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Systems architecture of a sea base surface connector system in a 2020 humanitarian assistance/disaster relief joint operational environment

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THESIS

SYSTEMS ARCHITECTURE OF A SEA BASE SURFACE CONNECTOR SYSTEM IN A 2020 HUMANITARIAN ASSISTANCE/DISASTER RELIEF JOINT OPERATIONAL ENVIRONMENT

by

Nathan V. Beach

September 2010

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13. ABSTRACT

In this thesis, an Expeditionary Warrior 2010 based humanitarian assistance/disaster relief mission conducted by U.S. forces set in the 2020 Joint Operational Environment is evaluated to determine potential surface connector system alternatives. The Sea Base surface connector system is tasked with not only supporting the Sea Base logistics sustainment, but also critically enabling delivery of commercially transported relief support cargo to austere coastal and inland destinations. Utilizing Dr. Steven H. Dam's methodology in developing vision architectures, a DoDAF 1.5 compliant architecture was created using Vitech's CORE© model-based systems engineering software. Within the backdrop of both Navy and Army operational concepts current watercraft programs of record were evaluated to assess the impact of potential capabilities of ONR's Transformable Craft. Through operational and functional model evaluation of the planned 2020 surface connectors through assembly, employment, and early sustainment amphibious operations, four discrete Transformable Craft capabilities were identified and discussed. An alternative Army-centric operation was encompassed for later consideration of the Transformable Craft's capabilities within the context of their watercraft activities. It is recommended that this architecture and its generated system configurations be used in further Modeling and Simulation (M&S) to refine Transformable Craft capabilities.

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ABSTRACT

In this thesis, an Expeditionary Warrior 2010 based humanitarian assistance/disaster relief mission conducted by U.S. forces set in the 2020 Joint Operational Environment is evaluated to determine potential surface connector system alternatives. The Sea Base surface connector system is tasked with not only supporting the Sea Base logistics sustainment, but also critically enabling delivery of commercially transported relief support cargo to austere coastal and inland destinations. Utilizing Dr. Steven H. Dam's methodology in developing vision architectures, a DoDAF 1.5 compliant architecture was created using Vitech's CORE© model-based systems engineering software. Within the backdrop of both Navy and Army operational concepts current watercraft programs of record were evaluated to assess the impact of potential capabilities of ONR's Transformable Craft. Through operational and functional model evaluation of the planned 2020 surface connectors through assembly, employment, and early sustainment amphibious operations, four discrete Transformable Craft capabilities were identified and discussed. An alternative Army-centric operation was encompassed for later consideration of the Transformable Craft's capabilities within the context of their watercraft activities. It is recommended that this architecture and its generated system configurations be used in further Modeling and Simulation (M&S) to refine Transformable Craft capabilities.

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LIST OF ACRONYMS AND ABBREVIATIONS

Acronym	**Definition**
ACV	Air Cushion Vehicle
AE	Assault Echelon
AMC	Air Mobility Command
AE	Amphibious Operations
APOD	Air Point-of-Debarkation
APS	Army Prepositioned Squadron
SPOD	Surface Point-of-Debarkation
ASF	Army Strategic Flotilla
ATF	Amphibious Task Force
BCT	Capability Based Assessment
CADM	CORE Architecture Design Model
CBA	Brigade Combat Team
CLF	Combat Logistics Force
COIN	Counter-Insurgency Operations
COCOM	Combatant Commander
CONOPS	Concept of Operations
CONUS	Continental United States
DOTMLPF	Doctrine, Organization, Training, Material, Logistics, Personnel, Facilities
EAF	Expeditionary Air Field
FHA	Foreign Humanitarian Assistance
FIE	Fly-In Echelon
FLO-FLO	Float-On/Float-Off
FLS	Forward Logistics Site
FNA	Functional Needs Analysis
FOB	Forward Operating Base
FOAE	Follow-On Assault Echelon
JAFO	Joint Advance Force Operations
JCD	Joint Capabilities Document
JFCOM	Joint Forces Command
JFEO	Joint Forcible Entry Operations

JHSV	Joint High-Speed Surface Vessel
JIC	Joint Integration Concept
JOpsC	Joint Operational Concept
JROC	Joint Requirements Oversight Council
HA	Humanitarian Assistance
HA/DR	Humanitarian Assistance/Disaster Relief
INLS	Improved Navy Lighterage System
INP	Innovative Naval Prototype
JCD	Joint Capabilities Document
JLOTS	Joint Logistics-Over-The-Sea
LF	Landing Force
LMCS	Lightweight Modular Causeway System
LMSR	Long-Range Medium-Speed RORO
LOLO	Load-On/Load-Off
LOO	Line(s) of Operation
LOTS	Logistics-Over-the-Sea
MAGTF	Marine Air/Ground Task Force
MBSE	Model Based Systems Engineering
MCO	Major Combat Operations
MCTL	Marine Core Tactical List
MET	Mission Essential Task
METL	Mission Essential Task List
MLP	Mobile Landing Platform
MOE	Measures of Effectiveness
MOOTW	Military Operations Other Than War
MOP	Measures of Performance
MPF(F)	Maritime Prepositioning Force-Future
MPS(E)	Maritime Prepositioned Squadron-Enhanced
MPSRON	Maritime Prepositioning Squadron
MSC	Military Sealift Command
M&S	Modeling and Simulation
NEMSS	Naval Expeditionary Medical Support System
NMCB	Navy Mobile Construction Battalion
NTTL	Navy Tactical Task List

NWP	Naval Warfare Publication
ONR	Office of Naval Research
OTH	Over the Horizon
ROGO	Range-of-Government Operations
ROMO	Range-of-Military Operations
RORO	Roll-On/Roll-Off
RRDF	Roll-On/Roll-Off Discharge Facility
SBC	Sea Base Connector
SBCS	Sea Base Connector System
SES	Surface Effect Ship
SLEP	Service Life Extension Plan
SS	Sea State
TRANSCOM	Transportation Command
UJTL	Uniform Joint Task List
UNTL	Universal Naval Task List
VTS	Vehicle Transfer System

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EXECUTIVE SUMMARY

The operational and logistical momentum of U.S. military forces in response to global events are anticipated to be greatly diminished by the ongoing trend of state and non-state adversaries engaging in anti-access strategies. A foreign overseas presence is vital in establishing and sustaining deployment momentum during major combat engagements, crisis response, and contingency operations. Pre-positioned reactionary forces, crisis management forces, and supporting logistics provide the means for the U.S. military to achieve the initiative; however, a reduction in the quantity of forward operating bases within key regions increases the difficulty of delivering a balanced joint force to include ground forces of sufficient weight and strength. In the case of U.S. response to a natural or manmade crisis, the nation's population may be exposed to additional crisis effects. It is all too common that the same uncontrollable factors that caused a humanitarian crisis, such as flooding, earthquake, or tsunami, have also severely degraded the operational ports required to conduct massive crisis response contingency operations. Regardless of cause, the Navy's Seabasing concept is the answer to insufficient access from the sea.

Naval Power 21 is comprised of Sea Power 21 and Expeditionary Maneuver Warfare Capabilities. An essential pillar of Naval Power 21 is Seabasing. According to the Seabasing Joint Integrating Concept (JIC), Seabasing is defined as:

> The rapid deployment, assembly, command, projection, reconstitution, and re-employment of joint combat power from the sea, while providing continuous support, sustainment, and force protection to select expeditionary joint forces without reliance on land bases within the Joint Operational Area. These capabilities expand operational maneuver options, and facilitate assured access and entry from the sea. (Department of Defense, Chairman, Joint Chiefs of Staff, 2005)

While the physical concept of the Sea Base has not been fully established, the current conceptualization of the Sea Base is a collection of naval assets, some of which exist today and others that are being defined. The notional Sea Base components are composed of a Carrier Strike Group, Expeditionary Strike Group, Maritime Prepositioning Group, Combat Logistics Force, surface connectors, Coalition Forces, and other U.S. service ships. From initial conceptualization to now Seabasing has remained aligned to the same core strategic principles.

Seabasing encompasses seven principles essential to our future naval fighting force.

- Use of the sea as a maneuver space
- Leverage forward presence and joint interdependence
- Protect joint force operations
- Provide scalable, responsive joint power projection
- Sustain joint force operations from the sea
- Expand access options and reduce dependence on land bases
- Create uncertainty for our adversaries. (Department of Defense, Chairman, Joint Chiefs of Staff, 2005)

A key component of the Sea Base is the collection of Joint and service specific surface ships known within this document as Sea Base connectors.

Sea Base connectors (SBC) perform numerous functions within expeditionary warfare and these are infinitely varied throughout the spectrum of peacetime crisis and conflict intensity. The purposes of the Sea Base connectors are to enable the Joint requirements within the Range of Military Operations (ROMO). Specifically, within the context of the major combat operations, enabling the 10-30-30 swiftness goals[1] is an objective. Emerging Navy doctrine highlights that the Sea Base is more than a launching point for Joint Forcible Entry Operations in an unavailable or adversarial denied surface/air point of debarkation, but the Sea Base must enable the Joint ROMO and perhaps even the Range of Government Operations (ROGO). The more frequent but less hostile ROMO/ROGOs are characterized best through humanitarian assistance/disaster

[1] The 10-30-30 Joint swiftness goals were established by the Office of the Secretary of Defense in 2003 with respect to operations to swiftly defeat the efforts of a regional aggressor. The 10-30-30 guidance indicate a 10-day goal to for U.S. force to seize the initiative, 30 days to defeat the enemy, and prepare for redeployment to a near-simultaneous conflict within the second 30-day period.

relief, non-combatant evacuations, and stability operations scenarios. Among the proposed 2020 Sea Base Connector System (SBCS) is the Office of naval Research's (ONR) transformable craft.

The Office of Naval Research conducts research and sponsors programs that could have a game changing impact on the way the Navy operates. The Sea Base connector Transformable Craft (T-Craft) is a technology being explored in the ONR's Innovative Naval Prototype program that grows such programs from initial concept design to construction and testing of a full-scale prototype demonstrator. The INP program is valuable in fostering collaborative research and design efforts in technological areas that are conceptually undefined and when the technology level is immature. The intent of the T-Craft INP program is to provide the availability of such a revolutionary surface platform for future Joint Capability Integration Development System (JCIDS) capability assessment.

The transformable craft operational concept is yet undefined. There have been thorough capability-based assessments by both the Navy and the Army for parallel concept austere access platforms such as the Ship-to-Shore Connector (SSC) and Joint High Speed Vessel (JHSV), respectively. The author cedes both craft will enhance the Joint Forcible Entry Operation capabilities and support conceptualized Seabasing operations; however, none of the 2020 surface craft inventory will fully enable the envisioned needs of twenty-first century amphibious operations requiring unprecedented over-the-horizon operations, heavier high speed lift for Joint forcible entry operations, and at-sea cargo assembly with multinational and commercial organizations. While the T-Craft program could indeed offer the availability of a superior technological platform, the operational concept of this craft has yet to be defined not only within the context of the T-Craft's mission portfolio, but within cooperation and integration of other Seabasing systems. Like a worker ant in a healthy colony the T-Craft alone cannot accomplish the multitude of tasks required for mission accomplishment, yet it must fulfill an operational niche that may at times robustly supplement or uniquely provide to the legacy Joint surface connector system through Seabasing operational transitions. The author believes that exploration of the T-Craft, within the major combat operations and humanitarian assistance/disaster relief environments, will exemplify the T-Craft's game changing utility in both peacetime and mid-to-high conflict environments; however, it is believed that the greatest opportunities for a single acquisition such as the T-Craft for capability gap fulfillment are within the humanitarian assistance/disaster relief environment.

The purpose of this analysis is to allow the determined Sea Base Connector System (SBCS) requirements to shape and define the role of the T-Craft. The problem was scoped to allow the interoperability and compatibility interface requirements of operational input/output items (physical and data) to define the alternative SBCS configurations. Examples of such physical and data input/output items are mechanical connections or transfer systems for at-sea loading/unloading and C2 data exchanges or voice communication links, respectively. More specifically, the SBC's interfaces with the future Maritime Prepositioning Force, Army Strategic Flotilla, Expeditionary Strike Group, commercial shipping, and intra-theater ports of the Sea Base were evaluated through the transfer of items necessary for the Joint landing forces to conduct the HA/DR mission. Items such as the Naval Construction Brigade's construction equipment, the Navy's Riverine patrol boats, or ISO containers were included. As anti-access environments only prohibit early access to theater surface and air access points, the bulk of this analysis was conducted on in-theater assembly, employment, and early sustainment lines-of-operations. Since the intent of this architectural description is to identify the requirements fulfillment of the Sea Base Connector System and its possible configurations, the internal and external system quantities and threshold requirements development were left for further M&S analysis. Programs of record in 2010 and current platforms still intended to be active in the 2020 timeframe were included.

The methodology of this thesis followed that developed by Dr. Steven H. Dam presented in *DoD Architecture Framework: A Guide to Applying System Engineering to Develop Integrated, Executable Architectures*. This process is particular to architecting "to be" or vision architectures. The methodology applied to "a vision architecture," typical of conceptual development of future military systems, is appropriate for architectural development of systems that initially lack a detailed set of requirements. The resulting architecture was documented in Vitech's CORE© database tool and presented through DoDAF 1.5 viewpoints. The Sea Base system-of-system constraints, capabilities, and assumptions were established utilizing a firm conceptual background established from capturing current and relevant source documents regarding Seabasing and HA/DR operations. Development of the Sea Base Connector System's architecture required the simultaneous generation of its operational and system domains through a highly iterative and interdependent process.

The SBCS's operational domain presented in DoDAF 1.5 consisted of three interlinked groupings: operational activity and hierarchies, concept of operations (CONOP), and originating requirements definition. The HA/DR mission operational activity and organization hierarchy outlines and provides traceability of the SBCS's essential inter-service HA/DR requirements, describes mission significant SBCS measures-of-effectiveness/performance, and describes resource exchange interfaces within internal/external system interactions. The CONOP details a relevant and significant strategic level operation to assist in shaping SBC system requirements. The SBCS originating requirements, extracted from Joint and service specific guiding documents, provides JCIDS tracing from the established Joint Capability Area framework to designated Functional Needs Analysis requirements. It also consolidates Joint and Army watercraft SBCS objective hierarchies for further M&S weighting. The operational domain is intertwined and linked to the system domain.

The SBCS's system domain presented in DoDAF 1.5 consisted of two primary groupings: external/internal system descriptions and functional decompositions. The system descriptions decomposed the 2020 Sea Base systems into manageable groups and described their interactions, described their organizational and operational authority linkages and tracing, and provided a structure for the 2020 Joint force resource pool for alternative M&S Sea Base configurations. All assisted to create a shared understanding of the SBCS roles within the Seabasing system. The functional decompositions, to include docking, load transfers, marshalling/staging, and transits, were diagrammed and detailed using IDEF0 modeling. These models provided detailed descriptions of physical resource exchanges between resource producers and consumers.

Systems engineering analysis of the 2020 Sea Base within the established architecture resulted in four discrete T-Craft capability alternatives: 1) direct large ship side/stern port connection only, 2) vertical replenishment capable with a dynamic positioning system, 3) vertical replenishment capable with a direct Large-Medium Speed Roll-On/Roll-Off (LMSR) ship side/stern port, 4) or direct large ship side/stern port connection with dynamic positioning system. However, the last alternative may possibly offer redundant functionality between phased mission tasks. These variants would supplement the 2020 legacy JHSV, SSC, and LCAC SLEP connectors.

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Diana … thank you for forgiving me for not being home during the day as much as the other wives’ husbands. I will now see if I can do better.

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I. INTRODUCTION

A. BACKGROUND

1. The Military Problem

The operational and logistical momentum of U.S. military forces in response to global military campaigns are anticipated to be greatly diminished by the ongoing trend of state and non-state adversaries engaging in anti-access strategies. International politics, often persuaded by U.S. adversaries or competing states, influence the availability and constraints of Forward Operating Bases (FOB) that are critical to wartime operations and logistics infrastructures. Such was possibly the case in the closure of Manas air base, located in Bishkek, Kyrgyzstan, near the capital, in 2009. Manas air base was a key staging point for operations in the Afghanistan War and, although citing base closure due to insufficient reimbursement, likely received external pressure from Moscow to squeeze the United States out of a region it historically has considered within its own sphere-of-influence (Schafer, 2009). Such internal or global pressure has induced many nations to find it untenable to allow U.S. presence or access through their nation as evident in Figure 1.

Figure 1. Illustrated reduction of U.S. controlled overseas land bases. This figure indicates a large number of overseas bases have been dramatically reduced in the time from the end of the Cold War to 2005 (From Department of Defense, Chairman, Joint Chiefs of Staff, 2005, p. 17)

Regional political pressure is not only isolated to FOB availability, but also may create operational constraints by inducing restrictions on operational capabilities and/or visibility to the host nation support. Adversarial states can "further take action to influence neighboring states, through threats, coercion, and/or positive incitements, to deny support to U.S. action in terms of overflight, basing privileges, logistical support (e.g., refueling), port access, transit of territorial waters, and other forms of support" (Joint and Army Concepts Division, Army Training and Doctrine Command (ATDC), 2006). Non-state sponsored adversaries also influence the FOB availability and capability constraints through acts of terrorism and direct targeting of critical overseas base elements. Anti-access strategies such as attacking maritime and land chokepoints, improved aerial and surface points of departure, or staging bases directly diminish FOB capabilities. Such efforts were exemplified by early Al Qaeda or supporting terrorist group/state's efforts to destabilize Pakistan. Consequentially, Pakistan's operational support to the Afghanistan war was reduced. Such anti-access strategies are explicit in the established Joint Operational Environment (JOE) that sets the stage for the future joint capabilities.

A foreign overseas presence is vital in establishing and sustaining deployment momentum during major combat engagements, crisis response, and contingency operations. "Deployment momentum is achieved through the use of multiple, simultaneous, and sequential force flows by air and sea. The future force must have the capability to employ multiple entry points throughout the course of a campaign or risk being denied entry into the joint operating area by a capable, imaginative adversary" or even exclusively through the effects of a natural disaster (Joint and Army Concepts Division, ATDC, 2006). Pre-positioned reactionary forces, crisis management forces, and supporting logistics provide the means for the U.S. military to achieve the initiative; however, a reduction in the quantity of FOB within key regions increases the difficulty of delivering a balanced joint force to include ground forces of sufficient weight and strength. As the current U.S. FOB capabilities are quite limited in regions of anticipated future need, such as illustrated in Figure 2, it is reasonable to expect that future combat operations will continue to have a significant time gap between entry operations and the arrival of a sufficient force to initiate decisive operations. This diminishment of deployment momentum leaves U.S. forces vulnerable to enemy action and adversaries to maintain significant freedom of action.

Figure 2. Seabasing enabled principles within emerging critical regions. Emerging areas pose a challenge to existing FOB capabilities. (From United States Marine Corps Combat Development Command (U.S. MCCDC), 2010, p. 24)

In the case of U.S. response to a natural or manmade crisis, the nation's population may be exposed to additional crisis effects. It is all too common that the same uncontrollable factors that caused a humanitarian crisis, such as flooding, earthquake, or tsunami, have also severely degraded the operational ports required to conduct massive crisis response contingency operations. Such was evident in the January 2010 earthquake in Haiti that destroyed approximately 50% of its only developed port leaving it at 10% normal capacity for a week prior to normalization about a month later (Doyle, 2010). While the emerging famine and medical crisis was primarily rebuffed by the close American military presence and world aid organizations, the need for enhanced at-sea assembly and distribution network was evident. The bulk of humanitarian aid via commercial shipping vessels were incapable of accessing Port-au-Prince to any significance for weeks and then became subject to slow distribution across the island's damaged transportation network.

