

## **EXECUTIVE SUMMARY**

The 2004 Seabasing and Joint Expeditionary Logistics Integrated Project represents the combined effort of 50 students and 18 faculty members from different Naval Postgraduate School (NPS) departments. Utilizing tasking provided by the office of the Deputy Chief of Naval Operations for Warfare Requirements and Programs (OPNAV N7) to the NPS Wayne E. Meyer Institute of Systems Engineering, the project examines logistics flow to, within and from a Sea Base to an objective in a joint warfare environment. The OPNAV N7 tasking requests the Meyer Institute to conduct a study to develop system of systems conceptual solutions for Seabasing and Joint Expeditionary Logistics (JELo) which use current systems, programs of record, and other proposed systems extending over the next 20 years. The Systems Engineering and Analysis Cohort Six (SEA-6) Team uses the Joint Capabilities Integration and Development System (JCIDS) as a systems engineering framework to conduct the multidisciplinary study.

Seabasing is an important part of Sea Power 21; however, analysis in this study indicates that 2004 capabilities and the capabilities expected through the 2015 timeframe cannot support the aggressive operational timelines envisioned for future doctrine. In order to achieve these timelines by the 2025 timeframe, several materiel and nonmateriel solutions are identified that offer promising investment possibilities to address the capability gaps.

Much of the current discussion involving the Sea Base and expeditionary operations revolves around a 10/30/30 construct and a brigade-size force. The 10/30/30 construct calls for expeditionary forces to seize the initiative within ten days of a deployment order; achieve their expeditionary objectives within 30 days, and then reconstitute and redeploy within the next 30 days. Seizing the initiative is defined as the employment of ground forces to the initial objectives. In order to accomplish this, the expeditionary forces must rapidly transit to the Sea Base in the Area of Operations (AO) (Close) and marry up with prepositioned equipment (Assemble) through a Forward Logistics Site (FLS). Seizing the initiative also involves delivering three Battalion

Landing Teams (BLT), two surface and one vertical, from the Sea Base to the objective ashore (Employ) in one 10-hour time period. The expeditionary forces are then supported for up to 30 days (Sustain) as they establish control of hostilities and achieve their objectives. The 2004 project employs the 10/30/30 operational construct to investigate the Closure, Assembly, Employment and Sustainment phases of seabased expeditionary operations.

Using JCIDS, the SEA-6 Team defines the problem, creates a scenario, develops modeling and simulation tools and conducts analyses to draw conclusions and make recommendations. The team designs a 2015 Baseline Architecture (2015 BLA) for the Sea Base that is centered on the Maritime Pre-positioning Force, Future (MPF(F)) ship. The project identifies, defines and quantifies capability gaps, develops platform solutions, and generates three alternative architectures for Seabasing and JELo out to the 2025 timeframe.

One of the alternative architectures for the 2025 timeframe incorporates a high-speed assault connector ship<sup>1</sup> (Joint Amphibious Combat Cargo Expeditionary Support Ship (Joint ACCESS)) designed by students in the NPS Total Ship Systems Engineering (TSSE) Group to address a specific capability gap identified during the Employment phase of operations. A collaborative war game against a near-peer competitor is conducted with students in the NPS Operations Research Department in order to gain a different perspective on the performance of the 2015 BLA, based upon man-in-the-loop simulation.

In order to identify and quantify the potential capability gaps for each architecture, SEA-6 develops a simulation model, the Systems Engineering and Analysis Baseline Architecture and Solution Evaluator – Six (SEABASE-6) model, using EXTEND™, a process-based, discrete-event modeling and simulation tool. A threat-based capability study results in the development of an operational scenario to judge system performance under realistic and expected environmental and combative

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<sup>1</sup> Total Ship Systems Engineering Team, (2004), “Joint ACCESS: A High Speed Assault Connector for Amphibious Seabasing Operations and Joint Expeditionary Logistics,” Naval Postgraduate School Technical Report, Monterey, CA, December 2004.

conditions. A designed experiment is used to plan an efficient data collection effort and operational requirements are used to formulate critical operational issues (COIs), measures of effectiveness (MOEs) and measures of performance (MOPs) to evaluate overall system performance.

