NSRP Ship Design & Material Tech (SDMT) Newsletter

NSRP' S MISSION

NSRP's mission is centered around reducing the total ownership cost of ships, the key to the program is its collaborative framework.

NSRP manages and distributes national shipbuilding and ship repair research & development funding on technologies and processes that:

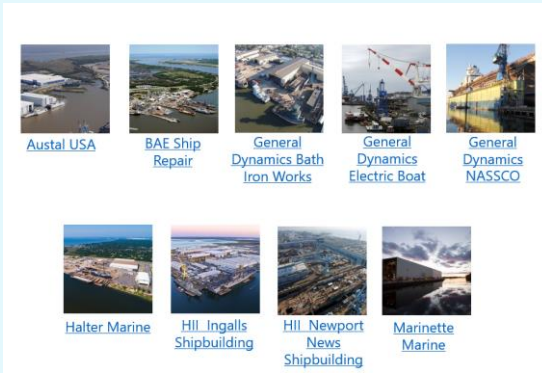
- Reduce the total ownership cost of ships for the U.S. Navy, other national security customers and the commercial sector.
- Develop and leverage best commercial and naval practices to improve the efficiency of the U.S. shipbuilding and ship repair industry.

NSRP provides a collaborative framework to improve shipbuilding-related technical and business processes. It currently has 9 member shipyard.

NSRP allows competitors to partner on common shipbuilding and ship repair problems to benefit the industry and their clients as a whole.

NSRP' S NAVSEA SPONSORS

NSRP MEMBER SHIPYARDS



- Austal USA
- BAE Ship Repair
- General Dynamics Bath Iron Works
- General Dynamics Electric Boat
- General Dynamics NASSCO
- HII – Ingalls Shipbuilding
- Marinette Marine
- HII – Newport News Shipbuilding
- Halter Marine

SDMT PANEL LEADERSHIP

SDMT Team Lead: **Dan Sfiligoi** (NASSCO) SDMT Team Lead: **Michael Gerardi** (BIW)	SDMT Panel Chair: **Monika Skowronska** (NASSCO) SDMT Vice Chair: **Victoria Dlugokecki** (Naval Consultant)	Project Manager: **Nick Laney** (ATI) Panel Coordinator: **Lydia Szydlo** (ATI)

2022 RESTRUCTURING OF PANELS

Extended Team

Major Initiatives

Ship Design & Material Technologies	Ship Production Technologies	Business Processes & Information Technologies	Infrastructure & Support

Panels

Ship Design & Material Technologies	Electrical Technologies	Business Technologies	Environmental, Health & Safety
Ship Warfare Systems Integration	Planning, Production Processes & Facilities	Digital Shipbuilding Committee	Workforce Development
	Surface Preparation & Coatings		
	Welding Technology		

Extended Team

Major Initiatives

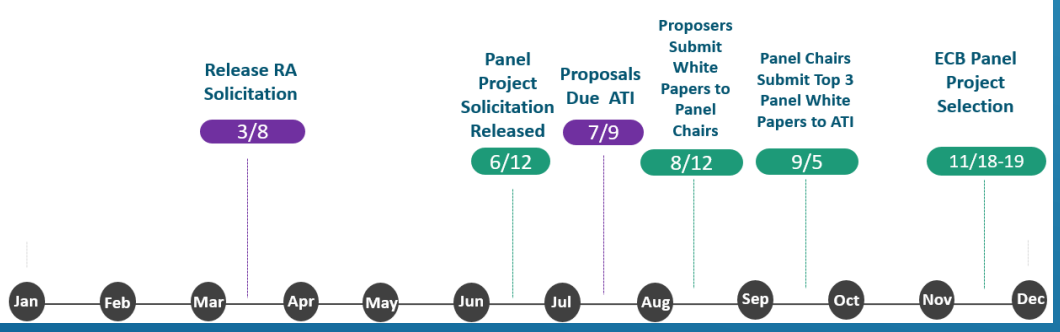
Ship Design & Material Technologies	Ship Production Technologies	Infrastructure, Logistics, & Sustainment

Panels

Ship Design & Material Technologies	Electrical Technologies	Workforce (Combined Former WFD and EH&S Panels)
Ship Warfare Systems Integration	Planning, Production Processes & Facilities	Sustainment
Business Technologies	Surface Preparation & Coatings	
	Welding Technology	