2. Strategic Lift Requirements

An Army TRADOC evaluation in 2006 projected the capability gaps of the DoD airlift and sealift programs for the next 20 years in the JOE. The projection is conditional upon an immediate intra-theater employment of U.S. Armed Forces from a strategic expeditionary posture for a swift defeat or decisive victory in an extended campaign against an aggressor. "The current and projected suite of strategic lift capabilities is insufficient to meet DoD 10-30-30 swiftness goals for strategic responsiveness of joint force as a whole within the 1-4-2-1 framework" (Joint and Army Concepts Division, ATDC, 2006). In 2006 these strategic and tactical lift were achieved through C-5, C-17, and C-130 airlift, prepositioned materials in the Navy's Maritime Preposition Squadron (MPSRON) and the Army's Afloat Strategic Flotilla (ASF), and immediate logistics support from the Combat Logistics Force (CLF) ships. The 2006 capability assessment included Naval force projection through the Amphibious Task Force (ATF) ships and logistics support was accomplished through TRANSCOM's strategic sealift capabilities without the JHSV consideration. These programs were assessed to have insufficient capability to:

- minimize reliance on improved aerial and surface points of debarkation (A/SPOD).
- employ multiple, simultaneous force projection routes.
- exploit multiple entry points to overcome enemy anti-access measures.
- operate effectively within austere theaters[2].
- project and sustain forces ashore from afloat amphibious forces within the immediate response timeframe.
- deliver ground forces in depth in combined arms configurations for immediate employment.

[2] An operational environment with the following characteristics: little or no host-nation debarkation; inadequate transportation and communications networks; unsophisticated medical, supply and other services. (Department of Defense, Chairman, Joint Chiefs of Staff, 2005).

- close the gap between early entry forces and the heavy forces that often follow.
- operate from unimproved landing areas.
- deliver Army forces through other than deep water ports in significant numbers.
- build and maintain deployment momentum.
- sustain forces within forward operating areas. (Joint and Army Concepts Division, ATDC, 2006)

3. Seabasing

Naval power 21 is comprised of Sea Power 21 and Expeditionary Maneuver Warfare Capabilities. An essential pillar of Naval Power 21 is Seabasing. Seabasing is defined as

> the rapid deployment, assembly, command, projection, reconstitution, and re-employment of joint combat power from the sea, while providing continuous support, sustainment, and force protection to select expeditionary joint forces without reliance on land bases within the Joint Operational Area. These capabilities expand operational maneuver options, and facilitate assured access and entry from the sea.

Seabasing encompasses seven principles essential to our future naval fighting force:

- Use of the sea as a maneuver space
- Leverage forward presence and joint interdependence
- Protect joint force operations
- Provide scalable, responsive joint power projection
- Sustain joint force operations from the sea
- Expand access options and reduce dependence on land bases
- Create uncertainty for our adversaries. (Department of Defense, Chairman, Joint Chiefs of Staff, 2005)

a. Sea Base Components

While the physical concept of the Sea Base has not been fully established, the current conceptualization of the Sea Base is a collection of naval assets, some of which exist today and others that are being defined. The notional Sea Base components are composed of a Carrier Strike Group, Expeditionary Strike Group, Maritime Prepositioning Group, Combat Logistics Force, an assortment of surface connectors, Coalition Forces, and other U.S. service ships.

(1) Logistic Support Ships. Sea Base operations are supported by the various classes of ships within the Combat Logistics Force Maritime Prepositioning Squadron—Enhanced (MPS(E)), and TRANSCOM's Maritime Sealift Command (MSC) vessels, the Army's Afloat Strategic Flotilla, and countless classes of commercial shipping vessels with varying capabilities. While the CLF vessels will continue to provide the baseline logistics support for Naval sustainment, the rapid buildup and assembly operations will be supported by the MPS(E). Follow-on sustainment logistics will be supported by the various commercial MSC vessels that have been modified to additionally conduct at-sea assembly with the MPS(E). While the CLF and MSC vessels of today will likely resemble the same classes and support capabilities of those in 2020, the Navy's concept of the MPS is rapidly evolving to specifically support the Seabasing concept. With the future capabilities of the MPS(E), commercial vessels are anticipated to become an increasingly significant source of cargo transport particularly in immediate humanitarian assistance missions or sustained stability operations.

(2) Advanced Bases. Closure and assembly of the assault echelon (AE), Follow-On Assault Echelon (FOAE), and Fly-In Echelon (FIE) can occur at operational area-located advanced bases to include Forward Logistic Sites (FLS) and advanced logistics support sites prior to continuing on to the Sea Base or directly ashore in the JOA. Closure assault forces or Crisis response forces may originate from CONUS or from prepositioned forces from advanced bases. Sustained combat operations, particularly in MCO, require an immediate resupply of critical supplies such as food, fuel, and ordnance. Especially in extended length and scale missions, FLSs will continue

to be the primary transshipment points for the majority of all personnel and supplies and thus typically maintain the transient demands of the so called “iron mountain” stockpile that can be moved from the shore to the Sea Base.

b. Operational Maneuver From the Sea

Amphibious operations enable joint forces the capability to pit their strengths against enemy weaknesses. The use of the sea offers Joint forces the maneuver space and freedom of action to overwhelm the enemy at planned or opportunistic points. Seabasing force projection provides an Amphibious Task Force (ATF) an unprecedented operational maneuver, unimpeded operational momentum, and assured access to maintain sequential force flows. In operational maneuvers from the sea, the landing force is primarily assembled, employed, and sustained from the Sea Base.

The landing force consists of ground combat units and any of its combat support and combat service support units that will be further organized into “landing teams” to facilitate the ship-to-shore movement and initial operations ashore. A Landing Force (LF) assembled and employed from a Sea Base for a MCO will likely be composed of one MEB, a light or medium Army Brigade Combat Team (BCT), multinational forces, and appropriate combat service support capabilities (Joint and Army Concepts Division, ATDC, 2006). Lower intensity conflicts such as humanitarian operations from the Sea Base will be composed of reduced scale and tailored MAGTF and BCT units.

4. Sea Base Connectors

Sea Base connectors perform numerous functions within expeditionary warfare and these are infinitely varied throughout the spectrum of peacetime crisis and conflict intensity. The purposes of the Sea Base connectors are to enable the Joint requirements within the Range of Military Operations (ROMO). Specifically within the context of the MCOs, enabling the 10-30-30 swiftness goals is an objective. The primary roles of a Sea Base connector have been well articulated by the Army’s CASCOM Functional Needs Analysis (FNA) of their watercraft (U.S. Army Combined Arms Support Command, 2006). Emerging Navy doctrine highlights that the Sea Base is more than a launching point for Joint Forcible Entry Operations in an unavailable or adversarial denied

Surface/Air Point of Debarkation (SPOD/APOD), but the Sea Base must enable the Joint ROMO and perhaps even the Range of Government Operations (ROGO). The more frequent but less hostile ROMO/ROGOs are characterized best through humanitarian assistance/disaster relief, non-combat evacuations, and stability operations scenarios.

a. Austere Beach Access

Sea Base connectors with the ability to access the shores of states with damaged or no port access are critical in realizing the Sea Base's Joint Force Expeditionary Operations (JFEO) and humanitarian assistance operation requirements. JFEO is characterized by the ability to seize multiple entry points through the acquisition of improved and unimproved APOD/SPOD. The overall capability [JFEO] will be made possible by high-speed inter and intra-theater connectors (air/surface) that are able to operate over-the-shore or through unimproved, shallow water or austere ports for near simultaneous reinforcement of immediate response forces to enable the Joint Force Commander to apply expanded maneuver options through the JOA (Department of Defense, Chairman, Joint Chiefs of Staff, 2005). The same capability provides access to heavily damaged or inaccessible ports common to foreign humanitarian assistance operations in response to a crisis. The vessels with austere beach access and subsequently developed and undeveloped port access considered in this research are the LCAC/LCAC SLEP, SSC, T-Craft, LCU-2000, and LSV. Except for the T-Craft all platforms are established and funded FY2010 programs of record, possess distinguishable austere beach access characteristics necessary for Sea Based Amphibious Operations (AOs), and are currently planned to be operational in 2020.

(1) T-Craft INP Program. The Office of Naval Research (ONR) conducts research and sponsors programs that could have a game changing impact on the way the Navy operates. The Sea Base connector T-Craft is a technology being explored in the ONR's Innovative Naval Prototype (INP) program that grows such programs from initial concept design to construction and testing of a full-scale prototype demonstrator. The INP program is valuable in fostering collaborative research and design efforts in technological areas that are conceptually undefined and when the technology level is immature. The intent of the T-Craft INP program is to provide the

availability of such a revolutionary surface platform for future Joint Capability Integration Development System (JCIDS) capability assessment. New technologies that are being explored for the T-Craft program include: catamaran/Surface Effect Ship hull forms, multi-mode propulsion systems, (including hybrid electric drive), inflatable bow and stern seals, retractable side skirts, ramp technologies and dynamic positioning systems, lift fan developments, automation, and human systems integration" (Joint and Army Concepts Division, ATDC, 2006). The T-Craft has been subject to workshop analysis of its operational concept, evaluated as the solitary surface connector within limited Seabasing logistics M&S, and as a component within Joint Seabasing war games hosted by Marine Corps Combat Development Command (MCCDC). The INP Phase II contractor design down-select of competing T-Craft designs and experimental demonstrators is currently scheduled for May 2010 and the selected prototype demonstration is anticipated to occur in 2014.

(2) UHAC INP Program. ONR is additionally sponsoring the design and testing of the Ultra Heavy-lift Amphibious Craft (Figure 3). The UHAC, designed as a nearly submerged displacement vessel, could potentially provide three times the load capacity of a LCAC and also have an over-the-beach capability. Operational within the same well-deck footprint as a LCAC, its acquisition would substitute for the LCAC/SSC in amphibious shipping or MLP transport. Ongoing testing indicates the feasibility of this platform offering high speed transport of multiple M1A2 tanks. Combined testing of the UHAC and SSC is anticipated to be completed by FY2018.

Figure 3. A modeling illustration of ONR's UHAC. The UHAC supports multiple mixed load configurations and an unprecedented heavy load capacity. (From Main, 2010, p. 21)

b. Austere Port Access

Joint forces intend to achieve the 10-30-30 swiftness goals partially through the employment of their Joint High Speed Vessel (JHSV). The JHSV is the only high speed, heavy lift, and shallow draft vessel that is optimal for the roles of a Sea Base surface connector. "MPF(F), JHSV, and [Super-Short or Short Take-Off/Landing aircraft] STOL/SSTOL capabilities permit deploying forces to avoid improved PODS, exploit multiple entry points, deliver forces in combat configuration for immediate employment, present multiple dilemmas to the enemy, and achieve operational surprise" (Joint and Army Concepts Division, ATDC, 2006).

B. SCOPE AND METHODOLOGY

The purpose of this analysis was to allow the determined Sea Base Connector System (SBCS) requirements to shape and define the alternative system configurations. The problem was scoped to allow the interoperability and compatibility interface requirements of operational input/output items (physical and data) to define the alternative SBCS configurations. Examples of such physical and data input/output items are mechanical connections or transfer systems for at-sea loading/unloading and C2 data exchanges or voice communication links, respectively. More specifically, the SBC's interfaces with the future Maritime Prepositioning Force (MPS(E), ASF, ESG, commercial shipping, and intra-theater ports of the Sea Base were evaluated through the transfer of items necessary for the Joint landing forces to conduct the humanitarian assistance/disaster relief (HA/DR) mission. Items such as the Naval Construction Brigade's construction equipment, the Navy's Riverine patrol boats, or ISO containers were included. As anti-access environments only prohibit early access to theater surface and air access points, the bulk of this analysis was conducted on in-theater assembly, employment, and early sustainment Lines-of-Operations (LOOs). Since the intent of this architectural description is to identify the requirements fulfillment of the Sea Base Connector System and its possible configurations, the internal and external system uantities and threshold requirements development were left for further M&S analysis. Programs of record in 2010 and current platforms still intended to be active in the 2020 timeframe were included.

The methodology of this thesis followed that developed by Dr. Steven H. Dam presented in DoD Architecture Framework: A Guide to Applying System Engineering to Develop Integrated, Executable Architectures. This process is particular to architecting "to be" or vision architectures. The methodology applied to "a vision architecture," typical of conceptual development of future military systems, is appropriate for architectural development of systems that initially lack a detailed set of requirements. While a set of originating requirements exist for the T-Craft technology, they primarily exist to guide technology development and conceptually establish the T-Craft capabilities within a military operation framework. However useful for initial conceptual development, they are without regard to the integration, interoperability, and interface requirements of the T-Craft within the SBCS architecture. Dam's methodology is based upon the classic SE approach.

Dam's middle out approach within the classical SE four-phase process, as depicted in Figure 4, enables the development of the originating requirements primarily through operational scenarios. The middle out approach was integrated into the architecture development and system design levels of the "V" lifecycle model. The approach was applied to the Sea Base Connector System (SBCS) conceptual development and high-level system requirements by determining the function's activities and decomposing them through functional modeling to their elemental functions within the context of a selected Seabasing mission. The Seabasing requirements specified in the Seabasing Joint Capabilities Document provided an outline of the desired Seabasing capabilities and derived SBCS capabilities Department of Defense (DoD), Joint Requirements Oversight Council (JROC), 2007). Through functional decomposition of the SBCS over the assembly, employment, and sustainment phases of amphibious operations the SBCS capability requirements within the context of the mission were refined.

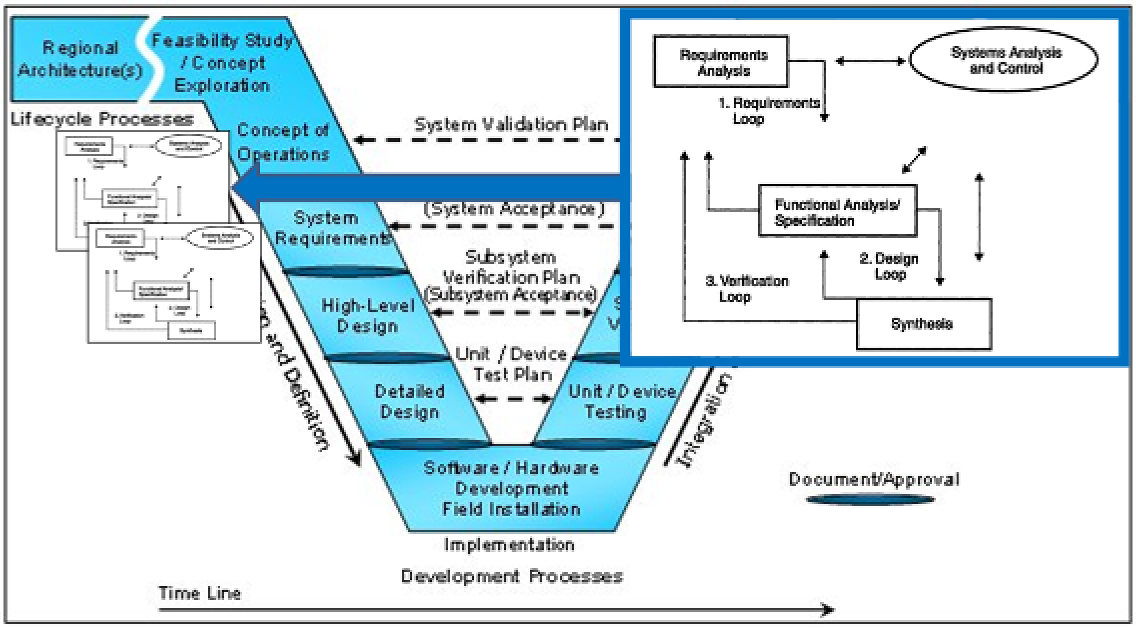

Figure 4. Dam's middle-out perspective of a classical SE four step waterfall process. Using a modification of EIA-632 Dam integrated the development of the requirements analysis and synthesis through functional and operational scenario modeling. (After Dam, 2006, p. 139)

C. PURPOSE OF RESEARCH

Current USN and USMC leadership has reemphasized the needed capability of heavier high speed lift from OTH and enhanced commercial and multinational shipping vessel interoperability. A previous argument has been made for the fulfillment of the Sea Base connector's JFEO and at-sea assembly capability gaps with the JHSV and SSC acquisitions. However, in the March 2009 Amphibious Operations in the twenty-first Century guidance, the Commanding General, MCCDC, Lieutenant General Flynn underlined a combination of vertical and surface lift as the key to rapid projection of combat power ashore.

> This issue has become so extreme that in recent years the five established embarkation planning factors…have been trumped by a previously unforeseen sixth factor: weight. The acquisition of an increased number of vehicles of all types, to include mine resistant vehicles, as well as larger assault support aircraft, has increased the weight problem exponentially. (U.S. Marine Corps, Commandant, 2009)

The Marine Corps Commandant highlights that, for more than a decade, the Marine Corps have fielded vehicles and equipment optimized for extended combat operations ashore with little regard to future AO embarkation requirements. Existing surface connectors capable of transporting such heavy vehicles to austere beaches are both slow and antiquated Army beach craft or are high speed air-cushion-vehicles that are overloaded with one over-sized vehicle. While the JHSV in combination with near-term innovations such as the Improved Navy Lighterage System (INLS) or Lightweight Modular Causeway System (LMCS) have been shown to meet the above conditions, they do not offer JFEO solutions or a robust mobile at-sea assembly area necessary for commercial cargo handling. Aside from JFEO, a DoD recognized capability gap to support commercial based logistics for low to mid conflict intensity and high frequency operations is becoming evident.

Missions within the ROMO that are detached from traditional military amphibious operations, newly classified as “other,” show fresh emphasis on coalescing the efforts of numerous multinational organizations, both military and civilian, and their respective sea shipping in a common mission. An example of this new focus is the recent Seabasing wargaming that focused on HA/DR and stability operations. Post-assessment revealed that the Sea Base’s capability to conduct at-sea offload of commercial ISO containers, mission integration, palletization, and distribution of the necessary cargo was exhausted. The conference proceedings recommended to “ensure connectors are interoperable across multiple military and commercial platforms” to include partner nations and continued support of capabilities to transfer, receive, and unload containers at-sea (USMC Wargaming Division, Marine Corps Warfighting Laboratory, 2010). While such missions are often perceived as lower threat environments, even apparently peaceful humanitarian missions occur in uncertain and militant regions and thus are more appropriately supported by employing seabasing principles.

Unstable sociopolitical environments and religious extremism characteristic of the joint operational environment openly challenge the perceived safety of the Sea Based multinational forces rendering military supported assistance and aggravate the host nation’s sensitivity to foreign assistance. More pointedly, “the proliferation of anti-access weapons among both state and non-state actors has further complicated the access challenge, even for benign missions. This is exemplified by Hezbollah employing a C-802 ASCM against an Israeli warship during the Lebanon crisis in 2006, which added an additional dimension to U.S. noncombatant evacuation operations" (USMC, Commandant, 2009). In assuring governmental stability and maintaining its perception of control, the Sea Base will likely be tasked with conducting HA/DR or stability operations utilizing a minimal footprint ashore. Such scenarios validate the wisdom of operating, at least initially, from over the horizon and illuminate potential for further surface connector acquisitions.

The T-Craft operational concept is yet undefined. There have been thorough capability-based assessments by both the Navy and the Army for parallel concept austere access platforms such as the SSC and JHSV, respectively. The author cedes both craft will enhance the JFEO capabilities and support conceptualized Seabasing operations; however, none of the 2020 surface craft inventory will fully enable the envisioned needs of twenty-first century amphibious operations requiring unprecedented OTH operation, heavier high speed lift for JFEOs, and at-sea cargo assembly with multinational and commercial organizations. While the INP program will indeed offer the availability of a superior technological platform, the operational concept of this craft has yet to be defined not only within the context of the T-Craft's mission portfolio, but within cooperation and integration of other Seabasing systems. The author believes that exploration of the T-Craft within the MCO and HA/DR environments will exemplify the T-Craft's game changing utility in both peacetime and mid-to-high conflict environments; however, it is believed that the greatest opportunities for a single acquisition such as the T-Craft for capability gap fulfillment are within the HA/DR environment.

The following benefits of this thesis research will be:

- To define the Sea Base Connector (SBC) operational concept and required capabilities within the context of a low intensity and uncertain threat environment while conducting HA operations.
- To develop alternative configurations of the Sea Base Connector System (SBCS) physical components that meet stakeholder requirements that can be further evaluated in M&S analysis.

- To develop initial SBCS functions and operational activities critical to conducting an M&S analysis to determine T-Craft measures-of-performance and design requirements. Such analysis will provide program decision makers insights to the T-Craft's mission portfolio and performance tradeoffs that define the design requirements.
- To generate DoDAF viewpoints and presentations of a capabilities-based SBC architecture that will aid in the conceptual development and experimentation of the T-Craft concept.

