



**Newport News
Shipbuilding**

A Division of Huntington Ingalls Industries

Extension Basis for 72 Inch POA Enclosure Systems to DDG and CG Ships

SWSI Panel Meeting
March 24, 2021

Michael Talley, D.Sc. and Lisa McGrath
Ship Survivability
Newport News Shipbuilding

Project Goals, Objectives, & Deliverables



- Proposer Identification:
 - Prime: HII-NNS, Michael Talley, D.Sc.
 - Participants: HII-Ingalls, John Walks and BIW, Nat Bedford
- Goals to Achieve
 - Ability to easily insert cutting edge technology as it evolves
 - Commonality and extendibility of components among systems and ships
 - Flexibility in varying physical system configurations
 - A reduction in acquisition and life-cycle costs by buying components at the drawer level
 - Reduced test time and costs
- Objectives
 - Provide a basis for extending 72 Inch POA Enclosure Systems to DDG and CG ships
 - Define processes, skill levels, and organizational responsibilities for implementing 72 Inch POA Enclosure Systems
- Deliverables
 - Final report documenting basis for extending 72 Inch POA Enclosure Systems to DDG and CG ships, processes, skill levels, and organizational responsibilities for implementation
 - Presentations at workshops to showcase results



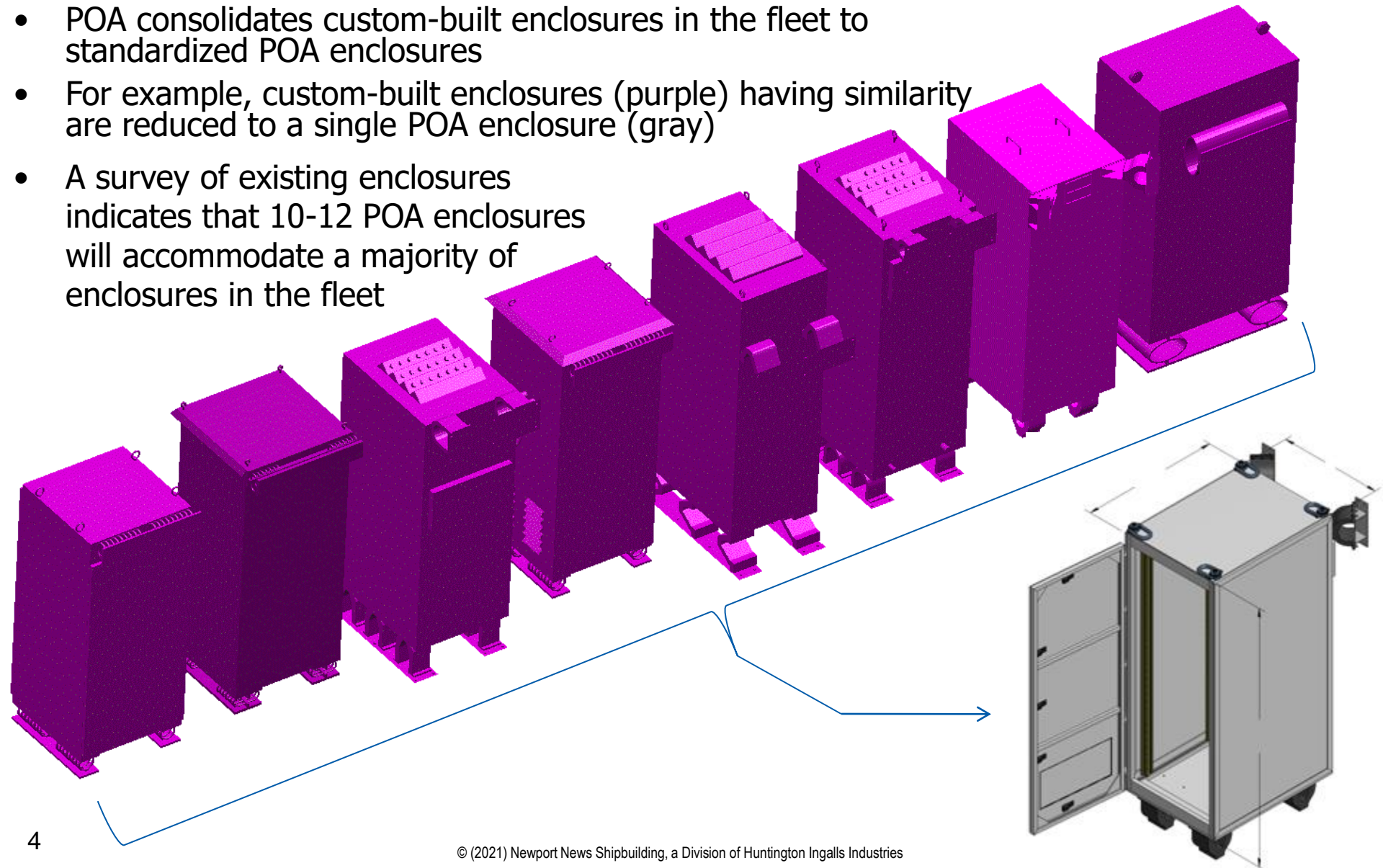
What is Physical Open Architecture (POA)?

- POA is a flexible mounting methodology enabling use of open architecture systems (plug-and-play, common components, modular design, COTS, etc.), while meeting Navy shock and vibration requirements.
- POA is implemented by standardizing physical attachments and qualification procedures, including the following:
 - Enclosures
 - Shipboard interfaces (i.e., foundations)
 - Shock mount solutions
 - Component attachment methods
 - Environmental test processes and procedures
- POA's flexible mounting methodology provides the ability to install components in different positions stacked within a rack enclosure, and install enclosures in different configurations such as multi-packs.

