Ship Warfare Systems Integration

Perry Haymon

Ingalls Shipbuilding
Current Panel Activities

Completed Projects

- Standardized Foundation – (Ingalls, March 2015)
- Ship Specification Review to Identify Technical Gaps between FI and Requirements (NNS, 2015-468, April 2016)
- Optimization of Design/Manufacturing of Flexible Interface Adapters (NNS, April 2016)
- Standardizing Warfare System Interfaces to Reduce Integration Costs (SFI, November 2015)

Ongoing Panel Projects

- Variant Reduction for Shipboard Installed Connectors
- Paradigm for Optical Networks in Ships: Flexible Communications Infrastructure

New Panel Projects awarded 2016

- Flexible Infrastructure Bulkhead Track Improvements (2017-415, Ingalls)
  - This project is a follow on to a previous NSRP RA Project that did shock and vibration testing of a bulkhead track system that is part of the Flexible Infrastructure (FI) system. Based on the results of RA project some elements needed to be re-analyzed and tested because they did not meet the acceptance criteria defined for the RA testing. The goal is to retest methods with proposed improvements so that the flexible infrastructure support system provides the Navy with a complete package track systems and attachments that have been tested for all relevant shock and vibration criteria.

- Advanced Composite False-Deck Material Systems for Rapid Modular Compartment Reconfiguration (2017-423, Material Science Corporation (MSC))
  - The primary goal of this effort is to establish production-ready design concepts for low-cost composite false-deck panels that:
    - Minimize ship yard installation time/costs and provide ROI over current installation methods.
    - Support compartment reconfiguration throughout life of the craft without permanent modification, also resulting in ROI through life-cycle cost reduction.
    - Meet all Navy prescribed structural and environmental performance requirements.
Future Panel Activities

• Continue to focus on commonality
• Continue to identify opportunities to support the “Flexible Warship” concept
• Continue increasing involvement from Combat System OEMs
• Continue to evaluate if the results of SWSI Panel and RA projects are beneficial to the Navy and the NSRP members
• Increase collaboration with other panel
Common Interface Pilot Project (CIPP)
Phase I Status Update
Presented to PEO IWS, Mr. Bray, and SEA 06, Mr. Shevock

Ms. Stefanie Doyle, PEO IWS 2.0
Mr. Perry Haymon, HII, SWSI Panel Chair

6 December 2016
**CIPP Goals & Benefits**

- **Goals**
  - More efficient and effective capability insertion
  - More efficient technology refresh to overcome obsolescence
  - Greater mission flexibility and adaptability
  - Increased efficiencies in acquisition, ship design, construction, and logistics
  - Enable just-in time delivery of C5I systems with state of the art technology without negatively impacting new construction cost and schedule

- **Benefits (Shipyard)**
  - Ability to reuse existing designs/structure for future ship capabilities/variants
  - Supports standardization between shipbuilder-provided distributed systems/components and Government Furnished Equipment (GFE)
  - Accelerate learning efficiencies through serial production of common interfaces for more consistent and repetitive ship configurations

- **Benefits (Navy)**
  - Reduced acquisition costs (design, construction time, labor)
  - Provides methods for technology insertion/refresh
  - Reduced operations & maintenance cost
  - Improved ship availability
  - Decoupled scheduling for the combat system
  - Cross-ship commonality
  - Off-board system integrated test
CIPP Update

18 Aug 15  NSRP Program Review w/ASN RDA - Pilot Suggested
15 Sep 15  Government-Industry Pilot WG established
03 Nov 15  SWSI Topside / Below Deck Flexible Design Workshop
16 Dec 15  Pilot Proposal / ROM briefed to ECB - 1/2 funding authorized
25 Mar 16  IWS authorized funding for other 1/2
03 May 16  Update Brief to Mr. Bray, IWS and Mr. Shevock, 06
17 May 16  Phase 0 Kick-off (Subgroup Roles/Initial Task Assignments)
23 Aug 16  Phase I Kickoff Meeting
16 Nov 16  Phase I Face-to-Face Status Meeting
# Phase I Combat Systems Interface Table

## CS Interface Table

- **Ship/Platform** (Carriers/Ships)
- **Weapon System** (IWS)
- **System/Platform Pairing Relevance**

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## Common Interface Table

**“Menu”**

### CS Equipment
- Requirements
- Interfaces
- Consoles
- Racks
- Topside

### Modular Concepts
- Flexible Infrastructure
- Modular Deck Systems

### Ship Impacts
- Space
- Weight
- Power
- Cooling
- HM&E

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## CS Topside NTE

- **CS Interfaces**
  - Radar
  - EW
  - Comms

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**Focus on Near Term Opportunities to Support EASR Integration**
**CIPP Phase I Scope**

