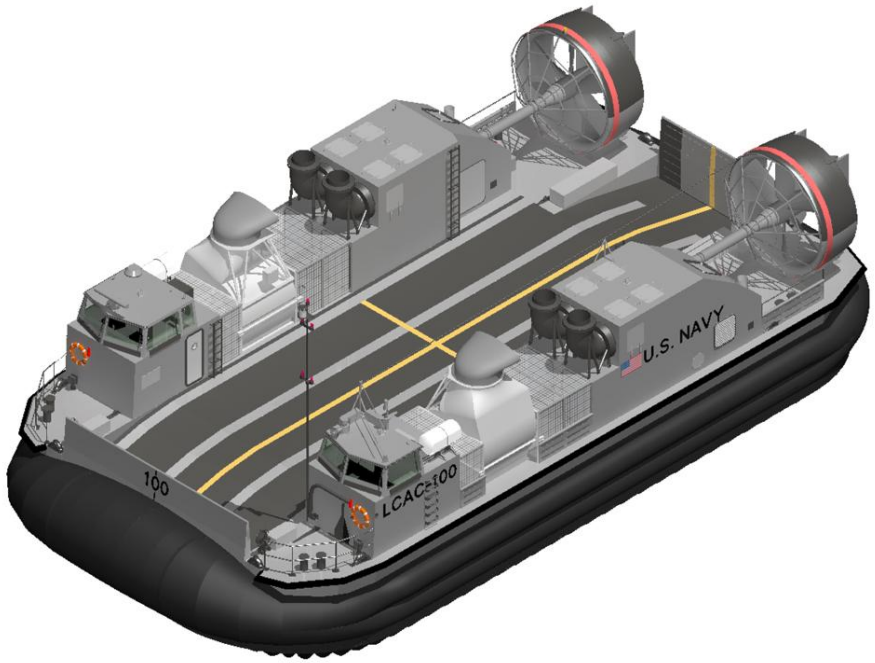
Ship to Shore Connector (SSC)