D. RESEARCH QUESTIONS

- What are the mission, originating, and system requirements for a SBC system?
- What is the objectives hierarchy of the SBCS as seen from the primary stakeholders? Who are the stakeholders?
- What are the appropriate Measures of Effectiveness (MOEs) for the SBCS mission requirements?
- What is the operational concept of the SBCS over the lines-of-operation? How are surface connectors being used? What are the operational activities of the SBCS?
- What is the functional behavior of the SBCS?
- What are the internal and external interfaces between SBCS elements?
- What are the appropriate Measures of Performance (MOPs) for the SBCS requirements?
- What are the alternative families of SBCSs and their associated performance tradeoffs?

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II. RESEARCH METHODOLOGY

A. CLASSIC SYSTEMS ENGINEERING WATERFALL

The classic SE Process includes the non-linear phases of requirements analysis, functional analysis and allocation, synthesis, and system analysis and control (Figure 4). The requirements analysis phase is conducted to decompose the customer requirements into testable requirements for system development. The requirements are derived from a doctrinal review of the internal and external systems and regular discussion of the stakeholder's originating requirements. The functional behavior of the system (or systems in an architecture) is determined in the functional analysis phase and then allocated to generic components. A functional analysis consists of defining a hierarchical model of the functions and activities performed by the system and its components and modeling the flow of information and physical items from outside the system through the transformational process of the system's functions and onto the serviced external systems. The synthesis phase is the mapping of those generic components to physical components. Within synthesis the functional architecture and coinciding functional activities are grouped into system appropriate cohesive units closely evaluating the component interfaces for coupling. The system analysis and control phase is continuously integrated into each of the previous three phases to provide a balance through trade-off studies, risk analysis, and other design verification and validation techniques (Blanchard & Fabrycky, 2006). These phases are non-linear and not only spiral through increasingly lower levels of system definition, but also evolve throughout the system lifecycle.

B. MIDDLE-OUT APPROACH APPLIED TO THE SBCS

Utilizing a variation of the system engineering process presented by Dam, the following steps were taken using CORE's© Model Based Systems Engineering (MBSE) approach:

1. Literature Review

The author obtained relevant Sea Base, Sea Base connector, Joint amphibious operations, Joint ship-to-objective-maneuver, and the Joint force combat unit organization related documents and captured them in CORE's© architecture repository. A document analysis to discover desired external system capabilities and SBCS issues, risks, and assumptions for other activities and capabilities was accomplished. The primary design documents that defined the SBCS capability requirements in a Joint environment were the Seabasing Joint Capabilities Document (JCD) and the Army Watercraft Functional Needs Analysis (FNA) (DoD, JROC, 2007), (U.S. Combined Armed Support Command, 2007). Seabasing guidance documents such as the Seabasing Joint Integration Concepts (JIC) and the Seabasing Naval Warfare Publication (NWP) provided descriptions of the strategic and operational actions of the Sea Base (Department of Defense, Chairman, Joint Chiefs of Staff, 2005), (Department of the Navy, Office of the Chief of Naval Operations and Headquarters & U.S. Marine Corps, 2006).

2. Assumptions and Derived External System Capabilities

The author reviewed assumptions and doctrine derived external system capabilities with the stakeholders to verify subsequent work met desired objectives. Seabasing doctrine and the assessed capability needs of Army watercraft were used to generate capability requirements of the SBCS. These capabilities typically include objective and threshold values and are often characterized as surface connector requirements for all Seabasing assets that could ultimately be allocated to task specific load requirements for each connector. All assumptions, issues, and risks were documented in CORE© for continuous assessment and re-evaluation. These records provided a traceable and validated catalog of accepted and ongoing assumptions, constraints, and risks essential to strategic, operational, and tactical decisions that were either established through Joint Seabasing documents or the author's documented assumptions (Appendix A. Sea Base Connector System Capabilities).

3. Existing and Planned Systems Identification

The author conducted a survey of the planned or ongoing activities relevant to Seabasing and individual service or Joint surface craft to ensure that capabilities already available or planned were taken into account. Joint wargaming and applicable surface connector conferences provided insight into inter-service areas of focus, updates to existing acquisition or research programs, and CONOPS of future focus (USMC Wargaming Division, Marine Corps Warfighting Laboratory, 2010). Establishment of the components of the 2020 SBCS was essential to determine its capability gaps for further surface connector acquisition assessment. Acquisition plans and service life upgrades to Army watercraft were particularly beneficial in determining the available 2020 Army watercraft assets (U.S. Army Transportation Office, 2008). Army and Navy acquisition plans and the intended assignment of those assets provided a phased description of the quantities and availability of those assets in the CONOPS. The programs of record in FY10 that were planned for 2020 operation were verified by the stakeholders prior to including in the analysis.

4. Constraints

The author captured the technical and schedule constraints imposed by external policies, regulations, and standards. The current acquisition schedules and anticipated technical innovation plans were used to generate and support the SBC system components. While the planned quantities of future platform acquisitions change frequently within their lifecycle, the type and planned capabilities that each platform provided to the Sea Base were of more importance in this analysis than the planned quantities available in 2020. This was most significant in the planning and service-life upgrades of existing Army and Navy watercraft.

5. Operational Context Diagram

Through an extension of the context diagram, the architecture environment to include the internal and external interactions was described within the context of a general Seabasing mission. This operational view provided the broad overview of the inter-service contributions and their required mission tasks in the HA/DR campaign while foreshadowing the general assumptions of the CONOPS. Such analysis shaped the fundamental descriptions of the SBCS, external systems, and their interfaces. The interfaces were decomposed to physical and informational linkages that better defined the future necessary standards and external system interoperability considerations. As emphasis in this analysis was upon the physical linkages, it was a concern to develop and describe the external Sea Base load exchange links (Appendix E. Operational/Physical Context Diagram).

6. Operational Scenarios

The author evaluated the directed and implied operational tasks of the SBC system in a HA/DR CONOPS to determine the simplest use-case and expanded it to encapsulate the most complex scenarios. The simplest use case for the SBC system was at-sea loading of cargo from CLF ships and deploying that cargo to shore facilities. This use case was expanded to eventually include the exchange of objective area personnel to and from the Sea Base. The directed tasks originating from a recommended Uniform Joint Task List (UJTL) operational humanitarian assistance template were further decomposed from operational activities into their respective Joint and inter-service military tasks (CJCS, 2003). A MBSE approach to define a hierarchy of each service's operational tasks and appropriate measures-of-effectiveness (MOE) was used to simultaneously define the functions necessary for their fulfillment. While numerous Joint and multinational strategies to achieve the HA/DR tasking exist, a holistic view of these combined tasks and the limitations imposed by the crisis was used to formulate an operational plan of Seabasing activities. To quantitatively evaluate the capability of the SBCS the generic scenarios were applied to a Navy and USMC relevant and significant mission.

The lessons and the general strategic plan discussed in the Expeditionary Warrior 2010 war game's HA/DR mission provided a general description of anticipated Joint and multinational operations. The HA/DR CONOPS utilized in this analysis offered numerous scenarios differing by geographic limitations, local threat, and crisis severity across the entire coast and inland waterways of Nigeria, but a single scenario with accompanying constraints and assumptions was used to capture the bulk of LOO-phased SBCS capability requirements. The author derived operational and tactical level scenario descriptions and use cases to allow proportional adjustment of the Sea Base's resources available in the selected scenarios with respect to the entire Nigeria crisis response and a potential description of T-Craft tasking within the SBCS. While such operational analysis through potential scenarios is useful in constraining operational variables and defining performance requirements, it needs to be highlighted that these detailed activities are highly dependent upon the strategic, operational, and tactical plans and assumptions generated by the author. Although the basis for such strategic plans and assumptions are referenced in Seabasing doctrine and validated through USMC wargaming, the 2020 HA/DR Sea Base is still yet an evolving concept and specific operational plans are not publicly available.

7. Derived SBCS Functional Behavior

The author developed a functional decomposition of the SBCS from the operational scenarios. Stated HA/DR tasking was decomposed, guided by the military task list(s) refining the operational activities, to define the necessary SBCS functions. IDEF0 modeling and FFBD modeling provided a means of decomposing the functions of the SBCS to appropriate levels while simultaneously allowing them to be traced to the operational activities hierarchy. From the operational scenarios, the data list of inputs, controls, mechanisms, and outputs of the SBCS's top-level functions were determined to model the conversion of the external Sea Base system's provided resources to be consumed by the objective area system and vice-versa (i.e., delivering food to Lagos or civilian MEDEVACs to advanced base).

8. Functional Elements

The author developed generic components for the physical architecture which incorporate all functions identified during the functional architecture development. This packaged functionality was specific to both the selected HA/DR scenarios in the Assembly, Employment, and Sustainment AO phases and mapped to those existing

SBCS components to determine their individual ability to conduct such functions. The author then generated alternative physical architectures using the generic components developed and selected candidate physical configurations.

9. Function to Element Allocation

A traceability matrix was created by allocating SBCS functions to potential candidate physical system configurations. The priority of functional to physical system mapping was to first utilize legacy SBC platforms available within the CONOPS phase and scenario and then supplement with a generic INP acquisition platform that could enhance the system configuration. The selection of alternative system configurations was driven by increased at-sea assembly interface capabilities and deployment of the functional items to the objective area.

10. Interface Diagrams

The author defined potential physical load exchange interface capabilities between SBCS and Sea Base components that would enable a new platform acquisition to meet the needs of candidate alternative SBCS configurations. Given the purpose of the research and 2020 assessment considerations, only relatively mature technologies were considered beyond standard Navy load exchange systems.

11. Alternative System Configurations

The author documented SBCS physical alternatives, noted shortfalls and gaps, provided options for problem resolution, and developed conclusions. A 2020 legacy watercraft SBCS alternative was established and evaluated as a baseline consideration to illuminate potential capability gaps. The author then evaluated and documented trade-offs conducted throughout the process. The integration of stand-alone capabilities was required to develop a robust solution throughout all phased requirements.

12. Views, Briefings, and Reports

The author created the DoDAF viewpoints shown in Figure 5 throughout the development of the SBCS architecture.

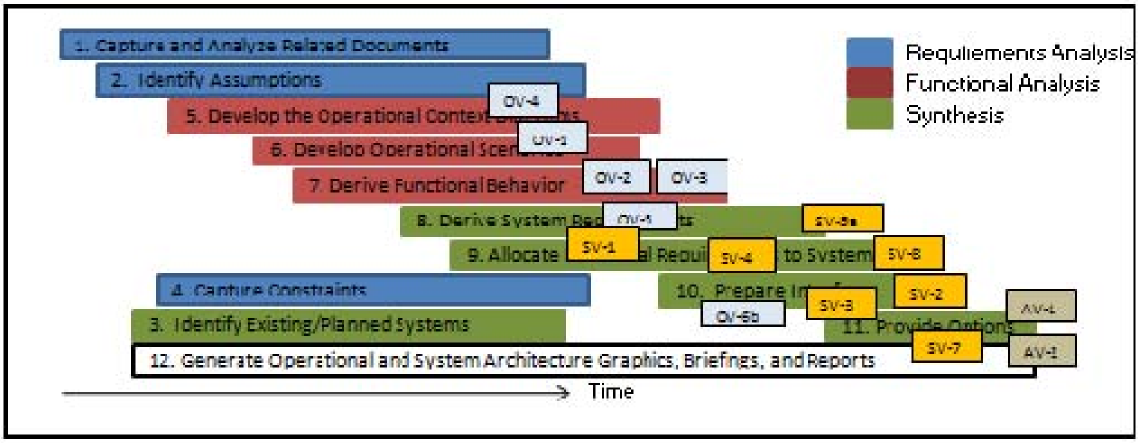

Figure 5. **SBCS architecture plan. The plan indicates a chronological but overlapping methodology tailored to generating relevant architectural DoDAF viewpoints. (After Dam, 2006, p. 144)**

C. DOCUMENTATION AND PRESENTATION

1. System Engineering in CORE©

The CORE© software by Vitech is a systems engineering software tool that manages the numerous components of an architecture. The CORE© tool allows the Systems Engineer to integrate the system architecture with behavior models, requirements, and verification/validation throughout the design process. CORE© facilitates the functional and operational requirement traceability within the operational and system architecture domains.

CORE© offers a schema that divides an architecture into operational or system architectural domains (Figure 6). The operational domain is best understood as a construct of the operational activities that are specifically defined by their operational tasks that are required to accomplish a mission. These relate to the Joint force’s hierarchical listing of mission, to operational activity, to service task descriptions. The operational architecture domain is used to capture originating concepts, capabilities, and supporting analysis to expose requirements used in the system domain architecture. The system’s domain is best visualized by the defined system’s functional decomposition mapped directly to system requirements and defined physical systems. By utilizing CORE©’s DoD Architectural Framework (DoDAF) schema requirement’s tracing from the customer to the physical components can be verified and more easily configured. The preconfigured schema provides input on-demand graphical and tabular representations and/or reports aligned to DoDAF views. Through CORE's model based simulation behavior diagramming can be completed rapidly and CORESIM© can provide high level trade-off analysis data to evaluate system specifications.

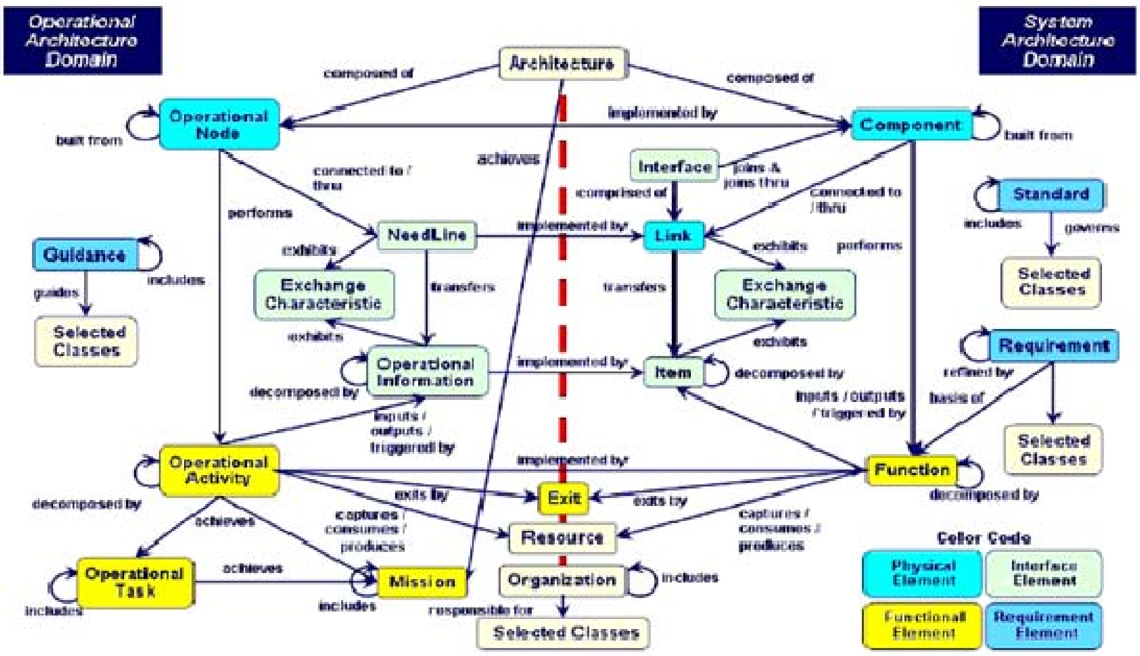

Figure 6. CORE© DoDAF V1.5 architecture composition. This perspective divides the architecture into two domains: operational and system. (From Vitech, 2007, p. vii)

2. DoDAF 1.5 Description

DoD Architecture Framework "provides a foundational framework for developing and representing architectures across organizational, Joint, and multinational boundaries" (Department of Defense, Chief Information Officer, 2007). DoDAF 1.5 emphasizes a disciplined process of defining the purpose, scope and information requirements of the architecture up-front, followed by a collection of data in accordance with a standard vocabulary. Visualization of the architectural data is accomplished through models that are typically documents, spreadsheets, or viewpoints, or other graphical representations. The models serve as a template for organizing and displaying data in commonly understood and communicated formats. Various perspectives, appropriate to the audience, are called views (i.e., operational, systems, services, standards) and collections of these views are termed viewpoints as individually described in Figure 7. Collectively the composition of these viewpoints creates an architectural description.

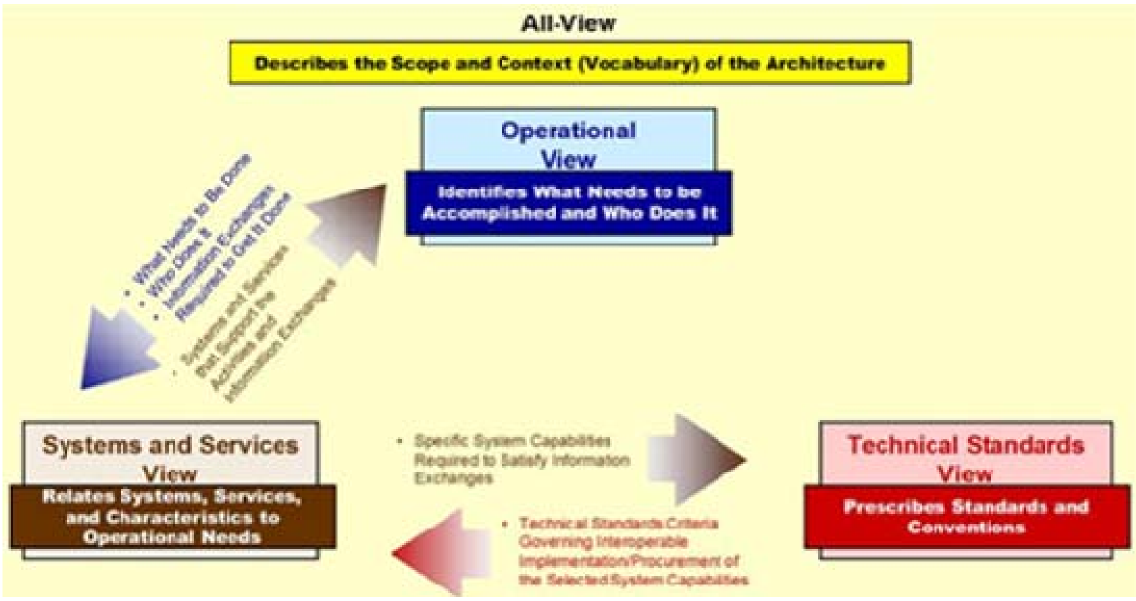

Figure 7. DoDAF 1.5 Overview of system architecture viewpoint linkages. The illustration describes the internal relationships between the architecture viewpoints. (From Department of Defense Chief Information Officer (DoDCIO), 2007, pp. 1–8)

3. DoDAF 1.5 Application to the SBCS

Steven Dam’s methodology of architecting a DoD system was based upon the 2004 DoDAF V1.0. While the application of his methodology is still solidly representative of system architectural modeling, DoDAF 1.5 “places more emphasis on architecture data, rather than products, introduces the concept of federated architectures, and incorporates the Core Architecture Data Model (CADM) as an integral component of the DoDAF (DoDCIO, 2007). Figure 5 illustrates the SBCS engineering timeline and the model viewpoints generated. Not all pertinent views are included within this architectural description as many require in-depth technical analysis of the SBCs and their sub-systems and were evident to be beyond the scope and resources of this analysis.

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III. SYSTEM DESCRIPTIONS

A. EXTERNAL SYSTEM DESCRIPTION

1. Sea Base

While the physical concept of the Sea Base has hardly yet been established, the current conceptualization of the Sea Base is a collection of naval assets, some of which exist today and others that are being defined. The logistics backbone of the Seabasing concept is currently the enhanced Maritime Prepositioning Squadron (MPS(E)). A 2007 report to Congress on Seabasing requirements "states that the key performance parameters for the MPF(F) squadron include… an ability to deliver ashore, in a period of 8 to 10 hours, one Marine Brigade Landing Team (BLT) by surface transportation from a range of up to 25 nautical miles, and a second BLT by air transportation.from a range of up to 110 nautical miles" (Defense Science Board, Task Force on Mobility, 2005). The MPS(E) concept includes supporting and sustaining Seabasing operations through the following capabilities: prepositioned USMC MEB equipment, unhindered operations without port or host nations support, enable at-sea arrival and assembly of forces, providing unreinforced sustainment of twenty days or more from the Sea Base pre-combat configured and tailored logistic packages (U.S. Marine Corps, Commandant (CMC), 2009)).

