Mobility Capabilities and Requirements Study (MCRS) Insights and Navy Strategic Mobility Initiatives

Presented by

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Briefing Outline

• Mobility Studies
  – Strategic Sealift Policy
  – Previous Studies
  – Mobility Capabilities & Requirements Study

• Sealift Science and Technology / Research and Development
The purpose of National Security Directive on Sealift (NSD 28) is to ensure that the US maintains the capability to meet sealift requirements in crisis or war.

“...First, the U.S.-owned commercial ocean carrier industry, to the extent it is capable, will be relied upon to provide sealift in peace, crisis, and war. This capability will be augmented during crisis and war by reserve fleets comprised of ships with national defense features that are not available in sufficient numbers or types in the active U.S.-owned commercial industry...” -NSD 28 Oct 1989

How are these sealift requirements determined?
## Previous Mobility Studies

<table>
<thead>
<tr>
<th></th>
<th>MRS</th>
<th>MRS-BURU</th>
<th>MRS-05</th>
<th>MCS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Start Date</strong></td>
<td>January 1991</td>
<td>May 1994</td>
<td>January 1999</td>
<td>May 2004</td>
</tr>
<tr>
<td><strong>Completion Date</strong></td>
<td>January 1992</td>
<td>March 1995</td>
<td>September 2000</td>
<td>March 2005</td>
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<tr>
<td><strong>Scenario time frame</strong></td>
<td>1999</td>
<td>2001</td>
<td>2005</td>
<td>2012</td>
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<tr>
<td><strong>Mobility threat</strong></td>
<td>Conventional</td>
<td>Conventional</td>
<td>Conventional and Chemical</td>
<td>Conventional and WMD</td>
</tr>
<tr>
<td><strong>Warfighting threat</strong></td>
<td>Conventional</td>
<td>Conventional w/some chemical</td>
<td>Conventional and Chemical</td>
<td>Conventional and WMD</td>
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<tr>
<td><strong>Scope</strong></td>
<td>Inter-theater, Intra-CONUS</td>
<td>Inter-theater</td>
<td>Intra-CONUS, Inter-theater, and Intra-theater</td>
<td>Intra-CONUS, Inter-theater, and Intra-theater</td>
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<tr>
<td><strong>Influenced by</strong></td>
<td>Desert Shield/Desert Storm and Congressional Mandate</td>
<td>Bottom-Up Review and new defense strategy – two near simultaneous MRC</td>
<td>Force structure changes, WMD, and reduction of overseas bases, Strategic Airlift decision</td>
<td>GWOT and evolving global defense posture, Strategic Airlift Decision</td>
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<tr>
<td><strong>Focus of Recommendation</strong></td>
<td>Sealift and Prepo</td>
<td>Airlift, Sealift, limited Prepo</td>
<td>Airlift</td>
<td>Airlift</td>
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<tr>
<td><strong>Major Recommendation</strong></td>
<td>Increase sealift, prepo, and maintain current airlift program (Max req derived from single most demanding MRC)</td>
<td>Increase airlift prepo of CS/CSS and reset AWR-3 immediately after use for second theater</td>
<td>Strategic Airlift, intra-theater airlift deficient, containerization of UE would speed up deployment</td>
<td>Maintain current Strategic Airlift levels, facilitates airlift and sealift recap analysis, refine intra-theater airlift requirement</td>
</tr>
</tbody>
</table>

**MRS:** Mobility Requirements Study  
**BURU:** Bottom-Up Review Update  
**MCS:** Mobility Capabilities Study
What ships are needed?

**Mobility Capabilities Study: Sealift Insights**

- Projected capabilities are adequate to achieve U.S. objectives
- Programmed organic sealift combined with current Commercial Agreements provides sufficient capacity
- Further analysis of operational impacts of containerization required to assess impact of using containerships to transport Unit Equipment
- Further analysis required to determine if projected tanker fleet can satisfy inter-theater demand without continued reliance on Foreign-owned assets
Navy’s Strategic Sealift Program Has Fully Met Requirements Since 2003
• This study will examine alternatives in mobility capabilities, sources (military/commercial), forward basing, pre-positioning, air refueling deployment/employment capability, advanced logistics concepts, and destination theater austerity. -MCRS Charter

