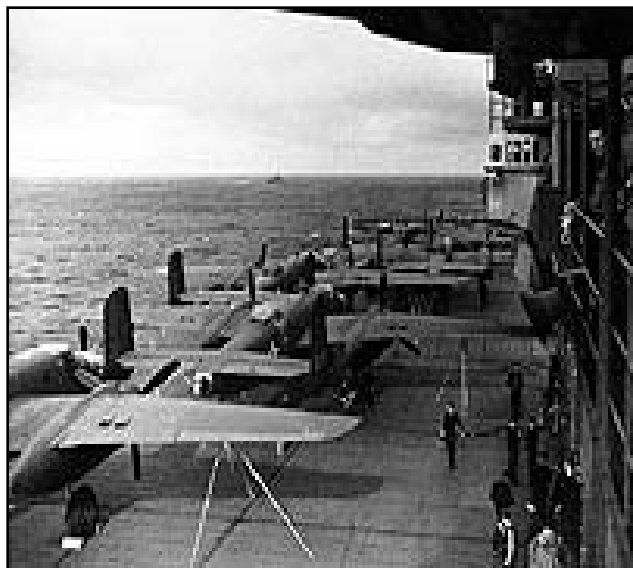
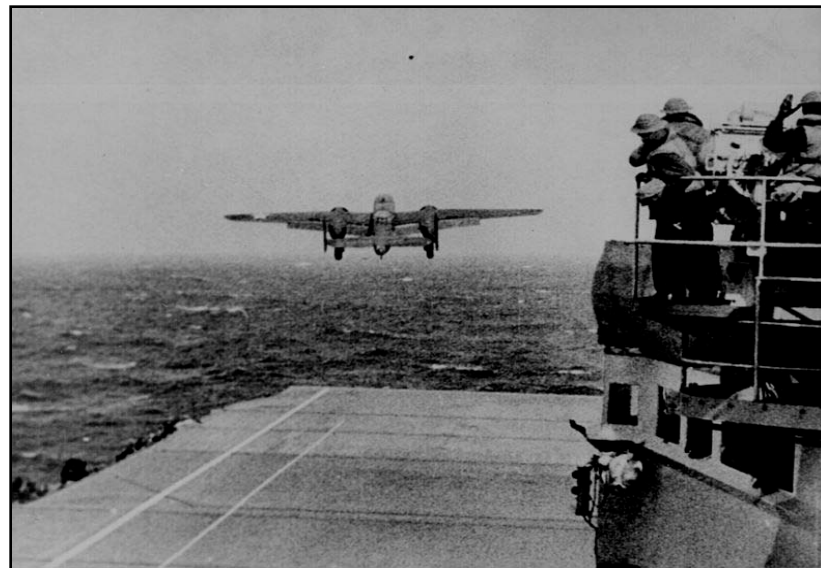
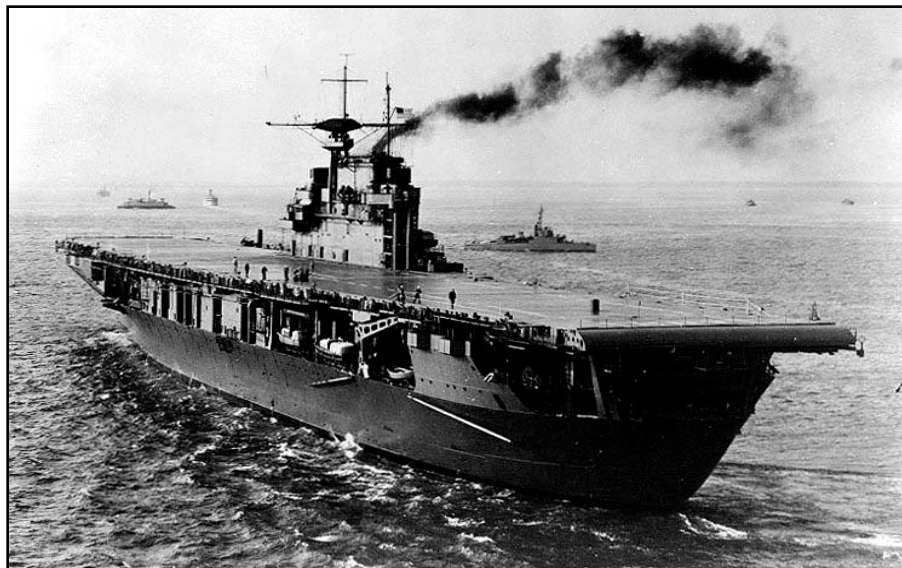