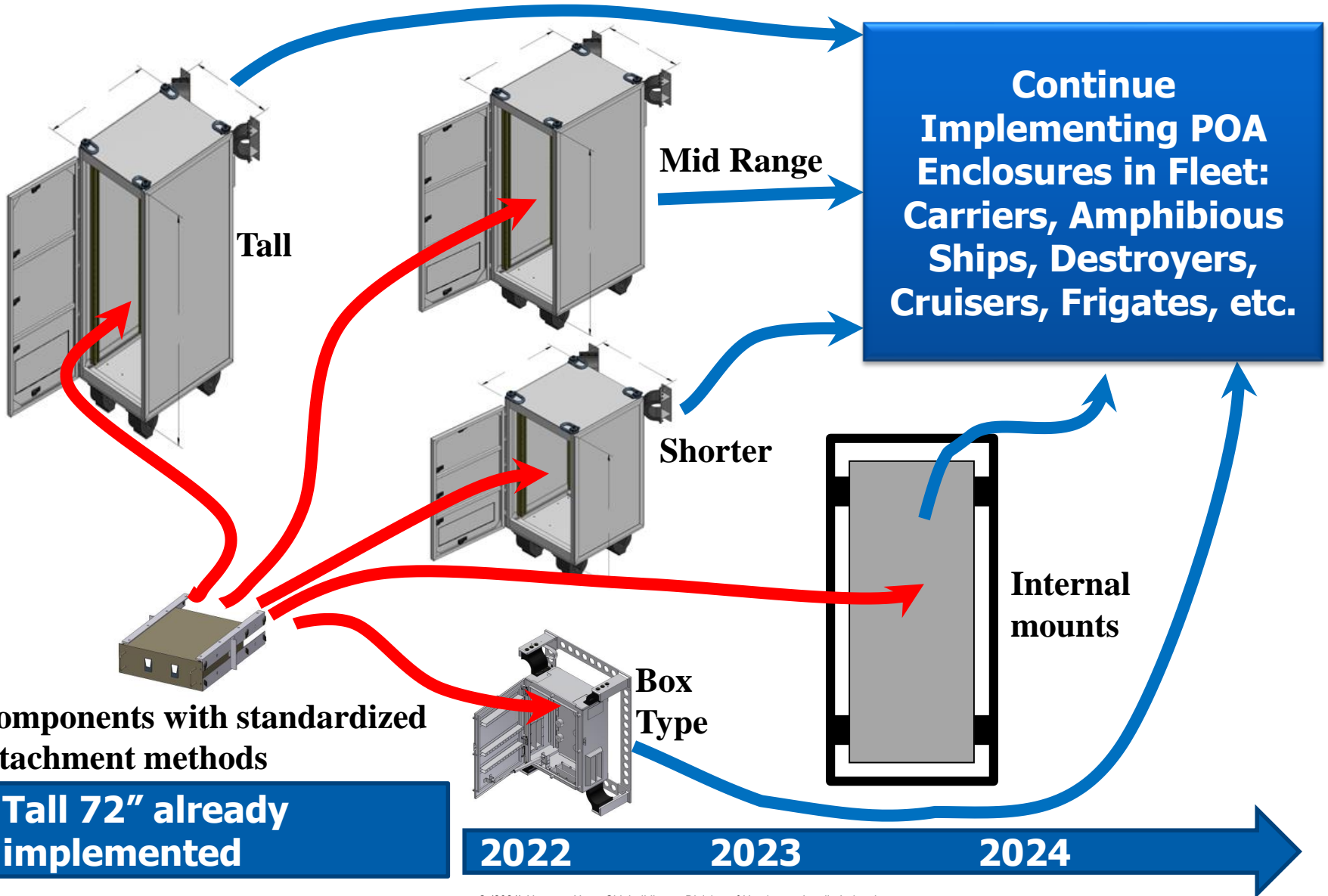
Previous Work: Standardized POA Enclosures and Ship Interfaces



- POA consolidates custom-built enclosures in the fleet to standardized POA enclosures
- For example, custom-built enclosures (purple) having similarity are reduced to a single POA enclosure (gray)
- A survey of existing enclosures indicates that 10-12 POA enclosures will accommodate a majority of enclosures in the fleet