The notional Sea Base components are composed of a Carrier Strike Group, Expeditionary Strike Group, Maritime Prepositioning Group, Combat Logistics Force, an assortment of surface connectors, Coalition Forces, and other U.S. service ships (Table 1). As no two Sea Bases will be alike and their future components will look much different than those shown, the Sea Base is better viewed as a scalable portfolio of capabilities tailored to the needs of the joint task force commander.

NOTIONAL COMPONENTS OF THE SEA BASE			
U.S. NAVY			
Carrier Strike Group (CSG) CVN Air Wing DDG(2) CG T-AOE/T-AO/T-AE/ T-AKE SSN	**Expeditionary Strike Group (ESG)** LHD/LHA LPD LSD DDG(2) CG SSN	**Maritime Prepositioning Force (MPF)** MPSRON Naval Support Element Naval Beach Group Assault Craft Unit (LCU/LCM) Assault Craft Unit (LCAC) Beach Master Unit	**Surface Strike Group (SSG)** CG DDG (Total 3 ships) **ATF Shipping** Assault Echelon (AE) (U.S. Navy provided) Assault Follow-on Echelon (AFOE) (MSC provided)
Combat Logistics Force (CLF) T-AO T-AOE T-AKE T-AFS T-AE	**Navy Expeditionary Combat Command (NECC)** Navy Expeditionary Logistics Support Group Explosive Ordinance Disposal Teams Naval Coastal Warfare Forces Naval Construction Forces Expeditionary Security Forces Mobile Diving and Salvage Units Naval Riverine Forces Navy Cargo Handling Battalion		**Other U.S. Navy Forces** MCMs HM Squadrons VR Squadrons Navy Unique Fleet Essential Aircraft (NUFEA) AS Submarine Tender T-AH T-ARS T-ATF
OTHER SERVICES/JOINT FORCES			
U.S. MARINE CORPS MEU(SOC) Amphibious MEB MPF MEB Fly-In Echelon	**U.S. ARMY** Army Strategic Flotilla (ASF) Landing Force Elements	**U.S. AIR FORCE** Combat Search and Rescue Air Force Prepositioning Ships (MSC controlled) **U.S. COAST GUARD** Cutters Patrol Boats Port Security Units (PSUs) Law Enforcement Detachments (LEDETs)	**JOINT FORCES** SOF Elements **TRANSCOM** **Strategic Sealift (MSC provided)** T-AKR RO/RO T-AVB T-ACS JHSV Troop Ships Sea Barge Heavy Lift Ship OPDS Tanker **Strategic Airlift (AMC)** C-5 C-130 C-17

Table 1. Notional components of the Sea Base. The diagram summarizes the potential Sea Base assets available to the 2020 COCOM. Note that the T-AE will not be a in the U.S. inventory by 2020. NECC's NCW forces and the MPF(F) have transitioned to the Maritime Expeditionary Security Force and the MPS(E), respectively. (From Department of the Navy, 2006, pp. 1–7)

The Sea Base is a system of inherently mobile and networked platforms that will revolutionize the way Joint and multinational forces provide movement, maneuver, and sustainment for campaigns, major operations, and other contingencies. While the desired capabilities of the Sea Base system are more Jointly explored and understood in the context of MCOs, a robust method of achieving those capabilities is still far from being determined. Significant DoD doctrine, organization, training, materiel, leadership and education, personnel and facilities (DOTMLPF) gaps exist within the Sea Base concept and more have yet to be recognized. Some of the Seabasing capability gaps are currently being explored through Joint Capability Based Assessments and experimentation through wargaming, but some have already initiated DOTMLPF changes. These efforts have had substantial focus on MCO Concept of Operations (CONOPs), but recent focus has been on Military-Operations-Other-than-war (MOOTW).

Seabasing offers substantial capabilities in the globally prevalent MOOTW, constituting non-combatant evacuation operations, peace operations, foreign humanitarian assistance, crisis consequence management, strikes and raids, and homeland civil support operations.

> Seabasing provides adaptive force packages with the requisite capacity, rate, and infrastructure to support a tailored maritime or joint force. Adaptive Force packages optimize the combination of people and platforms to provide the right force at the right time, given a particular operational requirement which is enhanced by the inherent scalability of Seabasing. (Department of the Navy, United States Fleet Forces Command, 2009)

The enhanced capabilities of the Sea Base's MPS(E) will provide groundbreaking at-sea assembly of personnel, cargo, and vehicles exchange from military prepositioned shipping vessels, military vessels, and commercial shipping to support the logistics requirements within the ROMO/ROGOs.

The overarching Seabasing phases of operation are typically described through the sequential simplification of five primary Seabasing lines-of-operations (Figure 8). While the missions within the ROMO vary, the persistent and scalable Joint force projections of the Seabasing LOO are equally relevant in all missions. Although the established LOO is traditionally applied to MCO, these basic functions are universal for all MOOTW and only differ by scale, temporal variations, and frequency of occurrence. The LOO have defining metrics within the context of a MCO.

Although the MPF(F) guided metrics were generated for MCO, some have direct application to MOOTW and others can be scaled accordingly. Currently desired MCO-defined LOO capabilities require the Seabasing concept to close the force within 10–14 days of the execution order by leveraging the forward presence of Joint prepositioned forces. This is accomplished through a combination of strategic intra-theater Air/Surface Point[s] of Departure. The joint force is assembled and married with their equipment in theater within 24–72 hours of arrival without host nation support. The USMC and the USA landing forces are united with their prepositioned stock and equipment aboard the MPS(E) and the Army Strategic Flotilla, respectively. This necessarily requires utilizing the sea as a maneuver space. Employment of at least one brigade OTH within one period of darkness (8–10 hrs) and sustainment of at least two joint brigades is envisioned. The Sea Base reconstitute LOO requires reemployment of one brigade operating ashore within 10–14 days (Department of Defense, Chairman, Joint Chiefs of Staff, (2005). While the LOO for MCOs provide the framework for parallel Seabasing operations to support MOOTW such as HA/DR, multiple variations to the process depend upon the forces at which military vessels are to interoperate with and the availability or operational status of advanced bases or objective access points.

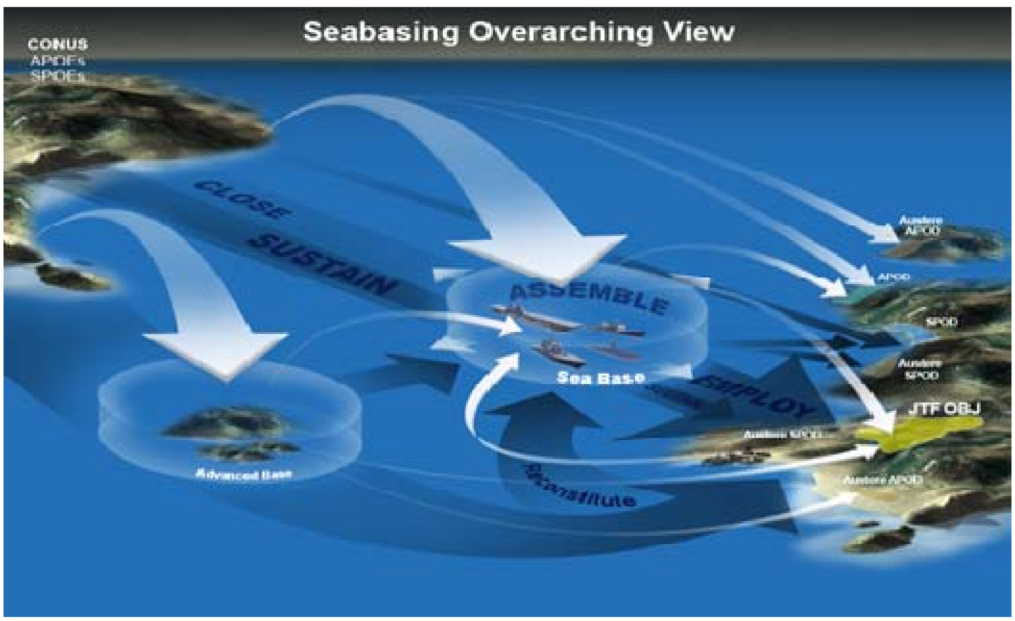

Figure 8. Seabasing lines-of-operations. The graphic highlights the logical progression of the operational phases with respect to a general amphibious operation. (From Strock, 2007, p. 7)

Seabasing provides improved operational maneuver of joint landing forces by minimizing the needed setup and protection of support facilities ashore. “By performing command and control, fires, and logistics functions afloat, fewer personnel and resources would need to be transported ashore and amphibious flexibility, tempo, and unpredictability would be enhanced, permitting the landing force to maneuver directly from the sea to inland objectives" (CMC, 2009). A practical example is when key supply stockpiles are maintained safely at sea, vice the supply stockpile on the coast commonly referred to as the "iron mountain," and the ATF is able to expand its operational region away from the logistics supply. Additionally, the landing force is not constrained to protecting the logistics stockpile and the military personnel and facilities footprint ashore is minimized. The Sea Base's inherent maneuver flexibility enables deployment momentum by projecting forces directly from the sea.

With assembly being conducted at sea, deployment momentum can be maintained through assured access to the objective territory and operational responsiveness. The Sea Base concept allows assured theater access and if strategically positioned it can significantly improve force flows through simultaneous entry of objective territory at multiple points. The improved operational maneuver capability over a large JOA allows the Joint force to be strategically unpredictable, thus less vulnerable to attack, and bring operational surprise and the ability to adapt to changing battlespace conditions. Current employment operations afforded at SPOD/APOD cause considerable time delay "to unload LMSRs that are loaded administratively at high STOW factor rates, to move those unit sets and stocks to assembly areas, to link personnel arriving by strategic air at airfields within the region, and then to organize into units and move to objective areas" (United States Fleet Forces Command, 2009). At-sea staging can facilitate operational responsiveness by deploying in unit configurations with personnel and rolling stock fully integrated and immediately employable at arrival to a SPOD/APOD.

a. Logistics Support Ships: MPS(E)

The recently funded MPS – Enhanced includes one T-AKE class vessel, an LMSR, a new design MLP, and four T-AKs to augment the existing fleet tanker and container ships Figure 9 (Department of the Navy, Office of the Chief of Naval Operations and Headquarters, U.S. Marine Corps, 2010). The MPS(E) will provide the Sea Base with revolutionary maneuver flexibility and logistics support. Three MPS(E) squadrons will be prepositioned around the world. These squadrons are expected to be located in the Atlantic Ocean or Mediterranean Sea, Diego Garcia, or Guam/Saipan areas.

The MPS(E) is capable of independent operations with Sea Base components in a low-to-medium threat environment. The MPS(E) does not currently have any additional berthing facilities or C2 functionality, provide any maintenance, repair, or medical treatment support, or possess any capability to handle standardized commercial Twenty-Foot Equivalent Unit (TEU) containers. However, the MLP is intended to support such functional specific modules that can be later developed. The landing force's logistics infrastructure will be maintained afloat at the Sea Base and replenished from T-AKEs provided by the CLF ships arriving from CONUS or other FLSs.

The MPS(E) is a combination of legacy MPS ships and existing ship classes or variants, but all will have technology insertions that are currently being developed to create improved at-sea assembly operations. The technology insertions and the proposed MLP Lite are illustrated in Figure 9. The existing T-AKE provides ammunition and dry stores to include frozen, chilled, spare parts, consumables, and limited quantities of fuel. It has upgraded material handling equipment, transfer deck and pre-staging areas, shipboard warehouse management system, lightweight cargo stowage system and elevator upgrades. The T-AKE will have the ability to receive at-sea the specialized military container (QUADCON)[3] level cargo that is dense packed aboard the T-AK vessels or others and palletize it for vertical lift or underway replenishment. Operationally it will act as a station ship or shuttle ship to support the future Marine Expeditionary Brigade (MEB) indefinitely. From tanks, ammunition, food, fuel, spare parts to engine oil, the prepositioned T-AK vessels contain nearly everything combat-loaded that the USMC's MEB will need for initial assembly to support a MCO. Since the components of the MPS(E) already exist or have been funded, its capabilities will be assumed for this analysis. Each prepositioned group contains one MPS(E) vessel pre-loaded and configured for HA/DR mission with the following capabilities:

- It contains equipment and supplies to support an Expeditionary Airfield (EAF). An EAF provides the flexibility needed to allow the force commander to order a variety of airfield configurations to suit the tactical situation.

[3] A TEU equivalent container that is separable into four individual ISO containers.

- Naval Expeditionary Medical Support System (NEMSS). Staffed by 940 Sailors, the NEMSS can be fully operational in 10 days. This expeditionary hospital consists of six operating tables as well as 80 intensive-care and 420 acute-care beds. The NEMSS provides in-situ state-of-the-art medical care for personnel engaged in remote areas.

- Naval Mobile Construction Battalion (NMCB). The NMCB, which is capable of carrying out numerous vertical and horizontal construction missions, will be able to build troop billeting facilities and both refueling and ammunition supply points, to clear main supply routes, and to provide other construction support as needed. (Global Security.org, 2006; Military Sealift Command, 2010)

Figure 9. Notional MPS(E) and ongoing technology experimentation. The MPS(E) is to support a 2015 MEB and the joint swiftness goals. (From Strock, 2009, pp. 18–20)

LMSRs are primarily equipped with heavy lift cranes and all include a stern ramp or side ramp for pier side or at-sea RO-RO Discharge Facility (RRDF) cargo transfer. Successful underway transfer of vehicles from a modified LMSR side-ramp to a proxy Mobile Landing Platform (MLP) via a horizontal side ramp in sea-state 3 has been conducted. Additionally, similar sea-state 3 cargo transfer testing to a notional MLP from an existing LMSR crane with pendulation control has been completed. Retro-fitting of the pendulation crane to the existing MPS LMSRs is extensive and the implementation of such technology has not yet been determined at this time, however, this technology is assumed to be present in at least one LMSR within the 2020 MPF(F).

The MLP version recently funded is a flow-on/flow-off (FLO-FLO) vessel that has the ability to submerge the majority of its main deck. This gives it the ability to transport other large vessels and act as a mobile landing dock for displacement and ACVs. The general purpose value of this vessel is to offer a large area for vehicle, personnel, or cargo assembly and integration prior to distribution via its docked vessels or transfer systems. It will likely house the Vehicle Transfer System (VTS) ramp for at-sea employment to at least fitted LMSRs.

The closure and assembly phases particular to MCOs currently depend upon advanced bases or FLS to provide a staging and assembly areas for the USMC and Army equipment and supplies prepositioned aboard the MPS and ASF, respectively. The MPS(E) will capitalize on OTH usage of the sea as a maneuver space to support the full range of military operations. The planned capabilities of the MPS(E), from the Seabasing Naval Warfare Publication, include the following:

- Close a MEB in 10–14 days.
- Provide at-sea arrival and assembly in 24–72 hours.
- Support forcible-entry operations when joined with a CSG or ESG, or both, by employing two battalions, one by air, and one by surface, in a single period of darkness.
- Sustain joint Seabased operations, including up to at least two joint brigades operating ashore, for an indefinite period using advance bases up to 2,000 miles away.
- Reconstitute one brigade from ashore to the Sea Base; reemploy within 10–14 days of execution order. (Department of the Navy, United States Fleet Forces Command, 2009)

The Army's strategic flotilla contains the Army Prepositioned Stock (APS) in dense packed storage. As an alternative to combat-loaded methods, dense packed storage maximizes loading capacity by sacrificing any ability for selective offload. While the Navy has made strides to provide a selective offload capacity, the

Army has yet to make modifications to its prepositioning concept. The ASFs are typically collocated with the MPSRON and each consists of various combinations of vessels classified as Large Medium Speed Roll-on/Roll-off (LMSR), Roll-on/Roll-off (RO-RO), Lift-on/Lift-off (LO-LO), break bulk, and container ships. The LMSRs are primarily equipped with heavy lift cranes and all include a stern ramp or side ramp to pierside, at-sea RRDF, or the Army's Joint Logistics over the Sea (JLOTS). While both the LO/LO vessels and container vessels contain TEU loads, only the LO/LO has an organic capability to heavy lift crane containers at-sea or to undeveloped piers. It is assumed that the Army's LMSRs and LO-LO vessels will not be outfitted with MPS's enhanced sea-state 3 crane pendulation system. Lastly, break bulk vessels contain large open or covered containers well suited for loose cargo. Within this analysis it is assumed that the ASF has made some steps to modularize the loading of its APS to support HA/DR operations, but will remain aligned to developed port offloads.

b. Logistics Support Bases

Logistics support bases include those military bases located in CONUS or overseas. The U.S. Transportation Command (TRANSCOM), through the Maritime Sealift Command (MSC) and Air Mobility Command (AMC), provides cargo and personnel sealift and airlift either directly to the JOA, or established advanced bases. The Navy possesses many advanced bases such as those in Spain or Bahrain and the Army utilizes bases in Germany or Iraq to provide prepositioned forces and logistics. The Navy's established FLSs, currently Guam, Diego Garcia, Sigonella, and Rota, is assumed to be indefinitely sustained from the highly developed logistics bases within the continental United States (CONUS). In order to meet typical supply demands of military operations a FLS commonly has a deep water harbor, sufficient number of large ship berths, a military or commercial airfield with sufficient throughput and maximum on-ground transport capability, petroleum storage, container marshalling yards, ordnance magazines, cranes, trucks, material handling equipment, and barges. Container marshalling yards must contain adequate equipment and machinery to sort, store, consolidate, and repackage cargo as necessary. Typically, at least a minimal medical and maintenance facility are available. As one would expect, the likelihood of a FLS or even a developed port being available in an objective theater is improbable. The Joint Operational Environment assumes such a case and has defined seaports with limited infrastructure, either inherently or through man-made/natural disasters, as austere ports or those with no infrastructure such as a beach or shore as austere accesses.

The sources and delivery methods of Joint logistics advanced bases are varied. Fuel is often delivered in-theater by merchant tankers. Supplies may arrive in-theater by commercial container ships, AMC assets, or CLF T-AKE ships. The MPSRON and the ASF may utilize advanced bases as an assembly area for unloading and subsequent loading onto amphibious shipping or high speed connectors. During MCO or HA/DR sustainment of the Sea Base from advanced bases CLF ships may provide logistics support via station ship or shuttle ship methods with additional high speed surface craft augmentation available in the latter.

2. Combat Elements

a. Marine Expeditionary Brigade

The 2015 baseline Marine expeditionary brigade is functionally composed of traditional Marine Air-Ground Task Force (MAGTF) elements; a command element, ground combat element, aviation combat element, and a logistics combat element. The MEB varies in size and composition and is task-organized to meet the specific situation. "The various missions likely to be conducted in an uncertain environment may be performed by a MEB embarked aboard amphibious, by an ARG/MEU, by disaggregated portions of an ARG/MEU, by a SP (Special Purpose) MAGTF embarked in one or more amphibious ships, or by other task organized Navy-Marine Corps forces operating from a variety of vessels" (CMC, 2009). The notional 2015 baseline MEB elements and unit approximations are provided in Figure 10. A MEB can operate by itself with a self sustainment capability of 30 days, fully integrate within Navy/Joint logistics systems for indefinite sustainment, and can conduct forcible entry operations.