Building Operational Flexibility

**RDML Dave Lewis
Program Executive Officer, Ships
Expeditionary Warfare Conference
October 26, 2011**

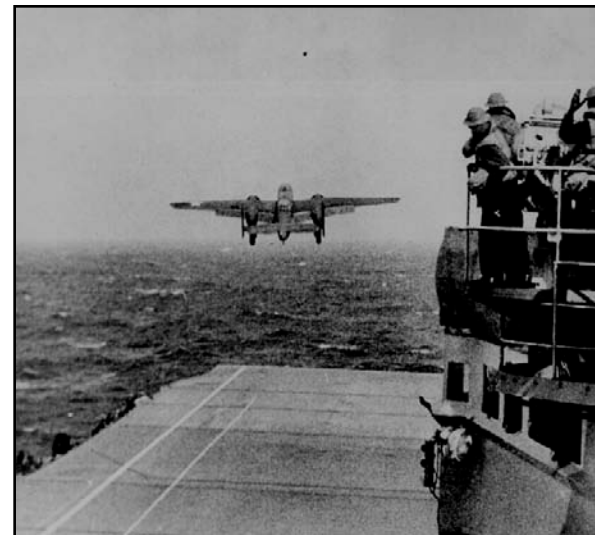
USS Hornet - Dolittle Raid



Timeline of Doolittle Raid

**December
1941**

21 Dec- President Roosevelt expresses to JCS that he wants to bomb Japan ASAP to boost public morale after Pearl Harbor disaster.



**January
1942**

10 Jan- Concept for the attack developed by Navy CAPT Francis Low, Asst CoS for ASW. CAPT Low reports to Adm. King that twin-engine Army bombers could be successfully launched from an aircraft carrier

**February
1942**

3 Feb- Two B-25s loaded aboard USS Hornet at Norfolk and flown off deck without difficulty. Leads to immediate approval of the raid and the 17th Bomb Group is chosen to provide the recruits for the mission.

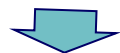


**March
1942**

1 Mar- The 24 crews selected for mission received intensive training (simulated carrier deck takeoffs, low level and night flying, low-altitude bombing) for three weeks in Eglin, FL.

25 Mar- Remaining 22 B-25's leave Eglin for McClellan Field, Calif. Arrive two days later at Sacramento Air Depot for final modifications.

1 Apr- 16 B-25 bombers hoisted to flight deck and parked on USS Hornet while moored at NAS Alameda pier. The B-25 Detachment consisted of 70 officers and 130 enlisted men under the command of Lieut. Colonel James Doolittle, U.S. Army.



April 1942

2 Apr- USS Hornet and Task Force 18 leave port of Alameda and rendezvous with Task Force 16, commanded by VADM Halsey, a few days later.

18 Apr- Task Force 18 spotted by Japanese picket boat, which radioed an attack warning to Japan. Doolittle decides to launch B-25s immediately -10 hours earlier and 170 nm farther from Japan than planned. First B-25 launched at 0825 and 16th bomber (last) launched 0920.

Aircraft Embarked on Pacific Fleet CV's



Program Executive Office, Ships

Peacetime
(1939-1940)



**Early
Wartime**
(1941-1942)



**Intermediate
Wartime**
(1943-1944)



Late Wartime
(1945)

Douglas TBD-1 Devastators



F4F-3 Wildcats



SBD-3 Dauntlesses



F4U Corsairs



SBC-2 Helldiver



F4F-4 Wildcats



SBD-5 Dauntlesses



TBM Avenger-3/3E/3N



SB2U-1 Vindicators



Army B-25's, Army P-40's



Grumman F6F-6 Hellcats



SBC2 Helldiver



Aircraft Embarked in USS Midway



Program Executive Office, Ships



Aircraft Embarked in USS Midway

1940's

Corsair, Hellcat, Helldiver, Avenger



1950's

AVAIL [Nov 1950-Apr 1951] Reinforcement of flight deck to accommodate heavier aircraft

Mauler, FH-1 Phantom, Bearcat, F9F Cougar

AVAIL [1955-Sep 1957] Extensive modernization program for capability to operate high performance jet aircraft. Fitted with two steam catapults on the bow and a shorter steam catapult in the new angle deck to allow ready deck launches. Additional improvements included enlarging the number one elevator to accommodate longer aircraft, jet blast deflectors, and the largest aviation crane ever installed on an aircraft carrier.