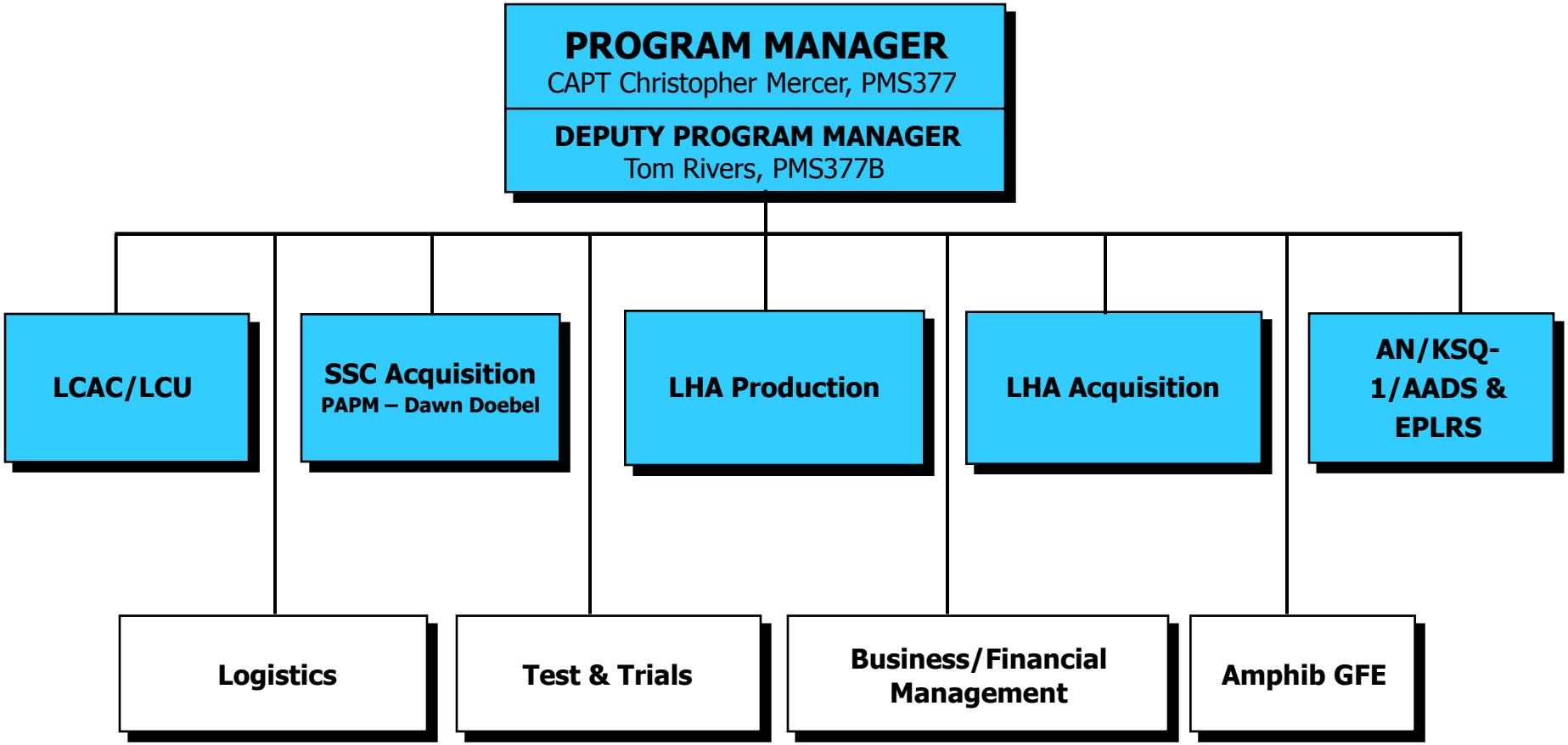
A Turning Point in Naval Ship Design

9 September 2010

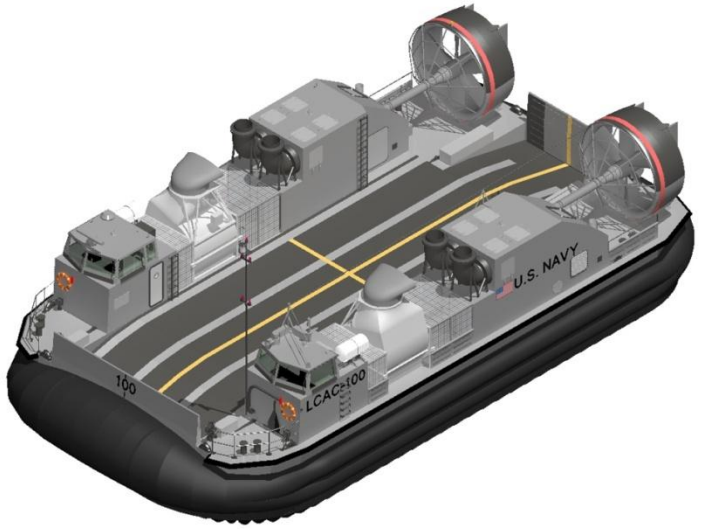
CAPT C. P. Mercer
Amphibious Warfare
Program Office
PMS377

Amphibious Warfare Program Office Organization

PMS377



SSC Program



- **Replacement for the LCAC**
- **Deploys in LPD, LSD, LHD Amphibious Well Deck Ships**
- **Transports weapon systems, equipment, cargo and personnel**
  - **High speed (over 35 knots)**
  - **High payload (74 Short Tons)**
  - **Over the Horizon (25nm or greater)**
  - **Over-the-beach operations**
  - **Through NATO Sea State 3 (significant wave height of 4.1 ft)**
- **Operate independent of tides, water depth, underwater obstacles, ice, mud, or beach gradient**

Evolution of LCAC to SSC

1970's 1980's 1990's 2000's 2010's

JEFF A / JEFF B

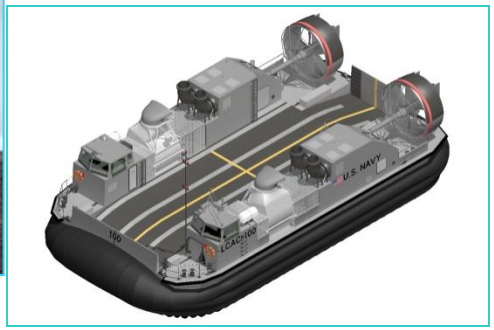
- Prototypes leading to LCAC
- JEFF B was selected as the LCAC baseline

LCAC

- 91 Craft delivered (1984-2000)
- 79 currently in operational inventory
- Designed for 20-year service life
- Capable of carrying a 60 TON (M60) payload at speeds over 35 knots
- Amphibious assault from 15 nautical miles offshore

LCAC (SLEP)

- Rotating machinery refurbishment
- C4N Replacement
- Enhanced Engines & Deep Skirt
- +10 yrs Service Life
- 27 Craft Completed + 11 In-process



SSC

- R&D funded craft to be delivered FY18
- Designed for 30 Year Service Life
- 74 TON (M1A1) payload & OTH assault from 25 nautical miles
- Increased reliability & availability
- Pilot/Co-pilot cockpit
- Procuring 73 craft over 8 year period

SSC Program History

- **2005 - Program Studies and Analysis began**

- **2006 - Oct Initial Capabilities Document (ICD) approved by JROC**
  - Nov Concept Decision DAB

- **2007 - Nov AoA Final Report signed by N85 & DASN Ships**
  - Dec USN Resource, Requirements Review Board (R3B) (Gate 2)

- **2008 - Mar SSC Design Site officially established**
  - Apr DAB approved start of Preliminary Design (PD)
  - Apr – Sep Set-Based Design (SBD)
  - Nov NAVSEA Stakeholders Steering Board (SSB) #1
  Approved Baseline Design and PD effort continued