• Five Overarching Objectives
  – Determine the Joint Deployment Distribution Enterprise (JDDE) needed to support the National Defense Strategy (NDS) in 2016 timeframe
  – Identify the capabilities and requirements to deploy, employ, sustain and retrograde joint forces in support of the NDS
  – Determine capability gaps/overlaps associated with the programmed mobility force structure
  – Provide a risk assessment
  – Provide study insights and recommendations to support the upcoming QDR and future defense programs
MCRS Methodology

Scenario-based end-to-end modeling over a 7-Year period

- Mobility Demand based on:
  - Two overlapping conventional campaigns
  - Or, one conventional campaign, if engaged in a long duration IR campaign
  - Plus steady state demand

- “1-4-2-1”
- “10-30-30”
MCRS Process

- Establish Study Organization
- Draft Terms of Reference
- Draft Study Plan
- Sr Ldr (DSD) approval
- Literature/Historical Review
- Begin Analysis

Support Decision Making
- Focus on near-term decisions

Document Results
Update Analytic Baselines
ID Follow-on Analysis

Integrate Results
- Air Mobility
- Sealift
- Prepo

Mobility Demand Analysis
- Scenario Analysis
- Case Study Analysis

Start

We Are Here

Integrate Results

Final report Expected December 2009
Future Sealift Requirements

- Sea Base Interfaces and Connectors
- FSS and RRF Recapitalization
  - Defense Science Board (2005), “Analyze how best to replace the sealift capabilities of both the eight Fast Sealift Ships and the aging vessels in the Ready Reserve Force (with consideration given to recapitalization, reliance on the Maritime Security Program, or some combination).”
  - Ship’s speed to meet requirements?
  - Potential opportunity for Short Sea Shipping to be the future “Active RRF”

Possible RO/RO Recap. Approach

- New Build
- Replace with Organic LMSRs
- Extend ESL 5 Years
- Recap with Commercial Program
- Delays First New Build RO/RO Delivery to 2025
Vehicle Transfer System and Pendulation Control System

VTS is a ramp from the Mobile Landing Platform to the LMSR that is capable of at-sea transfer of vehicles (including a M1A1 tank) in Sea-State 3. PCS is a crane system on the MLP that can transfer containers at-sea in SS3.

Large Vessel Interface Lift-On / Lift-Off (FY09 Transition)

Advanced Positive-Control Crane that enables the rapid and safe at-sea transfer of standard ISO 20ft containers from military or commercial vessels onto the Sea Base in sea state 4.

Small-to-Large Vessel at-Sea Transfer (FY10 Transition)

Enables efficient combined MLP, LCAC/JMAC, and MPF(F)/LMSR on-load / off-load operations through the high end of sea state 4 through the development of close-in precision dynamic positioning systems.

Interface Ramp Technologies (FY11 Transition)

Develop an advanced lightweight, cost-effective ramp system for the JHSV capable of a Sea-State 3 Roll-On/Roll-Off at-sea transfer capability to/from the JHSV. (Current JHSV ramp is limited to SS1 ops.)
Internal Ship Cargo Handling Technologies

Compact / Agile Material Mover (FY08 Transition)
Enables efficient weapons/cargo transport in high sea states by providing the capability to move very large payloads (~10K lbs) using minimal manpower (human amplification technology).

Automated Warehouse (FY07 Transition)
Fully Automated Shipboard Cargo Warehouse enables automated storage and retrieval of cargo/munitions onboard ship at rates up to 280 pallets/hour. Handles standard pallet or JMIC.

High Rate Vertical / Horizontal Material Movement (FY10 Transition)
Enables the automatic transition from the horizontal to vertical plane and vertical to horizontal plane during cargo/munitions movement in sea state 5. Enabling technology for strike-down to occur at the rate of receipt (UNREP), achieve required sortie generation rate, and reduce overall manning.