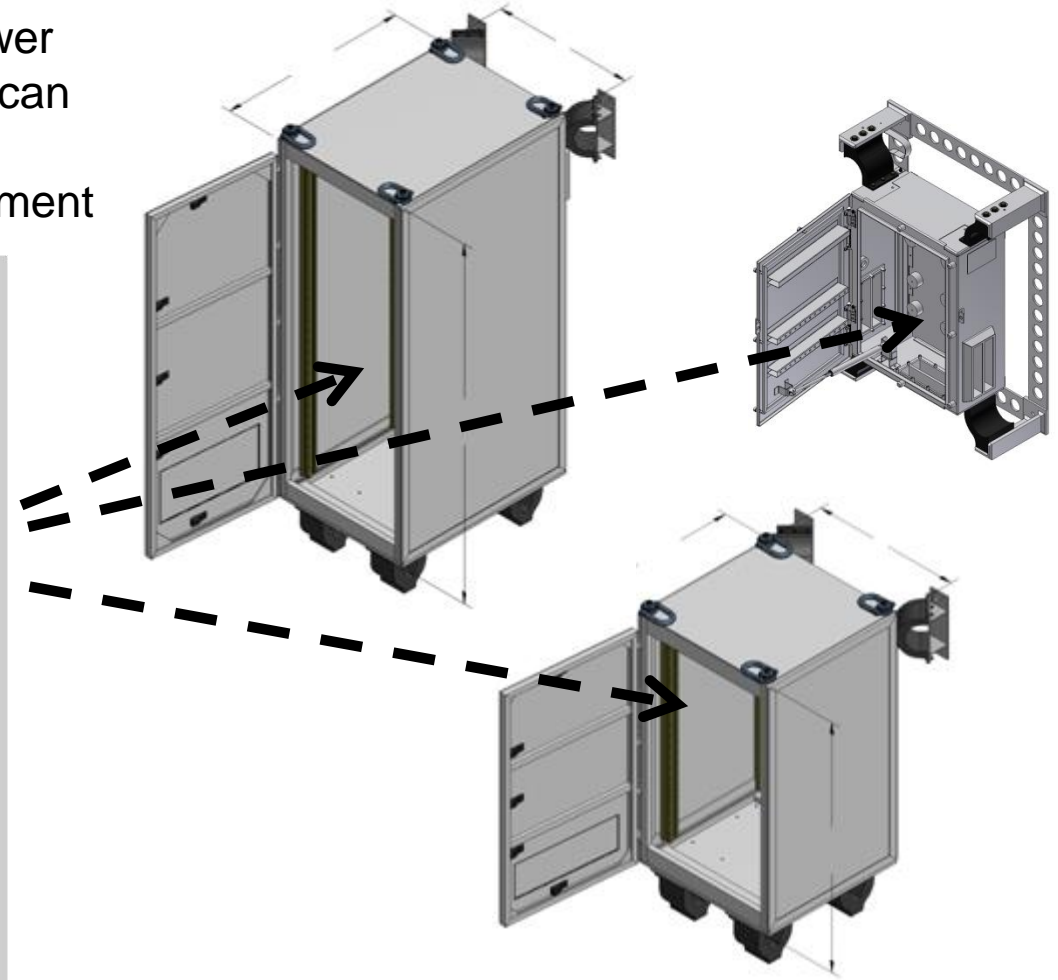
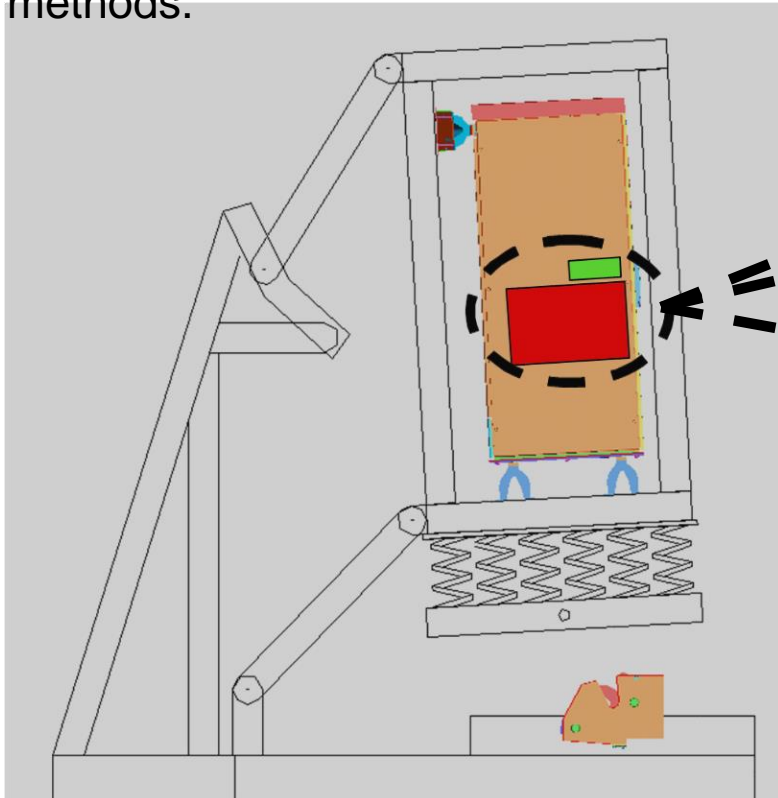
Roadmap for Implementing at the Drawer or Component Level Using POA Enclosures



Standardized Environmental Test Processes and Procedures



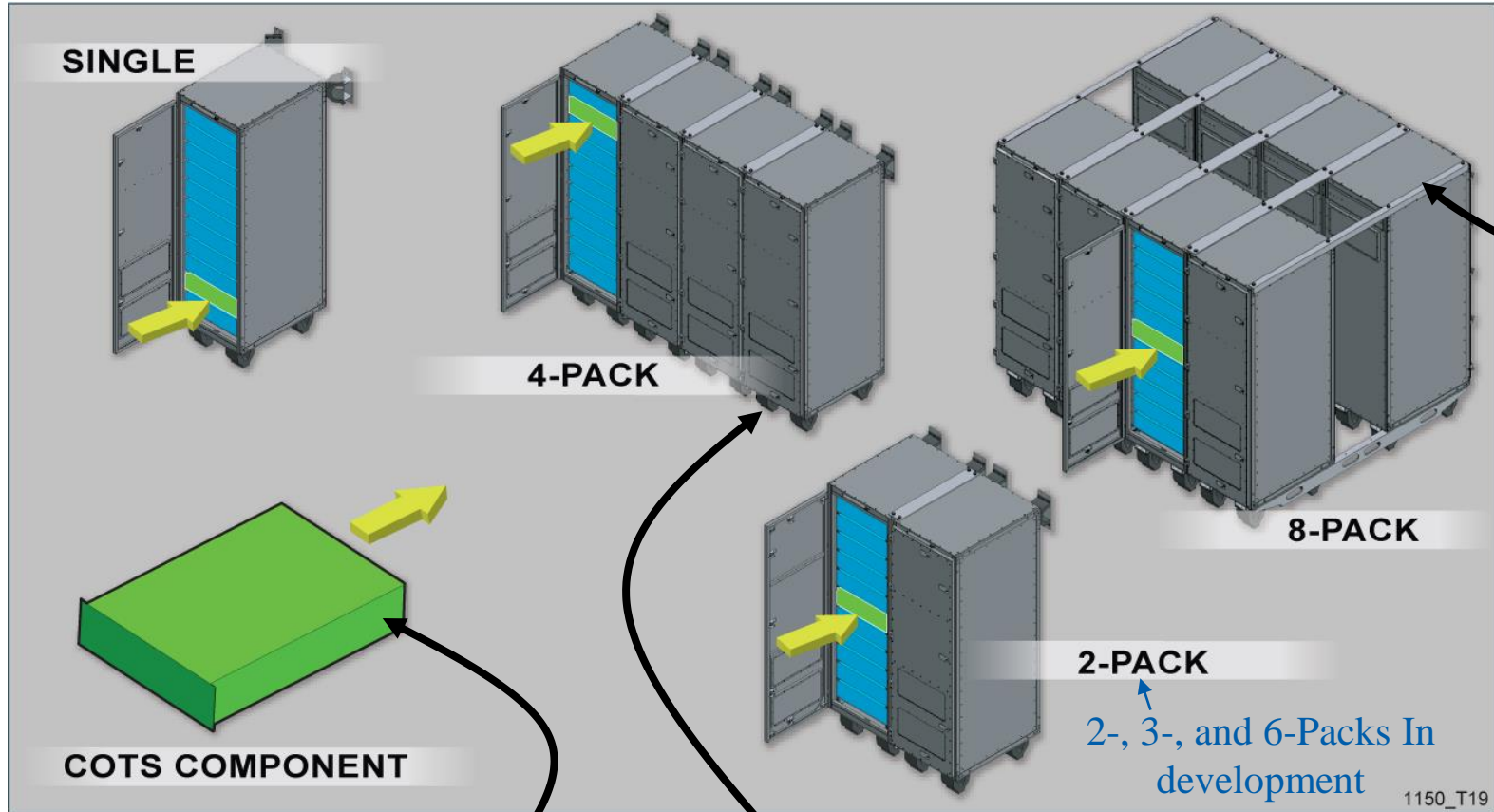
Shock tests of components at the drawer level satisfying prescribed test criteria can then be installed in the POA enclosures using standardized attachment methods.



