Emil Casciano

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

Chair, NSRP Executive Control Board

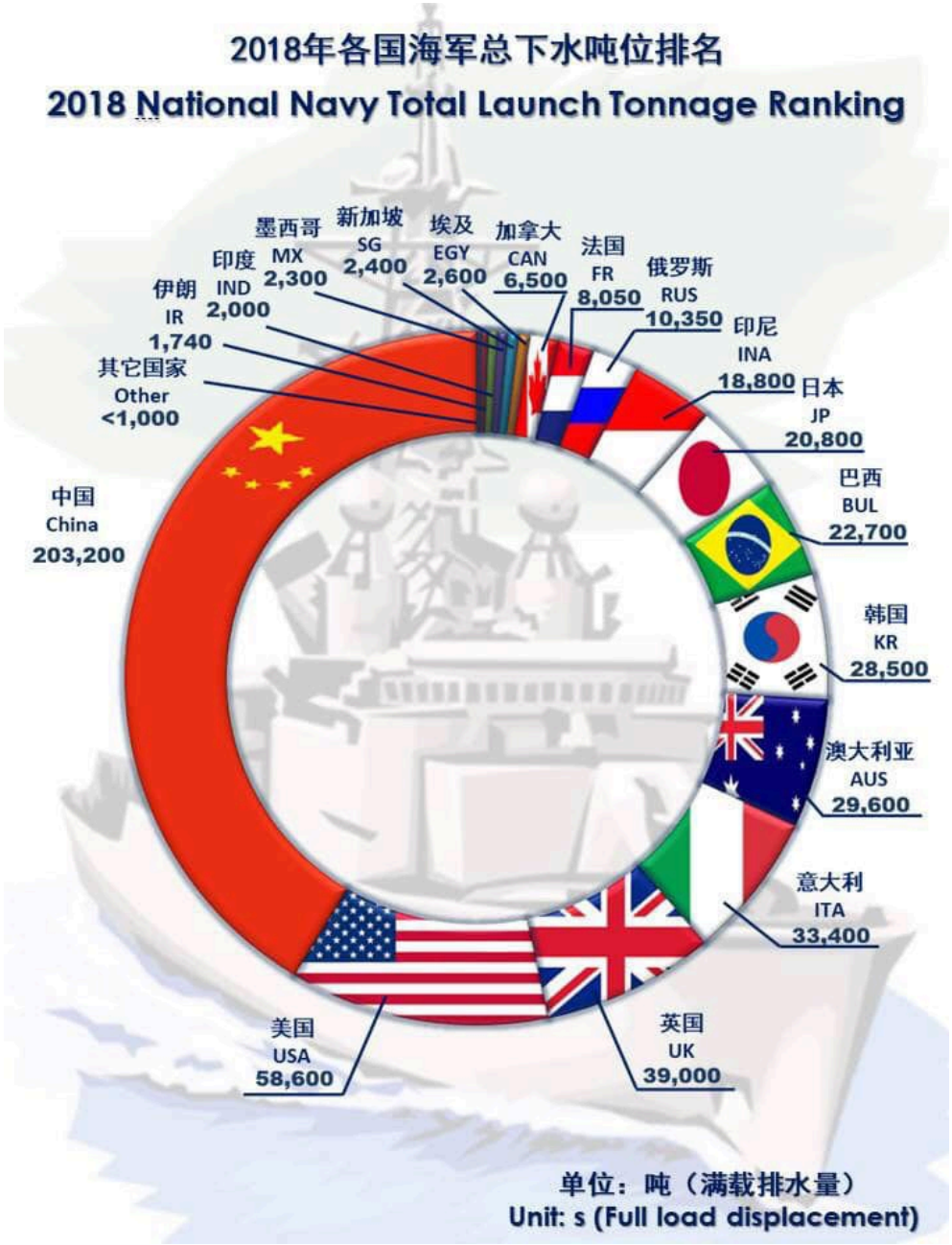
GENERAL DYNAMICS
Electric Boat

VP, Nuclear Operations and Fleet Support

NSRP at the Century Mark-100 years old- 2071

- The first 50 years (1971-2021)
  - Largely peaceful
  - Peace dividend; drawdown and outright loss of organic manufacturing capability
  - Dawn and explosion of free trade
  - IT revolution
  - Skilled manual workforce
- The next 50 years (2021-2071)
  - Geo-political conflicts (Ukraine, South China Sea?, Arctic?)
  - Military build-up (specifically China)
  - Highly-integrated, worldwide, just-in-time supply chains are breaking
  - "Internet of Things"
  - Shortage of industrial workforce with 21st century skills

