, a courtyard for dining and cocktails, and have become a destination spot for those seeking fine wine and a locally sourced and seasonally inspired menu.

Serves lunch and dinner.

LOCATED AT 630 KING STREET – 1.6 MILES

MELLOW MUSHROOM

PIZZA

Mellow Mushroom is proud to serve Charleston with delicious pizza, hoagies, calzones and salads. Providing quality food since 1974, we use fresh ingredients on all our menu items. Mellow Mushroom is more than just a pizza restaurant; it is where Charleston pizza lovers and beer lovers gather. Our menu and locations are as eclectic as our fans. Join the beer club, shop our Mellow shirts and see the unique artwork in each of our locations. The search for the best pizza in Charleston is over.

Serves lunch and dinner.

LOCATED AT 309 KING STREET – 1.9 MILES

VIRGINIA'S ON KING

SOUTHERN CUISINE

Classic Charleston influenced interior and home cooking aromas inspire the ambiance of this local favorite. At the heart of Virginia's you will find gracious southern hospitality and comfort foods that make you feel right at home.

Serves breakfast, lunch, and dinner.

LOCATED AT 412 KING STREET – 1.9 MILES

COAST BAR AND GRILL

SEAFOOD

COAST's chefs meet daily with local farmers and fishermen to procure the freshest seafood and produce in the Lowcountry. At the heart of the restaurant is the hickory and oak custom made wood burning grill, a feature you will only find at COAST. Served nightly, this diverse menu incorporates Charleston Classics with our chefs' unique creations. Local favorites include the selection of wood-grilled fresh fish, Seared Rare Tuna, Fish Tacos and the full raw bar.

Serves dinner.

LOCATED AT 39 JOHN STREET – 2.0 MILES

GAULART & MALICLET FAST & FRENCH

FRENCH CUISINE

Gaulart & Maliclet French Café opened its door during the summer of 1984 in Charleston, SC by artists Gwylene Gallimard & Jean-Marie Mauclet.

Our mission is to provide fresh, affordable, healthy, global cuisine with French flair in a social environment that encourages community, transparency and the Arts.

Serves breakfast, lunch, and dinner.

LOCATED AT 98 BROAD STREET – 2.0 MILES

MICHAEL'S ON THE ALLEY

STEAKHOUSE

Tucked away, off of Historic King Street, sits Michael's on the Alley. Providing Charleston's ultimate dining experience, we pride ourselves in serving only the highest quality cuts of steaks. Michael's features USDA Prime Angus and Choice steaks that are wet or dry-aged to your specific desire. Our flavor means business, whether from land or sea we provide an authentic, classic dining experience for everyone. At Michael's we do things the right way, serving up luscious steaks cooked to order with a side of that famous Charleston hospitality.

Serves dinner.

LOCATED AT 39 JOHN STREET – 2.0 MILES

VINCENT CHICCO'S

ITALIAN CUISINE

Boasting with chic comfortable surroundings and offering dinner nightly, Vincent Chicco's delivers good old-fashioned Italian-American cuisine, presenting authentic ingredients, handmade pastas, rich homemade sauces, delectable desserts and a full-service bar. Allow yourself to step back into the luxurious time of the past and enjoy the classic, wholesome flavors that were founded in our country.

Serves dinner.

LOCATED AT 39-G JOHN STREET – 2.0 MILES

POOGAN'S PORCH

SOUTHERN CUISINE

Since opening in 1976, Poogan's Porch has been a favorite of well-known celebrities, politicians, tourists and locals alike who rave about this Southern institution. Whether it's a warm homemade buttermilk biscuit and sausage gravy for brunch, a bowl of she-crab soup for lunch, or our signature buttermilk fried chicken for dinner, your meal at Poogan's will be unforgettable. A state-of-the-art, 1500-bottle wine cellar and over 28 wines offered by the glass will be a perfect complement to any meal.

Serves lunch and dinner.