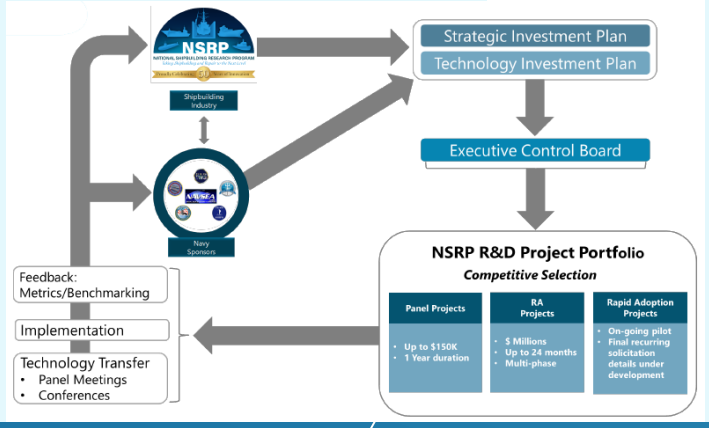
TYPICAL SOLICITATION CYCLE TIMELINE
(DATES SUBJECT TO CHANGE)

Solicitation Cycle



NSRP PROJECT SELECTION PROCESS

Technical/Strategic Investment Plan identifies high priority issues and current industry challenges where research proposals would be of particular interest to the program. The reports are great resources for project proposers.



UPCOMING NSRP EVENTS

Best way to learn about NSRP and to get involved is to attend an event!

All Panel NSRP Meeting 2023

- March 27th - 31st 2023 - In Person
- Charleston Convention Center, SC

JOINT SDMT AND BT PANEL MEETING IN HAWAII AUG/SEPT

SDMT + BT PANEL LEADERSHIP

71 ATTENDEES TOTAL (44 IN PERSON + 27 VIRTUAL): 2 FULL DAYS + 1 HALF DAY

Meeting Focus: Digitalization of Shipbuilding

Address: Foreign Trade Zone Homer A Maxey Conference, 521 Ala Moana Blvd, Honolulu, HI 96813

Objectives:

- Presentations and discussion on shipyard digitization and updates from ongoing projects
- Collaboration with Pearl Harbor Shipyard and Innovate Hawaii
- Tour of Pacific Shipyard International

PARTICIPATION AND ENGAGEMENT

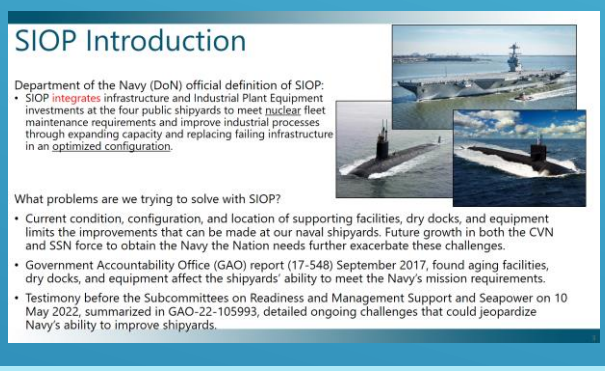
71 Attendees included:

- NSRP Shipyards: NASSCO, Ingalls, Newport News, BIW, Electric Boat, Austal, Marinette
- NAVY: NAVSEA Carderock, Pearl Harbor SY, ONR, NAVSEA Naval Undersea Warfare Center Division Keyport, NSWCPD Philadelphia PA, Tech Bridge
- Other Yards: Pacific Shipyard and Philadelphia Shipyard
- Local Companies: Makai, Innovate Hawaii, Ship Repair Association of Hawaii, Epsilon Systems
- Classification Societies: American Bureau of Shipping
- Industry: Siemens, Genoa, SSI, Viega, ATI, Auros, TruQC, Wartsila Defense, Malone Consulting, Gibbs & Cox
- Academia: Carnegie Mellon University and University of Maryland

27 Presentations included:

- Pearl Harbor presented on their 3D Scanning work, their Innovation Program, and provided a virtual tour of iLab
- Navy's Shipyard Infrastructure Optimization Program (SIOP) update from Brian Kupczyk, Project Manager
- Navy's Tech Bridge, Meal Miyake and Kaipo Crowell
- Paul Huang from ONR presented on "Digital Transformation in Manufacturing and How Standards could be Leveraged"
- ABS presented on "Classification Role in Supporting the Life Cycle Digital Twin"
- ManTech Presentation on "Dynamic Rules based Material Process"
- 7x NSRP Project updates and many more!
- For ALL presentations see NSRP.org website
- Coming soon recordings to be posted on our YouTube channel!