Automated Weapon Assembly (FY12 Transition)
Reduces the time, deck space and manpower required to unpack and/or assemble component-based configured weapons and All-Up-Round (AUR) weapons into ready-service weapons.
Connector Technologies

High Speed Seabase-to-Shore Connector (FY10 Transition)
Lift fans and Advanced Skirts enables Seabase-to-Shore Connector by providing the connector with the capability to carry greater payload or have increased range, operate at higher speeds in Sea State 4 conditions, and still allow for well deck and beaching operations. (LCAC/SSC)

38 MW Axial Flow Waterjet (FY12 Transition)
Enables rapid closure of equipment, materials, and personnel to the Sea Base via high speed surface connectors. Addresses the need to develop high levels of propulsive thrust in a constrained propulsor diameter. (LCS)

Intra-Connector Material Handling (FY10 Transition)
Enables the Rapid tensioning and instant release of vehicular cargo onboard current and future surface connectors. (LCAC/SSC)

Environmental Ship-Motion Forecasting (FY15 Transition)
This product will forecast wind, waves and ship motions into the future to support go/ no-go decisions for cargo transfer and to drive future feed-forward control algorithms. (MPF(F))

Advanced Mooring Systems (FY15 Transition)
Automated mooring and positioning of connectors / ships alongside the MLP through the use of sensors, control algorithms, and responsive actuators. (MPF(F))
Sea Base Connectors

Future Connector Concepts

- **Heliplane or Carter Copter**
  - Speed: 365 KT
  - Range: 800 NM
  - Payload: 22 ST
  - 180 PAX

- **WALRUS**
  - Speed: 78 KT
  - Range: 5,607-10,000 NM
  - Avg Payload: 238 ST

- **High Speed Sealift**
  - Speed: 38 KT
  - Range: 6,000 NM
  - Payload: 8,000 ST
  - 158,000 SQ FT

- **Seaplane**
  - Speed: 325 KT
  - Range: 2000 NM
  - Payload: 30 tons
  - 180 PAX

- **Articulated Tug Barge**
  - Speed: 15 KT
  - Range: 12,000 NM
  - Payload: 13,000 ST, 750 TEUs
  - 175,000 SQ FT
  - 30-55,000 bbis
Hybrid Aircraft

Hybrid aircraft (or hybrid airship): air vehicle which combines aerostatic lift (buoyant) with aerodynamic lift (wing-borne) and, sometimes, direct (propulsive) lift.

Small-Scale Vehicles Flown/Flying

- **ATG “Sky Kitten” 1999** (unmanned prototype)
- **Locked-Martin ADP “P-791” 2006** (manned demonstrator)
- **HAV “HAV-3 / Condor 104” 2009** (unmanned demonstrator)
“Sea Basing and Alternatives for Deploying and Sustaining Ground Forces”

- Evaluated hybrid aircraft, new rotorcraft, existing rotorcraft, conventional aircraft (for airdrop), and sea-based deployment and sustainment

- Strategic responsiveness:
  - “[Hybrid] airships would provide the greatest improvement in responsiveness, potentially reducing employment times…”

- Geographic reach:
  - Hybrid aircraft provide greatest reach of all alternatives considered

- Vulnerable to enemy defenses

- Questions timeliness of medical care if dependent on airships vice strategic airlift
Potential Mission Sets

- **Airlift**
  - Ability to carry large loads directly from point-of-origin to point-of-need
  - Faster closure times from point-of-origin to point-of-need
  - Ability to operate independent of most fixed infrastructure
  - Sea-base connectors

- **ISR/communications**
  - Cell tower in the sky, tactical network backbone
  - Ability to carry large sensor packages/large aperture radars
  - Ability to stay aloft for days – weeks

- **Humanitarian assistance/disaster relief**

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**Less** Time, Cost, Technical Risks, Operational Challenges, Programmatic Risks  **More**

<table>
<thead>
<tr>
<th>Operational Characteristics</th>
<th>Small comm &amp; ISR bus</th>
<th>Small air delivery UAS*</th>
<th>Large comm &amp; ISR bus</th>
<th>Large air delivery UAS*</th>
<th>Theater mobility platform</th>
<th>Global mobility platform</th>
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<tbody>
<tr>
<td></td>
<td>20K ft</td>
<td>5-10K ft</td>
<td>20K ft</td>
<td>5-10K ft</td>
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<td></td>
<td>1000 lb payload</td>
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<td>2500 lbs payload</td>
<td>15 tons payload</td>
<td>50 tons payload</td>
<td>200+ tons payload</td>
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<tr>
<td></td>
<td>2-3 days endurance</td>
<td>1000 nm range</td>
<td>2-3 weeks endurance</td>
<td>1500 nm range</td>
<td>2000 nm range</td>
<td>7500+ nm range</td>
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NASA & DDR&E Risk Reduction Effort – Pelican ATD / RAVB Demo