Already implementing process for 72" tall enclosures

Deck Simulating Shock Machine (DSSM)

Previous Work: Approved 72" POA Packaging Methods

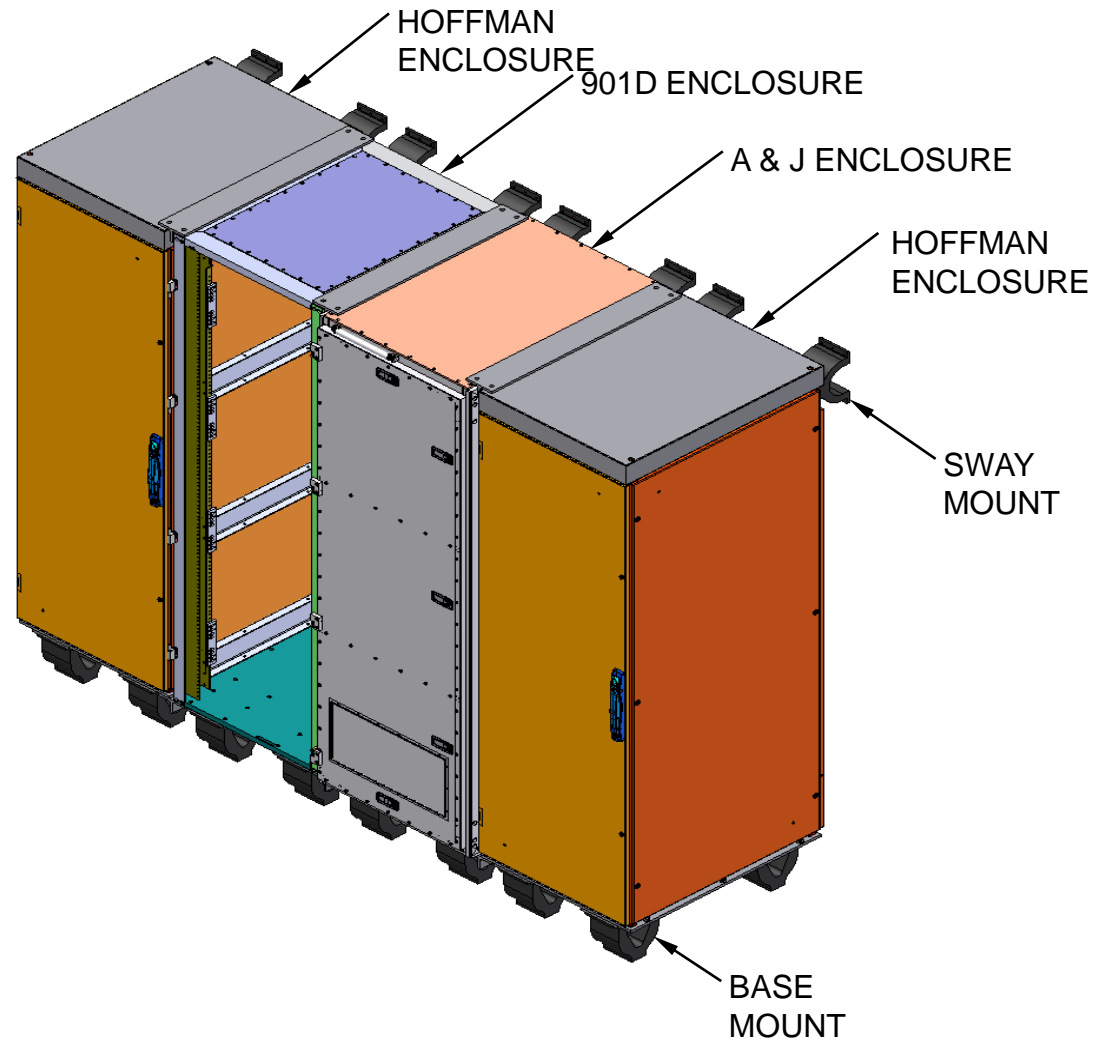


State of the art components with standardized attachment methods may be hosted anywhere within POA enclosures, bringing the ship interface to the component level.

All mounts have standardized solutions and interfaces for ships

No sway mounts on 8-packs

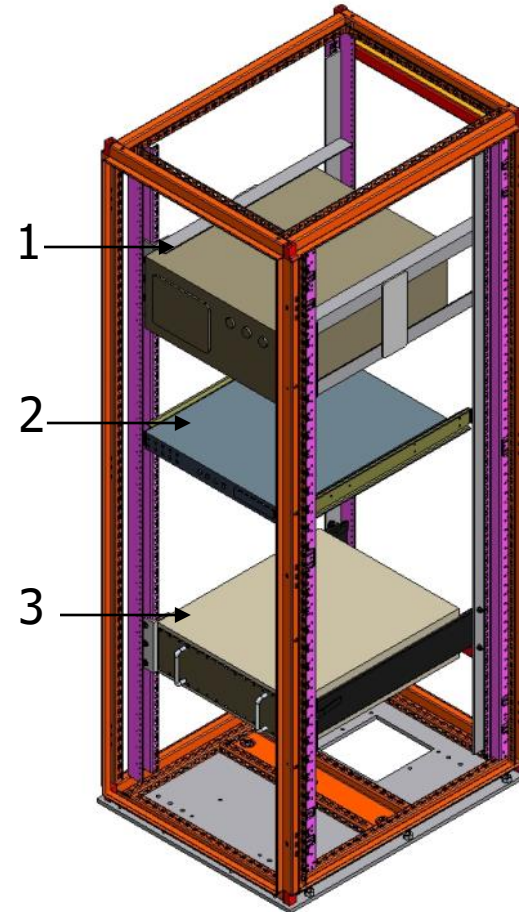
Previous Work: Standardization Enables Interconnectivity of Enclosures from Multiple Suppliers