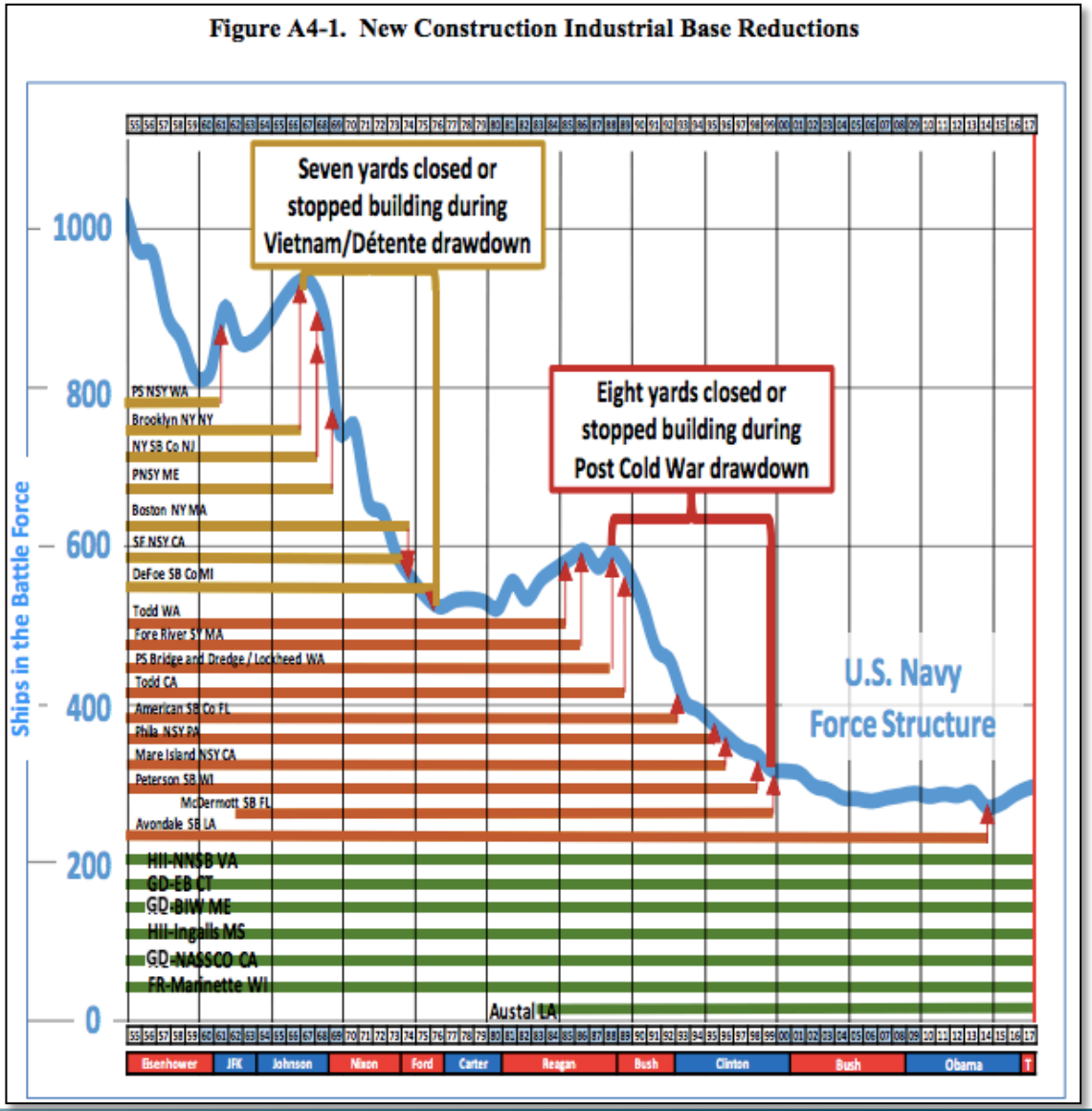
In a Maritime War of Attrition…



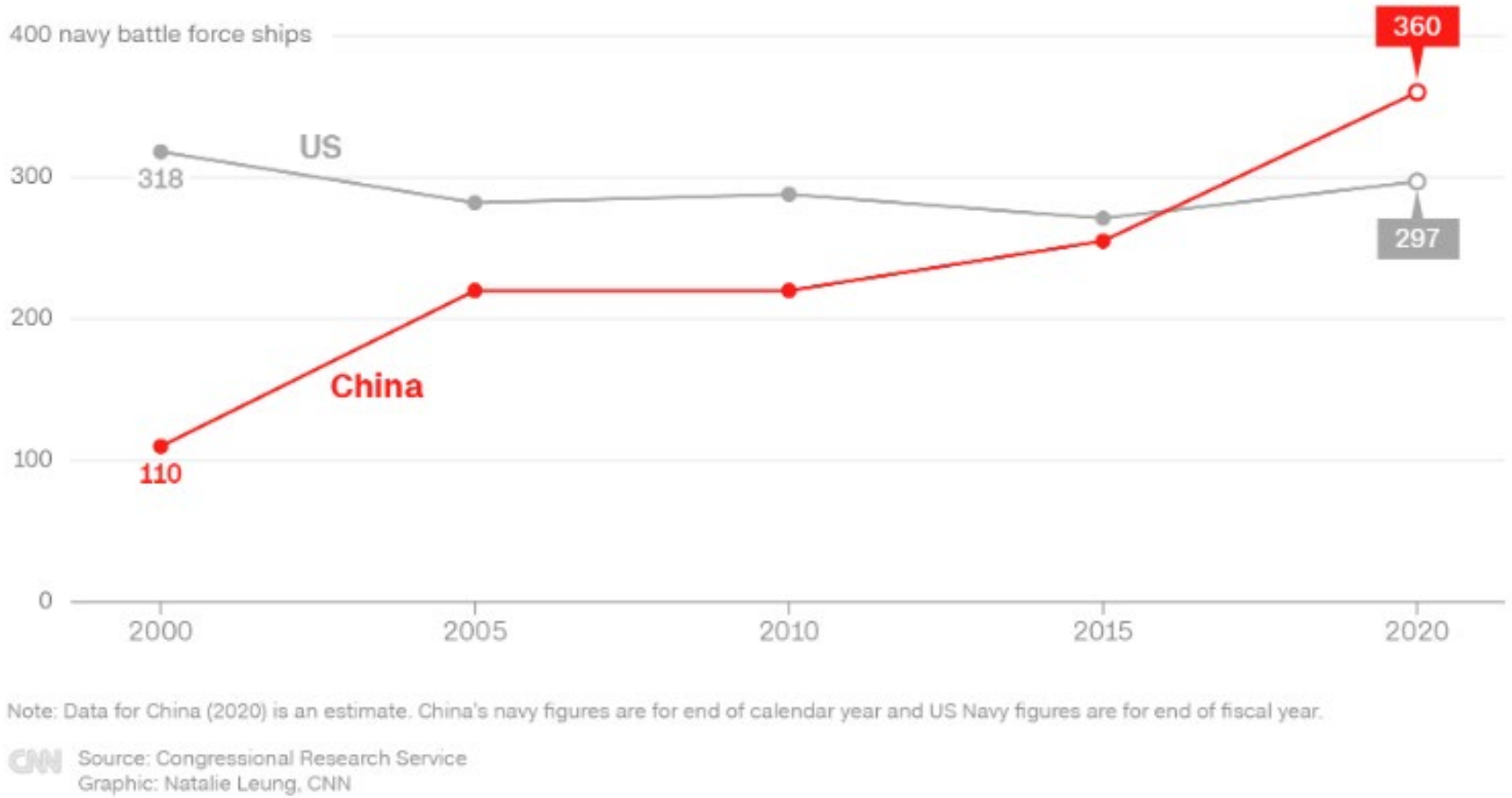
Source: www.quora.com; accessed 20 March 2023

Stagnant U. S. Shipyard Capacity

- Number of shipyard largely unchanged
- Demand signal for new construction and repair will trend up to match a growing fleet size
- Doesn't consider potential battle damage



China’s Naval Fleet Exceeds the US Naval Fleet in Numbers



Source: CNN; [China has built the world's largest navy. Now what's Beijing going to do with it? | CNN](); accessed 20 March 2023

"Speed at the Point of Need

- Establish that ultimate point of need is sailors, Marines, Coast Guardsmen, and merchant mariners potentially or actually in harm's way

- How: these ships must
  - Deploy with most current capability to defeat an ever-changing threat
  - Maintain all other design features
  - Be on station when scheduled

The Nation needs military and commercial ships and boats built and repaired on time (or early), at cost (or below), and with requisite quality and capabilities

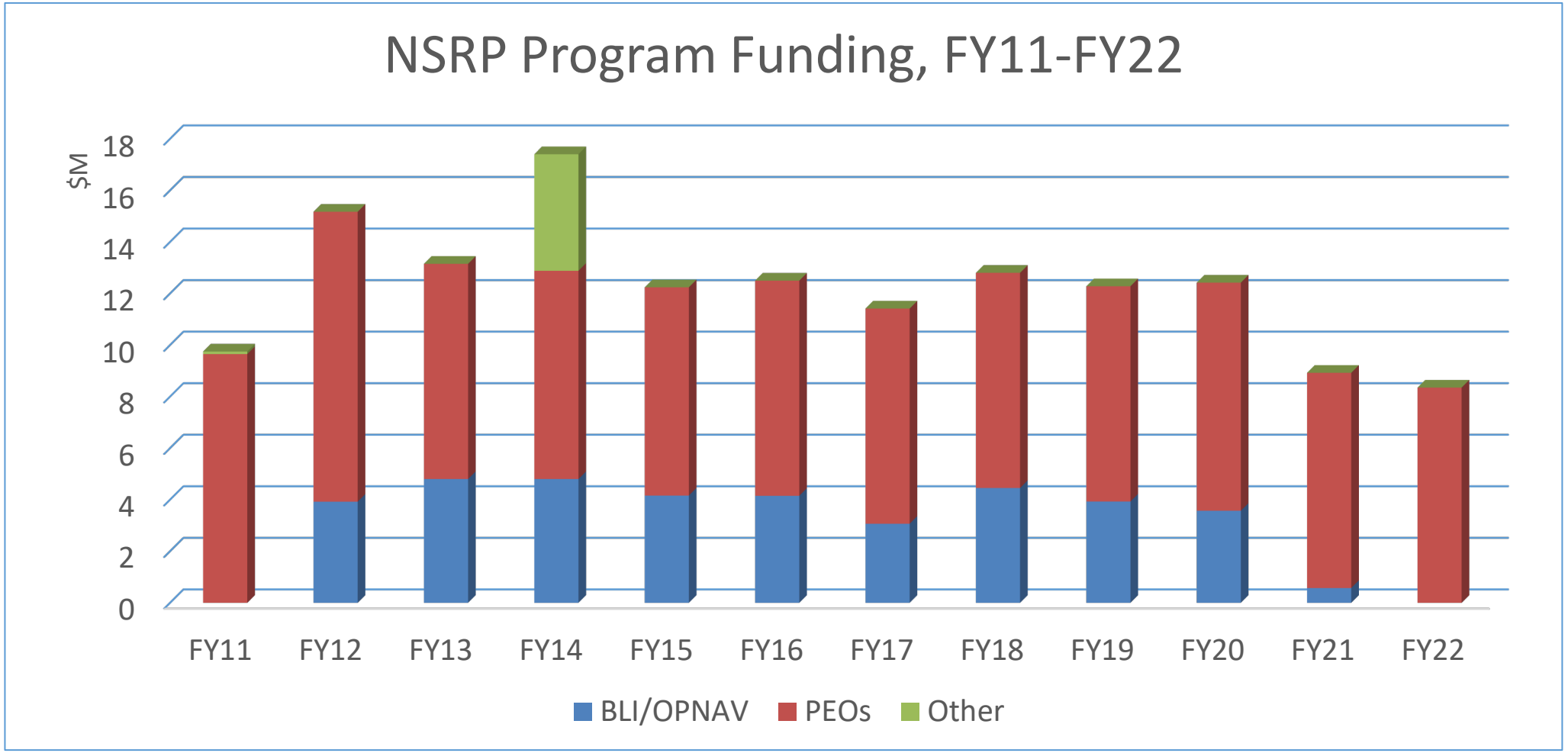
Simplified R&D Ecosystem

Independent Research and Development (IR&D)