TOUR OF PACIFIC SHIPYARD INTERNATIONAL + BOAT RIDE ON THEIR 3 POROTYPE BOATS



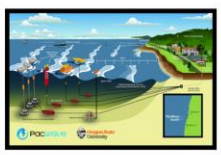
2 FULL DAYS AND 1 HALF DAY: 27 PRESENTATIONS TOTAL, 24 TECHNICAL PRESENTATIONS

Received positive feedback! Great discussions following each presentation, lots of engagement form audience. Looking at 2024 for a follow on panel meeting to tour PHNSY's iLAB.

IDEAS FOR FUTURE SDMT TOURS

Where should we meet in 2023?

- Washington State
  - Keyport, WA- NAVSEA Warfare Center
  - Theme: Unmanned Underwater Marine Vehicles
- Block Island, Rode Island
  - Theme: Off Shore Wind Power
- Vigor Shipyard Tour- Portland
  - Autonomous Vehicles – SeaHunter
  - DOE funded Buoy 35- US Navy's Wave Energy Test Site
- Tennessee- Oakridge National Lab tour
  - 3D Printing – Manufacturing Demonstration Facility
  - Transportation Research Center- Marine Engines
- San Diego
  - Autonomous Ship Tour: Sea Hunter- in Point Loma
  - Theme: Unmanned Surface Marine Vehicles
- Seaspan Tour - Vancouver
  - Shipyard tour
- Alaska- Ketchikan or Seward
  - Vigor Yard Tour
  - NOAA Icebreaker
- Contact Monika with theme and tour ideas



DON'T FORGET TO FOLLOW NSRP ON LINKEDIN!

PANEL PROJECT DOWN SELECT - SDMT TOP 4 PROJECTS

- September 13th Project Pitch Meeting: opportunity to brief project to voting member
- Vote breakdown: 8/10 NSRP Shipyards Voted, 10 Industry Votes, 3 Navy Votes
- Top 3 projects selected plus 1 Joint Project with Sustainment Panel (Meld Tie Downs)
- ECB Panel Project Selection Meeting to take place the week of November 14th

Using MELD to Additively Manufacture Flight Deck Tie Downs

Project Lead Organization: Hepburn and Sons LLC
Project Team Members: Ingalls Shipbuilding, MELD Manufacturing, NSWCs Carderock and Philadelphia

Concept/Idea

Issue: Current flight deck tie downs are expensive and have long lead times.

Proposed Solution(s): Use MELD's additive friction stir deposition (AFSD) technology to additively manufacture (AM) the tie downs and test them to ensure they match the performance of conventionally manufactured tie downs. It is proposed to print a universal tie down that can easily be adapted with the addition of a collar that matches the ship deck material structure. An advantage of the AFSD process is its ability to print different metals together.

Benefits/Justification

Benefits of the project

- Maintain the geometry and function of current tie downs while reducing cost and schedule for the Navy and shipbuilders/ship repair facilities
- Provide the shipbuilders or repair yards the ability to print tie downs on site thus reducing acquisition costs and long (6-20 week plus) lead times
- Aligns to NAVSEA mission to implement AM in effective and efficient areas of shipbuilding
- Estimated ROI of 59% ($6.89M) in savings over five years

Project Approach

High level statement of work

- Use shipyard-provided sample tie downs and specification guidance to create the slicer model design for the AFSD machine
- Print tie downs for Aluminum and Steel flight decks
- Conduct pull tests and complete Test Report

Metric(s) of Success

- The AFSD AM printed tie down passes the pull testing
- ROI estimate is verified

Cost/Images/Relevant Information

Project Estimated Cost: $149,985 (6-month POP)

3D Printing of Supply Sensitive Parts

Project Lead Organization: General Dynamics NASSCO
Project Team members: Justin R Rettaliata, Additive Manufacturing Tech Warrant Holder
Whitney Joes, Director of Submarine Industrial Base and Adam Sprecace, General Dynamics Electric Boat

Concept/Idea

Issue: Navy is concerned with supply chain for the Submarine parts and wants to explore other manufacturing processes like AM to speed up production quantity and yield, as stated in NAVSEA-NSRP Gap list item #24.

Proposed Solution(s): The goal is to conduct research into COLUMBIA and VIRGINIA parts which currently are not sufficiently meeting NAVY's production yield requirements. The objective is to evaluate and recommend part candidates which are best suited for the AM process. This will be achieved through partnering with an AM software company. Further research will be done to find commonalities and AM printers will be proposed which apply to broadest number of parts.