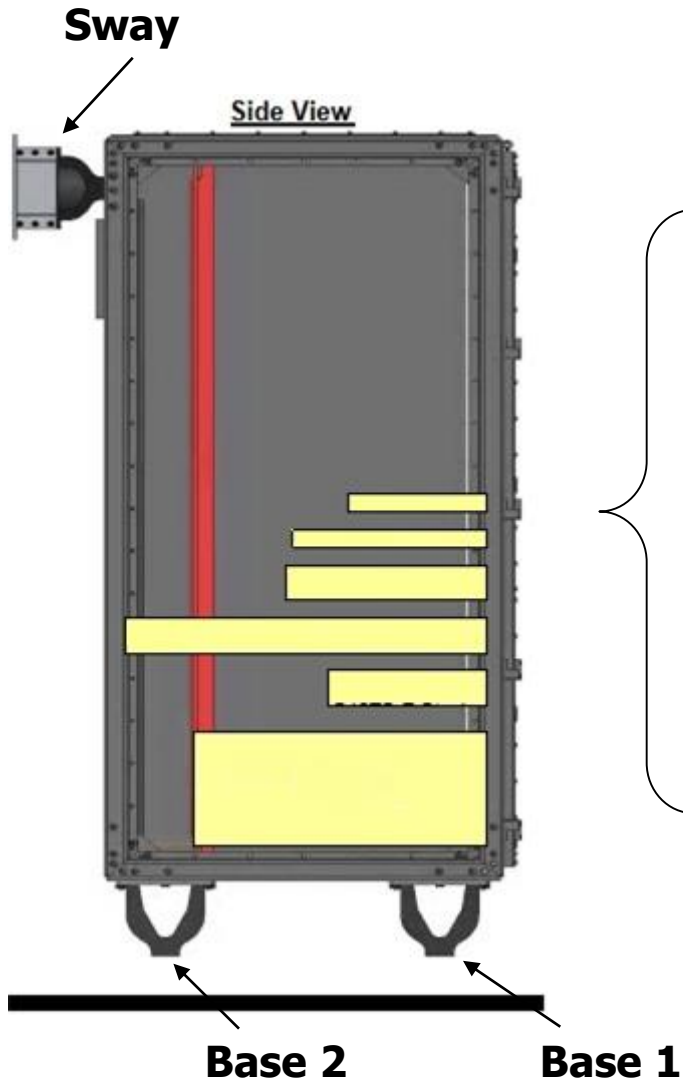
Previous Work: Examples of Standardized Attachment Methods



1. NNS Angle Frame
2. Jonathan 128QD-22
3. General Devices CTHRS-222



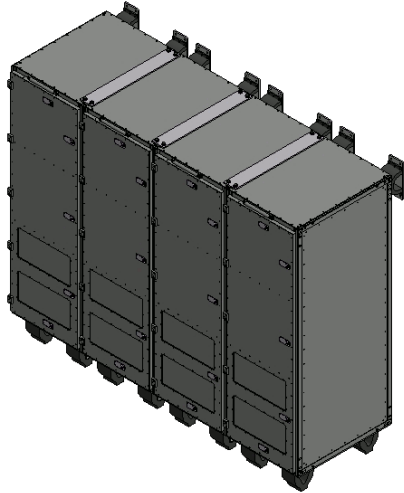
Previous Work: Engineered Mount Sets for 1-pack



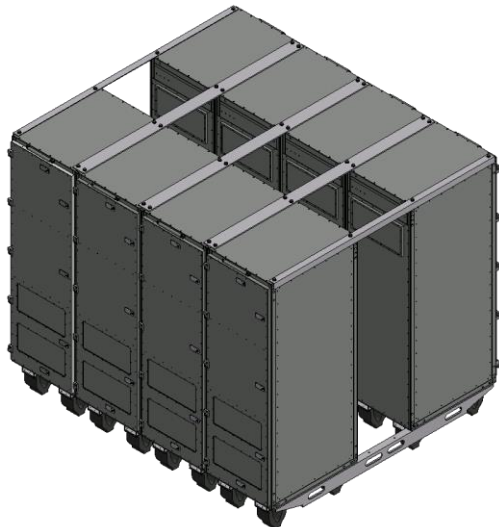
Mount Set	Enclosure Weight Range (lb)	Vertical CG Range (in)	Base 1	Base 2	Sway
1	630-770	19-30	70776-45	70776-15	70535-3
2	630-770	30-38	70776-45	70776-15	70535-4
3	770-890	19-30	70776-65	70776-25	70535-3
4	770-890	30-38	70776-55	70776-15	70535-4
5	890-1087	19-30	70776-85	70776-35	70535-3
6	890-1087	30-38	70776-50	70776-15	70535-5
7	1087-1230	19-30	70776-85	70776-25	70535-4
8	1087-1230	30-38	70776-80	70776-15	70535-5

All mount part numbers are ShockTech

Previous Work: Engineered Mount Sets for 4- and 8-packs



4-pack Mount Set	Enclosure Weight Range (lb)	Base 1	Base 2	Sway
1	550-650	70776-20	70776-15	70535-3
2	650-750	70776-35	70776-15	70535-3
3	750-900	70776-50	70776-15	70535-3
4	900-1050	70776-45	70776-15	70535-4
5	1050-1200	70776-65	70776-15	70535-4
6	1200-1350	70776-80	70776-15	70535-4



8-pack Mount Set	Enclosure Weight Range (lb)	Base 1	Base 2
1	555-610	70776-65	70776-20
2	610-755	70776-85	70776-20
3	755-950	70776-85	70776-40
4	950-1070	70776-85	70776-55
5	1070-1300	70776-85	70776-80



Cable Installation Methods	
101/102-NG	Trapeze Cableway 6-26 inch width
108-NG	Cable Retention
117-NG	Supporting Cableway Bundles
123-NG	Typical Cableway Installation
Cable Penetration Methods	
206-NG	Packing MCT and RMCP Transits
210-NG	Clear Holes in Stiffeners and Beams
401-NG	Cable Clamps
403-NG	Nylon Stuffing Tubes
406-NG	Multi-Cable Transit

Methods are developed IAW DOD-Std-2003.