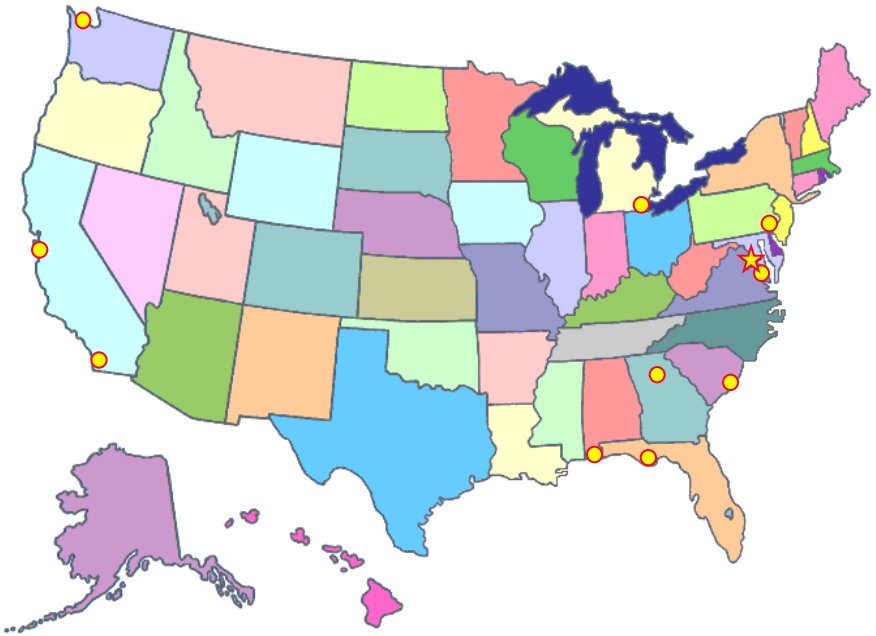
SSC Program History (Cont.)

- **2009**
  - **Mar NAVSEA SSB #2 approved Functional Baseline Design**
  - **Mar NAVSEA Preliminary Design Review (PDR) to SEA 05**
  - **Apr Milestone A DAB**
  - **May Contract Design (CD) begins**
  - **Sep – 0ct First Technical Data Package (TDP) TWH Reading Session**
  - **Dec Industry Day and Release of Draft Specifications and Drawing to industry**

- **2010**
  - **Mar Final TDP Reading Sessions**
  - **May – Jun SSB/Critical Design Review (CDR)**
  - **Jul TDP Certified**
  - **Aug USN Resource, Requirements Review Board (R3B) (Gate 4/5)**

SSC - Innovative Approach

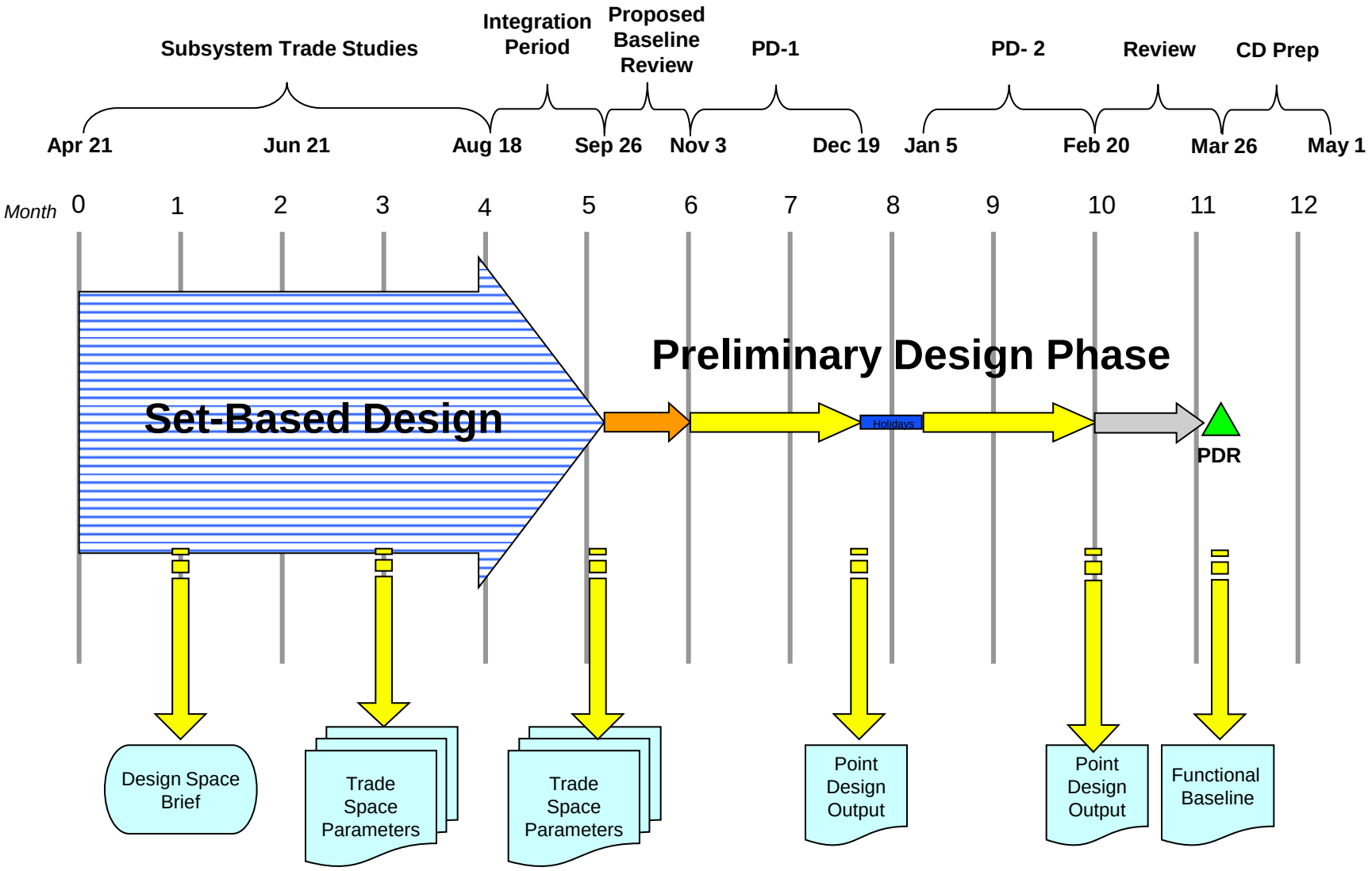
- **Returned to Navy led design process**
- **Design team distributed throughout US**
  - **NSWCCD, West Bethesda & Philadelphia**
  - **SPAWAR, Charleston & San Diego**
  - **NUWC, Keyport**
  - **NSWC, Dahlgren**
  - **NSWCPCD, Panama City**
  - **NRL**
  - **Contractor design expertise**