- Reduce risk while exploring technical answers to operational challenges
  - Develop variable buoyancy system to enable ballast free and VTOL ops
  - Develop modern rigid structure technology
  - Study scalability & survivability
- Produce a flying demonstrator in 3-5 yrs
- No meaningful operational utility
- NASA-Ames executing contract with DDR&E support
- Builds on DARPA investments (4 years of precursor risk-reduction)
Sealift R&D: JHSS

POTENTIAL CHARACTERISTICS

- Built to commercial standards
- Civilian mariner manned
- Speeds of 36 - 39 Knots
- 8000 nm range
- 1,650 military passengers
- 250 TEU (Twenty feet Equivalent Unit)
- 131,000 square feet
- Max Draft: 27'
- Payload: 5,000 short tons

Army:

- Views AAAS as a critical conceptual requirement
- Means of projecting large mounted forces from CONUS with assured access (increased basing of Army forces in CONUS)
- Address “Vulnerability Gap” in expeditionary operations:
  - Seabasing Joint Integrating Concept (JIC)
  - Joint Capabilities Document (JCD) for Seabasing
  - Army Sea Base CCP
  - Army Watercraft CBA
- Intent: Revise the draft ICD to (1) Identify DPS scenario, and (2) Strengthen analytical underpinnings

Marine Corps:

- Previously indentified requirement for one RSLS vessel to transport non self-deploying MPF(F) aviation assets
- CMC changed MPF(F) CONOPS, Jan 2007
- No requirement for JHSS

ICD lead shifted to Army / ARCIC

- Plan A: Validate requirement via JS/J8 Joint Seabasing Analysis and Wargaming (JSAW) Study
**Purpose:**
Provide a technology summary and assessment report of JHSS program analytical, experimental, and tool development efforts including:
- Mono and multi-hull hullform development
- Resistance, powering, and propulsion
- Structural loads and criteria
- Structural design concepts
- Machinery system alternatives
- Maneuvering and seakeeping
- Ship arrangements and cargo handling interfaces.

**SOW:**
- Collect all the published reports, papers, presentations, and interim files generated in the JHSS and related Sealift R&D programs. Conduct subject matter expert review meetings with principal investigators.
- Generate executive level summary reviews and technology assessments in each of the technology topic areas.
- Prepare a summary report highlighting the main results of the JHSS technology program with an index to the related source material. Provide status of all design and computational tools.

Performing Activity: NSWCCD
TPOC: Mike Wilson, NSWCCD

**Schedule: FY 2009**
- Collect all reports, papers, documentation
- Conduct reviews
- Generate review narratives and assemble the key findings
- Prepare final summary document with indexed references

<table>
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<tr>
<th>FY 08</th>
<th>FY 09</th>
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<tbody>
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<td></td>
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<tr>
<td></td>
<td>Report</td>
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“Seatrain” - Concept Description and Status

The Seatrain concepts evolved in response to the recommendation of the Defense Science Board Task Force on Mobility report “... initiating a research and development program for a high-speed transoceanic vessel with the capability to access austere ports.”

- A longitudinal assembly of essentially similar size hydrodynamic transportation units that increase the overall length resulting in a performance benefit to the system. Basically, create a high length to beam ratio ship from smaller elements.

- Status of Seatrain work
  - Some government concepts and testing
  - Several Small Business Innovate Research concepts and testing
  - Research Goal – Bring Seatrain technology to a Technology Readiness Level commensurate with consideration in future Analysis of Alternatives Studies
**Notional Concept Design Considerations**

- Austere port access (draft < 15 ft, length < 650 ft)
- Size to accept a battalion, 6250 LT payload
- Maintain section area continuity between units
- Low entrance angle for high speed. Max beam at transom to enable low entrance angle
- Powering in each unit for individual operation
- Minimize large forces between units
  - Vectored thrust on each unit to handle yaw moment
  - Proceed individually in high sea state