Scenario effects are captured in the input variables of the SEABASE-6 simulation model to evaluate JELo system performance. Each of the JELo system architectures are influenced by sea state, level of combat (consumption rates) and range (both Sea Base to shore and shore to objective). Given the varying degrees of technological maturity, technological and operational risk and affordability, the study focuses on the capability of various platforms and systems to meet requirements without trying to determine a specific combination for an overall best architecture design. Additionally, although cost is not a determining factor in the design of the various architectures, it is used as a tool to make relative comparisons.

The key findings of this study are:

- Programs of record for 2015 Sea Base forces are challenged to meet a 10/30/30 response timeline. Major capability gaps are highlighted in the various phases associated with these expeditionary operations (Closure, Assembly, Employment and Sustainment). Using three top-level performance measures as well as estimated cost, Table 1 provides a side-by-side comparison of each of the architectures evaluated in the study. It is apparent that each of the alternative architectures performs better than the 2015 BLA at a relatively lower cost; however, further analysis of the performance and cost of the three alternatives is required to determine which one holds more promise.

<b>ARCHITECTURE</b>	<b>Closure Time (Days)</b>	<b>Employment Time (Hours)</b>	<b>Seize the Initiative (Days)</b>	<b>Total Cost (FY04\$B)</b>
<b>Baseline</b>	<b>16</b>	<b>30</b>	<b>17</b>	<b>\$34-\$42</b>
<b>Alternative 1</b>	<b>13</b>	<b>10</b>	<b>13</b>	<b>\$28-\$35</b>
<b>Alternative 2</b>	<b>9</b>	<b>12</b>	<b>10</b>	<b>\$29-\$36</b>
<b>Alternative 3</b>	<b>9</b>	<b>9</b>	<b>10</b>	<b>\$28-\$35</b>

**Table 1:** Architecture Summary and Total Cost (FY04\$B).

- Dedicated Strategic Lift assets are needed to move a brigade-size force in order to seize the initiative within ten days. Since expeditionary forces are our nation's first responders, it is important that they arrive as early as possible during a crisis so they can control the initial phases of hostilities and influence subsequent courses of action. Seizing the initiative encompasses the Closure and Employment phases. Specific capability gaps include the transport of non-self-deploying aircraft (NSDA) to the Sea Base, especially aircraft that must be disassembled for transport and subsequently reassembled. The additional time required for the Air Mobility Command (AMC) to plan, coordinate, and establish an air bridge to transport the NSDA and all non-prepositioned equipment to the FLS degrades the performance of the 2015 BLA and Alternative Architecture 1 as shown in Figure 1. This delay is not present in Alternative Architectures 2 or 3 since they incorporate dedicated strategic lift assets to improve their performance.