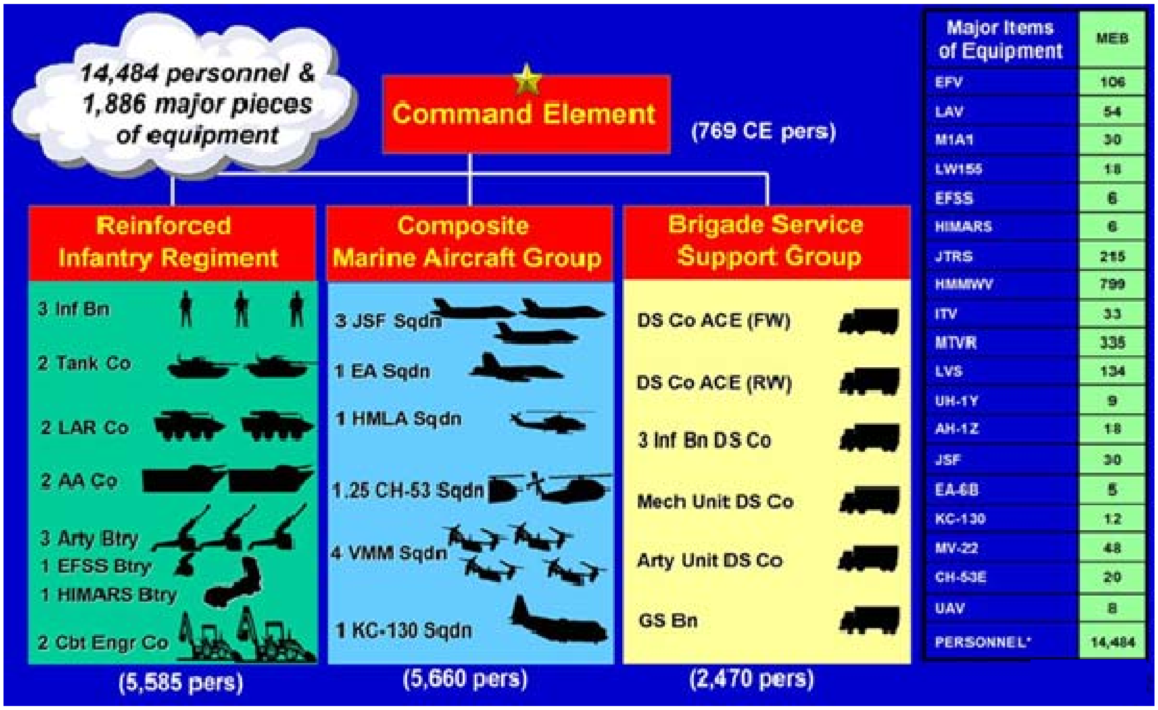

Figure 10. MAGTF Elements of a notional Sea Base MEB. The MEB includes unit troop and equipment approximations. (From Department of the Navy, Chief of Naval Operations, 2005, p. 12)

The baseline 2020 MEB is organized to be deployed and employed from Amphibious Warfare Ships. The amphibious MEB is assumed to be transported and employed in four echelons. It is likely that an advanced force, primarily composed of Joint special operations forces conducting operations in the area, will be employed to prepare the OA stage before the main echelon's force arrives. This would include operations such as reconnaissance, preparation of supporting positions, and crisis assessment.

The rapid reinforcement echelon and the follow-on echelon may each be composed of an additional MEB equivalent and select Joint or multinational forces which can be assembled and employed in the OA to provide strategic reinforcement of the main echelon through the MPS(E). The follow-on echelon deploys on ten to fourteen combat loaded strategic sea sift ships, as available, and provides troops, vehicles, aircraft, equipment, and supplies required to sustain the operations. The forward base echelon flows to a forward base to support fixed wing aircraft that are not Sea Based such as the

KC-130, EA-6B (or its successor), and F- 35 Joint Strike Fighters. The Amphibious Task Force with its follow-one echelon will accommodate a Navy Support Element that may have 2,500 to 4,000 Navy personnel, depending on the deployment/employment mode (Strock, 2007).

b. Brigade Combat Team

The Army is currently undergoing an overall transformational effort to reorganize the force from a division-based to a modular brigade-based force. The intent is to redesign organizations to perform as integral parts of the Joint force, making them more effective across the ROMO and enhancing their ability to contribute to Joint, interagency, and multinational efforts. The modular brigade-based force is mission-set tailored, but illustrated most appropriately here by degrees of combat armor, ranging from light, medium, to heavy. The modular brigade concept includes three types: light, or airborne brigade; mechanized infantry (Stryker); or heavy with armor. An additional variant that should be highlighted here is the Security Force Assistance BCT that is assumed to be equated with the similar loading and sustainment requirements as the Stryker BCT. While the Army has shaped much of its future fighting concept around access-denial, thus projecting and sustaining its forces through multiple parallel paths, implementation of such a strategy in a MCO still relies heavily upon austere port access. However, as the at-sea closure and assembly capability of the Sea Base is realized the Army’s concept of deploy-employ will be recognized directly from the Sea Base vice through an advanced base.

3. Commercial Shipping Description

Commercial shipping has been differentiated from the vessels of the MPS(E). While both the commercially provided vessels, either owned or contracted by the MSC, government organizations, or non-government organizations, have the same general hull type descriptions and rigging suited for HA operations they have not been adapted to directly interoperate with the U.S. Navy’s Sea Base connectors or enablers. For the sake of simplification in system modeling these vessels are either organically rigged load-on/load-off container ships or break-bulk vessels. It is assumed that they are capable of at-sea load exchange operations in a low sea-state environment, such as a protected harbor or channel inlet, to include directly moving container or palletized loads from a beam mounted crane over-over-the-side to an adjacent MLP, INLS, or dynamic positioning system (DPS) enabled vessel.

a. MSC Shipping

The MSC utilizes tankers, dry cargo ships, and LMSRs to move more than ninety-percent of the U.S. war fighter's equipment and supplies by sea. MSC seeks to economically lease cargo space aboard U.S. flagged vessels before using its own vessels. Most cargo shipping requirements for the military are fulfilled by the Army Surface Deployment and Distribution Command's usage of commercial container shipment that is undistinguishable from civilian channels. Dry cargo ships are specifically tasked with cargo that is too large to fit in containers, military vehicles, aircraft, or ammunition. It also utilizes its own 10 ship surge ready LMSR fleet that is currently capable of crane offloading in calm waters to lighterage or barges. These LMSRs are surge ready within as little as four days. Additionally, MSC maintains a ready reserve fleet consisting of fast sealift, RO/RO, heavy lift, and crane ships quickly ready to support operations such as humanitarian assistance and disaster relief (Military Sealift Command, 2010).

b. International Relief Agency Shipping

No particular ship class or types are indicative of the countless numbers of relief ships that may be utilized by international relief organizations to offer humanitarian assistance. They are characteristically likely to be older vessels equipped with their own rigging and have been refitted for dry cargo transport to austere accesses. Such vessels, frequently providing assistance in undeveloped nations during times of peace or internal struggle, may offer 5,000 tons of humanitarian assistance cargo to be transported to austere accesses and are typically offloaded using a boom crane. These ships also may offer medical staffing, supplies, and mobile hospitals.

B. SEA BASE CONNECTOR SYSTEM DESCRIPTION

The Sea Base Connector (SBC) or Sea Base Connector System (SBCS) provides the following functions within the ROMO/ROGO.

- **Conduct Force Closure.** Deploy from CONUS or a pre-positioned site in a JOA to another JOA in the required timeframe. Depending upon a SBC's endurance, underway replenishment, and loading/unloading capabilities, it may close to an advanced base, Seabasing component, or directly to an improved or unimproved port or austere beach. Navy Seabasing doctrine emphasizes the ability through employment operations to "maintain deployment momentum and to create multiple dilemmas for the adversary by utilizing simultaneous and/or force flows through these multiple entry points to provide more rapid buildup of combat power throughout the JOA" (DoD, JROC, 2007).
- **Conduct Maneuver Operations of the Joint Landing Force.** Provide the Sea Base simultaneous maneuver, maneuver support, and maneuver sustainment at the operational and tactical levels. This includes linking with amphibious warfare ships to load assault or sustainment forces and deliver them directly to and from the objective port or beach. This activity may include evacuating casualties, bulk liquid movement, or bulk liquid transfer systems. The current logistics sustainment of the MEB is currently preferred to be accomplished via cargo-carrying aircraft (MV-22 and CH-53K) to assist in the rapid maneuvering of the landing force inland; therefore, ongoing sustainment of material through surface connectors will likely be limited to heavy armor and bulk liquids or via available inland waterways. The greatest sustainment challenge in any Seabasing ship-to-shore operation is the movement of liquids. Bulk liquids potentially account for more than 75 percent of the tonnage moved ashore during a Sea Based operation (Department of the Navy, Office of the Chief of Naval Operations, 2005). This may be fulfilled by physical transfer of bulk liquids provided from the MPS(E) or CLF ships or may be done more efficiently through the transport of Offshore Petroleum Discharge Systems (OPDS) or Amphibious Bulk Liquid Transfer Systems (ABLTSs).
- **Transporting Personnel and Material between Sea Base Components.** SBCs conduct personnel and material transfer activities to enable the preparation and sustainment of the landing force. This activity may include transferring casualties to medically capable vessels or acting as intermediary transport of personnel, equipment, or cargo.
- **Transporting Personnel and Material between the Sea Base and Advanced Bases.** SBCs are tasked with transporting personnel and material to-and-from improved and unimproved SPODs within the JOA.

- **Serve as a Common Intermediary Interface.** SBCs may transfer material and personnel between unimproved ports or austere beaches and those Sea Base components or SBC unable to do independently. This may be accomplished by temporarily acting as a physical linkage between two non-interfacing platforms or austere port/beach.

1. Austere Beach Access Sea Base Connectors Description

a. LCAC/LCAC SLEP

The LCAC is the default surface connector for existing and planned well-deck ships. The LCAC is the Navy's primary means of transporting weapon systems, equipment, cargo, and personnel from ship to austere beaches. The advantage of the air cushion vehicle is that it can access over 70 percent of the world's coastlines, as compared with 17 percent for the conventional landing craft, at loaded speeds (60-ton nominal) in excess of 40 knots (Rivers, 2009). A 75-ton overload condition allows the LCAC to operate at a reduced speed. It operates independent of tide levels, water depth, underwater obstacles, and beach gradients. With a one-way range of 50 nautical miles fully-loaded, its speed and beach access provides the ATF the greatest OTH opportunity to achieve Joint objectives of assured access and operational responsiveness. The platform's air–cushion capability allows it to avoid the buildup of troops and material in the surf zone by discharging cargo directly onto dry trafficable beaches. With the current Service Life Extension Program (SLEP) the LCAC inventory could be sustained at 72 units in FY 2020, all of which will have undergone updated C4I system upgrades that enable future COTS equipment upgrades. Only LCAC SLEP units will be operational within the 2020 period considered (Rivers, 2009).

b. SSC

The Ship-to-Shore Connector will replace the current LCAC capabilities. The SSC enhances the LCAC capabilities by providing a sustained speed in excess of 35 knots in the loaded condition (74 STONS) in increased sea states (NATO 3-4) for 86 nautical miles (Figure 11). The SSC is planned to operate with the same footprint as the LCAC. A highly anticipated feature of the SSC is the bow door/ramp system and the ability to un-gripe vehicles near shore that would improve the speed and security of an

OTH Expeditionary Fighting Vehicle debarkation or a rapid offload of existing or off-the-shelf mechanized vehicles to the shore. The planned fleet introduction of the SSC is FY 2014 (Rivers, 2009).

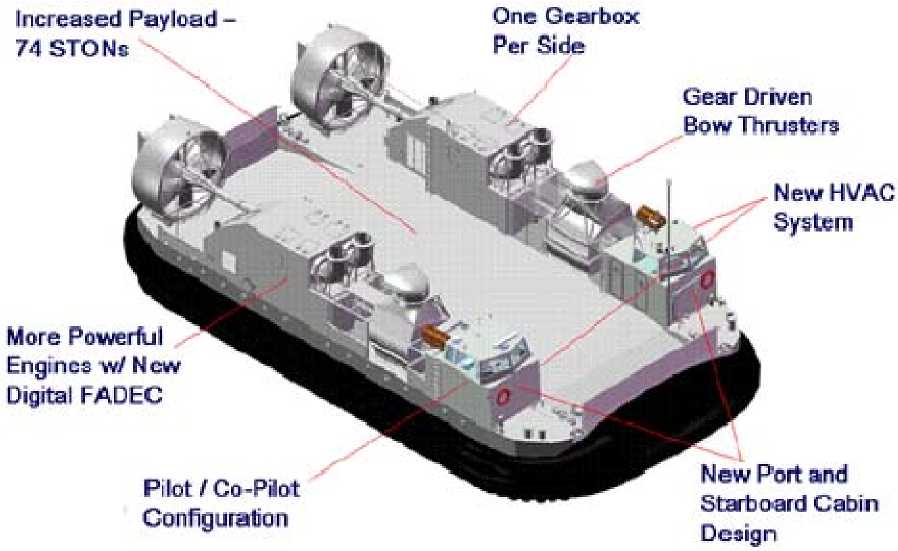

Figure 11. SSC model with LCAC enhancements. Major technological improvements over the LCAC include improved payload capacity and range. (From Rivers, 2009, p. 28)

In a Joint CONOPS STOM scenario of a moderate or greater threat environment the SSC will be tasked with deploying the heavier follow on forces from the ESG, MPS(E), or ATF to support the main effort. If outfitted with a personnel carrier they can be used to evacuate up to 180 non-combatants or the wounded to the ESG or move additional forces across short spans of water such as a peninsula or island.

b. T-Craft

The Transformable Craft (T-Craft) will be capable of high speed inter-theater deployment to the JOA in an unloaded condition. Unlike the predecessor air cushion vehicles (ACVs) the T-Craft will be capable of self-deploying to long ranges (2500 nm) while possessing superior heavy lift amphibious beach landing capabilities than the legacy ACVs. This revolutionary capability will be accomplished through a transformation of the craft from a high speed Surface-Effect-Ship (SES), which in combination with ACV characteristics enables high sea-state vehicle transfer, to an amphibious craft employing heavy loads or vehicles on an austere beach. The T-Craft could potentially physically interface at-sea with a LMSR, conduct vertical replenishment operations, conduct skin-on-skin crane operations with amphibious shipping, or offer a highly mobile and large area platform for military staging and integration or commercial TEU breakouts. A generic ONR model of the T-Craft carrying an entire MEB Light Armored Reconnaissance vehicle company is illustrated in Figure 12. Thsize and lift capacity of the T-Craft with a threshold lift capacity of 280 s-tons (4 M1A1 tanks) enables the employ-to-deploy strategy and offers cohesive elements of the MEB to be maneuvered and employed together.

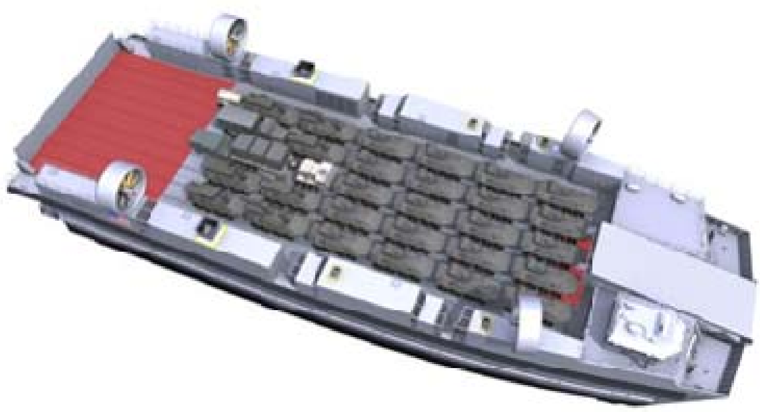

Figure 12. A rendering of a concept T-craft. This MCCDC illustration shows an idealized T-craft employment of a MEB LAR company. (From Booth, 2009, p. 12)

The availability of a self-deploying high speed sea lift with a greater lift area and weight capability than legacy ACVs has the potential to release the true advantages of OTH operations. The T-Craft will enable Seabasing employment and logistics out of the littorals and enhance operational and tactical surprise and flexibility. The T-Craft concept and design objectives are illustrated in Figure 13

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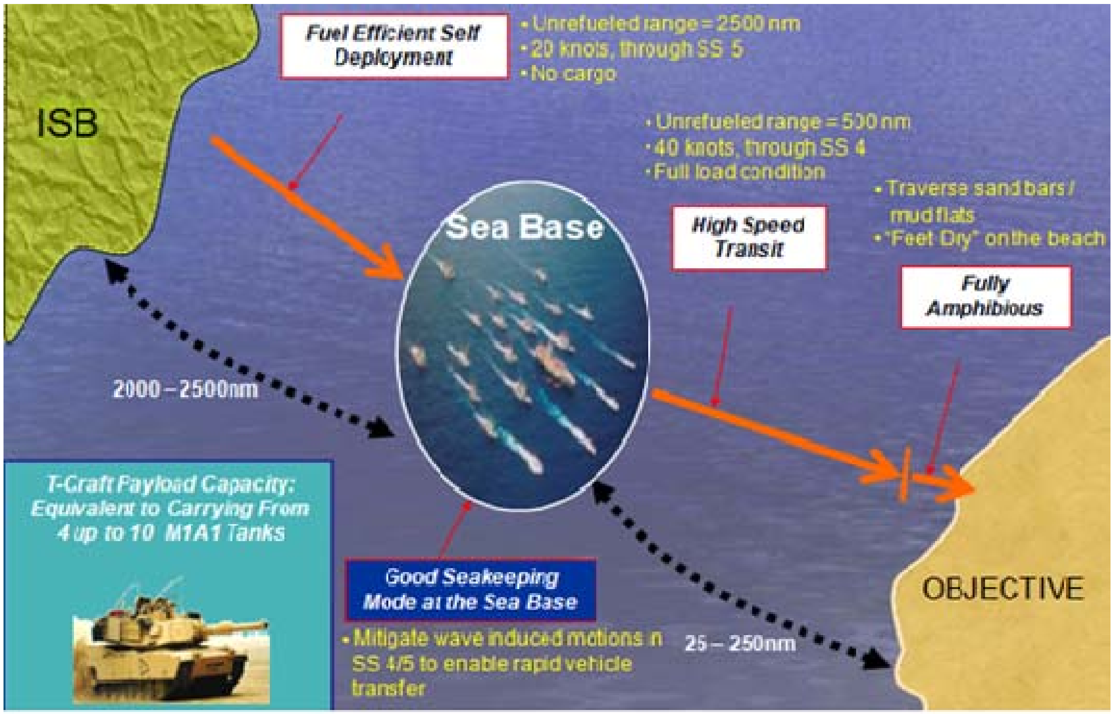

Figure 13. ONR established proposal objectives. This illustration highlights the general operational concept as provided in the initial ONR solicitation. (From Paulo, 2009, p. 5)

c. LCU-2000

The Landing Craft, Utility, 2000, is a medium sized self-deployable vessel that provides intra-theater movement of cargo and equipment (Figure 14). The LCU-2000's shallow draft and bow ramp enable it to be commonly used for tactical resupply missions to remote, underdeveloped coastlines, and inland waterways or unloading/loading RO/RO vessels through Logistics-Over-the-Sea (LOTS) operations. The LCU-2000 modernization strategy plan includes improved C4ISR, force protection, fuel transfer upgrades and a SLEP to provide the enhanced capability by 2015 through 2024 (U.S. Army Transportation Office, 2008).

Figure 14. LCU-2000. It provides a slow heavy lift container or vehicle transfer to shallow water austere ports or beaches. (From U.S. Army Transportation Office, 2008, p. A–7)

d. LSV

The Army's Logistics Support Vessel provides transport of combat vehicles and sustainment cargo to the JOA theater (Figure 15). The LSV replicates many of the LCU-2000 functions; however, with bow and stern ramps it is particularly adept in RO/RO operations.

Figure 15. LSV. It provides a slow moving heavy transport well suited for LOTS operations. (From (U.S. Army Transportation Office, 2008, pg, A–5)

2. Austere Port Access Sea Base Connector Description

JHSV The Joint High Speed Surface Vessel provides a self-deployable and rapid inter/intra-theater movement of personnel and equipment to an austere port. The JHSV provides COCOMS a 35 knot intra-theater transport of over 600 tons of combat ready units over 1200 nautical miles (Figure 16). The JHSV contains a telescoping boom crane that enables it to move medium weight cargo (up to 13.5 tons at 15m) from its decks to the pier, a slewing articulated ramp, and an embarked helicopter detachment; thus, providing the unique capability of rapid cargo offload in an austere port with little or no infrastructure. With a modicum of armament and ATFP weaponry the JHSV possesses a limited Joint Forcible Entry Operation capability, but its advanced C4I package enables it to coordinate directly with attached security forces. However, it is capable of being equipped with an embarked helicopter detachment.