1960's

AVAIL [Feb 1966] Flight deck increased in surface area from 2.82 acres to 4.02 acres. Elevators were enlarged, relocated, and given almost double the weight capacity. Two powerful new catapults on the bow, three new arresting gear engines, and one barricade were installed and rearranged to accommodate a change of 13 degrees to the angle deck. Smaller waist catapult removed since it was ineffective in launching the now heavier aircraft.

1970's

F8 Crusader, F4 Phantom, Corsair II, A6 Intruder, E2 Hawkeye



1980's

AVAIL [Mar 1986] Addition of the catapult flush deck nose gear launch system, the additions of MK7 MOD1 jet blast deflectors, new air traffic consoles, and the construction of intermediate maintenance avionics shops to support the F/A-18 aircraft.

1990's

F/A 18 Hornet



USS Eisenhower- Invasion of Haiti



Program Executive Office, Ships



Operation Uphold Democracy



Program Executive Office, Ships

**July
1994**

29 Jul- 10th Mountain Division given mission to form Joint Task Force 190 to carry out Operation Uphold Democracy

31 Jul- UN passes Resolution 940 calling for the “application of all necessary means” to restore democracy in Haiti. Resolution authorized a U.S. led invasion force, followed by multi-national peacekeeping force.

26 Aug- President Clinton approves military’s plans for invasion.



**August
1994**

12 Sep- Eisenhower’s aft hangar bay selected for vehicle and equipment staging- filled with 25 HMMWV’s, 3 trailers, and numerous Army supplies. Ammo was uploaded into the magazines .

14 Sep- USS Eisenhower sails from Norfolk with 10th Mountain Division unit embarked using the concept of “adaptive force packaging”- using USS Eisenhower as an Army helicopter and troop carrier.

19 Sep- 10th Mountain Division conducts air assault from carrier USS Eisenhower to seize Port-au-Prince Int’l Airport and the port itself. 1st Battalion 22nd Infantry lands at Port-au-Prince Airport, flying directly in from U.S.

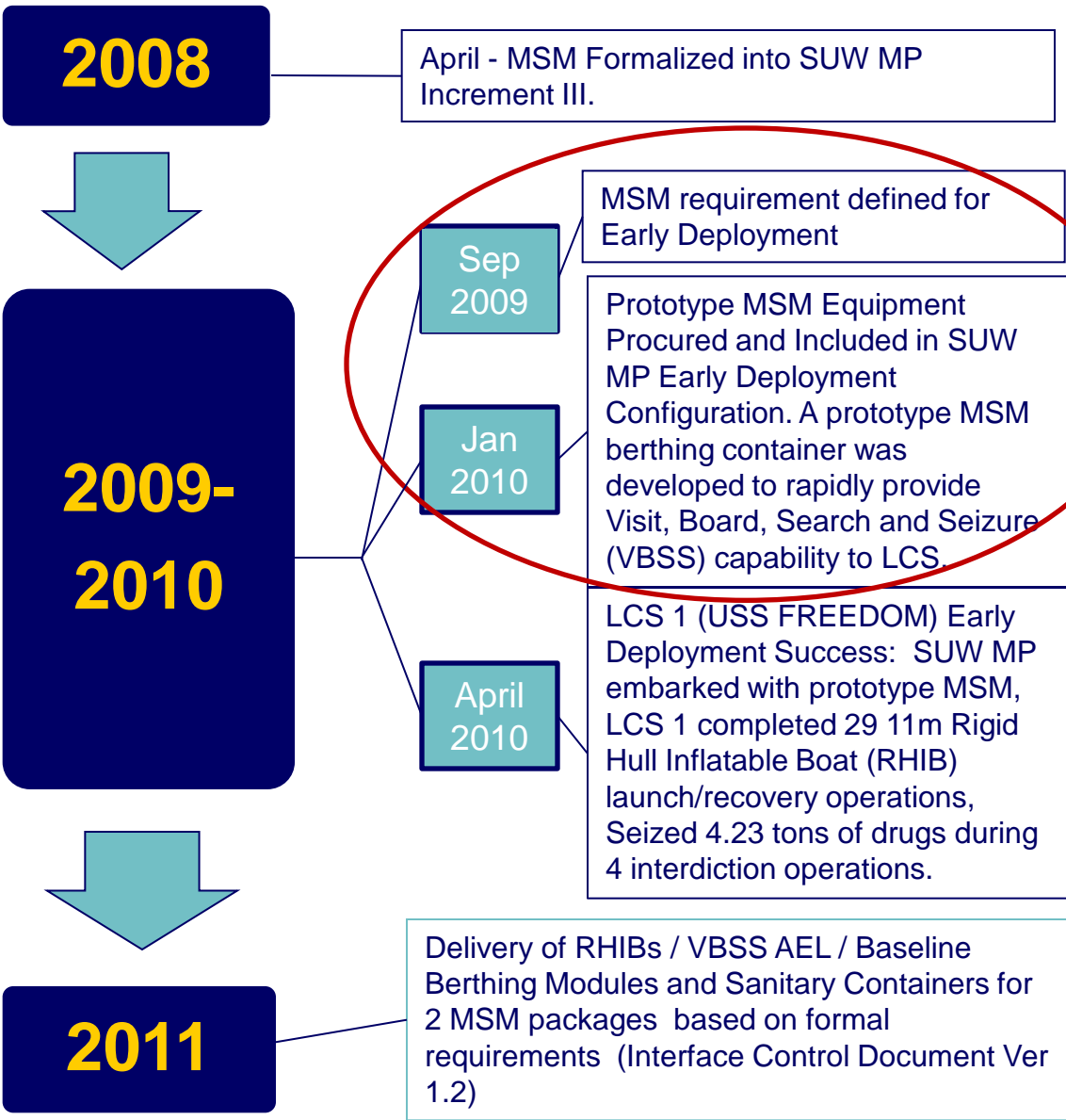
19 Sep AM- All 18 Black Hawk helicopters ferry troops ashore. First two HMMWV’s staged on Eisenhower’s fantail while additional 12 vehicles were staged.