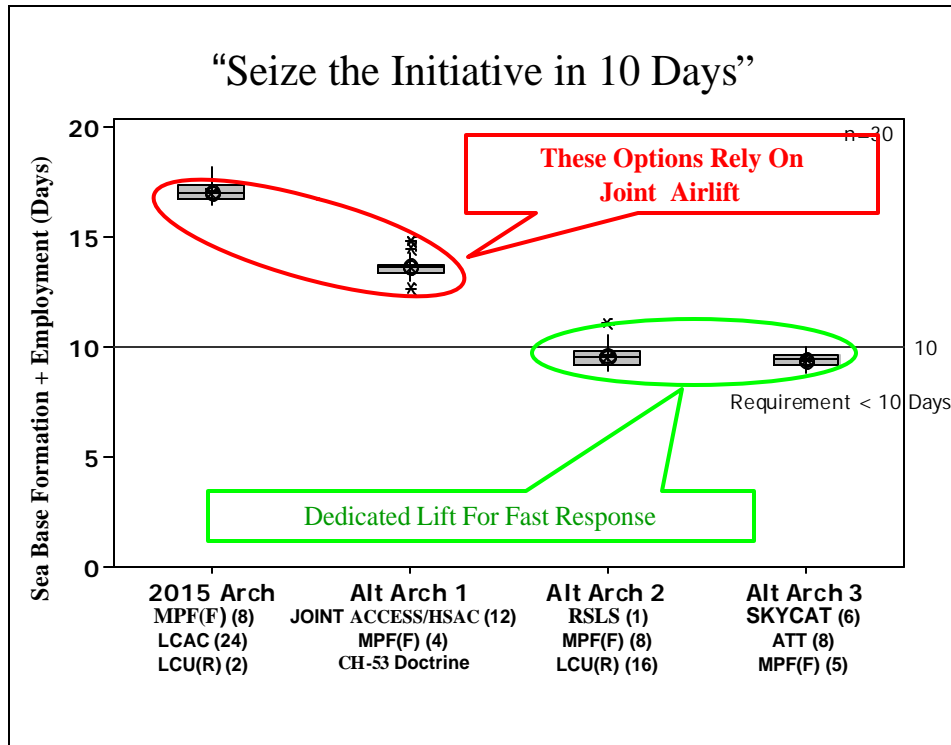


Figure 1: Dedicated lift is required to seize the initiative within ten days.<sup>2</sup>

- Rapid force employment is hindered by multiple at-sea transfers. The Employment phase is defined as the elapsed time to complete the insertion of the two surface and one vertical BLTs. Relatively small craft, such as the Landing Craft, Air Cushion (LCAC) vehicle and even the Heavy Lift LCAC (HLCAC) vehicle, require multiple at-sea transfers in order to load vehicles during the Employment phase. These transfers are time-consuming, even under ideal conditions, and may be impossible in heavy seas. Large assault connectors, such as the Landing Craft Utility, Replacement (LCU(R)) and the Joint ACCESS, designed by students in the TSSE Group, are beneficial in that they reduce the number of at-sea transfers and improve architecture performance during the Employment phase. Each of the three alternative architectures in Figure 2 incorporates a large assault connector enabling them to out-perform the 2015 BLA.

<sup>2</sup> HSAC is High Speed Assault Craft. RSLs is Rapid Strategic Lift Ship. ATT is Advance Theater Transport.

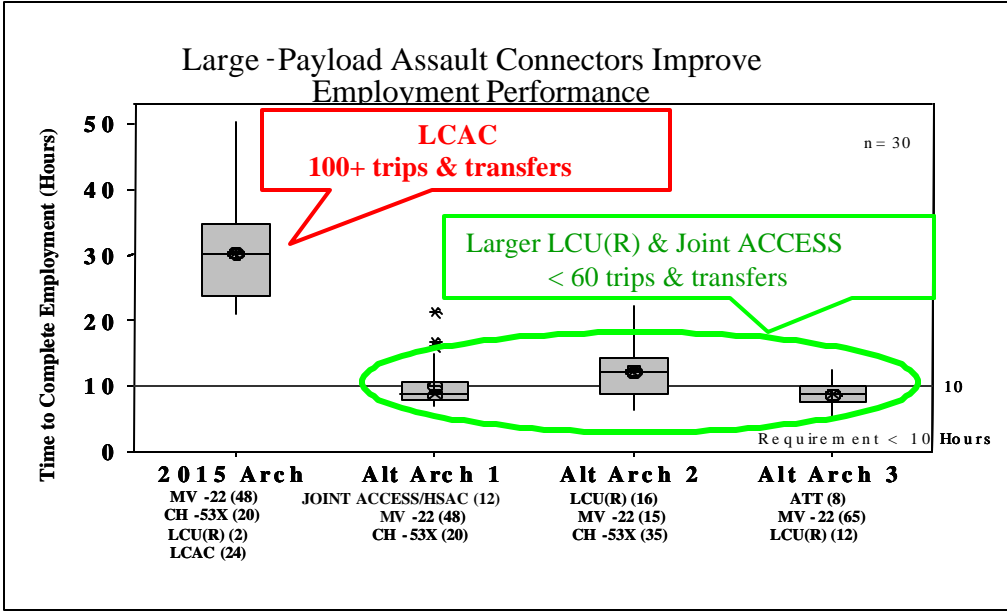
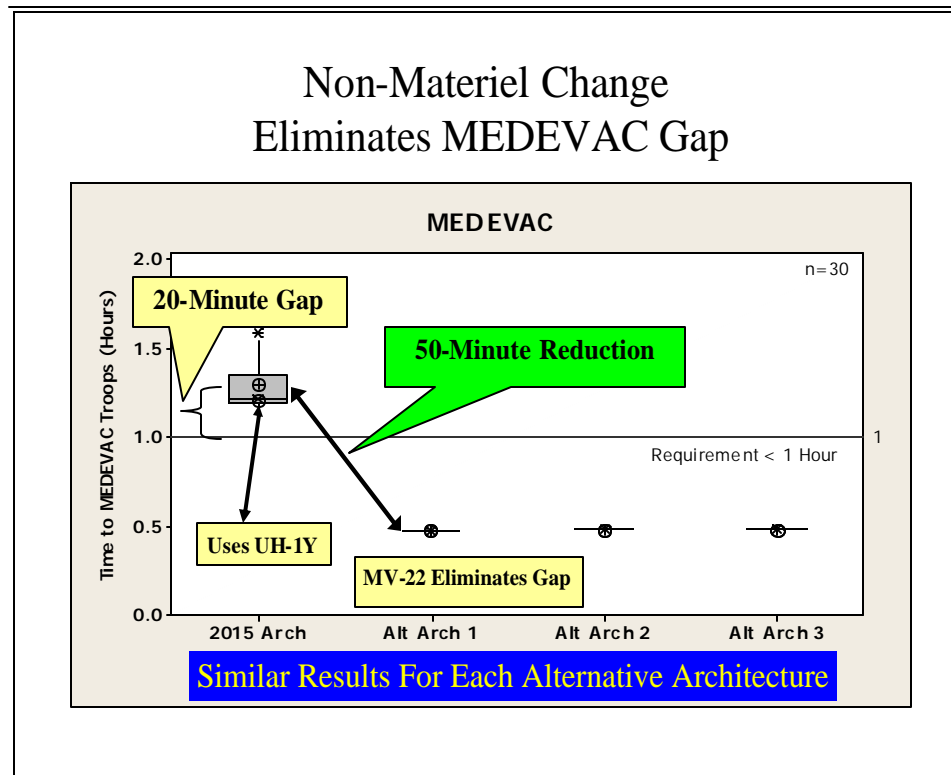