Benefits/Justification

Benefits of the project

- The main benefit of this project is to provide an alternate manufacturing process for the COLUMBIA and VIRGINIA parts in order to meet submarine production quality and yield requirement.
- The printers will be evaluated for placement in the Subtender workshops to expand on the current capabilities

Project Approach

High level statement of work

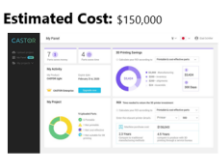
- Phase 1: Compile part list, identify part candidates and define acceptance criteria matrix for analyzed parts.
- Phase 2: Download software and configure for NSRP study, validate software.
- Phase 3: Analyze database of selected parts, review analysis results against acceptance criteria, document software configuration and utilization procedures.

Metrics of Success

- Software chosen to evaluate parts for 3D printing also contains cost analysis module which will be used to evaluate cost benefit of manufacturing each part.
- Created inventory of part candidates suitable for alternate manufacturing methods provides the Navy with a solution to current problem of not meeting production quantity and yield requirements.

Cost/Images/Relevant Information

- **Project Estimated Cost:** $150,000



Next Generation Design Review: Deeper Analysis with Zero Travel

Project Lead Organization: SSIUSA
Project Team members: Fincantieri Marinette Marine, ShipSpace, D'Angelo Technologies

Concept/Idea

Issue:
Since the COVID pandemic, many if not all went from face-to-face, which offers much to communications, to video conferences. Interaction between people was limited even through video conferences. Additionally, design reviews using the model are not new; however, they rely upon a single individual navigating for all

Proposed Solution(s):
Integrate the existing and in use throughout the world virtual reality software "ShipSpace" with the 3D ShipConstructor model to provide an individual personal perspective on a collaborative design model review where communications is instantaneous benefiting real-time decision making. Further, this same environment can be used for safety training and other shipyard training and learning activities.

Benefits/Justification

Benefits of the project

- The benefits are cost savings and time on many levels. ShipSpace allows stakeholders to enter the 3D virtual model and collaboratively communicate amongst others in the session instantaneously, as if in the real world. They can have private discussions within the model and not rely on another person "driving" the meeting.
- ShipSpace allows efficient design review notes / action items. Stakeholders will not have to wait for screen shots to be e-mailed, reviewed, comments returned, responses compiled, and sent to all via e-mail only to restart the review, comment, and response cycle again for the next design review.
- Reduces model review cycle time by having stakeholders "inside" the 3D virtual model with the ability to navigate the model independently from others also inside, a life like experience.
- ShipSpace can accommodate 64 independent users with reviews occurring anywhere a stout internet connection exists and anytime there is a need

Project Approach

High level Statement of Work

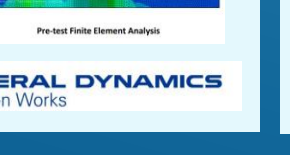
- Provide a method for efficient data exchange between the 3D model and ShipSpace
- Highlight the vast capabilities of a fully collaborative virtual reality software
- Set-up the ShipSpace system and train the team on ShipSpace
- Explore additional use cases to support owner training, shipyard safety to name a few

Metric(s) of Success (ROI)

- Shipyards successfully standing up the ShipSpace system through IT departments
- Successful demonstrations of Design Review and other shipyard engineering, production and operational use cases
- Shipyards implementing ShipSpace

Cost/Images/Relevant Information

https://stirlinglabs.com/xspace/
https://vimeo.com/232049031



BLÜCHER STAINLESS STEEL, PUSH-FIT DRAINAGE SYSTEM

Project Lead Organization: Watts Water Technologies/Blücher
Project Team members: Fincantieri Marinette Marine

Concept/Idea

Issue: Most shipbuilders use welded steel for drainage systems – this is labor intensive, heavy, poses safety issues (hot work and weight) and high maintenance.

Proposed Solution(s): Blücher offers a thin-wall, stainless-steel, push-fit drainage system that is already used in commercial and Navy vessels around the world. Shock and vibration testing is required to qualify it for use on Navy combat vessels – it is already used on support vessels (the entire EPF program at Austal).

A Navy project is required to 1) Get input from shipyards and NAVSEA to ensure test set-up is appropriate, 2) Allow the test lab to acquire the appropriate, Navy approved explosives.