19 Sep- HMMV’s lifted off flight deck of Eisenhower by either Army Black Hawk helos or Navy CH-53 helos and ferried to the shore. By the end of 19 Sep, both infantry battallions and their equipment were ashore.

**September
1994**

22 Sep- Sling-load operation completed after four days. During its course, 204 sling loads were transported ashore.

LCS Maritime Superiority Module (MSM)



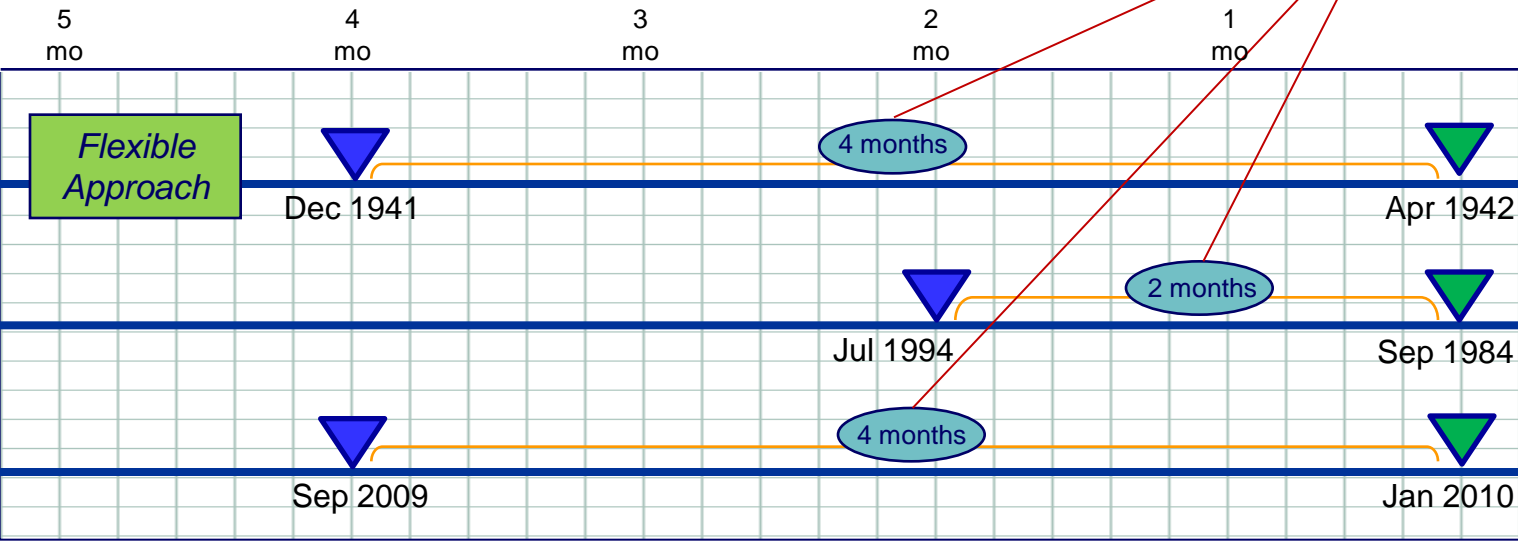
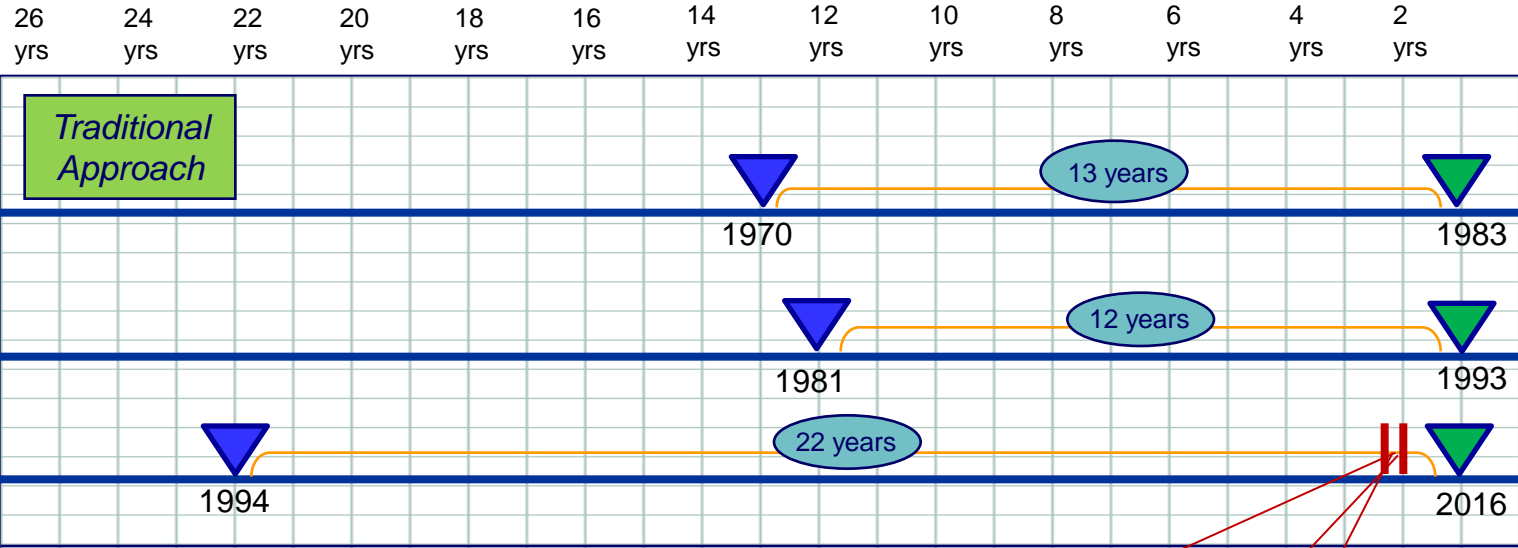
All MSM equipment was delivered to LCS 1 within 4 months of requirement definition.