Figure 2: Large-payload craft reduce at-sea transfers.

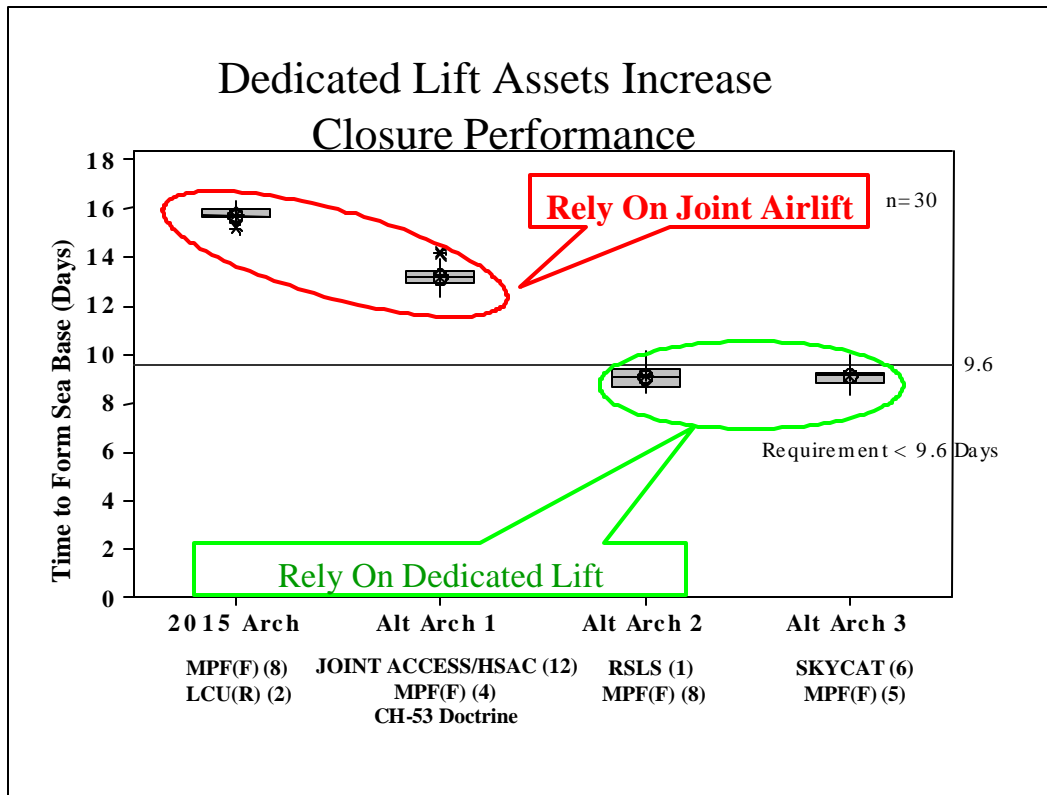
The 2015 architecture uses LCAC as its primary assault connector and requires 127 total trips and transfers (loading and unloading). Alternative Architecture 2 and Alternative Architecture 3 use the larger LCU(R) and average 50-60 trips to insert the two surface BLTs. Alternative Architecture 1 utilizes 12 preloaded Joint ACCESS vessels, which are able to off-load the two surface BLTs with no additional at-sea transfer. The large-payload Joint ACCESS and the LCU(R) yield fewer trips, which eliminate or reduce the at-sea transfer accompanying each trip.