Previous Work:

4 Phase Approach to Carrier Shock Qualification



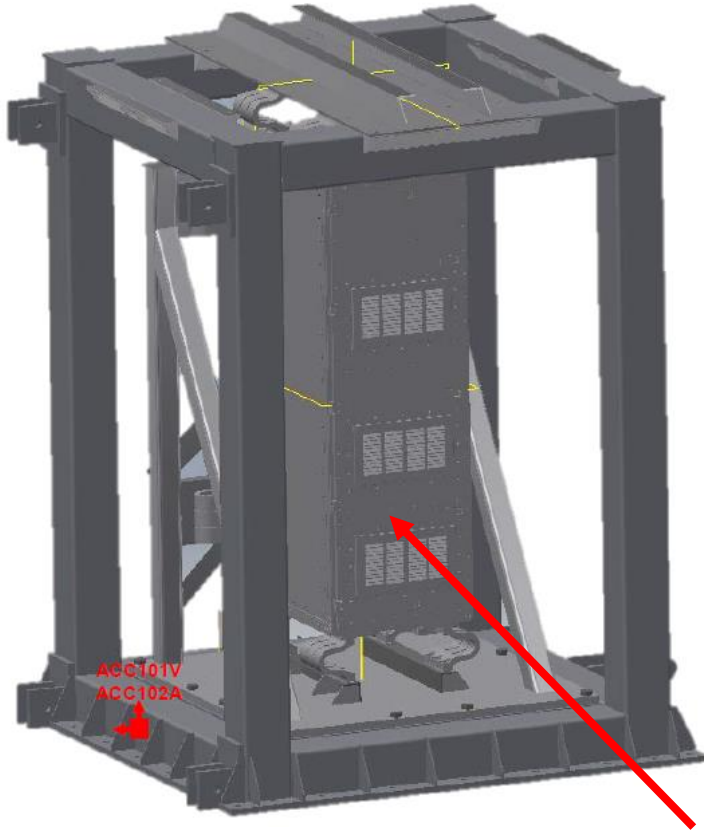
- **Phase A:** Heavyweight shock testing of worst case simulated Principal Unit Assemblies
 - ✓ Completed 2008
 - Single Racks
 - 4-Pack Multipack
 - 8-Pack Multipack

- **Phase B:** Heavyweight shock testing of representative components
 - ✓ Completed 2008

- **Phase C:** Type B shock testing in Shock Mounted Standardized Enclosure (SMSE) on Deck Simulating Shock Machine (DSSM)
 - ✓ First Tests Completed 2010
 - ✓ Over 10 tests performed for Carrier components so far

- **Phase D:** Shock Qualification Extension Packages
 - ✓ Part A – General Extension – First Approved 2012, Revised as needed, Most recent Revision: Rev. 3, 2017
 - ✓ Part B – Specific Extension – First Approved 2012, Revised as needed

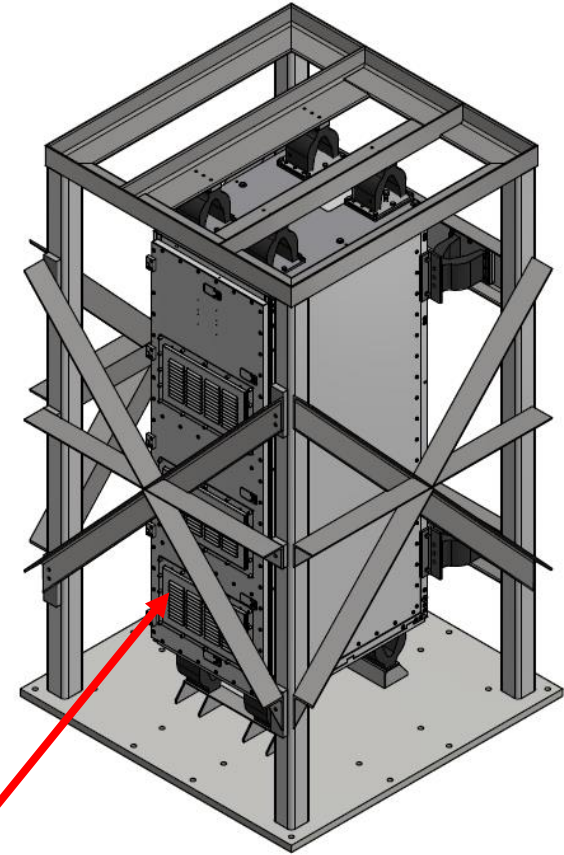
Previous Work: Phase C Shock and Vibration Testing



Shock Test Setup



Shock Mounted
Standardized Enclosure
(SMSE)