- **Early Deployment Equipment**
 - Visit, Board, Search & Seizure (VBSS) Boarding Equipment for two teams
 - 2 x 11m RHIBs with cradles
 - One 12-man 20 ft prototype berthing container
 - One prototype shower container
 - 1 x 10' VBSS Equipment Storage Container

Operational Flexibility



Program Executive Office, Ships



▼ = Requirement
 ▼ = Fielding

Ticonderoga

Arleigh Burke

SC 21

Hornet

Eisenhower

Freedom

Combat System Development vs. Ship Design and Construction

Attribute	Combat Systems	Ship Design & Construction
Timeline	Short	Long
Expertise required	Electronics, software	HM&E, Hardware
Configuration	Volatile	Stable
Effect on <i>Design</i> Ship Service Life	Little influence	Strong driver
Effect on <i>Actual</i> Ship Service Life	Strong driver – can't cost effectively update	Moderate driver – Ships decommissioned early

Affordability will become increasingly important

Modular adaptable ship technologies enable ships to affordably remain operationally relevant over their service life.

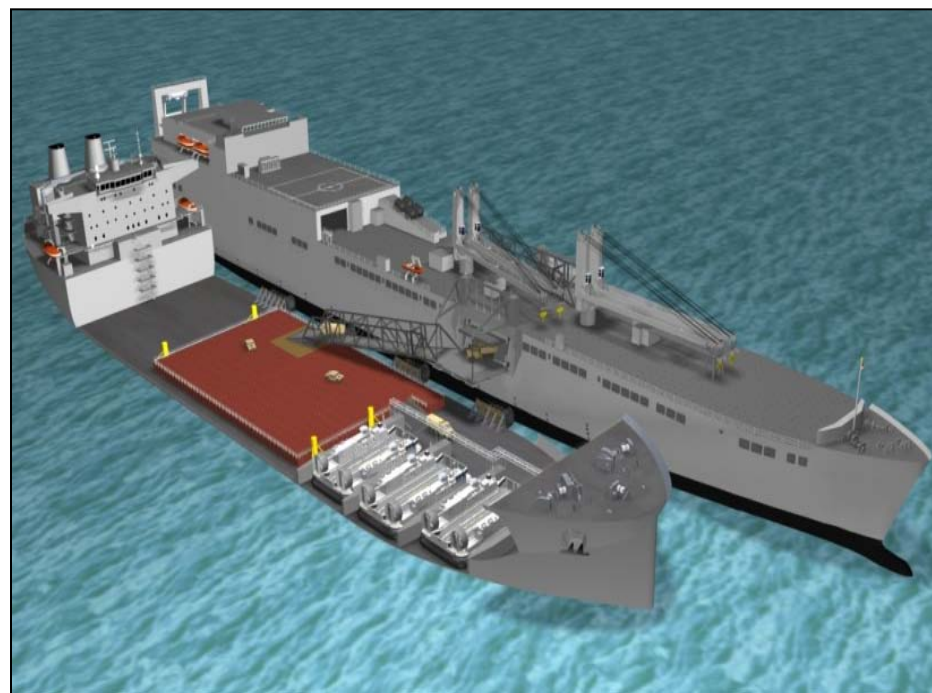
Modular adaptable ship technologies are not yet an institutional part of our design and modernization processes.



Modularity Today

• Cost Control Initiatives

- Performed requirements versus cost trade-offs to achieve 80% of original MLP capability at 40% of the cost
- Concurrent design/production engineering approach ensured a high degree of design and production planning maturity prior to start of construction to minimize cost and schedule risk
- Government-led contract for deck interface
 - Refine and translate the requirements into the design and specifications
 - Competing the contract
 - Synopsis released Sep 28



• Program Status

- MLP 1 Start of Construction was Jun 2011
 - Currently 8% complete