Benefits/Justification

Benefits of the project

- Reduced total cost of ownership (3D design, major labor savings, reduced weight = performance, corrosion resistance = reduced maintenance)
- Improved safety, wellness and environmental stewardship (no hot work, non-welded A60 fire-rated penetrations, lightweight to reduce injuries, increased bacterial resistance)
- Labor factors (very little training required versus welding, low-cost labor can be used)

Project Approach

Shock and Vibration Testing

- Final test method agreement – Blücher, FMM, NAVSEA
- Testing complete – Hi-test
- Train FMM on Blücher system to implement on FFG(x)

Metric(s) of Success

- Successful shock and vibration testing
- FMM metrics can validate labor, weight, safety and performance savings

Cost/Images/Relevant Information

- **Project Estimated Cost:** $150,000 + (Watts will cover all additional costs).

CURRENT SDMT PANEL PROJECT

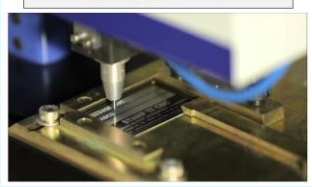
Automated Label Plate Generation

Project Lead: Erik Bjorkner, SSI

The goal is to develop a process to reuse existing data already contained within the 3D design model for label plates. This project will provide a process for passing digital data in a usable format label plate data directly to the supplier through purchasing, provide the label pate digital information to planning, QA, and production, and can be used to develop the Label Plate drawing.

Reusing the digital data from the 3D Model to the Label Plate Manufacturer / Supplier

Dry Stores
2 – 10 – 1 – A



AUSTAL · CONRAD SHIPYARD · FINCANTIERI MARINETTE MARINE

RECENTLY AWARDED PANEL PROJECT

Development of an AM Capability for CuNi Seawater Heat Exchangers

Project Lead: Scott Kasen, ElectraWatch
Shipyards: Austal, Newport News
NAVY: NAVSEA 05T, Dr. Justin Rettaliata

The goals is to enable a new generation of high performance, compact seawater heat exchangers through a first-of-its-kind additive manufacturing process of CuNi alloys. The approach uses a new AM modality which relies on the innovative combination of a process referred to as "bound pellet extrusion" and microwave sintering. The use of this new process – which does not rely on intense local melting or a powder bed – overcomes the typical technical challenges of using AM with copper.

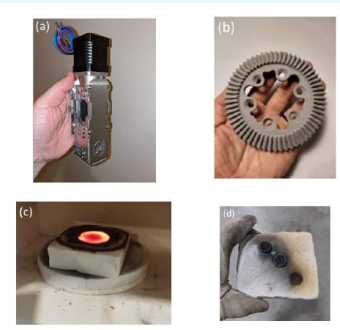


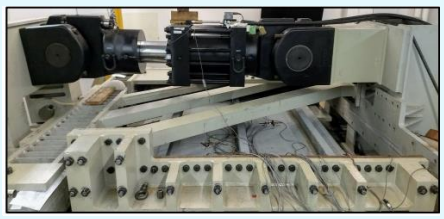
Figure 1. Photographs showing (a) the pellet extrusion print head, (b) a green part produced by M3D's extrusion process, (c) a heated part during microwave sintering, and (d) sintered parts embedded in susceptor material prior to cleaning.

CURRENT NSRP RA PROJECTS

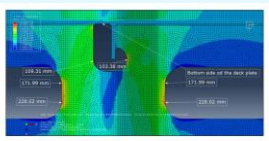
Fatigue Analysis of Swaged Bulkheads

Lead: Jessica Skogberg, NASSCO

This project's overall goal is to demonstrate that swaged bulkheads have fatigue strength equivalent to or better than a structurally equivalent, traditionally stiffened bulkhead.



Instrumentation Plan – Center Swage



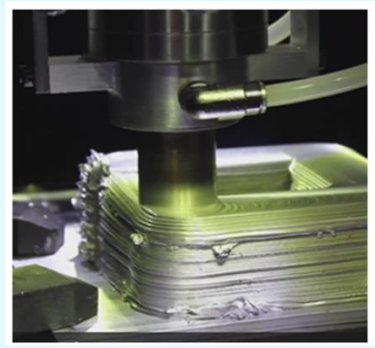
Pre-test Finite Element Analysis

GENERAL DYNAMICS NASSCO · SAN DIEGO STATE UNIVERSITY · GENERAL DYNAMICS Bath Iron Works

Scaling Up of 3D Printed Castings

Lead: Kolby Pearson, NASSCO

U.S. shipyards are looking to implement cost-saving additive manufacturing technologies on a large scale and Classification Society rules are in the beginning stages of being developed to address the design and use of AM on commercial and Navy vessels.



In order for the U.S. Navy to benefit from additive manufacturing, further research is required to determine the feasibility. The goal is to establish a 3D printing process for steel and demonstrate that the material properties of the printed coupons are adequate by NAVSEA standards.