Expeditionary Logistics Component

Littoral Combat and Power Projection FNC

HiCASS Focus Areas

HiCASS Industry Day

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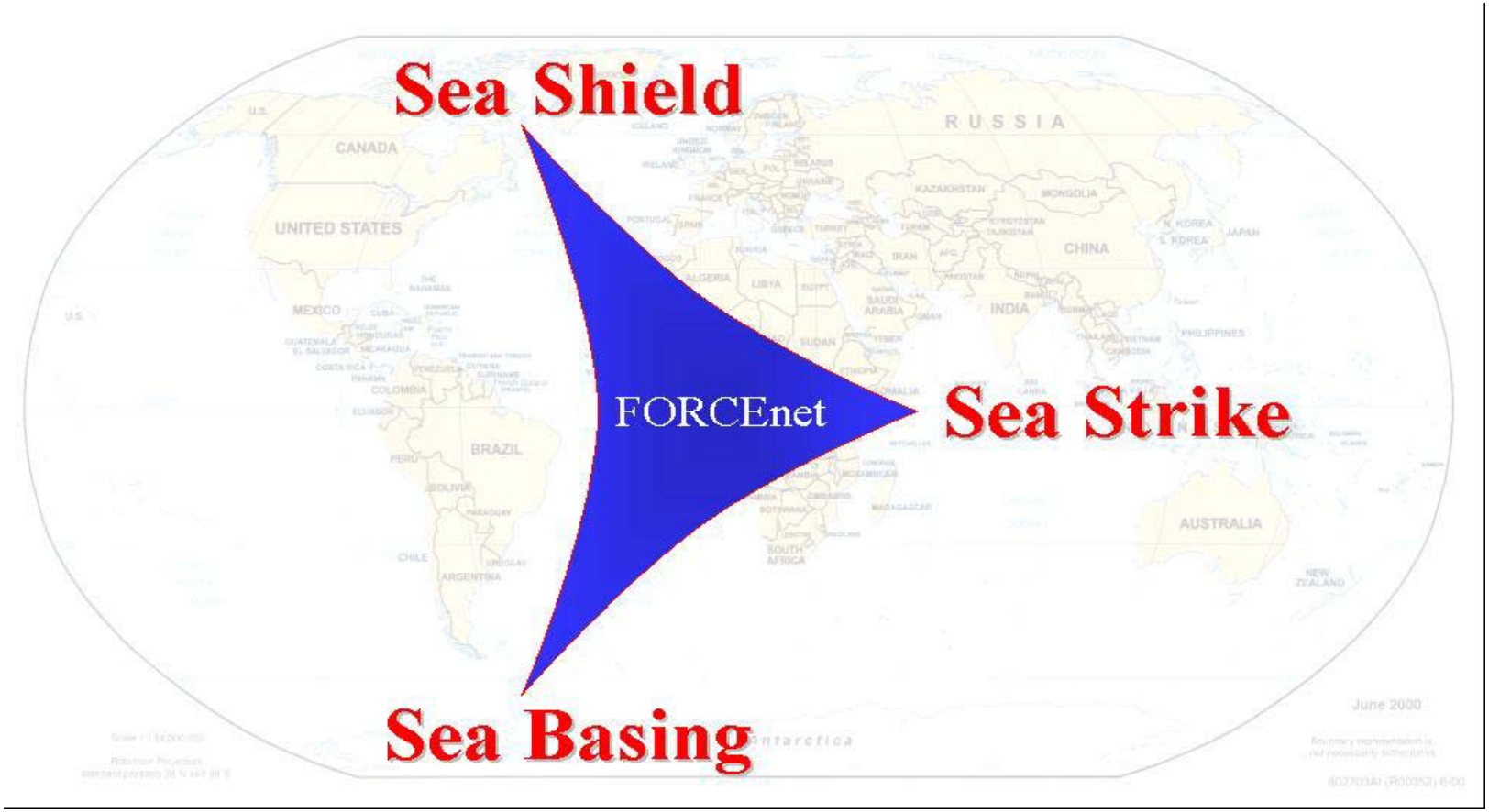
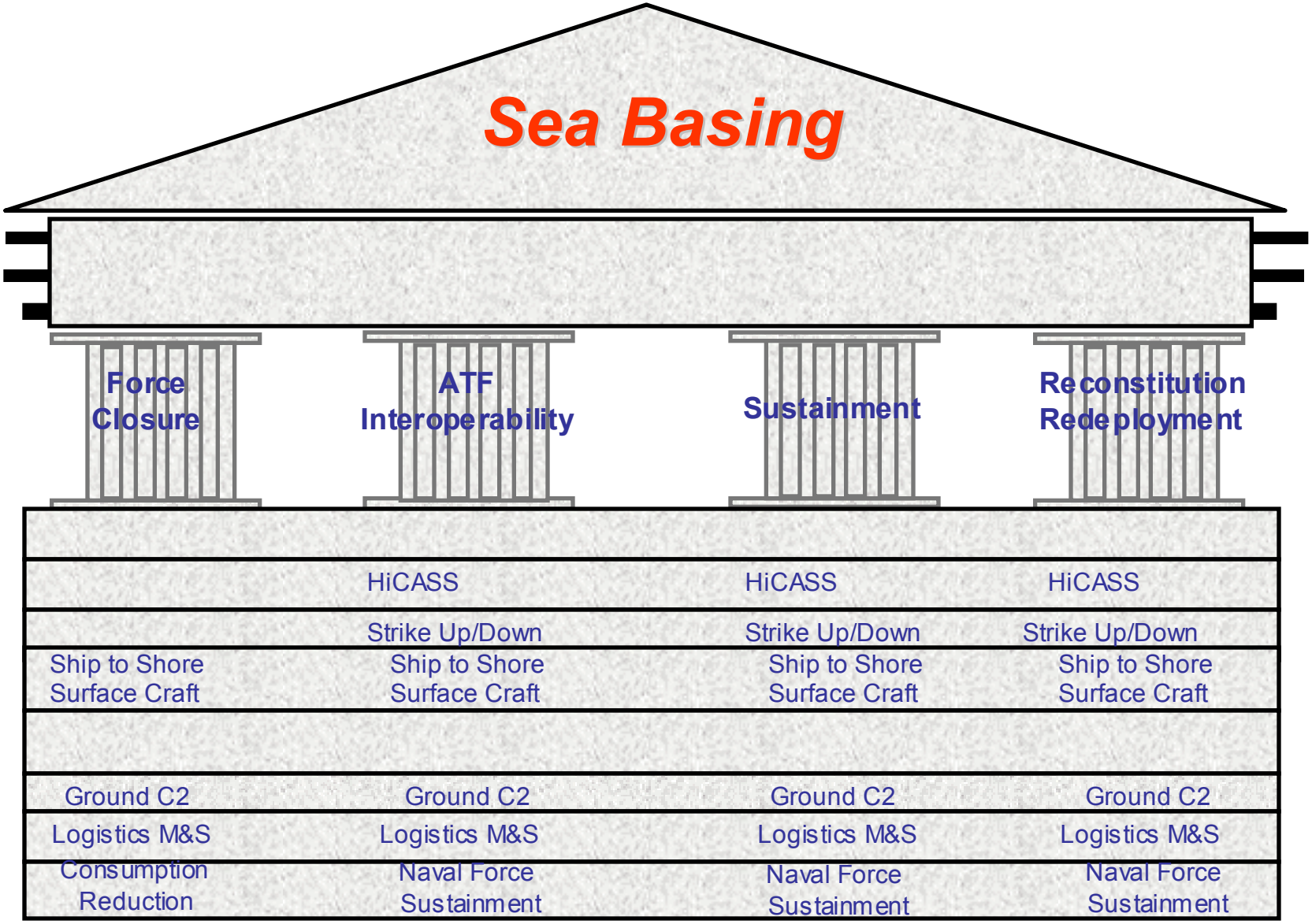
Seapower 21