- Core Capabilities Set RFP to be released in Nov

Joint High Speed Vessel (JHSV)



Program Executive Office, Ships

• Cost Control Initiatives

- Designed to commercial standards
- Conducted rigorous production readiness review prior to start of construction, ensuring design maturity greater than 85%
- Modular Manufacturing Facility will aid in production of high quality ship modules and improve production efficiencies
 - Improve capacity, production planning and process control
 - Reduce construction duration, lower production costs, and mitigate existing production process and control risks



• Program Status

- Detail design and construction contract for ten ships with seven options exercised
- USNS Spearhead (JHSV 1) Christened Sep 17, 2011
 - Currently 92% complete
- JHSV 2 started production in Sep 2010
 - Currently ~45% complete
- JHSV 3 started production in Sep 2011
- Contract for JHSV 4 and JHSV 5 awarded Oct 2010
- Contract for JHSV 6 and JHSV 7 awarded Jun 2011



Aircraft, Boats, UUV, UAV, USV

- What:
 - Support for multiple types of aircraft, boats, unmanned underwater vehicles, unmanned air vehicles, and unmanned surface vehicles.
 - Vehicle Stowage, Communications, Command and Control, Maintenance.
 - Vehicle Handling.
 - Boat Davits and Helo Deck
 - UUV / USV handling gear
 - UAV launch and recovery
- Why:
 - Extend the offboard reach of sensors and weapons. Enable independent development of the ship and the embarked vehicles.
- Status:
 - Well Established methods for integrating manned aircraft and craft

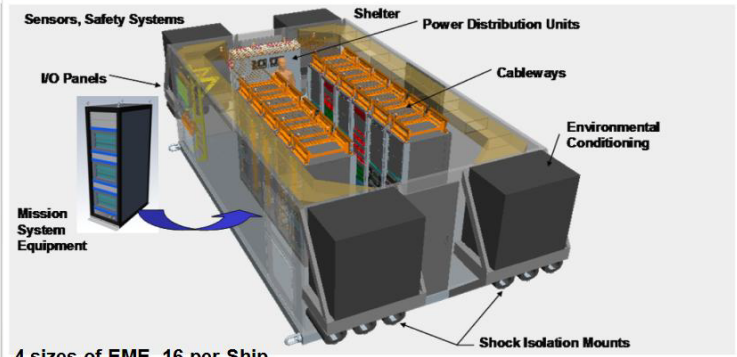
**Need to mature systems and methods for integrated unmanned systems.
Need to develop methods to value different combinations and numbers of craft.**



Electronic Modular Enclosures (EME)