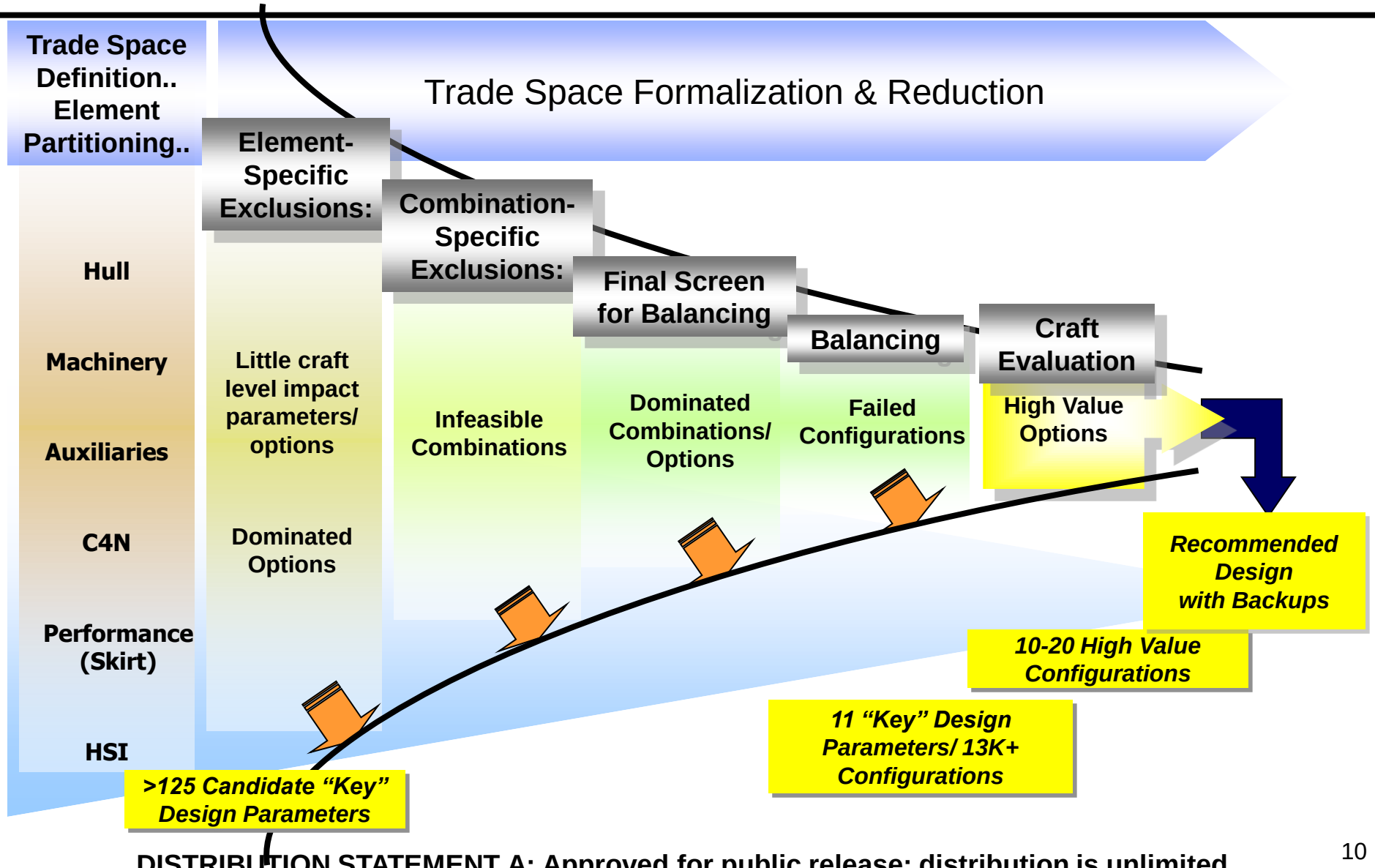
SSC - Innovative Approach (Cont.)