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**Full Transom Design**

*Twice the installed power as notched hull*

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**Notch Transom Design**

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**Example of a 4 Unit Seatrain with Notch Transom Design in Last Unit**

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**Example of a 3 Unit Seatrain with Full Transom Design in Last Unit**
When the units are assembled into a seatrian, the resistance of any one unit is much less than that of a single unit (green triangle) operating by itself. Note that the second unit (red dashed line) is actually being propelled for “free” in the 32 to 37 knot speed range by the hydrodynamic forces of the other units. When assembled as a train for model testing, all units were in close proximity, but not touching each other.
Seatrain

Seatrain Concept Model Testing

**Purpose:**
- Evaluate the connectorless seatrain concept
- Support the SBIR program by providing unique testing facility support and specific data presentations to several SBIR contractors.
- Support seatrain presentations to the commercial and military community.
- Define those R & D tasks, technologies and tool development that will be needed to in order to minimize the risk associated with developing and fielding seatrain systems to meet specific objectives.

**SOW**
- Conduct tow tank model testing of a government connectorless seatrain concept and prepare data reports.
- Conduct tow tank model testing of several SBIR contractor prepared seatrain models with a mix of resistance, propulsor, and connector load testing.
- Prepare data reports of the SBIR contractor supplied designs for each contractor on a common basis with regard to efficiency and range.
- Participate in the development of a road map for future technology development efforts needed to advance seatrain design technology.

**Performing Activity:** NSWCCD  
**TPOC:** Gabor Karaffath

**Schedule:**

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<tr>
<td>SBIR support testing</td>
<td>SBIR support testing/reporting (TBD)</td>
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<tr>
<td>Data report preparation, presentations &amp; analyses</td>
<td>Potential Maneuvering Test / Demonstration</td>
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<tr>
<td>Road map for R &amp; D</td>
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Connectorless Concept
Model Photos

NSWCCD

Unit interface

Bow with Vertical sides, 10 deg half entrance angle

Vee notch with Vertical sides matches bow shape

Three Units
32 Knots

Four Units
38 Knots
JHSS/Seatrain Structures and Loads Analysis

**Purpose:**
Develop improved hull structural design and assessment capability to support unique challenges related to the JHSS/Sea Train concepts.

Critical primary and secondary loadings due hull systems unique to the JHSS/Sea Train concepts are largely unknown and will be strongly dependant on structural properties. Numerical simulation is the most effective short-term method for providing the complex hull interaction, motions and loadings including hull impact and slamming. Focus of tool verification and validation for these purposes will rely heavily on recently acquired sealift model test data. Appropriate criteria and tools are also needed to provide the most cost and weight effective design solutions to the unique loadings.

**Work Status:**
- Analyze motions and loads data from segmented model tests to develop primary and secondary load response predictions.
- Incorporate response predictions into structural predictions tools to enhance the capability of achieving optimal structural configurations.
- Continue upgrading the Design Program for Ship Structures (DPSS) to provide graphical user interface and improve primary and secondary structural analysis.
- Validate the Large Amplitude Motions Program (LAMP) against previously collected model test data.
- Review ship-to-ship impact literature base and existing tools for structural design under these conditions. Assess ability to integrate into existing design tools.

**Schedule:**

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<thead>
<tr>
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<tr>
<td>Analyze segmented model test results and incorporate into analytical tools</td>
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<tr>
<td>Upgrade to DPSS program</td>
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<tr>
<td>Validation of LAMP program and assessment of ship-to-ship loads</td>
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Performing Activities: NSWCCD
TPOC: Dan Bruchman
Conclusions

• Anticipate MCRS/QDR will shape future strategic sealift decisions
• Sealift S&T/R&D important to ensure innovative approaches to future mobility challenges

Questions?
Backups
Collapsible/Retractable wingwalls / batterboards

Active Motion Control to minimize MLP motions, MLP / LMSR relative motions at ramp foot, or MLP deck edge / wave surface relative motions

Fendering that protects hull and deckhouse during close-in dynamic positioning

Close-In Precision Dynamic Positioning System (DPS)

LCACs Embark Here

Greenwater Management System

LCACs Disembark Here

LCACs Embark Here

LCACs Embark Here
Pendulation Control System (PCS)

**Purpose:**
- Increase MPS & LMSR Crane PCS system capabilities by continued technical development, testing, and system packaging to support acquisition of SS3 capable shipboard cranes.
  - Critical technology shortfalls is hook/payload swing sensing. This task includes continued research into a rate gyro based sensor package.
  - Testing will include more representative environments, including at sea testing during the JLOTS 08 exercise. FY09 testing during LVI LO/LO demo will include movement of container cargo between the ship and alongside lighterage and potentially an underway skin-to-skin operation with another large vessel.
  - System packaging includes software documentation & hardware specifications.