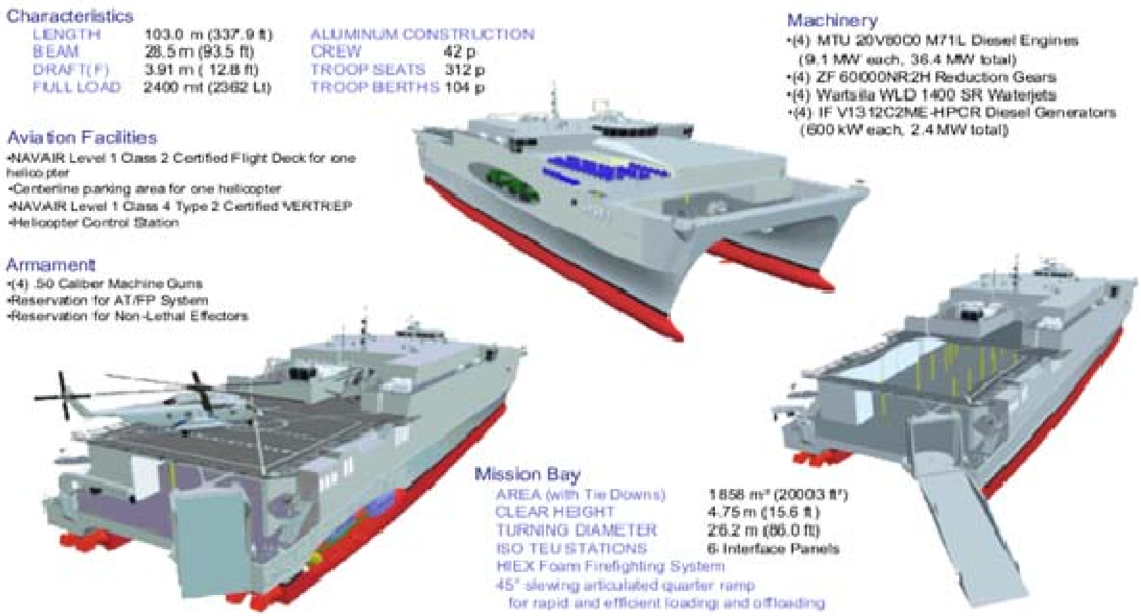

Figure 16. JHSV description and characteristics. The JHSV will be well suited for austere port accesses with its slewing ramp, flight deck, and shallow draft. (From Austin, 2009, p. 16)

The JHSV's speed and load capacity enable it to maximize intra-theater lift to/from advanced bases or Sea Base components to the austere ports located in littoral battlefields or rivers to realize the Army's deploy-employ strategy. The JHSV is particularly well suited for tactical shore-to-shore movement of troops and vehicles through ports with limited infrastructure. Advanced ramps currently being tested will provide a higher sea state interoperability with the INLS, LMCS, and RRDF that will greatly enhance the JHSV's ability to delivery cargo and vehicles directly to austere accesses.

IV. OVERVIEW OF SEA BASE CONNECTOR CAPABILITIES

A. INTRODUCTION

The Sea Base Connector System is an open system, with permeable system boundaries, and its functional and process requirements are defined by its external system interfaces. These interfaces are defined by their exchange of input and output items, such as personnel, fuel, sensor data, etc, that occur at the boundary interface of the external and internal systems. The SBCS's functions and processes are evaluated by a set of measures-of-effectiveness and measures-of-performance/suitability. The Sea Base, logistics support ships and bases, and combat forces were previously established as external systems. While the actual Sea Base concept includes the surface connectors internally, they have been isolated as a cohesive group for the sake of this analysis.

The Sea Base connector system is to be defined through Seabasing logistics and amphibious operations capability requirements across the range of military operations. A closer examination of the Seabasing assembly, employment, and early sustainment LOOs was conducted as it was found that the highest level of concern and difficulty occurred within these coinciding phases. The provisional SBCS capability requirements were initially defined by the established JCIDS analysis of Seabasing and Army watercraft documents. The Sea Base logistic and landing force capability requirements were each respectively captured by the supposition of the capability requirements determined in the Joint Seabasing JCD and the Army Watercraft FNAs.

Joint Capability Integration Documents share common conceptual strategies and goal. The two system capability assessments have been rigorously evaluated by their respective Joint or service and approved by the Joint Requirements Oversight Council (JROC). The Capabilities Based Assessment (CBA) of each system was completed under the guidance of the 2005 Joint Chiefs of Staff document, Capstone Concept for Joint Operations, and the Joint Operational Environment, the World Through 2020 and Beyond. The Joint Operational Concepts (JOpsC) document states the ultimate goal of the U.S. military forces is to accomplish the National Strategies through four Joint

Operational Concepts: Major Combat Operations, Stability Operations, Homeland Security, and Strategic Deterrence. All future combat scenarios are cross-cut by the Joint Integration Concept (JIC), thus, the derived Joint and Service capabilities envision the Seabasing concept within MCOs and stability operations. The stratification from National Strategy documents to the SBCS capabilities is illustrated in Figure 17. In order to uncover the system capability requirements across the ROMO, variations to the Seabasing based MCO and the use complementary defense planning scenarios occurred.

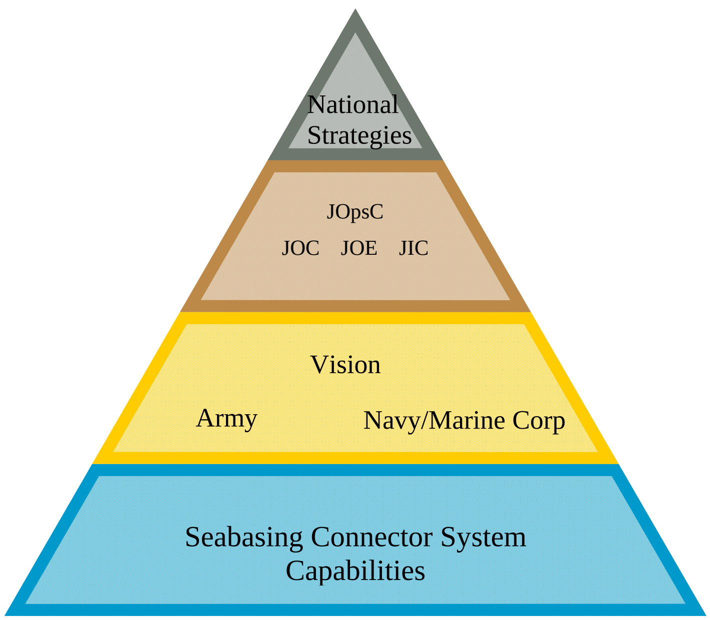

Figure 17. Derivation of SBCS originating requirements. This illustrates the stratification of SBCS capabilities through the Joint Chiefs of Staff doctrine and service capabilities assessments.

B. SCOPE OF CONCEPT OF OPERATIONS

Some Joint capabilities were excluded from the Sea Base Connector System capability analysis. The largest capability exemption is the Joint forces vertical lift capacity. This system was determined to be independent from the surface connector system, although vertical lift capabilities were assumed to fulfill some overlapping

Seabasing logistics and maneuver support capability requirements. The mission capabilities and surface connectors of the special operations force were excluded under the assumption that the small group and clandestine mission scenarios would be more appropriate for vertical delivery or their own specialized high speed vessels. Harbor clearance and salvage platforms were also excluded because Joint maneuverability concepts adhere to a common strategy of avoiding degraded ports. Lastly, the Army's Joint Logistics over the Sea capability was excluded until the early sustainment phase because of its slow and cumbersome logistical assembly and anticipated later availability. Applicable SBCS capabilities were also only evaluated through specific LOO phases.

The Seabasing capabilities were defined over the spectrum of combat intensity as illustrated in Figure 18. Desired external and internal system capabilities were evaluated within the scope of the assembly, employment, and early sustainment LOOs within a HA/DR operational concept. Overall emphasis capitalized on the Sea Base's OTH movement and maneuver capability enabling unopposed force employment at the beach. According to U.S. Fleet Forces Command, the most significant challenge for the 2020 SBC system will be in the simultaneous employment and sustainment of combat forces ashore.

> There are limited connectors on the Sea Base and these same connectors have potentially competing demands based upon mobility needs, medical evacuation, ship-to-shore logistics, ship-to-ship logistics, and maintenance down time. (Department of the Navy, United States Fleet Forces Command, 2009)

All significant cargo transfers of personnel, food, water, fuel/water, ordnance, infrastructure materials, and major end items will be included. Late sustainment and reconstitute phases were not considered as it is assumed that mature infrastructure of at least one established surface point of embarkation, INLS, or JLOTS causeway are established.

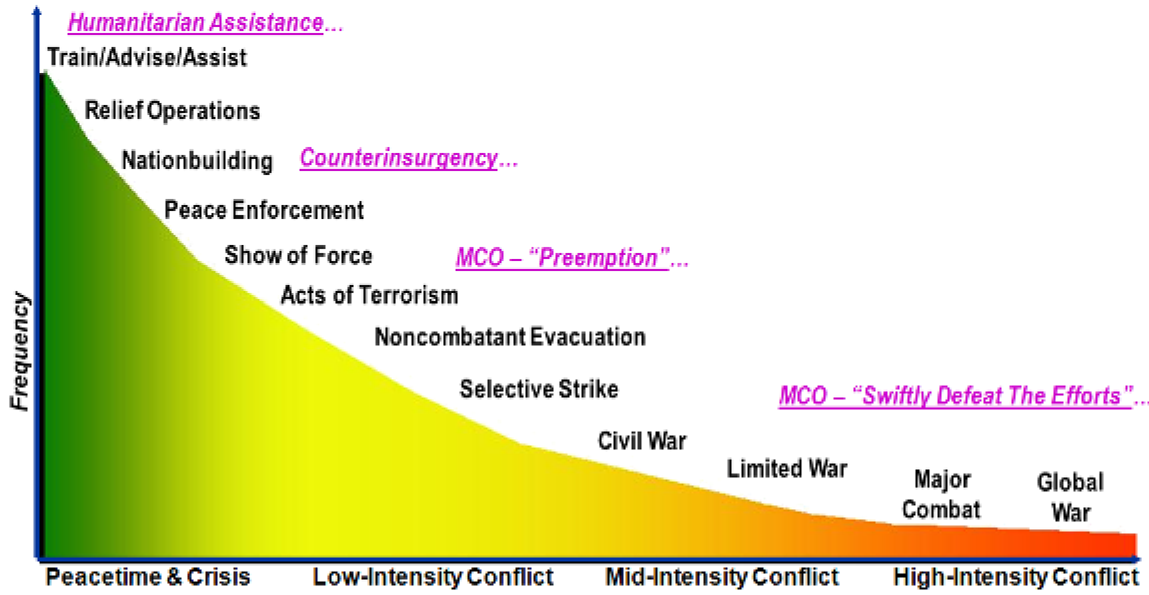

Figure 18. Seabasing operational continuum. Seabasing provides opportunities for scalable and responsive power projection (From Strock, 2007, p. 8)

C. SYNTHESIS OF EXTERNAL SYSTEM CAPABILITIES

The Joint Sea Base capabilities, while still evolving through Joint Experimentation efforts, have been initially established through the completion of the Seabasing JCIDS process. The initial Seabasing Joint Capabilities Document (JCD) established a comprehensive list of necessary Sea Base capabilities through CONOPS analysis and wargaming insight. The capabilities were based upon the CBA approach to MCO CONOPS outlined in the Seabasing JIC report version 1.0 and other defense planning scenarios designed to explore low conflict and peacetime Seabasing capabilities. A key characteristic of the JCIDS approach is to ensure adequate Joint representation of the inter-service stakeholders.

Generation of the JCD Seabasing capabilities was accomplished through the active participation of multiple stakeholders in the CBA approach. The JCD was validated and approved by the JROC through Initial Capabilities Document approval. Legitimacy of purpose of the required Seabasing Concept capabilities was achieved through comprehensive participation of the major and minor program stakeholders as listed below (DoD, JROC, (2007).

Major Stakeholders

- Operational Commands
- Joint Staff
- Combatant Commands
- Army
- Navy
- USMC
- Coast Guard
- Functional Capabilities Board (JFCOM, TRANSCOM)
- Secondary Stakeholders
- Seabasing Studies, Analysis and Wargaming Division
- Seabasing Working Group – OSD representatives

1. Capabilities

The comprehensive list of Seabasing capabilities generated in the Seabasing FNA was prioritized by the surveyed needs of the Combatant Commanders (COCOM) and the JCD functional capabilities board. The priority capabilities were assessed on the perceived risk the gap posed to mission success. The resulting prioritized list of thirty required Seabasing capabilities was used in this analysis to construct the SBCS capabilities from the Seabasing logistics and force projection viewpoint. This list provides a Joint agreement of the Seabasing capabilities specific to the subsequent assumptions, risks, and constraints. The capability gaps were ordinally ranked within each phase to determine their relative risk to mission failure. This subject matter expert guidance was used to generate an input to the combined SBCS functional hierarchy and can be further used to weight the selected M&S MOE. The top concerns that were centrally applicable to the SBCS were that:

- The Joint force has limited C2 capacity, along with limited C2 and weapon systems interoperability to integrate into the command-overall picture.
- The joint surface connectors have insufficient throughput to supply forces operating ashore from advanced bases at extended distances, specifically

- an inter-ship equipment, cargo, and personnel transfer capability,
- the quantity of air and surface connector interface points,
- to distribute bulk liquids in quantities needed to support medium and heavy maneuver forces,
- and the quantity of connectors that can meet the range, speed, and lift capacity required of the Sea Base's sustainment distance.
- The joint force lacks the ability to conduct forcible entry from OTH to austere entry points.
- Current surface connectors do not provide adequate skin-to-skin transfer or platform-to-platform interfaces to support at-sea transfer required supplies and medium and heavy equipment within the current family of ships in SS2–SS4. (DoD, JROC, 2007)

2. Assumptions

The JCD Seabasing capabilities were generated from the Joint CONOPs and defense planning scenarios derived HA/COIN scenarios established from the JIC 1.0 assumptions extrapolated to the 2025 timeframe. The following assumptions were used in the development of the JIC; thus will provide the foundation for the SBCS architecture assumptions.

- Reduced access to forward operations bases.
- U.S. joint forces will be required to conduct operations in anti-access environments.
- CONOPS and force structure based on baseline security posture, defense planning scenario(s) and multi-service force deployment campaigns with the following deviations:
- Seabasing will complement existing OPLANS, CONPLANS, and FUNCPLANS by reducing footprint at land bases, denying the adversary essential elements of friendly information, reducing transloads and minimizing in-route stops, and compressing reception, staging, onward movement and integration of joint forces.

- Future Seabasing systems, platforms, and capabilities will be employed (e.g.,, high-speed inter and intra-theater connectors (air/surface), selective off-load, etc.).

- Key Seabasing elements will continue to be forward deployed or pre-positioned in accordance with current and future defense strategies. (DoD, JROC, 2007)

3. Constraints

In addition, to support the scope of the effort, SBCS CONOPS development was bounded by the following JIC considerations:

- Examining an operational force capable of supporting four scenarios, including MCO, COIN, and Humanitarian Assistance (HA) Operations.

- No specific force size has been established for these operations, however to support capabilities and CONOPS development, the JIC referred to the 2003 Defense Science Board task force on Seabasing that examined Seabasing in support of brigade-sized or larger combat operations. (DoD, JROC, 2007)

4. Risks

In any operation, a variety of factors can pose risks to execution. These risks can be mitigated by accounting for them in advance and monitoring their feasibility through the analysis. Many of these factors are common across most, if not all, operations. The following factors are considered in the JIC to have a great impact on Seabasing operations, and were thus directly extracted into the SBCS architecture.

- Enemy anti-access capability—mines, missiles, aircraft, submarines, ships, and surveillance assets – threaten or delay the Sea Base's ability to achieve maritime and air/space superiority.

- Force protection assets supporting the Sea Base must provide sufficient protection for the Sea Base and employed forces.

- Adverse weather conditions and sea state impact sea-based operations and affect the rapid build-up of combat power and timely sustainment of employed forces.

- Capacity, rate, and survivability of high-speed inter and intra-theater connectors (air/surface) must be sufficient to provide for the timely closure, assembly and sustainment of the Sea Base.

- Capacity, rate, and survivability of prime movers and connectors (air/surface) must be sufficient to provide for the timely projection and sustainment of necessary combat power ashore.

- Range of operations can be affected by need for self-protection and the size, distance, and distribution of joint forces that need to be sustained.

- Sea-based joint C2 is dependent on a secure, reliable, net-centric environment that supports distributed, on-the-move, over-the-horizon (OTH) operations. Future treaties and international laws may impact Seabasing operations.

- CONUS-based and forward land-based platforms/points of embarkation are vulnerable to terrorist attack.

- Surface vessels have unique decontamination requirements when subjected to chemical/biological attack. (DoD, JROC, 2007)

D. SEA BASE CONNECTORS

The Army watercraft capabilities are derived from the functional area analysis of the transportation needs of the Army's BCT based Modular Future Force. Under the general the guidance of the <u>Army Capstone Concepts, The Army in Joint Operations</u>, and <u>The United States Operating Army Operating Concept for Operational Maneuver,</u> specific Army watercraft tasks were developed (Table 2). In the FNA the Army watercraft tasks were evaluated by standards within the context of achieving FAA derived Joint capabilities and established transportation tasks. The Army capabilities that were considered an essential foundation to Joint operations were Joint Command and Control, Battlespace Awareness, Assured Access, Operational Maneuver, and Distributed Support and Sustainment (U.S. Army Combined Arms Support Command, 2006). The intent was to determine the existing and expected capability gaps of the focus areas and explore further research into necessary DOTMLPF changes. For the purpose of this research the developed Army watercraft capabilities were used to govern Army specific SBCS needs.

ARMY WATERCRAFT TASKS	
Task 1	Conduct Force Closure.
Task 2	Establish and maintain situational awareness and command & control with appropriate echelons in both maritime and land based domains (C4ISR).
Task 3	Support embarked force battle command on the move to include continuous interface with the COP and en route mission planning and rehearsal.
Task 4	Operate in open ocean and the littorals to include anti-access or area denial environments.
Task 5	Provide operational maneuver for combat configured forces throughout a JOA.
Task 6	Conduct distributed sustainment operations in support of Joint and Combined Forces throughout a JOA.
Task 7	Support terminal operations in fixed, austere, and degraded sea and water ports and during joint logistics over the shore operations.
Task 8	Conduct operations at a Seabase.
Task 9	Operate in a non-contiguous, uncertain threat environment to include extreme meteorological and maritime conditions.

Table 2. Army watercraft tasks. An Army Functional Needs Analysis identified nine watercraft tasks derived from the Army Transportation FAA. (From U.S. Army Combined Arms Support Command (CASCOM), 2006, p. 7)

The following Army stakeholders participated in the Army Watercraft FNA capability gap assessment including the development of the objective hierarchy weightings within the context of the BCT operating in the Joint Operating Environment:

Army Stakeholders:

- Army Combined Arms Support Command
- Strategic Plans & Operations
- Force Development Directorate
- Material Systems Directorate
- Concepts & Doctrine Directorate
- Sustainment Battle Lab
- Liaison Offices
- Army Medical Department
- Strategic Studies Institute
- The Judge Advocate Legal Center and School
- Army Test and Evaluation Command

1. Capabilities

The comprehensive list of the JCIDS approved Army watercraft capabilities generated in the FNA was prioritized by CASCOM. Additionally, the capability gaps were identified and prioritized to support FSA quantitative analysis and further decision. The prioritization by Army subject matter experts was used as input guidance to the combined SBCS functional hierarchy. The weighted concerns from the Army Watercraft FSA are depicted in Figure 19, and should also be used to determine the weighting of appropriate SBCS MOE.