- **First ship design implementation of Set-Based Design (SBD)**
- **Government Design locks in major details**
  - **Increased payload and more severe environment**
  - **Improved maintainability and reliability**
  - **Optimized Total Ownership Costs (TOC)**
- **Builder does what he knows best**
  - **Design for producibility**
  - **Reduce Acquisition Cost**

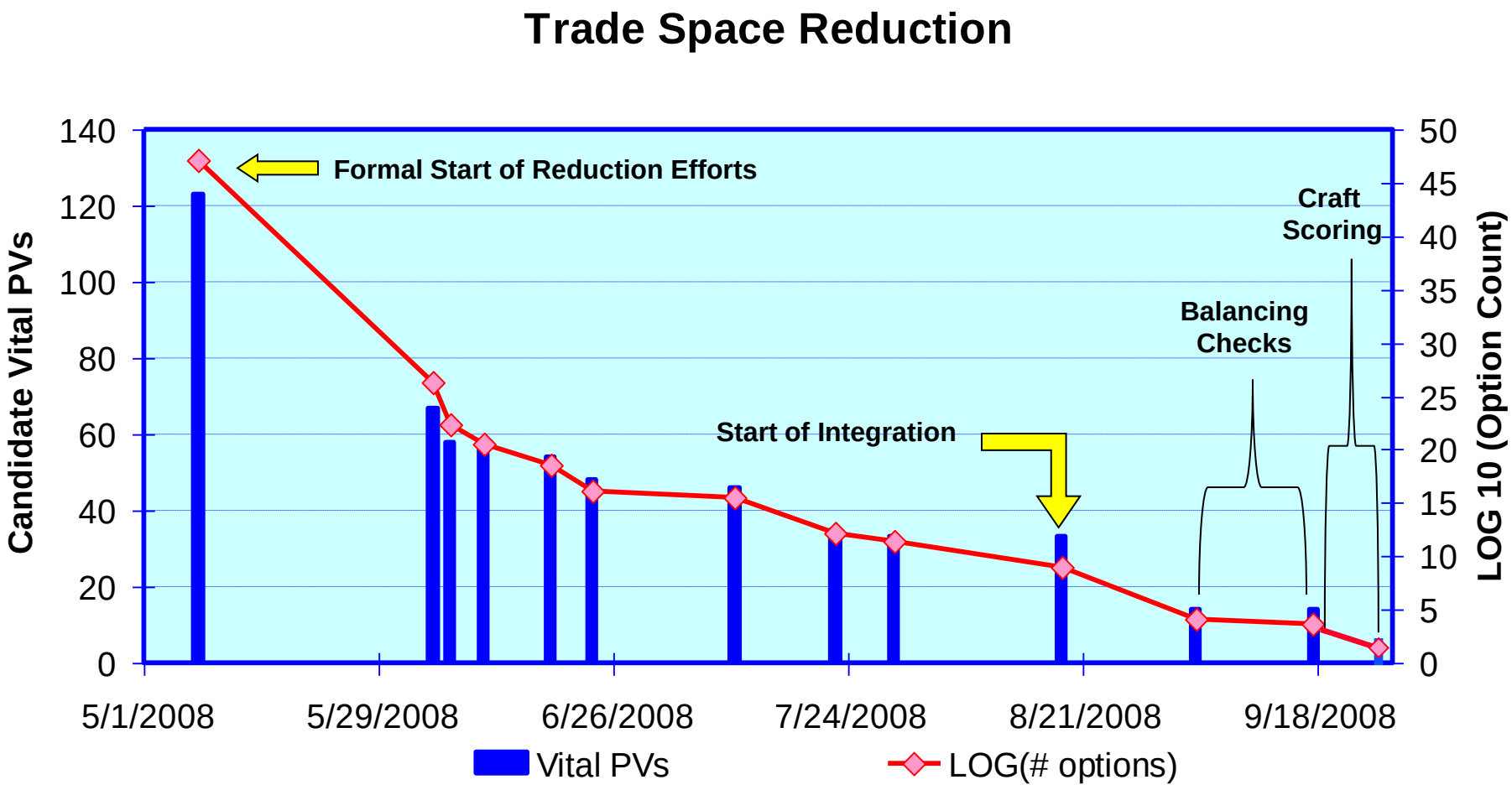