- Future nonmateriel proposals look promising. Reassembling the CH-53 aircraft while enroute to the Sea Base reduces the time required to complete the Closure phase. Additionally, a simple change in the type of air asset utilized for Medical Evacuation (MEDEVAC) lift addresses a gap in capability for the Sea Base to provide advanced medical care within one hour during the Sustainment phase. In order to increase the probability of survival following massive trauma, the 2015 BLA uses the UH-1Y as the primary MEDEVAC platform, while each of the three alternative architectures utilize the MV-22. As illustrated in Figure 3, each of the alternative architectures performs significantly better than the 2015 BLA.



**Figure 3:** Nonmateriel change eliminates MEDEVAC gap.

- Future materiel proposals look promising. Dedicated strategic lift assets, such as high-speed surface ships (Rapid Strategic Lift Ship) and lighter-than-air ships (Skycat™ 1000), may provide an answer to the capability gaps identified in the Closure phase. In order to allow the expeditionary forces to seize the initiative within ten days, the Closure phase must be completed within 9.6 days (ten days minus ten hours to complete the Employment phase). Figure 4 shows that reliance on non-organic strategic lift assets results in a gap of at least six days. Transporting the NSDA to the FLS is the primary cause of this performance shortfall.



**Figure 4:** Dedicated lift assets increase Closure phase performance.

Other key findings include:

- A near real-time asset-visibility system is critical in order to avoid building a large stockpile of supplies at the objective ashore.
- A majority of the operating air deck spots in the Sea Base are needed to sustain troops at the objective (few spots remain for non-logistical missions).
- The MV-22 is best suited for troop transport. Its benefits diminish when used for cargo resupply or when the mission radius is greater than 150 NM (in the external lift mode, the MV-22 is much less capable of resupply than the CH-53).

SEA-6 recommends further study efforts in the form of a detailed survivability analysis of the MPF(F), and a survivability and reliability analysis of the alternative connectors used in this study. Further study and experimentation is also warranted to investigate and measure tactical at-sea transfer performance for lighterage and Integrated Landing Platforms (ILPs) under various sea states. Additionally, a Unified Expeditionary



Command concept, vis-à-vis Special Forces Command (SOCCOM), or other alternative command structures, should be explored in conjunction with a conceptual design for Sea Base Common Logistics Picture (CLP) architecture.

The 2004 Seabasing and JELo Integrated Project is an academic exercise and is not endorsed by either the Navy or any other U.S. military service. Examining Seabasing and JELo in its entirety is extremely challenging. The regional conflict and near-peer competitor scenarios are used to facilitate analysis and do not represent official views or policies of the Navy or any government. Although all elements of Seabasing and JELo are not evaluated to the greatest extent possible, they are evaluated to the extent practical, given the time available for the study. SEA-6 nonetheless concludes that the results are informative and provide insights to a decision-maker involved in addressing the complex issues associated with this topic.