**SOW:**
- FY08
  - Develop gyro based swing sensor system
  - Upgrade functionality of operator display system
  - Design and execute test and experiments during JLOTS 08
  - Develop plans for STS demonstration
- FY09
  - Complete development of PCS/ARBITS twin-mode, vessel tracking and boom centering algorithm modifications
  - Demonstrate functionality during LVI LO/LO at-sea test
  - ABS review of final specification

**Schedule of Deliverables:**

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<td>STS Test Planning</td>
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<td>Test Plan (JLOTS FPC)</td>
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<td>STS Demo</td>
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<tr>
<td>JLOTS Demonstration and Report Algorithm Modifications</td>
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<td>ABS Review</td>
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<tr>
<td>PCS Demonstration at-sea</td>
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Lead Activity: NSWCCD
TPOC: Dr. Frank Leban
Hybrid Aircraft: Advantage

Advantage: Ability to operate from unimproved areas
- Potential over-the-beach sea base connector
- No minimum surface hardness
  - Soft terrain, water acceptable
  - Ability to operate over small obstacles
- Direct delivery heavy lift
  - Large payloads to austere areas
  - No inter-modal transfers
Hybrid Aircraft: Disadvantage

Disadvantage: Size
Non-rigid hybrids: Diagrams to scale

<table>
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<tr>
<th>Hull Volume (cu ft)</th>
<th>185,000</th>
<th>1,000,000</th>
<th>3,000,000</th>
<th>35,000,000</th>
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<td>2</td>
<td>15</td>
<td>50</td>
<td>500</td>
<td>1000</td>
</tr>
<tr>
<td>Length</td>
<td>180’</td>
<td>250’</td>
<td>370’</td>
<td>830’</td>
<td>1,000’</td>
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<tr>
<td>Width</td>
<td>75’</td>
<td>150’</td>
<td>185’</td>
<td>365’</td>
<td>450’</td>
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<th>C-17</th>
<th>C-5</th>
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<tbody>
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<td>80</td>
</tr>
<tr>
<td>Length</td>
<td>97’</td>
<td>174’</td>
</tr>
<tr>
<td>Width</td>
<td>132’</td>
<td>165’</td>
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**Air Vehicle: Aeroscraft**

### SEA BASING MISSIONS

In a sea basing mission, vehicle would be expected to provide ship-to-shore, shore-to-ship, and ship-to-ship operations to include:

*replenishment of ships within a sea base to constitute and regenerate forces.*

![Ship to Ship](image)

 ![Ship to Shore to Ship](image)

### DoD STUDY: LTA & HYBRID VEHICLE ISSUES

**THE ADVANCED MOBILITY CAPABILITY STUDY (AMCS) ANALYSTS**

**TECHNICAL CAPABILITIES ASSESSMENTS OF THE PHASE II ADVANCED MOBILITY CONCEPTS STUDY (AMCS), INSTITUTE FOR DEFENSE ANALYSES (IDA)**

**DEFENSE SCIENCE BOARD (DSB), TASK FORCE ON MOBILITY**

**STATED THE FOLLOWING AS ISSUES FOR THE LTA & HYBRID VEHICLE:**

- Buoyancy Management;
- Structure;
- Hover Enabling;
- Survivability

### LIGHTER-THAN-AIR FLIGHT

**CONVENTIONAL AIRSHIP**

The static lift generated as a result of Archimedes principle, and the force of gravity are precisely balanced.

**HYBRID AIRSHIP**

Dynamic lift is generated by its lifting body envelope. The principle is the same as an aircraft wing with airspeed being required.