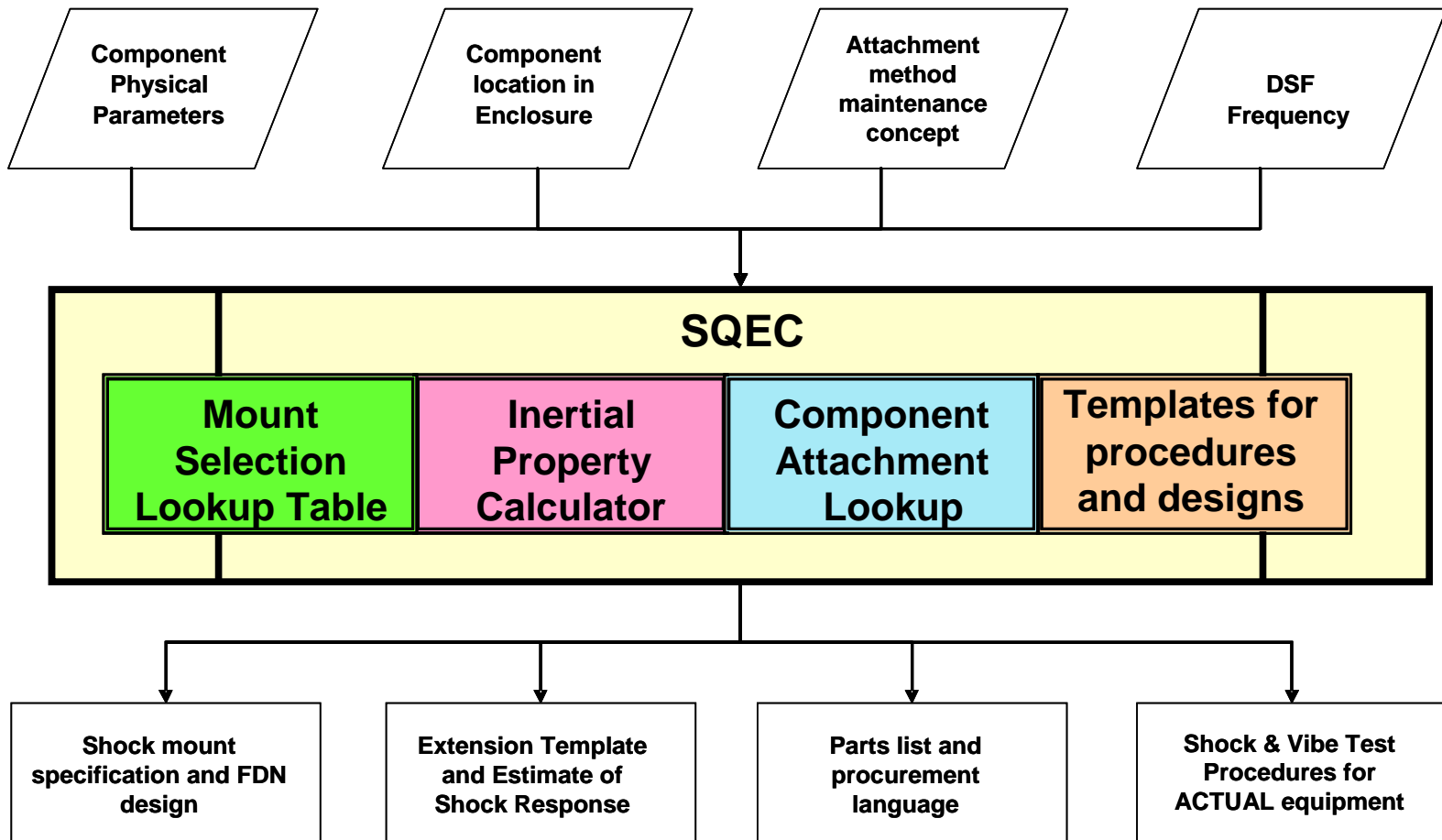
Vibration Test Setup





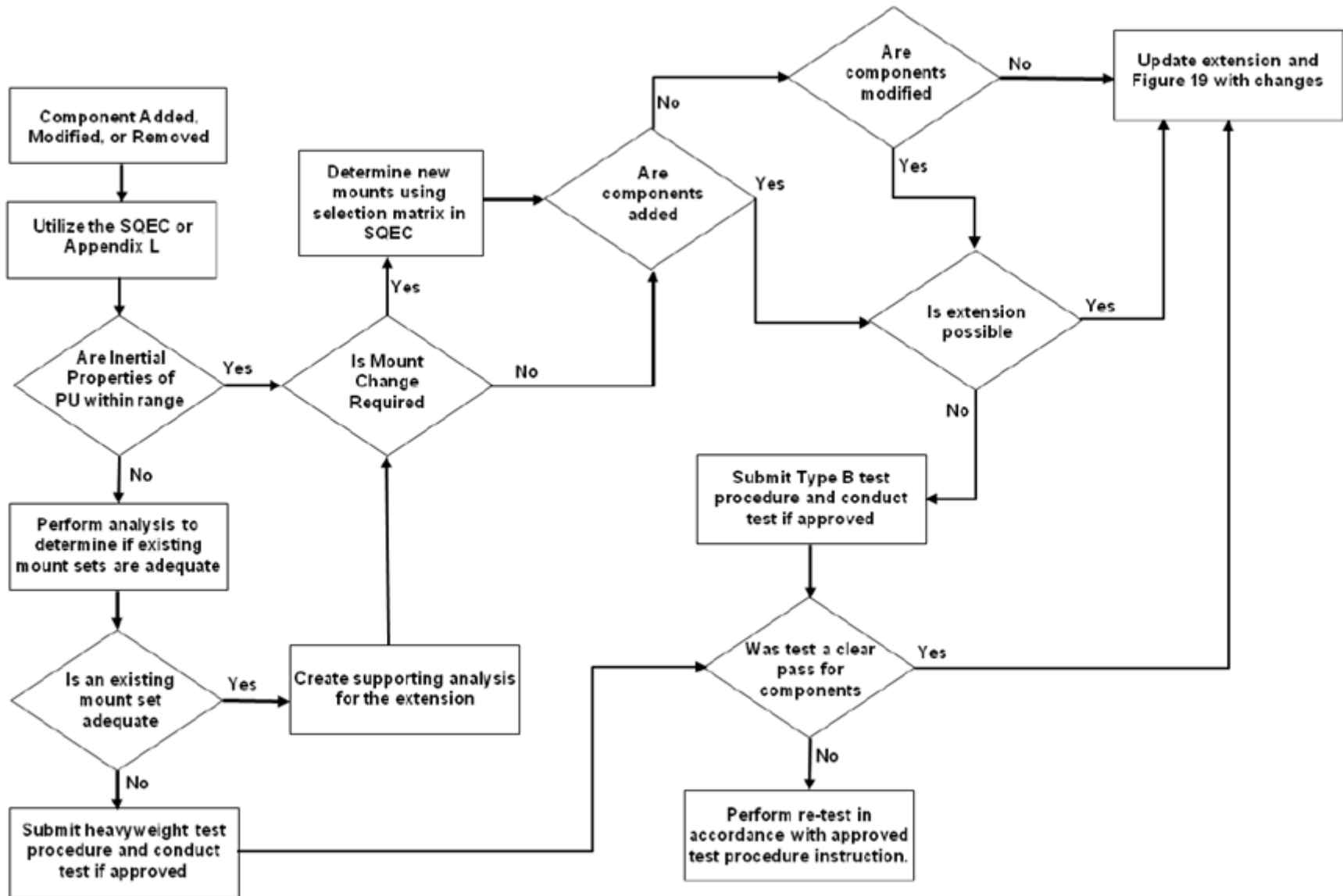
- The extension for equipment is done in two parts.
- Part A is the Generic Extension, which applies to every enclosure. This contains the general rationale for extensions based on Phases A, B, and C, and has already been approved by NAVSEA.
- Part B is the Specific Extension for each unique enclosure.
 - Provides information required by 901E and DI-ENVR-80706, Shock Test Extension Request for the similar extension of the specific assembly created by combining the enclosures tested in Phases A and B of the four-phase approach with the equipment tested in Phase C.
 - Fulfills requirements of Phase D of the four-phase approach to shock qualify equipment.
 - Fig 19's are created for each subsidiary component and unique rack assembly.