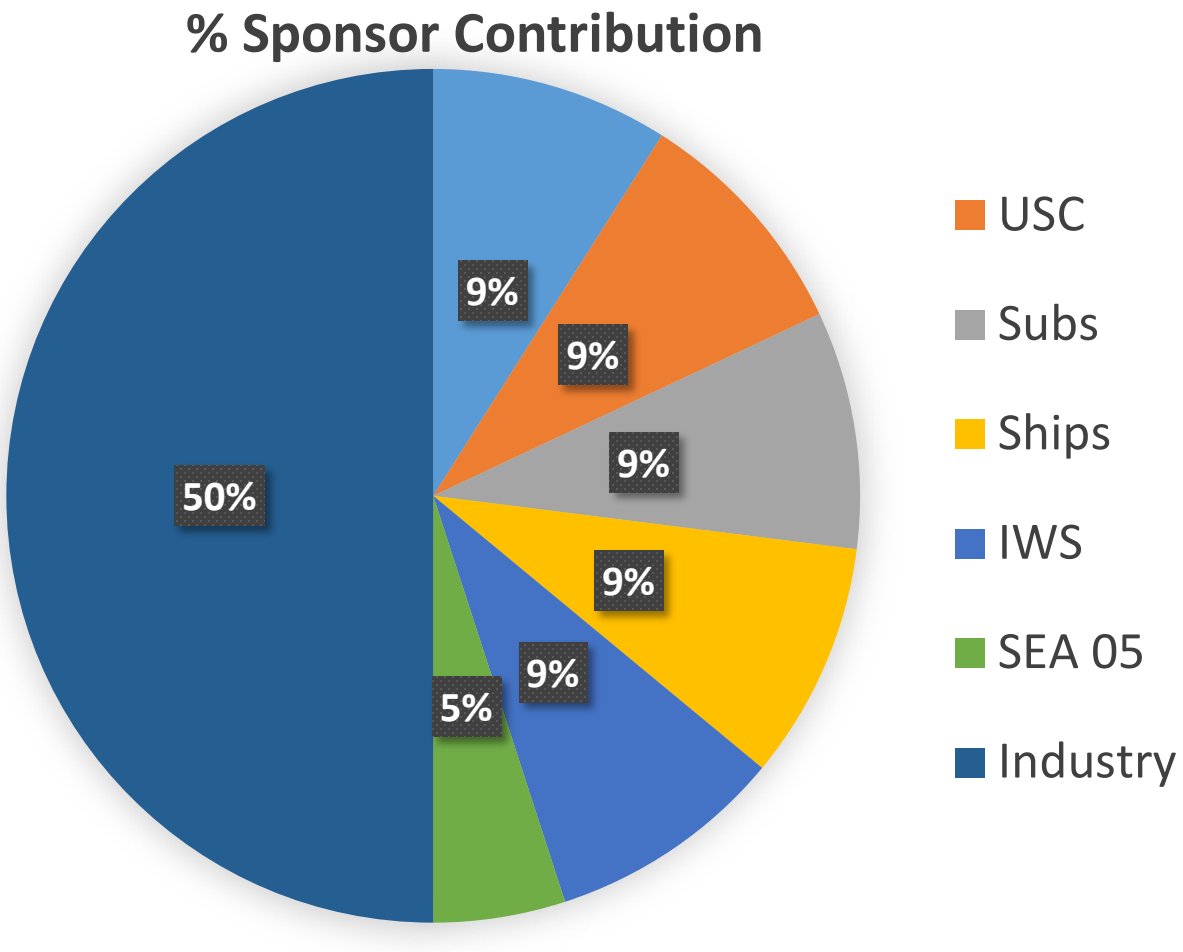
NSRP Collaboration

NSRP Navy Sponsors

Government Funding History



Total Funding Profile

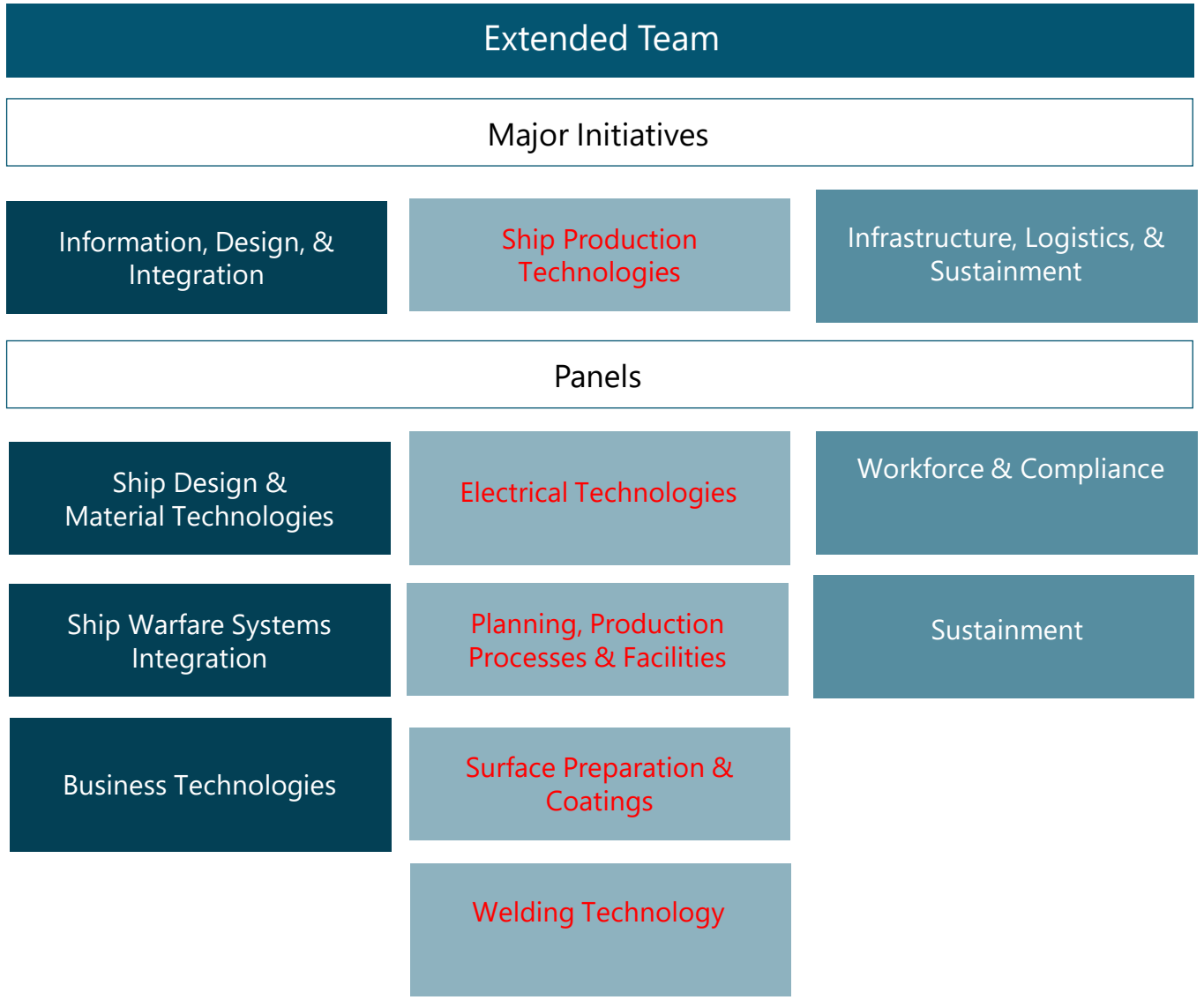


- ~$9M in Navy funding
- ~$9M from industry cost share from shipyards and vendors
  - Research projects
  - Panel Meetings
  - Implementation
  - Tech Transition

Program Changes

- Streamlined Panel structure
- Established dedicated Sustainment Panel
- Executed pilot and one year of Rapid Adoption Project solicitation
- Formal ROI calculation is an RA project phase "Go/No-Go" criteria

Panels-the Heart of NSRP



R&D Project Solicitations

- Research Announcement (RA) Projects
  - Larger projects
  - $0.5-1M in program funding and up to 2 years
  - 50% industry cost share target
  - Solicitation will be posted early next month
  - Task Order Awards-late 1st Qtr FY-24 (subject to funding available)
- Panel Projects
  - Smaller projects
  - $150K in program funding and 1 year
  - But no cost share requirement
  - Solicitation likely OOA Memorial Day
  - Task Order Awards-2nd Qtr FY-24 (subject to funding available)
  - **PANELS** screen the recommended projects for ECB selection