From: Sea Power 21 Brief

Enabling Sea Basing



N6/N7 Review of FNC Structure

Sea Base Technology Gaps Identified by N6/N7 Review

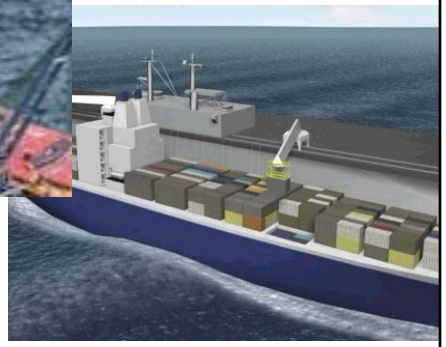
- **Integration of Naval Logistics**
  - Precision Logistics - eliminate separate flow into theater (Navy & Marine); Enable flow through Sea Base.
- **At Sea Arrival & Assembly**
  - Intra-Theater Lift Assets; physical interface of prime movers and connectors – Provide multiple assured pathways for sustainment in heavy weather.
  - Assembly and Habitability Facilities - Create capability where one does not exist.
- **Selective Offload**
  - Asset Management - System in-place for Near Real-Time resupply.
  - Reconfiguration Area - Provide working area for reconfiguration; Processes and equipment for rapid assembly of the force.
  - Material Handling Systems - Enhanced throughput with advanced packaging and handling systems.
- **Indefinite Sustainment**
  - UNREP; transfer heavy loads at sea; Skin-to-Skin transfer - eliminate "iron mountain" ashore.
  - Inter/Intra Theater Lift Assets - Expand palletized cargo delivery capability.
- **In Theater Reconstitution & Redeployment**
  - Unit/equipment readiness; NBCR cleanup; attrition: Backfill and fast turn-around of assets to make ready for employment.