### Subgroups

#### Power & Cooling

- **Lead(s):** J. McGlothin, 320
- **Lead(s):** J. Walks, Ingalls

Power distribution /conversion; cooling / HVAC / ventilation; cabling

#### Ship Physical Interfaces

- **Lead(s):** C. Carlson, IWS
- **Lead(s):** G. Dorsey, NNS

Accessibility, infrastructure, mounts, connectors

#### Combat Systems Interfaces

- **Lead(s):** W. Veazey, NSWC
- **Lead(s):** B. Lang, Ingalls

Digital interfaces, non-power cabling, signals

#### Programmatic

- **Lead(s):** G. Kwak, 06
- **Lead(s):** R. Wilson, Ingalls

BCA, contract language, metrics; Communications Plan; instructions

### Responsibilities

- **Power conversion**
- **Power distribution**
- **HVAC**
- **SWAP-C Management**
- **Power interfaces**
- **Switchboards/panels/load centers**
- **Growth Margin Management**

- **Infrastructure**
- **Foundations**
- **Topside interfaces**
- **Below deck interfaces**
- **Common connectors & re-use**
- **Equipment removal routes**
- **FI considerations**
- **Topside trade space**

- **CS Space Allocation Blueprint**
- **Boundary considerations**
- **Standard Peripheral Systems**
- **Common Processing Systems/Common Display Systems (CPS/CDS)**

- **BCA Template**
- **Validation of Template**
- **CBA Metrics**
- **Contract Language**
- **Contract Incentive clauses**
- **Communications Plan**

### Participants

- **Industry:** Ingalls, NNS, EB, NASSCO, BIW
- **OEMs:** Raytheon, Lockheed Martin, Northrop Grumman (ES)
- **Other:** Pit Stop Engineering, Gibbs & Cox
- **Navy:** PEO IWS, Ships, Carriers; SEA 05/06; PMS 320/317; NSWC Carderock/Dahlgren; PSU EOC
Plan of Action and Milestones

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<td>2</td>
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<td>3</td>
<td>Define BCA</td>
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<td>4</td>
<td>BCA Template</td>
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<td>Define Metrics</td>
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<td>Identify Existing Interfaces</td>
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<td>Develop Design Technical Brief</td>
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<td>29</td>
<td>Identify Gaps in Solution Set</td>
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<td>Develop Contract Language</td>
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Programmatic Subgroup

• Goals and Objectives
  – Generic template to perform business case analysis and calculate Return on Investment (ROI)
  – Quantifiable measures to track actual vs estimated benefits of projects
  – Generic contract / ship specification language that enables installation of combat systems with minimal disruption to ship
  – Communication Plan to distribute NSRP information to our most important stakeholders
    ▪ Targeted organizations / stakeholders include NAVSEA, PEOs, NSWCs, Shipyards, OEMs

• Deliverables
  – Business Case Analysis (BCA) Template
  – Cost Benefit Analysis (CBA) Metrics
  – Contract Language
  – Communication Plan
Combat Systems Integration Subgroup

• Goals and Objectives
  – Identify existing SPS-48G radar interfaces that support EASR
  – Common interface panels for equipment connections
    ▪ Same radar panel for all ship platforms
  – Standardization of peripheral systems
  – Open, modular interfaces to support combat system upgrades / backfit

• Deliverables
  – Current SPS-48 and AMDR Interfaces Report
  – LCS, AEGIS Ashore, and Danish Frigate Findings Report
  – Combat System Interface Focus Areas Report
  – List of Recommendations and Opportunities for Improvement
Power and Cooling Subgroup

• Goals & Objectives
  – EASR to be installed into new construction ship after delivery, thereby providing the most up to date technology possible into the ship
  – EASR updates to be installed without the need for interface hardware modification (e.g. foundations, piping, etc.)
  – These techniques to be applied to other future mission system installations

• Deliverables
  – Power and Cooling Interface Standards
    ▪ Initial draft
    ▪ Three rounds of revisions
  – Oversizing and Margins Report
Ship Physical Interfaces Subgroup

- Goals and Objectives
  - Create the “Tool Kit” Navy PMOs can use to insert new technology onto their platforms with a focus on “Standardization” of HM&E Interfaces for Topside and Below Decks
    - LHA-8 (Single Face Rotator), DDG, CVN-79 (3 panel array)

- Deliverables
  - List of Barriers and collect past findings from Flexible Ships WG
  - Baseline of the current state
  - Research of the Physical Interface Focus Areas
  - List of Recommendations and Opportunities for Improvement
  - Gaps in Solution Set
  - Contract Language
Near Term Opportunities

• Combat System Interface
  – Identify common test procedures across programs / equipment
  – Incorporate NSRP Common Connector Panel Project recommendations
  – Identify current SPS-48G interfaces and connectors that can be reused with EASR

• Power & Cooling
  – Connectorization / quicker connection methods for power cabling
  – Define common power panel

• Ship Physical Interface
  – Flexible Infrastructure
  – Access Routes (Hatchability)
Summary

• All subgroups on track for meeting goals and objectives

• Teams collaborating with other ship integration efforts
  – Flexible Ships (PEO SHIPS S&T)
  – Combat System Modularity (PMS 400D and IWS 1.0)
  – Combat Power and Energy Systems Working Group (PMS 320)
  – EASR’s Radar Ship Integration Working Group (IWS 2.0)

• Near term opportunities identified and being worked
Questions?