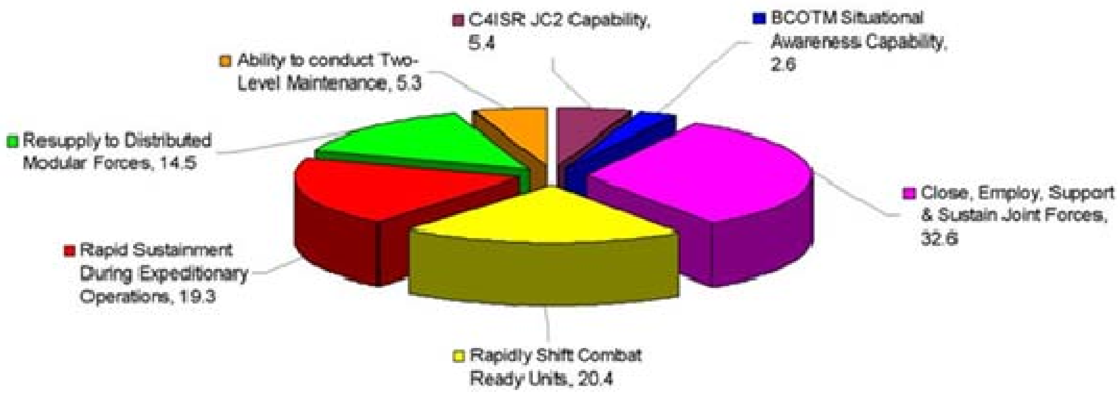

Figure 19. FSA capability-gap weight and priority. This stakeholder input may be used to support the determination of a SBCS functional hierarchy. (From U.S. CASCOM, 2007, pp. 2–1)

2. Assumptions

The Army's watercraft FNA assumptions were representative of those highlighted in the Seabasing JIC, but emphasized an Army specific subset to create added value to its Future Modular Force concept. The major assumptions that shaped the Army watercraft capabilities are as follows:

- Opponents will rely on less expensive but still sophisticated assets that are plentiful, easy to operate, and difficult to detect. Shallow mines, patrol craft, vessel-borne improvised explosive devices, torpedoes, and anti-ship missiles will be effective weapons defending against U.S. naval forces.

- The Army will always conduct operations as an integrated component of a joint force and will thus depend upon the capabilities of the joint force. (CASCOM, 2006)

3. Constraints

To support the scope of the Army Watercraft Capability definition effort, CASCOM utilized the following considerations:

- The Army's Future Force relies upon its watercraft fleet as the primary means for operational maneuver to project combat power throughout the battlespace.
- U.S. fleet's primary future operating environment will be in the shallower waters of the littorals. (CASCOM, 2006)

E. SEA BASE CONNECTOR SYSTEM ORIGINATING REQUIREMENTS

Synthesis of the SBCS's originating requirements was conducted through the context of the phased lines-of-operations. As previously discussed the emphasis of system requirements is upon closure, assembly, employment, and early sustainment. This was approach was taken to draw out the activity and interface requirements of the SBCS with specific regard to the T-Craft. The single greatest critical operational issue, appropriately characterized by its mission performance and risk, is the ability of the Joint force SBCS to conduct simultaneous assembly, employment, and early sustainment operations in a major combat environment. While it is understood that the LOO are not linear events, but are often simultaneous and reoccurring functions and activities, the originating requirements have been ordinally grouped within their respective phases where the majority of their activities are to occur. This results in constraining the AO phases to distinguishable and measurable performance metrics. However, in addition to the five LOO phases some specific capabilities were seen as overlapping at least one aspect of each function and were therefore included in a universal function and decomposing activities. The phased SBCS originating requirements are included in Appendix A. Sea Base Connector System Capabilities.

The Seabasing JCD and Army Watercraft FNA provided an ordinal value to their respective system's capabilities. This was used to develop a notional SBCS objectives hierarchy to support the selection and optimization of the selected M&S MOEs (Figure 20). While the rigor of such assessments is unknown, they do offer valuable insight into the collective opinions of the Sea Base and Army Watercraft stakeholders. Numerical weightings of the SBCS objectives hierarchy were avoided as to not convolute the outputs of two differing assessment methodologies and conceptual precepts. However, the nature and the scope of stakeholder involvement in the Seabasing JCD with the definite overlap of senior Army staff preferences gives these capabilities precedence over that of the Army Watercraft FNA. The intent of the Army Watercraft FNA capability was subsumed into the JCD where appropriate.

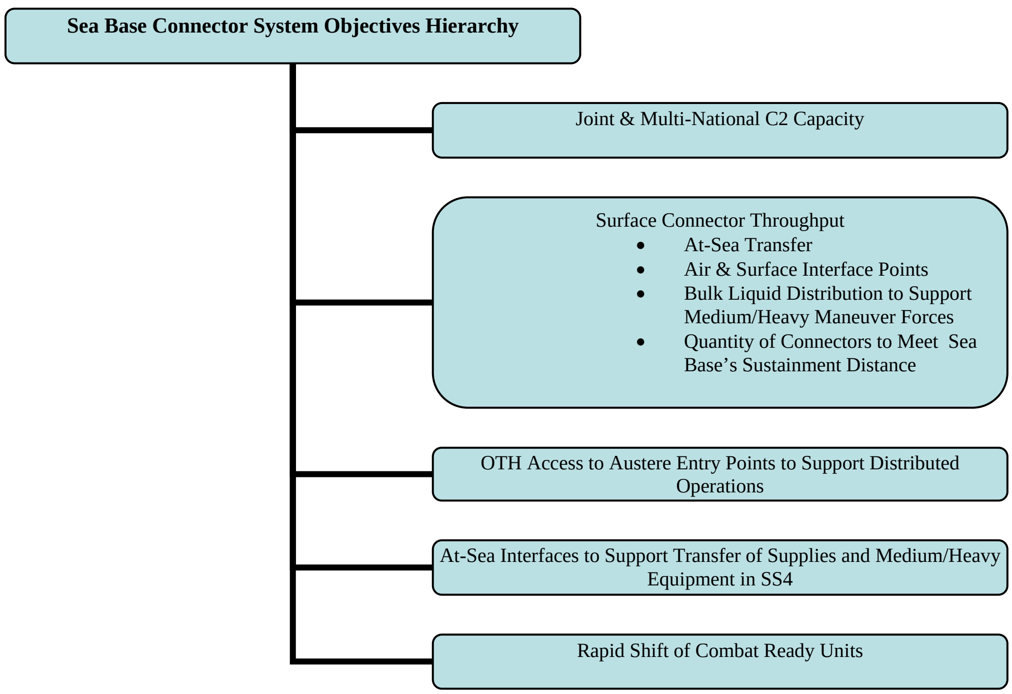

Figure 20. Sea Base Connector System Objectives Hierarchy. This consolidates the weighted priorities of the stakeholder inputs discovered in an analytical document analysis

V. OPERATIONAL CONCEPT

A. BASIS OF HUMANITARIAN ASSISTANCE/DISASTER RELIEF MISSION SELECTION

While the SBCS capability requirements previously determined reflected a Joint assessment throughout the ROMO/ROGO, greater exploration and concentration of such efforts and experimentation have focused on the Seabasing supporting a MCO. An obvious demarcation within the ROMO exists between mission probability and threat level. Through the author's participation in Expeditionary Warrior 2010 wargame and ASNE's High Speed Vessel Conference, a systemic shift of new Seabasing system acquisition interest towards supporting capability gaps within the high frequency and low threat missions was observed. The existing or planned acquisition of programs of record (JHSV, SSC, V-22 Osprey, and Joint Heavy Lift Replacement helicopters), near term realization of austere access enablers (INLS, LMCS, advanced JHSV ramp, and VTS), and the inherent limitations of MPS(E) emphasize less of a need for another surface craft directed at assault wave delivery of oversized vehicles. Current Sea Base gaps and Seabasing ROMO/ROGOs illuminate best utilizing the T-Craft as a large and mobile assembly area that uses its space to capitalize on general functions such as logistics on-load and breakdown, personnel and equipment integration, or housing modular Joint C2 Modules (JC2M). While this shift in focus is not unfounded from previous T-Craft workshop discussions, this research will not focus on the oversized vehicle/intact unit delivery of forces ashore in a MCO. The HA/DR operation scenario was determined by the author's wargame participation and conference de-briefing to most substantially strain the Sea Base and its surface connectors within the scope of the wargame.

The premise of the Nigerian HA/DR mission, excerpted from Expeditionary Warrior 2010 wargaming, is to provide aid and support to thirteen cities within Nigeria that have been devastated by extreme flooding of the Nigerian delta and inland waterways (USMC Wargaming Division, Marine Corps Warfighting Laboratory 2010). The sheer magnitude of the total Nigerian aid, large regional separation between aid stations, and limited interior transportation networks requires a distributed network that will surely strain the resources of the Joint and multinational forces. This aspect must be considered in the M&S analysis through thoughtful limitations on the quantities of air and surface connectors, and at-sea availability of logistics vessels mobilized over the entire Nigerian coast to support both U.S. and multinational operations. Additional considerations of each individual state's need must also be accounted for.

The situations for each state vary in their combination of access from the sea, threat levels, and the type and amount of need required. While the mission subsists of thirteen tailored packages provided from Joint and multi-national forces, some originating from the Sea Base and others not, only two scenarios were developed and modeled. The two most strenuous Nigerian government requests were to provide a tremendous and comprehensive amount of aid to the sea port city of Lagos and Delta state in uncertain threat environments with sensitivity to establishing a large coalition footprint. Each modeled CONOPS offers different challenges that the author believes will capture the majority of SBCS operational requirements. The humanitarian effort to Lagos poses a sea-lift capacity challenge in providing a tremendous volume of humanitarian aid cargo from the nearest supporting sea port of Lome that requires an approximately 140 mile coastal transit to the neighboring state of Tome. The second scenario demands a balance between the limited maneuverability of surface connectors to areas affected by inland flooding and the expansive coverage area of a difficult terrain environment. Each scenario can be described through a strategic, operational, and tactical level concept of operations.

While the strategic and operational plans for such a multinational effort have not been made available in this analysis, EW10 participation and enclosed assumptions for general Seabasing CONOPS were used to roughly establish the strategic Joint and multi-national force lay-down. The HA effort by the U.S. is anticipated to be largely conducted by the Army, Navy, and USMC forces and relies heavily upon the prepositioned ASF and MPS forces, respectively. From a broad strategic perspective the Army BCT and ASF forces are centrally tasked with providing requested HA support to the sea port city of Lagos primarily via coastal shipping channels provided from Lome, Togo. Naval assets, to include the Amphibious Ready Group, MPS assets, and CLF vessels are positioned to conduct assembly Seabasing operations outside of the Nigerian Delta and transition as needed along the coast to assist MN partners. The SBCS platforms are appropriately distributed to their service components; however, Joint high speed surface connectors such as the JHSV and T-Craft are dispatched as necessary to support phase dependent requirements. The viewpoints generated from the SBCS architecture's operational domain captured the CONOPS.

The operational concept is best depicted through phased diagrams and accompanying narratives. As illustrated in Figure 21 the SBCS provides early transport services of intra-theater fly-in forces followed by at-sea reception and staging of supplies, equipment, and vehicles from prepositioned forces, CLF support vessels, and amphibious shipping vessels sequentially. As shown, very few advanced shipping ports are available and most are degraded due to immense regional flooding debris. Initial actions to accomplish Delta HA mission essential tasks are done through the at-sea preparation of food stores, infrastructure repair equipment and supplies, emergency medical facilities and supporting staff, and the military security personnel to achieve such tasks are assembled on austere access vessels. The same HA/DR tasking is applicable to the Lagos assistance, but instead of a BCT staged for HA operations from the ASF vessels, it is provided from a sea port. As high speed surface connectors are anticipated to reach the operational theater first they initially embark fly-in forces to primarily include the Riverine squadron personnel, supplies, and watercraft for later objective area employment security and NEO/SAR operations. Within 18 -24 hours of arrival of the MPS vessels SBC enablers such as RRDFs in combination with INLS will further expand the large-to-small ship interconnectivity (Defense Industry Insider, 2009). The majority of consumable HA cargo designated for Delta relief is provided initially from amphibious shipping and MPF assigned T-AKE vessels.

Figure 21. Nigerian HA/DR OV-1 of assembly operations. This depicts a strategic level operational view of the Navy forces operating at-sea and the Army assembling in semi-degraded ports and harbors.

HA/DR employment activities consist of the SBCS transporting embarked Navy, MEB, and BCT units to the objective area's austere accesses or degraded ports (Figure 22). Given the widespread flooding debris fouling the inland river waterways, only air-cushioned vehicles or alike are considered capable of surface delivery to the disbursed IDP camps and villages of Delta state. The majority of Delta state's waterways with ocean access typically are draft limiting to 6.4 m and further inland access, primarily served by the Niger river, decreases to 2.5 m. However, additional draft and hull form considerations should be made to compensate for rapid flow and debris. Riverine units, in coordination with and under sustainment support of SBCs, provide local and regional transport of IDP, are the main thrust of SAR activities, and conduct civilian NEO operations. Employment of HA goods and services to Lagos are accomplished through the transport of palletized cargo, equipment, vehicles, and personnel originating from port Lome. The SBCS's role in force projection in both scenarios consists of routinely transporting the majority of security and aid distribution personnel to the Sea Base to minimize the military footprint ashore. The specified SBCS tasking then phases from assembly/employment to early sustainment needs.

Figure 22. Nigerian HA/DR OV-1 of employment operations. This illustrates a strategic level view of the Navy, USMC, and multinational forces conducting employment operations in support of Delta state.

The beginning of sustainment activities are primarily distinguished by a shifting of operational activities to support HA cargo sourcing from a shuttle ship strategy conducted by amphibious shipping and MPF T-AKEs to a dependence upon NGO/GO commercial vessel sources. These vessels are typically large to medium load-on/load-off vessels equipped with rigging adequate to unload/load cargo from their decks to austere ports or accesses. These commercial container or break-bulk vessels are owned or contracted by government agencies or international crisis relief organizations. Given a low sea state feasible of harbor or near shore operations these vessels are assumed to be capable of at-sea offload when coupled with surface vessels equipped with Dynamic Positioning Systems (DPS) or RRDF/INLS systems. SBCS sustainment activities additionally shift to providing routine MEDEVAC transport to at-sea T-AH vessels or to

Sea Base assets and high speed surface connector activities in support of long range high priority transport of personnel, equipment, and repair parts to and from the Sea Base and the advanced base. A graphical depiction of the sustainment CONOPs is shown in Figure 23.

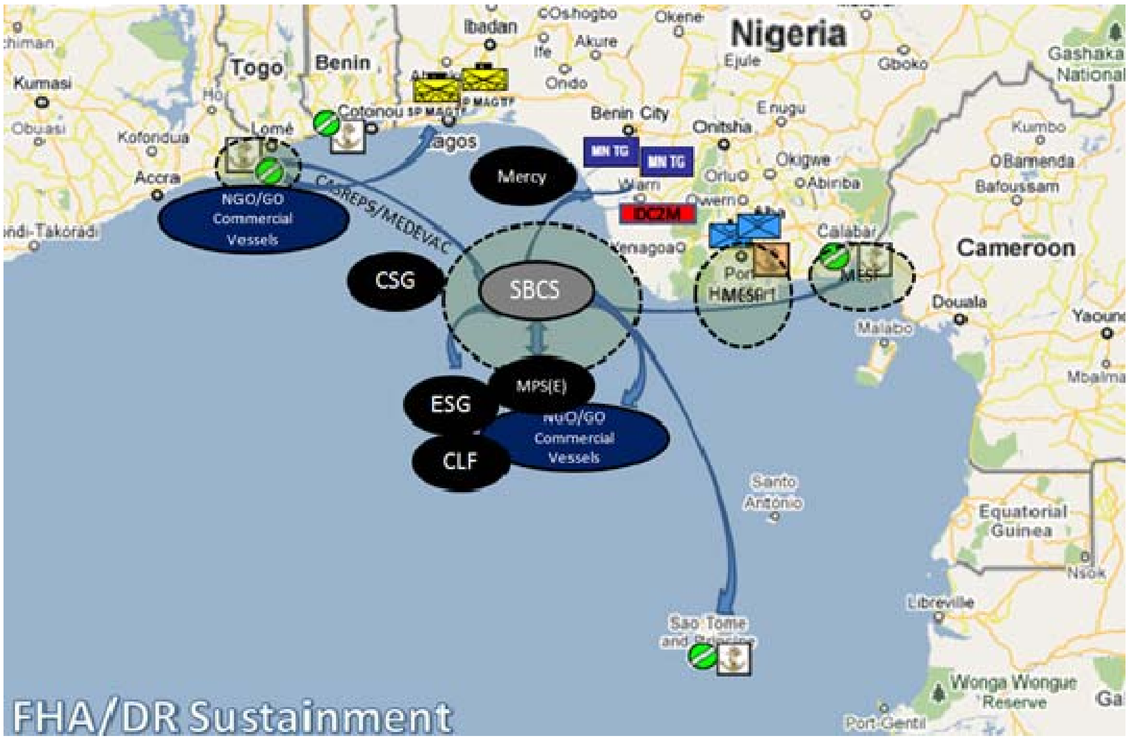

Figure 23. Nigerian HA/DR OV-1 of sustainment operations. This depicts the strategic level view the Joint and multinational forces conducting early sustainment operations.

B. RESOURCE POOL ASSUMPTIONS

The previously identified external systems and Sea Base connectors are assumed to be available to the COCOM for the HA CONOPS. These are summarized in Appendix C to include recent Army and Navy watercraft service life modernization and acquisition plans (U.S. Army Transportation Office, 2008). General assumptions were made for the initial locations of COCOM available assets, their anticipated transit times to include reasonable delay estimations in conducting pre-closure activities, and unit availability to determine an estimation of the force pool for the entire Nigeria HA/DR mission. The time-phased force deployment lists for Seabasing forces that are applicable to the SBCS analysis are shown in Table 3. The assembly/employment LOO is presumed to begin with the arrival of the prepositioned forces and rapid fly-away forces. While sustainment activities actually occur from Closure on, early sustainment is marked in this analysis by the completion of the Assembly specific activities particular to providing HA aid and equipment directly from prepositioned supplies and amphibious shipping. The shift from Assembly/Employment activities to Sustainment activities is distinguished by the sources of HA aid transitioning from prepositioned assets, the initial CONUS load out of amphibious shipping, and assigned USNS shipping to a robust reliance upon MSC Sealift and NGO/GO commercial shipping vessels equipped for such operations. The force mix available to conduct the Delta state and Lagos CONOPS scenarios should be judiciously selected given the difficulty of the Nigerian humanitarian assistance mission.

Sea Base Elements Arrival

Closure → Assembly/Employment → Early Sustainment

* Supporting ESG/CSG Transit
** Embarked aboard ESG
*** LCAC w/ SLEP
**** See SBCS Breakout

Seabased Elements	Forward Deployed	+ 1 Week	10 Days	+ 2 Weeks	+3 Weeks	+ 4 Weeks	+ 5 Weeks
Navy				ESG	ESG	ESG	ESG
Navy				CSG	CSG	CSG	CSG
Navy			Terminal BN	Terminal BN	Terminal BN	Terminal BN	Terminal BN
Joint	RIVRON	RIVRON	RIVRON	2 x RIVRON	2 x RIVRON	2 x RIVRON	2 x RIVRON
Joint				NMCB/NCR**	NMCB/NCR	NMCB/NCR	NMCB/NCR
Joint			NCHB/ESU	NCHB/ESU	NCHB/ESU	NCHB/ESU	NCHB/ESU
MSC	CLF		*	CLF	CLF	CLF	CLF
MSC	JHSV	JHSV****	JHSV	JHSV	JHSV	JHSV	JHSV
MSC	T-Craft	T-Craft****	T-Craft	T-Craft	T-Craft	T-Craft	T-Craft
MSC	T-AKE		T-AKE	T-AKE	T-AKE	T-AKE	T-AKE
MSC	T-AK		T-AK	T-AK	T-AK	T-AK	T-AK
MSC	MPS(E)		MPS(E)	MPS(E)	MPS(E)	MPS(E)	MPS(E)
MSC	MLP		MLP	MLP	2 x MLP	2 x MLP	2 x MLP
MSC	INLS		INLS	2 x INLS	2 x INLS	2 x INLS	2 x INLS
MSC				T-AH	T-AH	T-AH	T-AH
Army	ASF RORO		RORO	RORO	RORO	RORO	RORO
Army	ASF		LOLO	LOLO	LOLO	LOLO	LOLO

Time →

Sea Base Connector System Arrival

+ 1 Week	+ 10 Days	+ 2 Weeks	+3 Weeks	+ 4 Weeks	+ 5 Weeks
		9 x SSC/LCAC	12 x SSC/LCAC	12 x SSC/LCAC	12 x SSC/LCAC
JHSV	4 x JHSV	5 x JHSV	5 x JHSV	5 x JHSV	5 x JHSV
T-Craft	2 x T-Craft	3 x T-Craft	3 x T-Craft	3 x T-Craft	3 x T-Craft
UHAC	3 x SSC/LCAC	3 x SSC/LCAC	3 x SSC/LCAC	3 x SSC/LCAC	3 x SSC/LCAC
		2 x LSV	2 x LSV	4 x LSV	4 x LSV
		5 x LCU - 2000	5 x LCU - 2000	10 x LCU - 2000	10 x LCU - 2000

JHSV
10 total = 3 PREPO + 3 Pacific Flt + 3 Atlantic Flt + 1 Deployed

LCAC/SSC
9 LCAC/SSC on ATF Shipping, 3 MLP embarked from ACU

or

UHAC
4 LCAC/SSC Substitutes on ATF Shipping

T-Craft
5 Total = 3 PREPO + 1 Pacific Flt + 1 Atlantic Flt

LSV
8 Total = 2 /ASF + 2 in Shipyard

LCU - 2000
34 Total = 5 /ASF + 3 Pacific Flt + 3 Atlantic Flt + 13 in Shipyard

Assumes JHSV and MLP assigned from Diego Garcia PREPO. Remaining Non-PREPO depart from CONUS/MED.