Set-Based & Preliminary Design Schedule



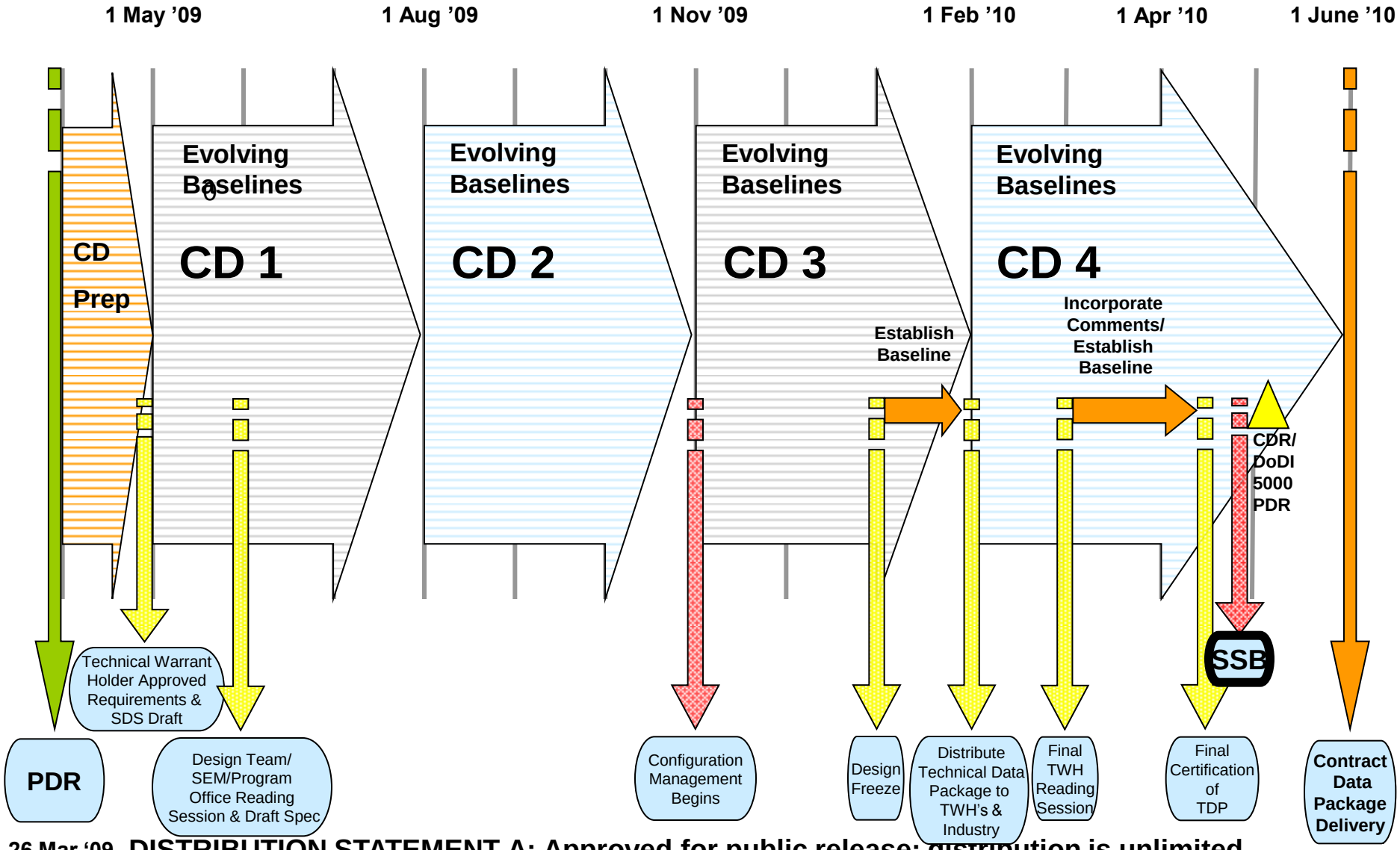
SSC Implementation of SBD



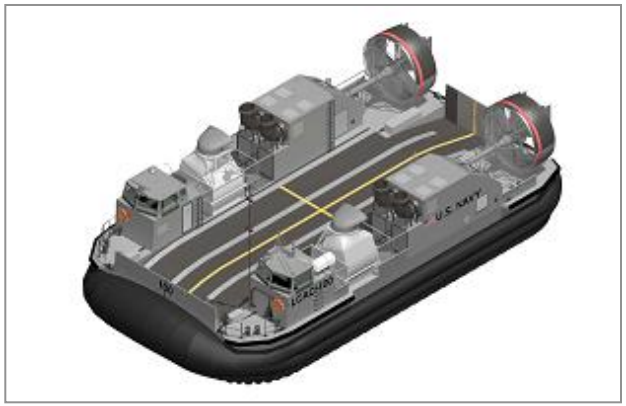
Trade Space Reduction Progress



SSC Contract Design



LCAC/SSC Comparison



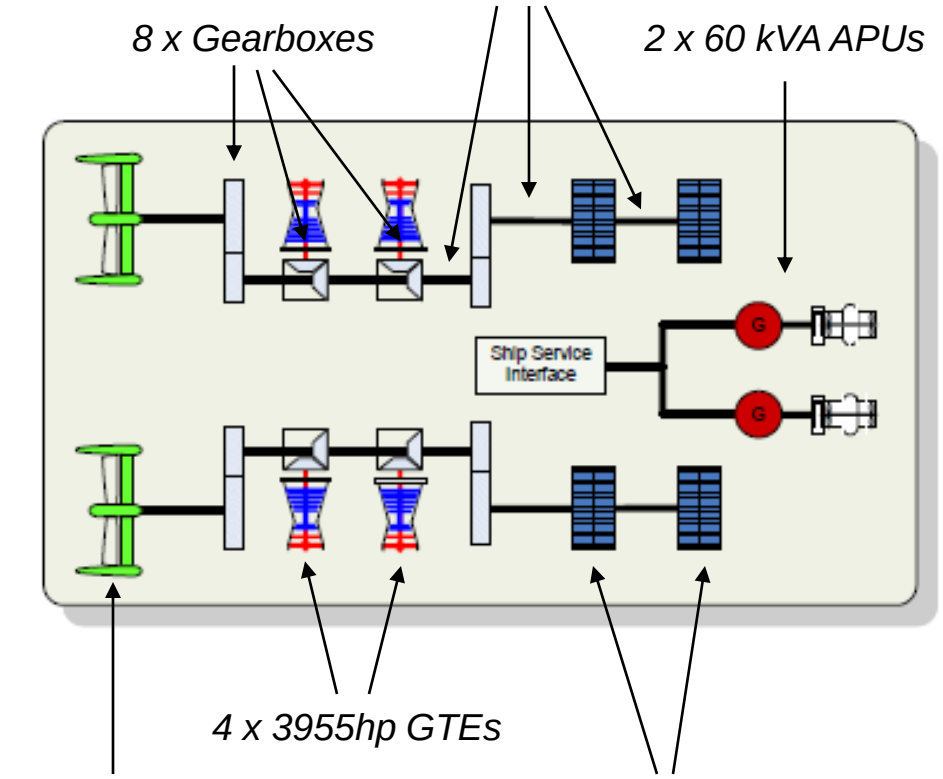
- **Length, Overall: 28.0 m (91.8 ft)**
- **Beam, Overall: 14.5 m (47.8 ft)**
- **Depth: 1.27m (50 inches)**
- **Design Payload: 54.43MT**
- **Flight Crew: 3**