### OPERATIONAL REQUIREMENTS

**MILITARY UTILITY**

- Interfaces
- Survivability
- Manufacturability
- Life Cycle Cost
- Supportability
- Sortie Generation Rate

**Control of lift in all stages of air or ground operations including off-loading of payload without taking on external ballast**

- Carry and deploy composite loads of personnel and equipment “ready” as they disembark the air vehicle
- Operate without support infrastructure and from unimproved landing sites
- Capable of hover and VTOL

**If we can’t control buoyancy, we can’t provide utilities in SEA BASING.**

**If we can’t achieve VTOL and control authority during hover, we can’t provide utilities in SEA BASING.**

**If we can’t develop lightweight and cost efficient rigid structure, we can’t provide utilities to war fighters.**

**If we can’t avoid small arms and reduce AAA treat, we can’t provide utilities to war fighters.**
Air Vehicle: Aeroscraft

AEROSCRAFT: BUOYANCY ASSISTED AIR VEHICLE

The latest Aeros proprietary technologies – Full Authority Direct Organic Lift Control (FADOLC), Dynamic Buoyancy Management System, innovative structure design and low speed control capability have resulted in the creation of the fourth type of air vehicle. The exceptional features of Aeroscraft, such as vertical takeoff and landing, capability to hover for extended periods of time, independence from airport facilities, all-weather operations and superb safety characteristics demonstrate its unique place in the market.

ENABLING TECHNOLOGY

Control of Static Heaviness (COSH) - Aeros lift management system is the enabling technology of the Aeroscraft. The COSH system allows the craft to constantly adjust the component of static lift by changing the volume of the gas envelope in conjunction with the flight profile status. The buoyancy management system allows the vehicle to be able to take off and land vertically, hover, remain “heavier than air” throughout load/unload cycles as well as compensate for fuel burn and atmospheric conditions without external ballasting. The result is a craft that offers long flight durations, ultimate in payload and freedom from ballast and ground infrastructure.

Composite honeycomb panels that can be cut, formed and fastened are used to construct the internal skeleton of an air vehicle, while the skin is made with formed composite panels. The greatest benefit for the development of the Aero shell is the reduction of weight without the loss of strength; with further benefits realized through reduced cost of construction over conventional aircraft methods, more fuel efficient crafts as a result of the weight reduction and an added benefit of drag reduction with the use of advanced smoother skin materials. Benefits are realized in the form of a faster and more fuel efficient vehicle that is able to operate in known icing conditions.

The incorporation of the cold gas thruster system provides the Aeroscraft with the ability to operate at very low speeds and hover. The safe operations and gentle landing is enabled with precise control through a wide range of climatic conditions. Safety by design is incorporated in every detail of the Aeroscraft. Such control enhances the stability of the craft and provides comfort for passengers and allows landing in areas with limited space.
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By Gen William Tuttle USA (Ret.) Chairman Defense Science Board, Task Force On Mobility

“An additional mission for the aircraft could be as a “connector” between a sea base and land forces ashore. When that idea was examined in a Defense Science Board study several years ago, the vertical take off and landing capability with buoyancy management had not been demonstrated. Landing on a ship requires that capability coupled with a low speed control system. The 60 ton capable buoyancy assisted aircraft could make the sea basing concept a more viable option than previously thought.”

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<th>Air Vehicle</th>
<th>Description</th>
<th>Operational Principals</th>
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<td>Aeroscraft</td>
<td>A new aircraft approach using derivative airship concepts and a suite of technologies integrated to control lift at all times, independently of off-board ballast, Achieves Greater Utility, Fewer Operational Limitations</td>
<td>• Control of lift in all stages of air or ground operations including off-loading of payload without taking onboard ballast</td>
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<td>Airship</td>
<td>Rigid, Semi-Rigid or Non-Rigid air vehicle that generates lift through the buoyancy of entrapped lighter-than-air gas, Dependency on off-board ballast and ballonet control</td>
<td>• Severe limitations in ability to control lift, Requires significant support infrastructure, Ground operations have severe limitations</td>
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<tr>
<td>Hybrid Airship</td>
<td>Non-Rigid air vehicle that generates static lift through the buoyancy of entrapped lighter-than-air gas and aerodynamic lift, Dependency on off-board ballast and ballonet control</td>
<td>• Significant limitations in ability to control lift requires ballast, Limited hover capability</td>
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