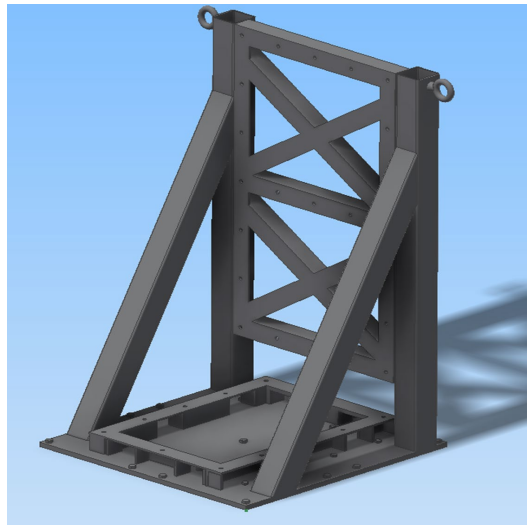
NSRP Completed Projects (Select examples)

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

Cost Reduction of Shock Application

-Meeting shock qualification requirements at lower cost

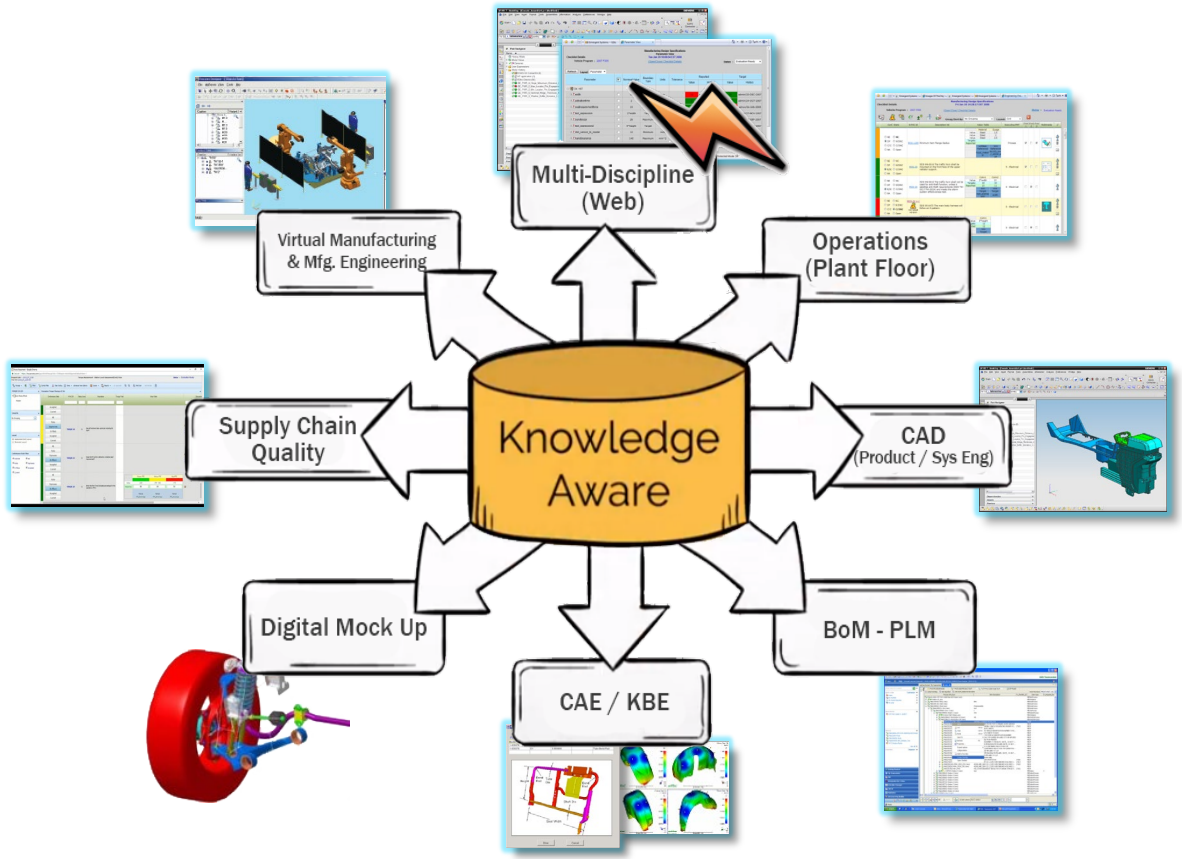
- Utilizing recent revisions to the MIL-DTL-901E pub, the project pushed old and new cost avoidance initiatives across the finish line and shares the results with the shock community through:
  - Navy Standard Drawings
  - Addendum to MIL-DTL-901E
- Benefit: For first-of-class ship, using standard test fixtures can save 10-15% of shock qualification testing costs
- Moving 100 Shock tests from the barge to a machine can save over 20% of the shock qualification testing costs
- Through Tech Transfer, project results are already transitioning for use on FFG-62 design and qualification



(above) Deck Simulating Shock Machine (DSSM) Test Fixture Design; *(below)* Universal Medium Weight Fixture Design

Knowledge Provisioning to Improve First Time Quality of Ship Design

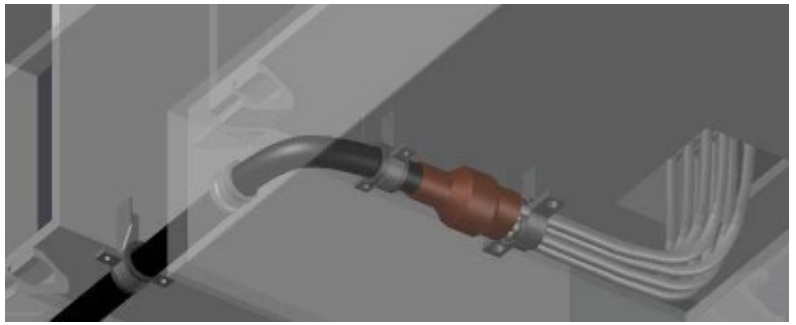
- Tailored an established, proven knowledge management and provisioning solution for the US Shipbuilding industry
- The resulting system improves the way shipyards maintain, update, and apply relevant knowledge during the ship design process
- Based on multiple pilot implementations, the estimated benefits:
  - 20% increase in engineering throughput/ 20% decrease in engineering mhrs
  - 50% reduction in Engineering review time
  - 50% reduction in ABS review comments
- Led by Conrad Shipyard, the project team included NASSCO, FMM, and BIW along with ABS, SSI, and Auros Knowledge Systems



Knowledge Provisioning has many applications across Ship Design and Construction processes

Qualification Testing of Insulated Bus Pipe (IBP)

- Insulated Bus Pipe (IBP) offers a modular, lighter, and more compact solution for high-current applications, but has had no US maritime application
- The project refined and evaluated IBP solutions that would meet Navy electrical, shock, flammability/ smoke and toxicity, and refined manufacturability and shipboard installation features
  - A follow-on project has addressed equipment connections
- Both NAVSEA and ABS consulted on the project test plans and reviewed the project test results
- Project team member provided estimated savings and impact for limited DDG-51 implementation
- The technology is planned for implementation by FMM, under another (ONR ManTech) program, on the FFG 62 Constellation class

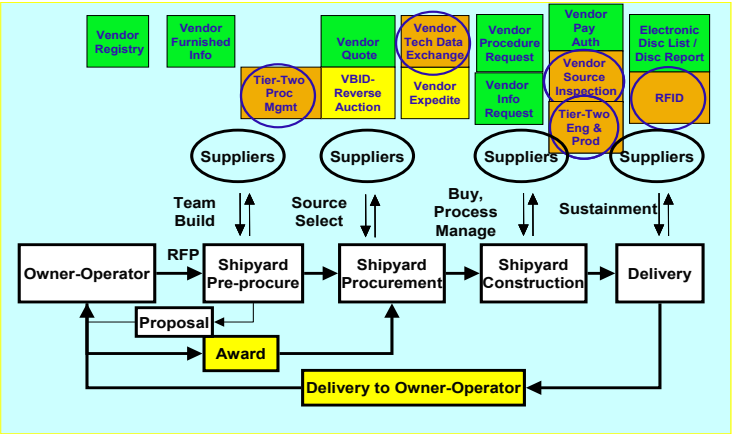


(above) Full scale coaxial IBP test article; *(below)* Interface design concept for shock-mounted equipment

SPARS – Shipbuilding Partners and Suppliers

-Project results continue to benefit Navy customers today

- Baseline process in 2000 for shipyard procurement was paper-based
  - Slow, error-prone, and expensive
- SPARS transitioned process to web server application
- System is still operational and in use 20+ years later
  - Last (of four) NSRP-funded projects ended in 2010
  - BIW, GDEB, NNS, and HII-Ingalls still utilize SPARS for procurement
- All Procurement engagements, from request for bid through delivery and inspection, are processed through SPARS
  - In considering the project's benefit today, it is difficult to quantify the value of such an 'ingrained process'