- **Length, Overall: Same as LCAC**
- **Beam, Overall: Same as LCAC**
- **Depth: 1.422m (56 inches)**
- **Design Payload: 67.13 MT**
- **Flight Crew: 2**

Changes driven by increased payload and improved reliability and maintainability

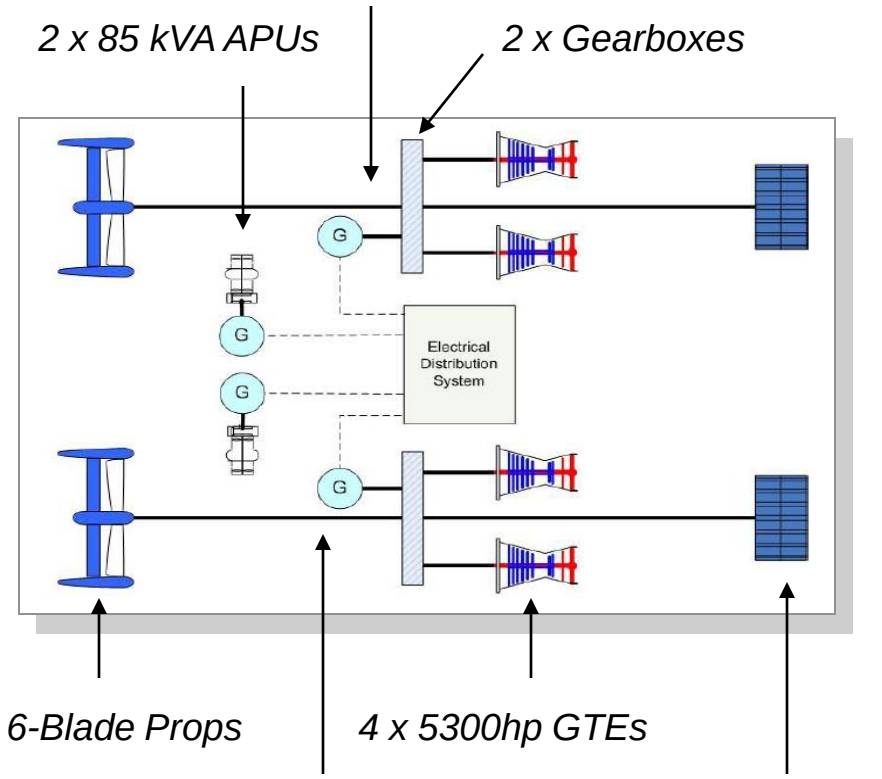
Machinery Design Improvements

LCAC



400 Hz Electrical Dist Split Plant

SSC



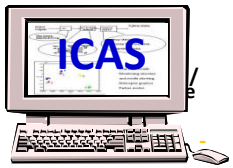
60 Hz Electrical Dist Parallel Plant

Addressed LCAC Top 25 RMA Drivers

LCAC Lessons Learned
- Top 25 Maintenance Drivers
- Prototypes

60 Hz Electrical Distribution System

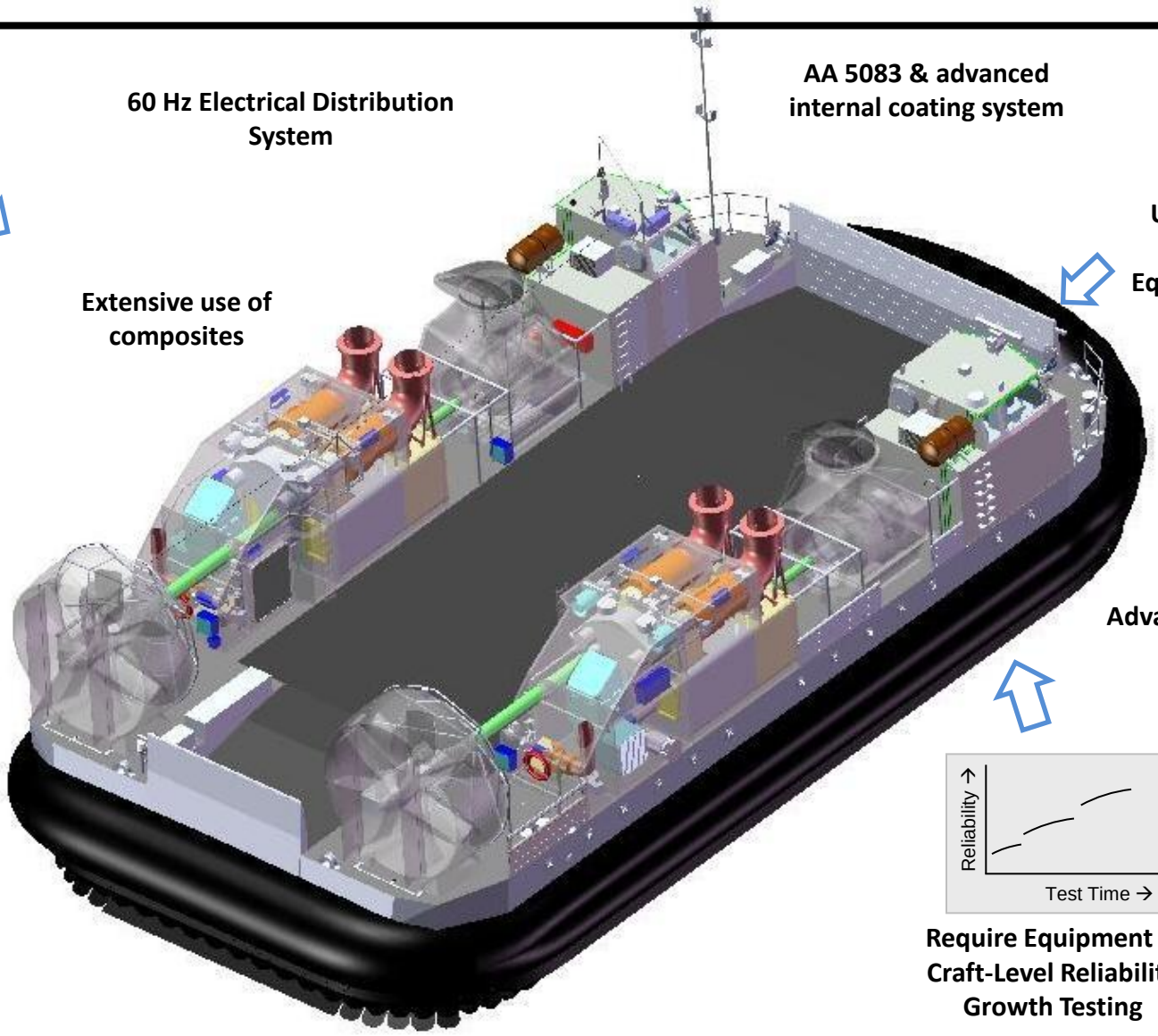
AA 5083 & advanced internal coating system