Previous Work: Shock Qualified Enclosure Calculator (SQEC)



Enables cost effective design efforts and configuration management

POA Life Cycle Configuration Management Approach



Methods and Procedures Required for Accomplishing Goals and Objectives

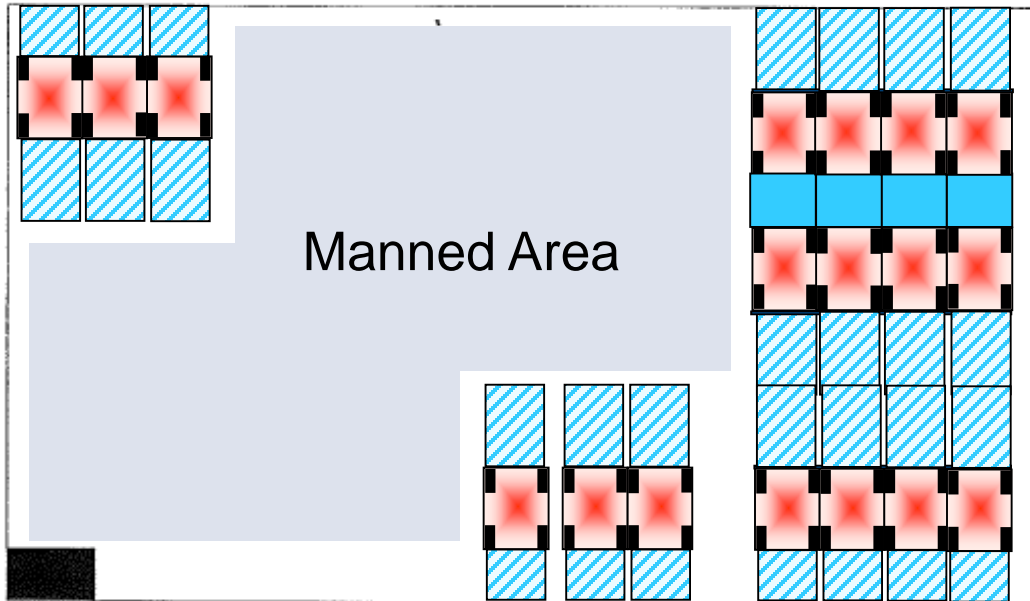


- Identify DDG and CG spaces that will benefit from 72-inch POA enclosures: HII-Ingalls shall perform.
- Identify environmental requirements gaps between CVN, DDG, and CG (e.g., higher frequency vibe testing, rack height, EMI variances, etc.): HII-NNS performs and HII-Ingalls participates.
- Develop initial rearrangement concepts for each space using POA enclosures: HII-Ingalls shall perform.
- Develop analysis & test plan to close gaps and submit to NAVSEA for approval: HII-NNS performs and HII-Ingalls participates.
- Define ordering and supplier information for POA enclosures, hardware, and mounts for DDG and CG platforms: HII-NNS performs and HII-Ingalls participates.
- Define processes, skill levels, and organizational responsibilities associated with POA enclosure builds, testing, ship outfitting, and enclosure configuration management
- BIW shall provide reviews and comments to all NSRP reports.

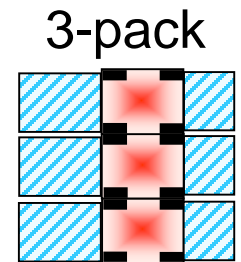
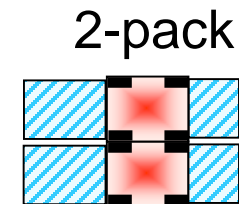
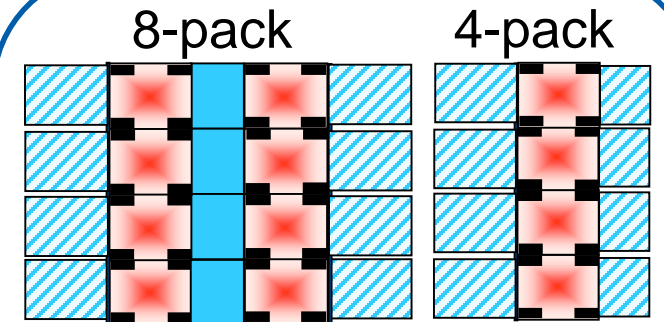
Develop Initial Rearrangement Concepts



Space rearrangement example



Legend



 Doorway or structure

Rearrangements will be iterated considering constraints and requirements

Status, Next Steps, Future Work



- Status

- DDG: ~8 spaces containing 36 enclosures identified for potential rearrangements using POA enclosures
- CG: ~37 spaces containing 124 enclosures identified for potential rearrangements using POA enclosures

- Next Steps

- Develop analysis & test plan to close gaps and submit to NAVSEA for approval.
- Define ordering and supplier information for POA enclosures, hardware, and mounts for DDG and CG platforms.

- Future Work

- Pursue funding to achieve “Roadmap for Anytime and Anywhere at the Drawer or Component Level Using POA Enclosures”



Questions