All three systems (four yards) are up and performing <u>today</u>

Screen grabs of each yard's login page today- GDEB, BIW; Ingalls and NNS use common login

Advanced Mobile Universal Electrical Tooling (AMUET) 4.0- Rapid Adoption Project (RAP)

AMUET is a commercially available TRL 9 technology used in the Aircraft Industry -but not in ship construction or repair

- An ideal candidate for RAP

When combined with Augmented Reality systems and ship model information, the system provides visual aids that greatly improves both the production and accuracy of:

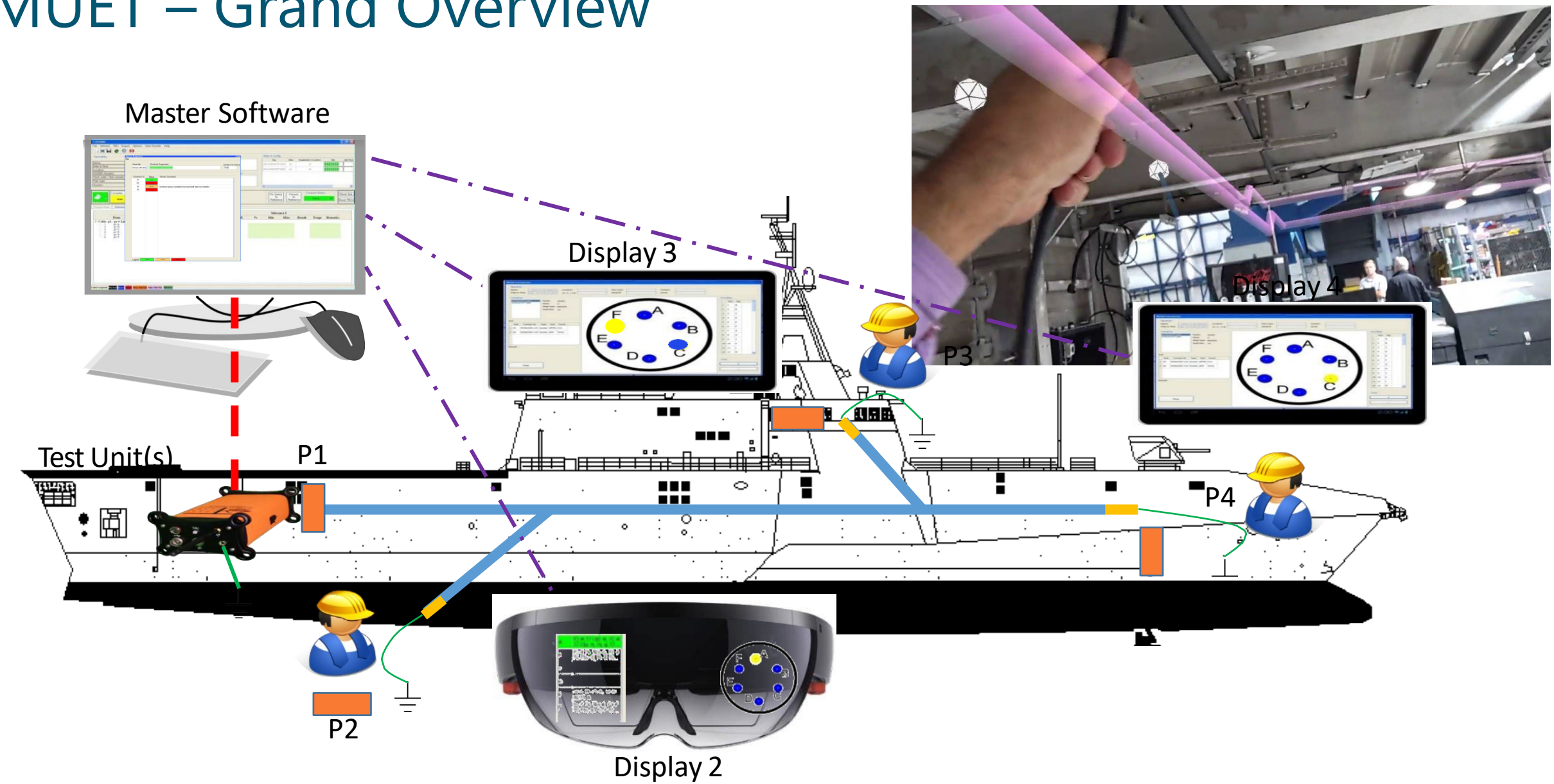
- Pinout for connectors
- Automated testing and reporting
- Continuity checks/troubleshooting for installed cabling
- Cable routing and installation

The system has received **TYPE APPROVAL** for LCS from SUPSHIP Gulf Coast

Evaluation work with NNSY and PHNSY is in progress

Display 2

AMUET – Grand Overview



Viega Press Fittings

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

ASTM F1387 MECHANICALLY ATTACHED FITTINGS (MAFs)

Programs: DDG-51, FFG-62

PROJECT INFORMATION

ASTMF1387 TESTING OF MECHANICALLY ATTACHED FITTINGS (Panel Project 2018)
Prime/Lead: HII-Ingalls Shipbuilding
Team Members: GD-Bath Iron Works, NAVSEA 05Z41

ASTMF1387 TESTING OF MECHANICALLY ATTACHED FITTINGS (Panel Project 2020)
Prime/Lead: GD-Bath Iron Works
Team Members: HII-Ingalls Shipbuilding

IMPLEMENTATION OF PRESS CONNECT FITTING IN CONSTRUCTION OF US NAVY SHIPS (RAP 2022)
Prime/Lead: GD-Bath Iron Works
Team Members: Fincantieri Marinette Marine, Viega LLC, GD-BIW SUPSHIP

OBJECTIVE

2018 - Define the testing requirements necessary to obtain NAVSEA approval of MAFs and to conduct shock testing of Viega MegaPress fittings.

2020 - Complete ASTM F1387 qualification testing of the Viega MegaPress fitting. Evaluate a Lead Free fitting for possible use in Potable Water Systems. Investigate ASTM F1387 testing requirements.

2022 - Create a US Navy specific training curriculum for a Train the Trainer Course to allow installation of these fittings where approved by ship specifications.

DELIVERABLES/BENEFITS/ROI

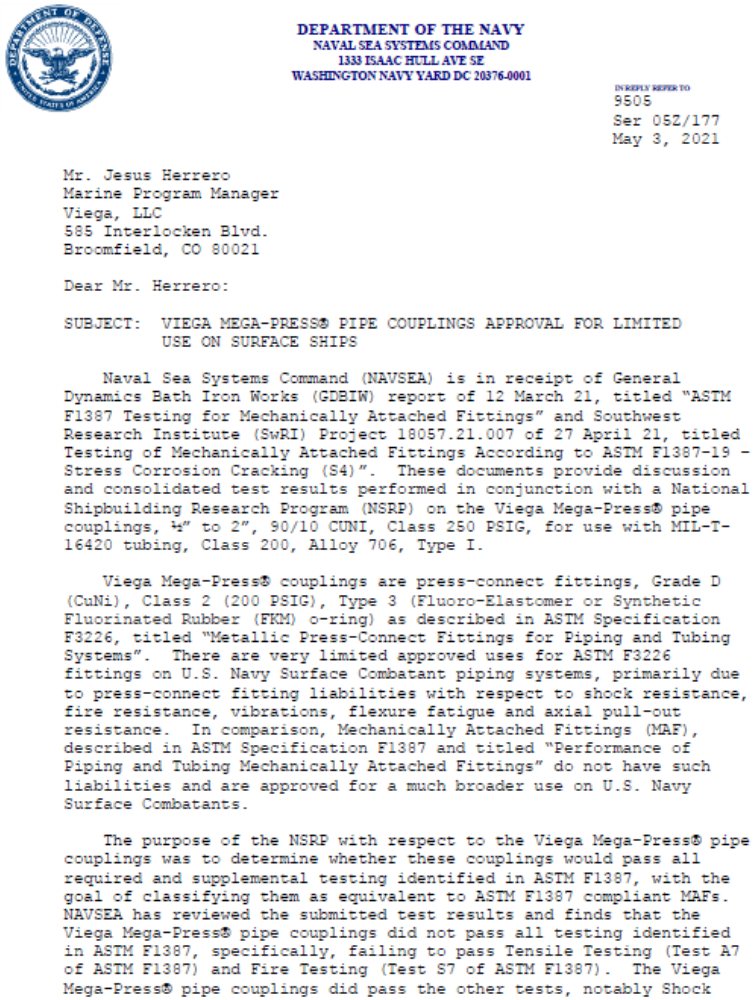
- Fire Risk Mitigation – no hot work required
- NASSCO studies showed significant reductions in defects during pipe system testing, avoiding repairs and retests. (ROI in excess of 100%, virtually 0% failure rate)
- Approved fittings reduce construction, testing and rework labor, and improves first time quality.
- Ship Specification Change Notice (SCN) CR-02363R1