Technology Drivers

- Capacity – 2,000 tons of pkg. material / day delivered to Sea Base
  - ~4,000 pallets or ~200 20’ ISO containers / DOS
- Open Ocean Environment – Sea State 5 capability
  - >80% operability worldwide
- Desire to Leverage Commercial Shipping
  - ISO Container Interface

Maximum Expected Relative Motion Values in Sea State 5			
	Displacement (m)	Velocity (m/s)	Acceleration (m/s^2)
Surge	1.5	0.4	0.25
Sway	3.0	1.0	0.60
Heave	3.2	1.8	1.05
Expected Absolute Roll Angle in Sea State 5			
	Large Containership	Small Containership	
2xRMS Roll Angle (deg)	2	4	
Maximum Roll Angle (deg)	4	10	

High Capacity Alongside Sea Base Sustainment (HiCASS)



OBJECTIVE:

- Assess the feasibility of skin to skin transfer of ISO containers in the open ocean environment
- Explore the parameter space for fenders, mooring systems, and transfer systems to identify ideal configurations.
- Develop performance specifications to guide technology investments to get the most capability for the investment

PAYOFF:

- HiCASS will act as a force multiplier by enabling commercial non-self-unloading containerships to provide at-sea sustainment eliminating the need to procure additional dedicated Combat Logistics Force ships.
- The M&S effort will ensure the S&T investment goes toward the best technologies.

PRELIMINARY RESULTS

- Operations are feasible with technology development
  - Fendering and securing system must be tuned
  - New sensor, actuator, control systems, and, crane technologies are required to enable this operation

ON-GOING EFFORT

•Examining sensitivity to commercial vessel size, sea way modal period, ship heading relative to sea way, wave spectrum spread (i.e., swell from other headings than wind-driven sea)

•Examining worst case performance requirements for fendering & mooring systems if vessels lose ability to control heading during HiCASS operations

Challenge Area Crossover Technologies

Heavy UNREP	Crossover		HiCASS
	Moderate	Strong	
• Power density • Energy density	• Advanced machinery • Advanced controls • Reduced HazMat • Low life cycle costs • Dynamic positioning	• Relative motion sensing & tracking • Motion compensation • Situational awareness • Predictive control • Communication • Station keeping • Auto helm • Tension sensing • Load position/dynamic sensing • Distance sensing • Sensors • Connection technology • Energy storage • Motion mitigation	• Separation technology • Relative motion compensation • Target tracking • Spreader technologies • Ramp torsion technologies • Ramp materials • Autonomous rigging

TECHNOLOGY FOCUS AREAS

- *Real-time tracking of own ship/platform motions and those of the other ship/platform involved in the at-sea material transfer*
- *Sensing of wave environment to enable predictive control*
- *Motion compensating transfer systems capable of the precision required*
- *Dynamic Positioning of Vessels in a Sea Way to enable Station Keeping*
- *Tension Sensing*
- *Situational Awareness*
- *Distance Sensing*
- *Load Position/ Dynamics Sensing*
- *Relative Motion Sensing and Mitigation or Compensation*
- *Positive Load Control*

NO “PREFERRED” TECHNOLOGY SOLUTION SET

TECHNICAL CHALLENGES

At-Sea Environment

Space Constraints

Space/Weight Integration with ship design/modification

Ship Motions

- Static List and Trim
- Dynamic Roll/Pitch/Heave motions and Accelerations

Ship Flexure

Reliability/Maintainability/Affordability/Ease of Operation

Eventual Regulatory Approval (ABS/USCG/NAVSEA OP 4)

Efforts to Date

- Initial feasibility studies in FY02.
  - Two teams - JJMA and NSWC-CD
  - Both showed feasibility of concept
- STTR efforts
  - Crane Motion Compensation
    - Leverage ATD for 3-D Tracking
  - Cargo Transfer Ramp
    - Two independent bridge beams with powered trolley
  - Advanced Fendering
    - Seaward fenders/JJMA
  - Advanced Rope Phase II underway
- CARDEROCK effort provided details on fendering concepts and crane concepts including ATD effort.
- JJMA effort provided details on current SOA in skin to skin lightering for the tanker industry and information on the NIST 6 DOF crane.

Efforts to Date

- HiCASS efforts combined with Heavy UNREP Product Line
- JJMA Continue to analyze Ship and Mooring Sensitivities - Completion in October 2003
- ExLog War Game July 2003 Complete
- CSC Modeling and Simulation Ongoing
- NRL/NSWCCD Study - Completion in October 2003

ONR Game Objectives

- Identify issues impeding transition of the at-sea transfer technology
- Identify steps that must be taken to bring these capabilities to the fleet
  - CONOPS / Doctrine
  - Requirements
  - Budgeting
  - Acquisition
  - Training
  - Supply processes
  - Technology maturation through S&T & R&D

Technology Transition Agreement

- A Technology Transition Agreement (TTA) documents the commitment between:
  - Requirements/Resource sponsor
  - Science and Technology activity (developer and provider of the technology/product)
  - Acquisition Program Sponsor (intended receiver of a technology or capability development)
- The TTA serves as the contract to develop, deliver and integrate a technology/product into an acquisition program.