Utilize ICAS & CBM to Optimize Equipment Preventive Maintenance Periodicities

Extensive use of composites

Electrical-Hydraulic Actuators

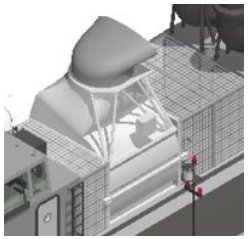


Advanced Fire Fighting – no HALON

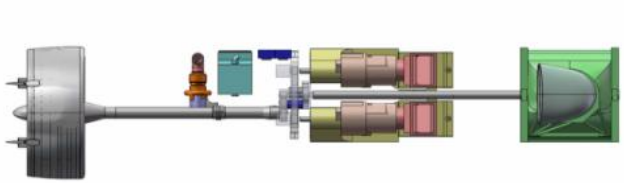
Require Equipment & Craft-Level Reliability Growth Testing

Maintainability Demonstrations

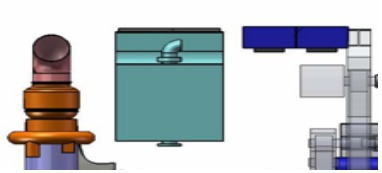
Addressed LCAC Top 25 RMA Drivers



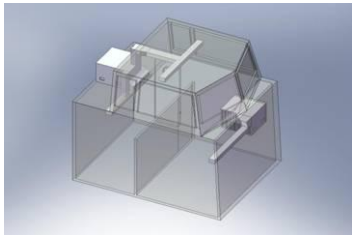
Gear Driven Bow Thrusters



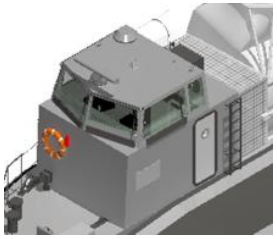
Simpler & More Efficient Drive Train



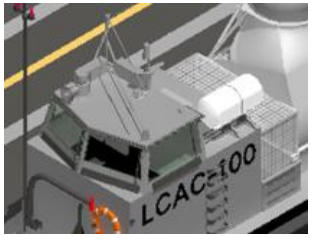
Gearbox Driven Generators



Improved HVAC



Simplified Window Arrangement – fewer unique parts



Improved HF Antennas – improved comms reliability

R&M Implementation

Requirements

R&M Program Related Requirements:

- *Reliability (12 hr mission)*
- *Operational Availability (Ao)*
- *Materiel Availability (A_M)*
- *Mean Time To Repair*
- *Maximum Time To Repair Values*
  - *= Machinery Equipment*
  - *= Auxiliary Equipment*
  - *= C4N Equipment*
- *C4N Software False Alarm Rate*
- *Specified Removal Methodologies*
  - *= Main Engine and Gearbox*

Design Influence

Design Influence -

Implement Comprehensive R&M Program

- *Develop and apply maintainability design criteria (Gov't approved)*
- *Perform R&M Allocations / Modeling / Predictions / Analyses*
- *Include quantitative R&M requirements*

Validation

R&M Validation Testing

- *Reliability Growth Testing and Failure Reporting Program (FRACAS)*
- *Maintainability Demonstrations (M- Demos) required on six major equipment groupings*

Way Ahead

- **Award Detail Design & Construction (DD&C) contract**
- **Maintain requirements throughout DD&C**
- **NAVSEA involvement in design risk items**
- **SUPSHIP oversight of construction**
- **Test to ensure craft meets requirements**

SSC design process is attractive for future Naval ship designs