FINANCIAL

Project	Program Funds
Panel Project 2018	$100K
Panel Project 2020	$146K
Rapid Adoption 2022	$150K
Total	**$396K**

Update – Viega MegaPress CuNi ½" thru 2" (90/10 Copper Nickel)

- Approved Systems
  - (1) Chilled Water;
  - (2) Potable Water Service, Distribution and Disinfection;
  - (3) Gas Turbine Freshwater Washdown;
  - (4) Freshwater Window Washing;
  - (5) Electronic Fresh Water Cooling;
  - (6) Diesel Engine Fresh Water Cooling;
  - (7) Sea Water Cooling (excluding Firemain);
  - (8) Main and Secondary Drainage;
  - (9) Seawater (Clean) Ballasting;
  - (10) Seawater – Washdown Countermeasures;
  - (11) Condensate (Non-Oily) Vents and Drains;
  - (12) Weather Deck Drains;
  - (13) Interior Spaces Deck Drains;
  - (14) Plumbing Vents and Drains;
  - (15) Sewage Collection, Holding, and Transfer (CHT);
  - (16) Sewage Vacuum Collection, Holding, and Transfer (VCHT);
  - (17) Freshwater Tank Sounding Tubes, Vents, Escapes and Overflows;
  - (18) Clean Ballast Tank Vents, Escapes and Overflows; and
  - (19) Void Vents, Escapes and Overflows.



DEPARTMENT OF THE NAVY
NAVAL SEA SYSTEMS COMMAND
1333 ISAAC HULL AVE SE
WASHINGTON NAVY YARD DC 20376-0001

IN REPLY REFER TO
9505
Ser 05Z/177
May 3, 2021

Mr. Jesus Herrero
Marine Program Manager
Viega, LLC
585 Interlocken Blvd.
Broomfield, CO 80021

Dear Mr. Herrero:

SUBJECT: VIEGA MEGA-PRESS® PIPE COUPLINGS APPROVAL FOR LIMITED USE ON SURFACE SHIPS

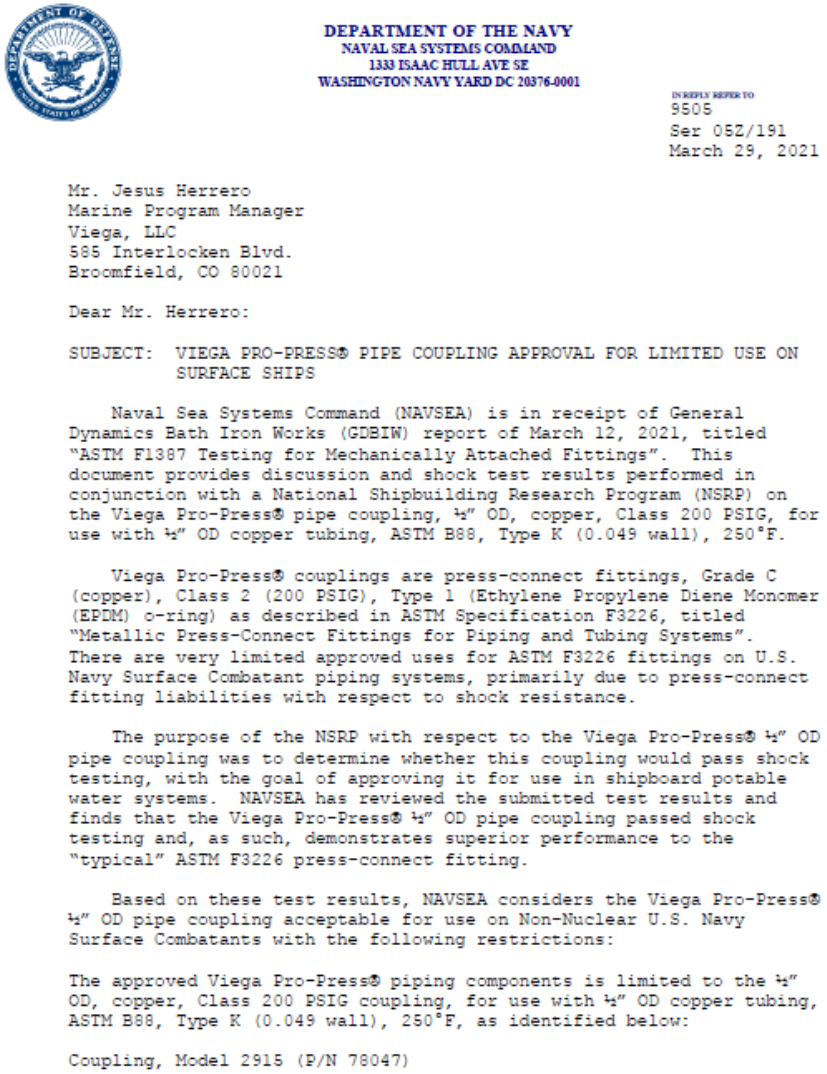
Naval Sea Systems Command (NAVSEA) is in receipt of General Dynamics Bath Iron Works (GDBIW) report of 12 March 21, titled "ASTM F1387 Testing for Mechanically Attached Fittings" and Southwest Research Institute (SwRI) Project 18057.21.007 of 27 April 21, titled Testing of Mechanically Attached Fittings According to ASTM F1387-19 – Stress Corrosion Cracking (S4)". These documents provide discussion and consolidated test results performed in conjunction with a National Shipbuilding Research Program (NSRP) on the Viega Mega-Press® pipe couplings, ½" to 2", 90/10 CUNI, Class 250 PSIG, for use with MIL-T-16420 tubing, Class 200, Alloy 706, Type I.

Viega Mega-Press® couplings are press-connect fittings, Grade D (CuNi), Class 2 (200 PSIG), Type 3 (Fluoro-Elastomer or Synthetic Fluorinated Rubber (FKM) o-ring) as described in ASTM Specification F3226, titled "Metallic Press-Connect Fittings for Piping and Tubing Systems". There are very limited approved uses for ASTM F3226 fittings on U.S. Navy Surface Combatant piping systems, primarily due to press-connect fitting liabilities with respect to shock resistance, fire resistance, vibrations, flexure fatigue and axial pull-out resistance. In comparison, Mechanically Attached Fittings (MAF), described in ASTM Specification F1387 and titled "Performance of Piping and Tubing Mechanically Attached Fittings" do not have such liabilities and are approved for a much broader use on U.S. Navy Surface Combatants.

The purpose of the NSRP with respect to the Viega Mega-Press® pipe couplings was to determine whether these couplings would pass all required and supplemental testing identified in ASTM F1387, with the goal of classifying them as equivalent to ASTM F1387 compliant MAFs. NAVSEA has reviewed the submitted test results and finds that the Viega Mega-Press® pipe couplings did not pass all testing identified in ASTM F1387, specifically, failing to pass Tensile Testing (Test A7 of ASTM F1387) and Fire Testing (Test S7 of ASTM F1387). The Viega Mega-Press® pipe couplings did pass the other tests, notably Shock

Update – Viega ProPress ½" (Copper)

- Approved Systems
  - a. Potable Water Service, Distribution and Disinfection.
  - b. Condensate (Non-Oily) Vents and Drains.
  - c. Interior Spaces Deck Drains.
  - d. Plumbing Vents and Drains
- Only one shock test was performed as an exploration for a lead-free alternative
- The approval is intended to gather support to fund additional testing to finish the qualification process for the system and promote the use of the system.



DEPARTMENT OF THE NAVY
NAVAL SEA SYSTEMS COMMAND
1333 ISAAC HULL AVE SE
WASHINGTON NAVY YARD DC 20376-0001

IN REPLY REFER TO
9505
Ser 05Z/191
March 29, 2021

Mr. Jesus Herrero
Marine Program Manager
Viega, LLC
585 Interlocken Blvd.
Broomfield, CO 80021

Dear Mr. Herrero:

SUBJECT: VIEGA PRO-PRESS® PIPE COUPLING APPROVAL FOR LIMITED USE ON SURFACE SHIPS

Naval Sea Systems Command (NAVSEA) is in receipt of General Dynamics Bath Iron Works (GDBIW) report of March 12, 2021, titled "ASTM F1387 Testing for Mechanically Attached Fittings". This document provides discussion and shock test results performed in conjunction with a National Shipbuilding Research Program (NSRP) on the Viega Pro-Press® pipe coupling, ½" OD, copper, Class 200 PSIG, for use with ½" OD copper tubing, ASTM B88, Type K (0.049 wall), 250°F.