LOCATED AT 72 QUEEN STREET – 2.2 MILES

CRU CAFÉ

ELEVATED AMERICAN CUISINE

Cru Café is Charleston's home to some of the best gourmet comfort food in the Lowcountry. Cru Café is the culinary creation of renowned Le Cordon Bleu graduate, Chef John Zucker. Opened in 2002 in response to overwhelming demand, Cru Café is a culinary destination off the beaten path in in a classic 18th century Charleston single-style home. Cru Café and its award-winning Cru Catering division are consistently ranked as top eateries by locals and tourists alike.

From our famous Four Cheese Macaroni to our tasty Thai Seafood Risotto, we feature something for everyone. And if you're in the mood for lighter fare, try our Chinese Chicken Salad or Duck Confit Salad. Guests of the restaurant can enjoy daily specials, indoor and outdoor porch seating, a wine list tailored to the varied menu and rich, mouthwatering desserts. We invite to stop in and enjoy a delicious meal with us today.

Serves lunch and dinner.

LOCATED AT 18 PINCKNEY STREET – 2.5 MILES

MAGNOLIA'S

SOUTHERN CUISINE

In 1990, Magnolias ignited a culinary renaissance when it opened in Charleston, S.C., paving the way for countless other restaurants across the South. Today, led by executive chef Donald Drake and his team, Magnolias remains a forerunner in upscale Southern cuisine, blending traditional ingredients and cooking techniques with modern flair for artful presentations.

Serves lunch and dinner.

LOCATED AT 185 EAST BAY STREET – 2.5 MILES

JESTINE'S KITCHEN

SOUTHERN CUISINE

Jestine's Kitchen is named in honor of Jestine Matthews, who was born in the Low country in 1885. Her mother was a Native American, and her father was the son of a freed slave who was farming land on Rosebank Plantation on Wadmalaw Island. "I don't know if I was born there" she says, "but when I first know myself, that's where I was living." Soon after the turn of the century, Jestine moved to Charleston, where she found work as a laundress and later as a house- keeper. In 1928, she went to work for Aleck Ellison and his wife, who were then expecting a baby. It was the start of a lifelong friendship between Jestine and the Ellison family. Dana Berlin, the owner of Jestine's Kitchen, is the daughter of the Ellison's' only child, Shera Lee Berlin, and this restaurant is her way of sharing the wonderful style of home cooking and the warm atmosphere that Jestine provided for generations of friends and family. Jestine died at the age of 112 on December 18, 1997, but her legend lives on. We invite you to share a meal that could have come from her kitchen-traditional veggies, seafood and fried chicken – and raise a glass of Jestine's table wine in a toast to her memory.

Serves lunch and dinner.

LOCATED AT 251 MEETING STREET – 2.6 MILES

TATTOOED MOOSE

PUB CUISINE

It all started with Jen's illustrious college career! Every day, her and her friend Steve would meet at a little Pub with great beer and delicious sandwiches. It had a big Moose on the wall, which always seemed friendly and happy to see her. Some days the Moose would beg her not to go to class and to stay with him and drink just one more beer. (Ok, maybe 5 or 10 more beers) One day, Jen pulled up into the parking lot and saw nothing but firemen and fire trucks, as far as the eye can see. "What tragedy was this?" she panicked, fearing the worst. She was right - her precious pub had burned to the ground! She sadly hung her head, weary with sadness, and never was to return to campus again.

Although Jen's college education was never going to come to fruition, she spent the rest of her life on her quest to make the perfect, cozy pub to drink her beloved, delicious beers in. Bartending one night, she met the other half of the equation. Mike came along with his Duck Club Sandwiches, his smoked brisket and a light bulb went off in Jen's head. "If I marry this guy I can have his duck and eat it too!" The Tattooed Moose was born and the rest is history!

Serves lunch and dinner.

LOCATED AT 1137 MORRISON DRIVE – 2.9 MILES


NAVSEA
NAVAL SEA SYSTEMS COMMAND
TEAM
SHIPS
Program Executive Office
Aircraft Carriers
TEAM SUBMARINE
PEO
IWS
PEO L
SCRA
Applied R&D