- What:
 - Encapsulation of Commercial Off the Shelf (COTS) electronics in a modular enclosure to enable equipment survival in a naval combatant environment.
- Why:
 - Allow COTS equipment to be used on a naval combatant.
 - Provide standardized equipment racks to enable rapid reconfiguration of the electronics.
- Status:
 - Will be installed on DDG 1000 based on DBPS section 681 and ICDS.
 - EME Design Criteria Manual Exists for specific DDG 1000 application
 - May be beneficial to convert DBPS section 681 to a MIL-PRF

Electronic Modular Enclosures



4 sizes of EME, 16 per Ship

	Length	Width	Height
Mini	18 ft	7 ft	7.45 ft
Small	25 ft	11.8 ft	7.45 ft
Medium	30 ft	11.8 ft	7.45 ft
Large	35 ft	11.8 ft	7.45 ft

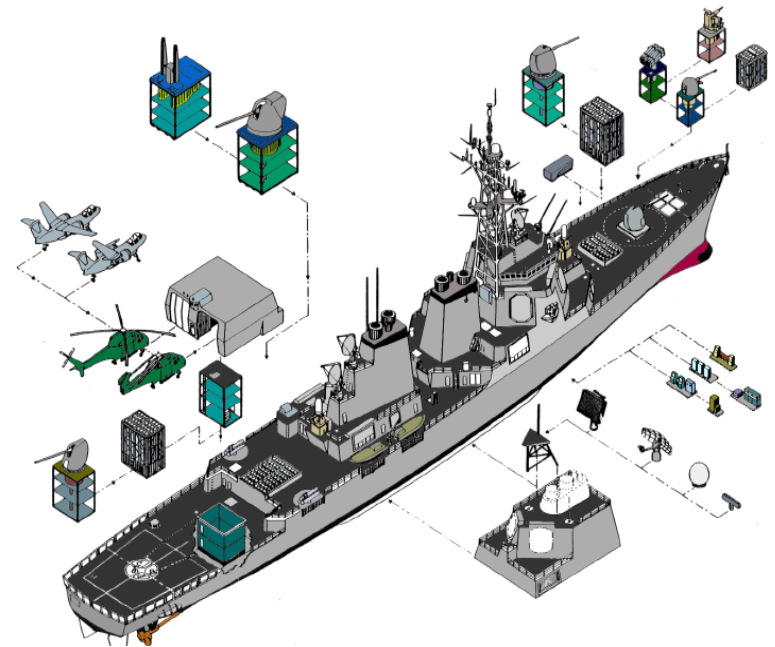
- Specialized shelter provides environment for Commercial Off The Shelf (COTS) Hardware
- 16 shelters house 236 cabinets
- Shock, Thermal, EMI, Security, & Noise Reduction
- Power Distribution and Control
- Enables Integration of electronics in factory



**Need improved Cost Estimation methods.
Need method to Value EME.**

Weapons/Electronics Modules / Zones

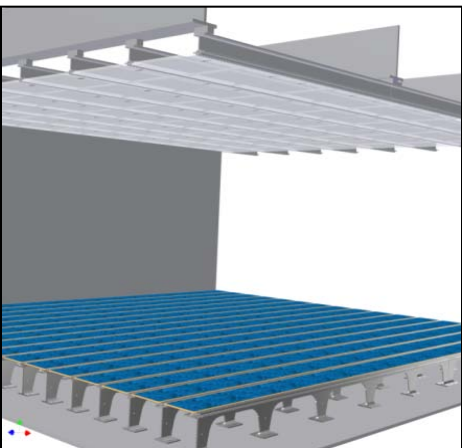
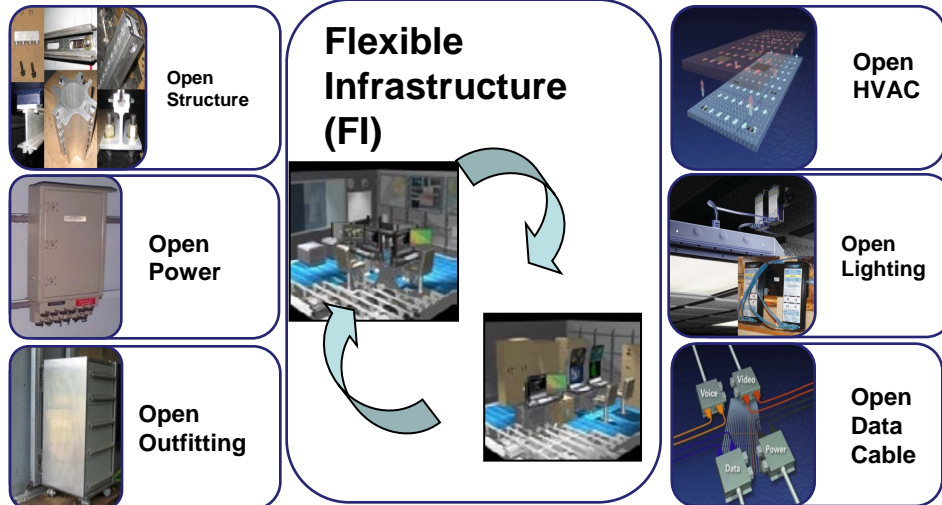
- What:
 - Predefined and standardized physical, structural, and distributed system interfaces for weapons modules.
- Why:
 - Facilitate upgrading of combat systems elements.
 - Facilitate reuse of combat system elements across ship classes.
 - Works well for elements that require both internal to the ship and external access.
- Status:
 - Guides Exist.
 - Specifications from original modularity efforts of 80's exist as a baseline.