Viega Pro-Press® couplings are press-connect fittings, Grade C (copper), Class 2 (200 PSIG), Type 1 (Ethylene Propylene Diene Monomer (EPDM) o-ring) as described in ASTM Specification F3226, titled "Metallic Press-Connect Fittings for Piping and Tubing Systems". There are very limited approved uses for ASTM F3226 fittings on U.S. Navy Surface Combatant piping systems, primarily due to press-connect fitting liabilities with respect to shock resistance.

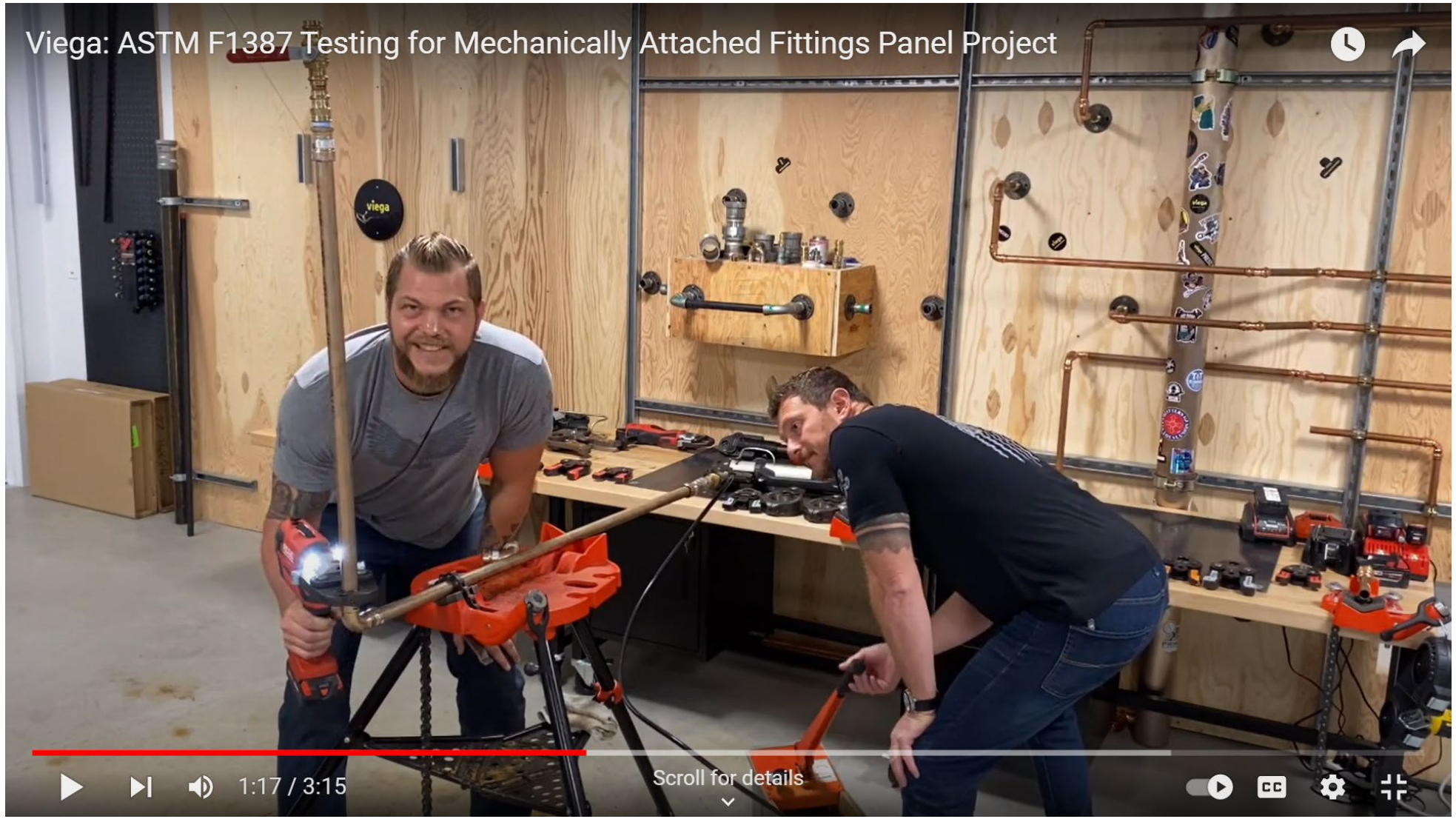
The purpose of the NSRP with respect to the Viega Pro-Press® ½" OD pipe coupling was to determine whether this coupling would pass shock testing, with the goal of approving it for use in shipboard potable water systems. NAVSEA has reviewed the submitted test results and finds that the Viega Pro-Press® ½" OD pipe coupling passed shock testing and, as such, demonstrates superior performance to the "typical" ASTM F3226 press-connect fitting.

Based on these test results, NAVSEA considers the Viega Pro-Press® ½" OD pipe coupling acceptable for use on Non-Nuclear U.S. Navy Surface Combatants with the following restrictions:

The approved Viega Pro-Press® piping components is limited to the ½" OD, copper, Class 200 PSIG coupling, for use with ½" OD copper tubing, ASTM B88, Type K (0.049 wall), 250°F, as identified below:

Coupling, Model 2915 (P/N 78047)

Viega: ASTM F1387 Mechanically Attached Fittings



SWSI Flexible Infrastructure

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

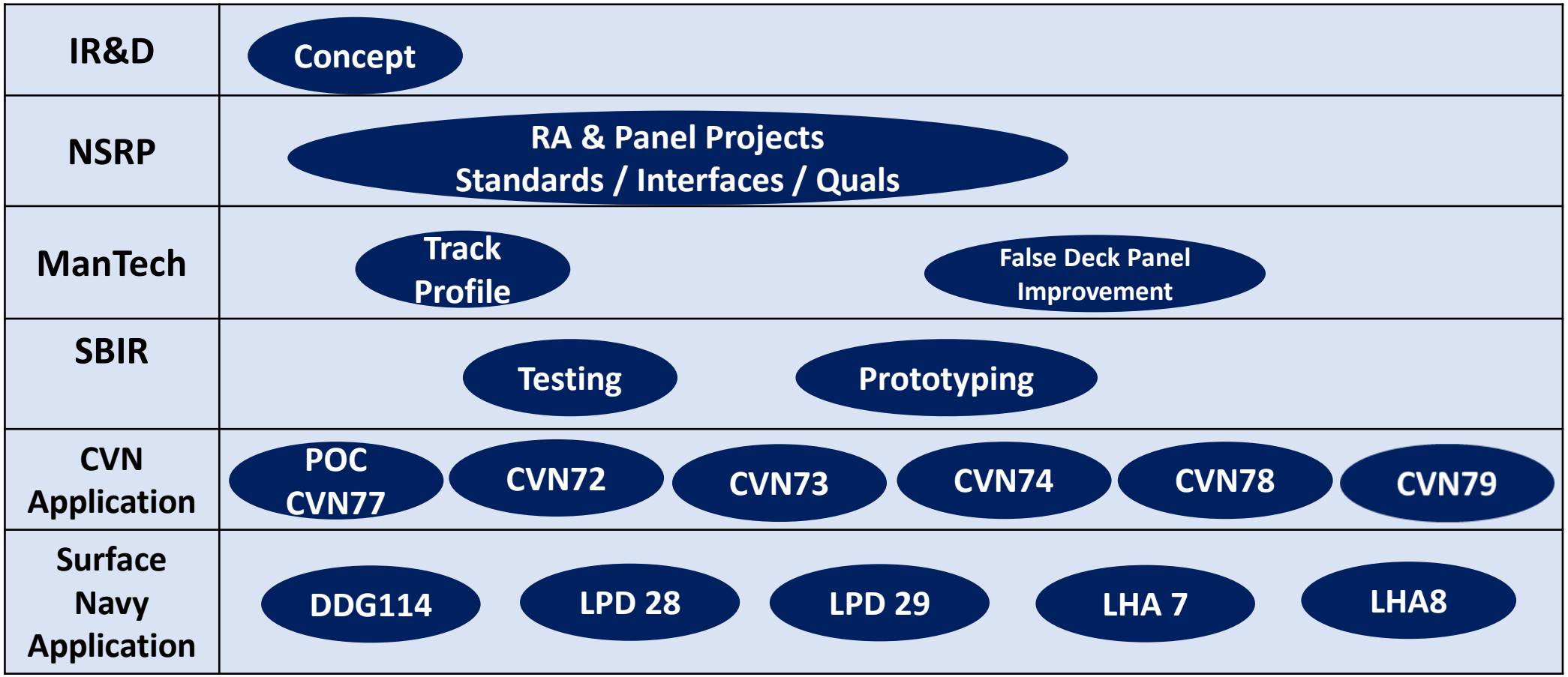
Example Enabler: Flexible Infrastructure (FI)

A system of systems that provides the capability for rapid compartment re-fit without the use of "hot work" and provides the following benefits:

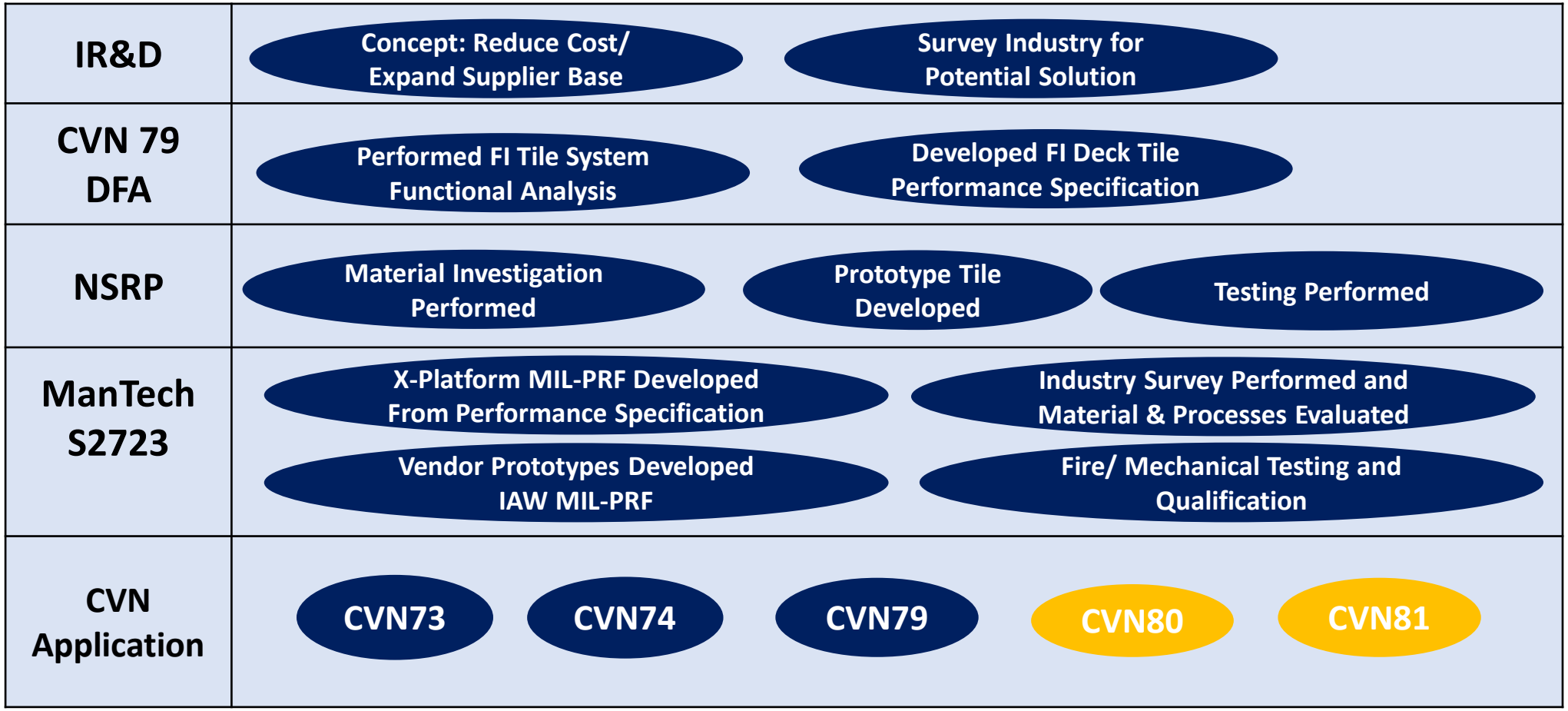
Objectives:

- **Maximize time for technology development prior to equipment installation during construction outfitting**
- **Eliminate cost and schedule impacts associated with the traditional conflicts from re-work and change orders during new construction**
- **Ease compartment reconfiguration to support changing missions and lifecycle refresh of electronic components**

Flexible Infrastructure – Path To Adoption



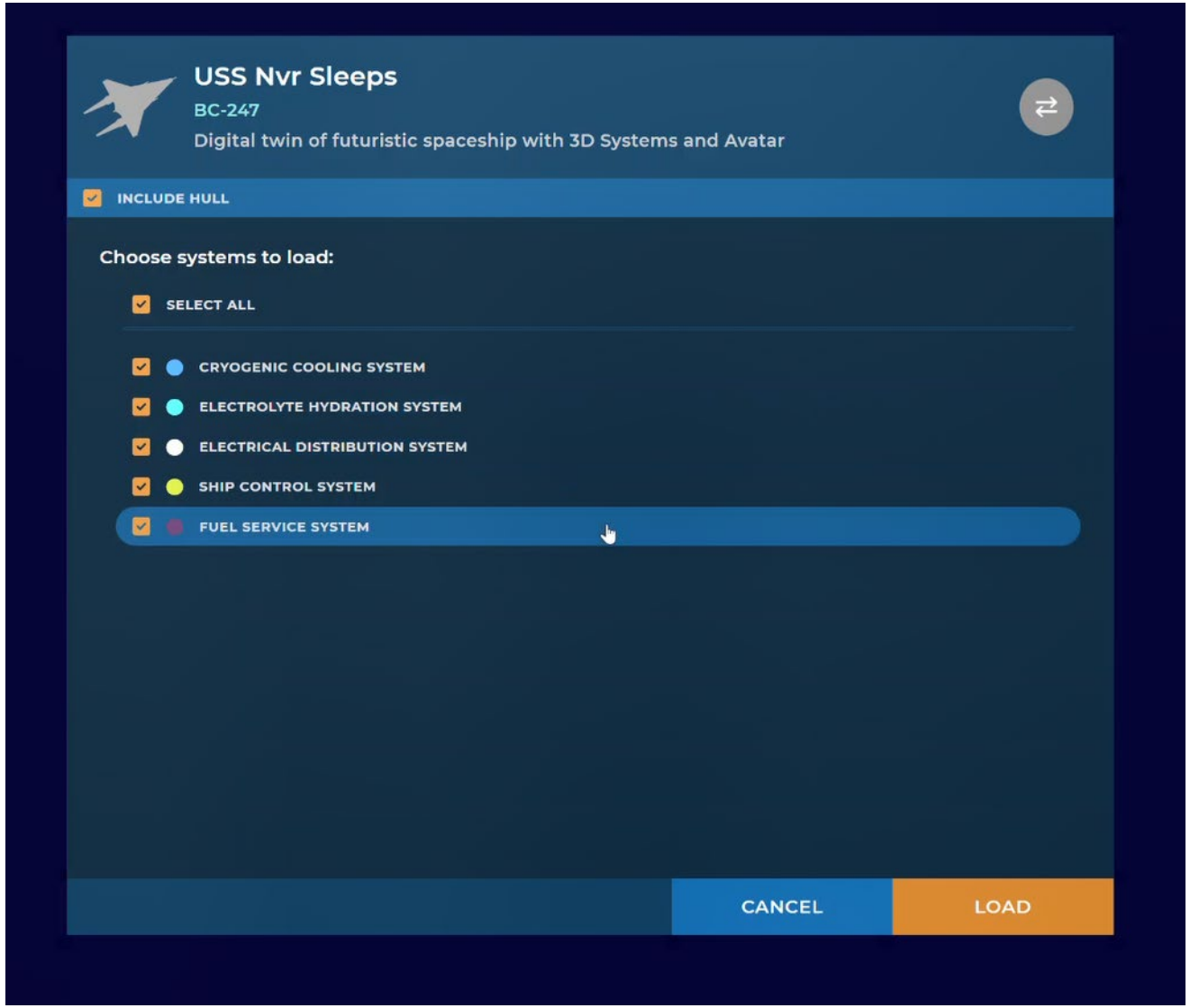
Flexible Infrastructure – False Deck Panel Improvement



Complete

In Progress

Columbia Sustainment Efforts



Questions?

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