Need Specifications and Standards development.
Need Cost Estimation methods.
Need method to value Weapons Modules / Zones needed.

Flexible Infrastructure

- What:
 - Infrastructure for an interior space to enable rapid reconfiguration without welding or other labor intensive activities.
- Why:
 - Facilitate rapid adaptation of spaces likely to change often during the service life of a ship.
 - Works well for command and control spaces and electronics intensive spaces.
- Status:
 - Demonstrated on ships. Standard Drawings in approval process.
 - Handbook in approval process.
 - Cost Data Exists, but not yet incorporated into cost models.

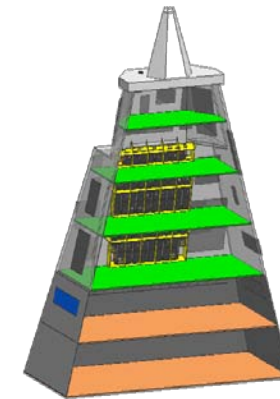


Need to develop method to Value Flexible Infrastructure

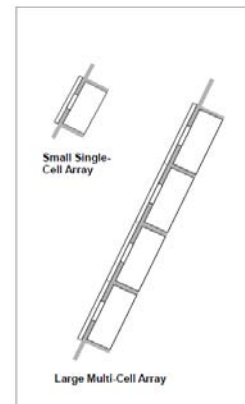
Aperture Stations

- What:
 - Standardized ship-aperture interfaces in the topside design of the ship to enable upgrading of transmit and receive modules.
 - Integrated into the ship in a manner to minimize co-site / EMI issues.
- Why:
 - Decouple transmit / receive module design from the ship design.
 - Enable combat systems design to be concurrent with detail design and construction of the ship.
 - Enable upgrading of apertures during the ship's lifecycle.
- Status:
 - ONR InTop INP is demonstrating how to use same array to meet multiple missions.
 - ONR Aperstructures programs demonstrating integrated apertures with OA structural integration ICDs.

Need to demonstrate that the array design facilitates modular upgrading over the service life of ship.
Need to develop an industrial capacity.
Need to develop specifications, standard drawings, and handbooks.
Need to develop cost estimating relationships.
Need to develop methods to value Aperture Stations.



Aperstructures



Design Alternatives

Range of Options

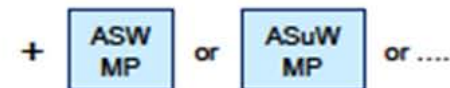
Generic (Civ / Mil) hull with full modularity

- Containerized reconfigurable or mission modules
- Combat systems independent of hull (treat like CVW)
- Modular hull design options



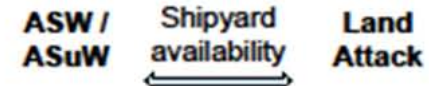
Single Mission modules

- Interchangeable mission modules
- Reconfigurable (~24 hrs)



Same ship—reconfigurable mission packages

- Only in shipyards



Different capabilities—common hull

- Pre-defined physical, structural, and interfaces for weapons modules
- Open architecture systems for modernization






CruDes (DDG-51 Fit IV)

- Full spectrum multi-mission
- Same across flight
- Modular via VLS



AAW / BMD / ASW / ASuW / Land Attack

- “Operational Flexibility” is emerging as a valid warfighting requirement
- Ship designs have proven capable of operational flexibility
 - CVN 
 - Amphibious Ships 
 - LCS 
 - JHSV (under construction)
 - MLP (under construction)
- Modularity provides one path to greater operational flexibility

**New demands require
new approaches.**

Questions?