Table 3. Time-Phased Force Deployment of SBCS. This table highlights the quantities and arrival times of the SBCS assets based upon prepositioning, Naval, anticipated deployment, availability, and transit times.

C. MISSION OPERATIONAL REQUIREMENTS

While the types of aid for the ports are similar, the quantity of aid, available objective infrastructure, and access to the region vary greatly. Port Lagos has open access from the sea, and although initially very much restricted by flooding and debris, it can be logistically provided through a neighboring state sea port and directly from the sea. Both scenarios occur at an escalated threat level due to local internal strife and regional religious extremism targeting western nations. The Nigerian state of Delta is not accessible via the port of Sapele and thus access to the numerous Internally Displaced Person (IDP) camps and towns affected by widespread flooding from the Niger and Escravos rivers must occur from their flooded banks or vertical lift where available. The following city specific task requirements in Table 4 and amplifying scenario information provided in Appendix B. Design Reference Mission was excerpted from the EW10 Player Book (USMC Wargaming Division, Marine Corps Warfighting Laboratory, 2010). A MBSE approach was utilized to develop the operational and system viewpoints.

State	Distro. Center	EVAC People & SAR	Delivery Food, Water, Medicine	Delivery Clothes, Shelter, Supplies	Provide MED /VET Services	Repair Open Airfields/ Ports	Provide ATC Control Support	Repair/ Engineer Support	Threat
Lagos	Lagos	X	X	X	X	X	X	X	Uncertain
Delta	Warri / Benin City	X	X	X	X	X	X	X	Uncertain

Table 4. Selected SBCS scenarios for the MBSE approach. Two scenarios within the context of the entire Nigeria HA/DR mission offer the best requirements determination of the SBCS. (After USMC Wargaming Division, Marine Corps Warfighting Laboratory, 2010, pp. 4–6)

Operational activity modeling was used to define the Sea Base mission tasking and derived SBCS tasking details to include what types of cargo or personnel were to be transported and standard MOE/MOP particular to those tasks. The provided scenario tasks, MBSE requirements-to-activity tracing of the SBCS, and operational activity decomposition dictated the following specified and unspecified essential mission tasks for the SBCS:

Provide Delta State Assembly/Employment

- Palletized Consumables
- Provide Infrastructure/Engineering Repair
- Provide Medical/Veterinarian Support
- Provide Force Projection Support
- Provide NEO/SAR Support

Provide Delta State Sustainment

- Palletized Consumables
- Containerized Consumables
- Force Support
- MEDEVAC
- Priority Transport

The MBSE approach also allowed verification that every operational activity was assigned to an operational node and that it was capable of conducting the supporting functions. The UJTL provided an initial humanitarian assistance mission template that was modified as shown in Figure 24 (CJCS, 2003). This template was segmented between general Seabasing activities and those that significantly impacted the roles of the SBCS. These general operational activities were linked to intermediate CONOPS defined essential tasks and then further reduced to their tasking requirements.

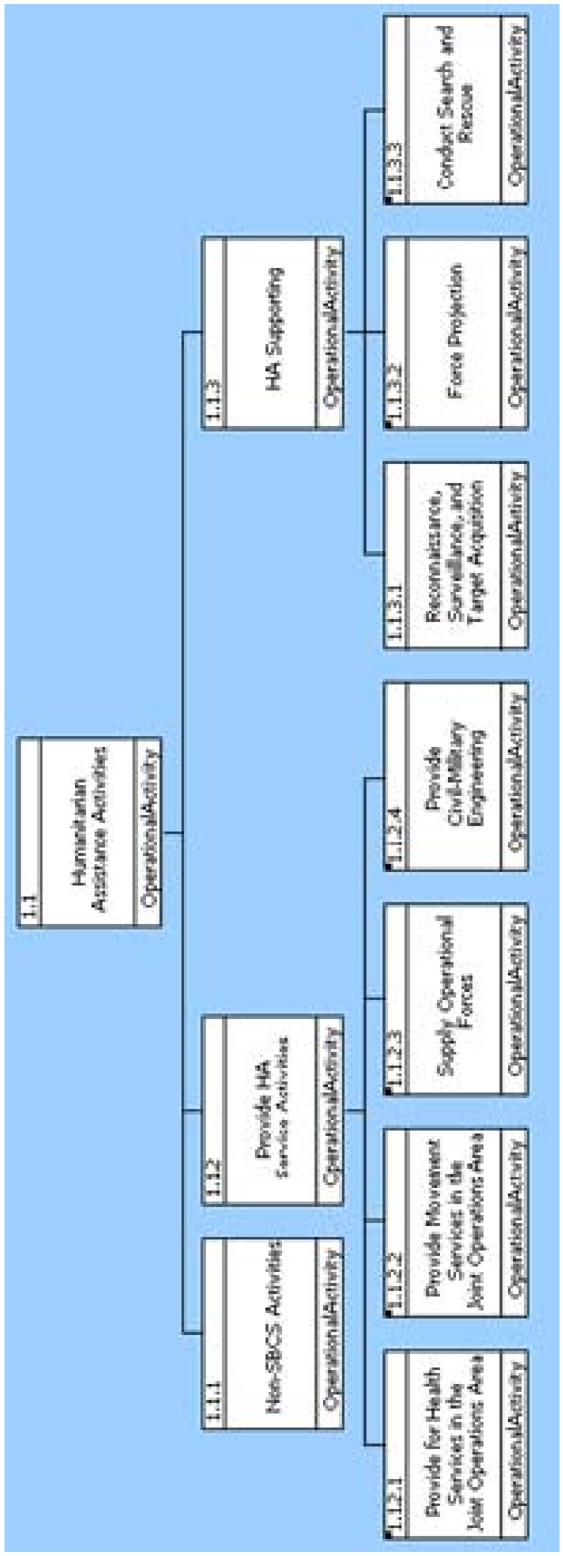

Figure 24. Humanitarian Assistance Mission Operational Activity Template. The UJTL provided HA template provided the initial scope of an operational activity description.

A sample of a single derived SBCS operational activity hierarchy is shown in Figure 25. An operational activity decomposition tree was constructed from mission essential operational tasks to service specific tasks (Appendix G. Operational Activity Heirarchy Descriptions). Each specified universal or service specific task and MOE/MOP was defined for further operational analysis determination of the most appropriate SBCS or single platform measurement criteria given the scope of analysis and model parameters. Table 5 shows a single Army Tactical Task (ART 6.1.6) specified from the Army task list. The operational activities hierarchies, complete with requirements and guidance references, are best viewed in the CORE© application.

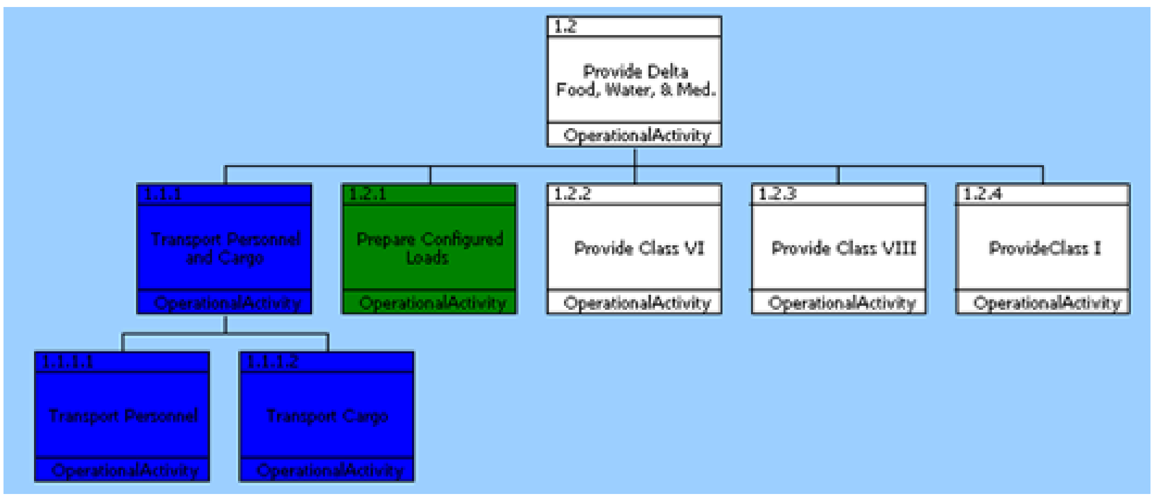

Figure 25. SBCS operational activity decomposition of "Provide Delta Food, Water, & Medicine" (Portion of the OV-5). The atomic-level operational activities provide service specific descriptions of the cargo class and appropriate MOE/MOPs. The blue and green coding indicates distinct service specific Navy and Army tasking, respectively.

ART 6.1.6 Provide Personal Demand Items (Class VI): Coordinate and provide personal demand items, such as health and hygiene products and nonmilitary sales items (FM 10-1) (CASCOM).		
No.	**Scale**	**Measure**
01	Yes/No	Unit has the necessary class VI supplies to conduct its mission.
02	Yes/No	The unit does not have to wait for class VI supplies before it can conduct its mission.
03	Time	Required to develop or update plans to establish support operations after receipt of warning order.
04	Time	To develop concept of support sustainment requirements after receipt of warning order.
05	Time	To achieve time-phased operating and safety levels of supply in AO.
06	Percent	Difference between planned and actual demand by supply line in AO.
07	Percent	Of class VI supplies available in AO compared to requirements.
08	Percent	Of replenishment stocks delivered on time in AO.
09	Percent	Of shortfalls in class VI supply in AO that have acceptable alternatives.
10	Percent	Of required class VI supplies in AO delivered.
11	Percent	Of planned class VI supply support achieved in AO.
12	Percent	Of operations degraded, delayed, or modified due to delays in moving class VI supplies.
13	Number	Of days of class VI supply stockpiled in AO to support campaign.
14	Number	Of days of sustainment supply in AO supported by available facilities.
15	Number	Of tons per day of class VI supply in AO delivered to operating forces.

Table 5. Sample ART "Provide Personal Demand Items (Class VI)". The size, weight, and loading considerations for each cargo class can be further considered for SBC Transport. (After Department of the Army, Headquarters, 2003, pp. 6–11)

D. SYSTEM BOUNDARY THROUGH AN EXTERNAL SYSTEMS DIAGRAM

1. External Systems

The Sea Base connector system boundary was defined both operationally and physically. The operational boundary is defined through the operational node interfaces. The operational nodes participating in the HA/DR mission are illustrated in Figure 26. The operational nodes are considered to be static during the phases evaluated. In peace time operations some surface connectors such as the JHSV and T-Craft will likely be under the authority of TRANSCOM, but operational control will be shifted to a subset operational node within the Joint Operational Commander's authority during wartime and contingency operations. During the context of foreign humanitarian assistance the SBCS operational activities will be conducted within the authority and control of the Joint Operational Commander. As a result the operational architecture domain consisting of the operational nodes, or better understood as organizational leadership, and the mission essential operational activity occurs entirely within the Joint Operational Commander's (JOC) operational domain. Additional operational node hierarchy diagrams of the SBCS nodes can be found in Appendix E. Operational/Physical Context Diagrams (OV-2, SV-1, and SV-3a).

Figure 26. Operational Nodes Required of a Humanitarian Assistance Mission. The complex operational and administrative organization was decomposed and modeled to determine the Seabasing system communication and load transfer interfaces.

The physical humanitarian assistance Seabasing system as a whole was divided into four systems within this analysis; the Sea Base, to include advanced bases, surface vessels, and the objective's austere accesses; the landing force system composed of the Army BCT, USMC MEB, and the Navy NECC assets; the commercial vessels system; and the surface connector system Figure 27. The high level interface interconnections are representative of physical and communication linkages through systems to their sub-systems. It is within these physical linkages between system elements that is a concern of the SBCS and will ultimately define the key interoperability standards and requirements of each system. Compatibility within the SBCS was not evaluated as each system element was considered independently capable from one another in conducting its operational activities.

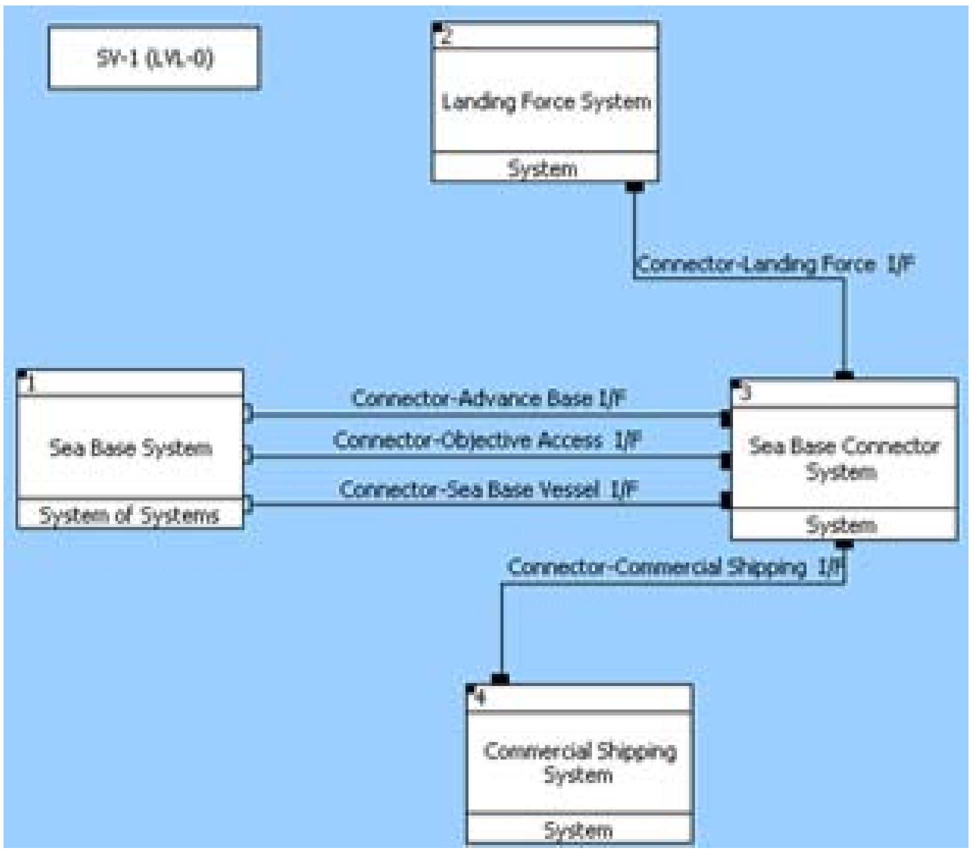

Figure 27. Viewpoint of the humanitarian assistance response systems (SV-1). Further detailed modeling indicated the required interface linkages between the SBCS and external systems that required load exchange resource exchange modeling. Note that the commercial shipping system I/F does not occur until the commencement of sustainment operations.

2. System Boundaries

The SBCS operational nodes resemble the organizational hierarchies of the Navy's ATF and the regional MSC's COMLOGEUR/CTF-63 structures. Figure 28 depicts the general logistics need-lines that encompass C2, logistics, force application, battlespace awareness, and force protection requirements. Its purpose is to track the exchange resources from specific operational nodes that play a key role in the architecture. Each operational node of this architecture, such as the regional MSC Commander, COMLOGEUR, coincides with an organization and is assigned to directly provide or support specified HA/DR operational activities. Within the phases evaluated all SBCs have linkages with afloat Seabasing assets and objective accesses or port, but only the JHSV or similar craft link with advanced bases. The need-lines are further disaggregated into physical and informational linkages to better describe connections between their sub-system elements.

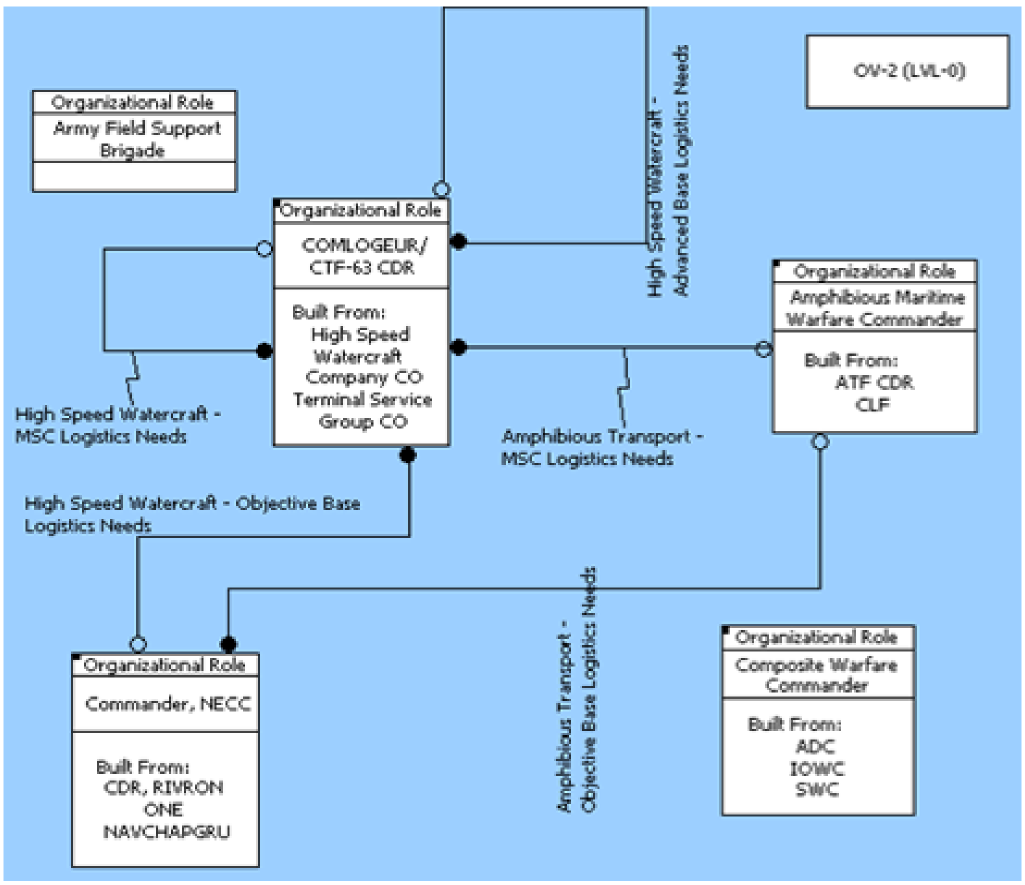

Figure 28. The Joint Operational Commander's Organizational Model (OV-2). It was determined that that the assessed SBCs operated within the operational responsibility of the JOC. The physical elements of the operational nodes are included.

The following figure illustrates the linkages between the SBCS and their external systems for assembly, employment, and early sustainment phases of the Delta state

HA/DR scenario. Each link is derived from an operational need within the CONOPS and further justified and defined through the SBCS requirements and general performance objectives. Figure 29 identifies the required links between the SBCS and the Sea Base system. Again, emphasis is placed upon the physical load transfer connections and not C2 aspects, although generally included. Additional system view diagrams are found in Appendix E. Operational/Physical Context Diagrams.

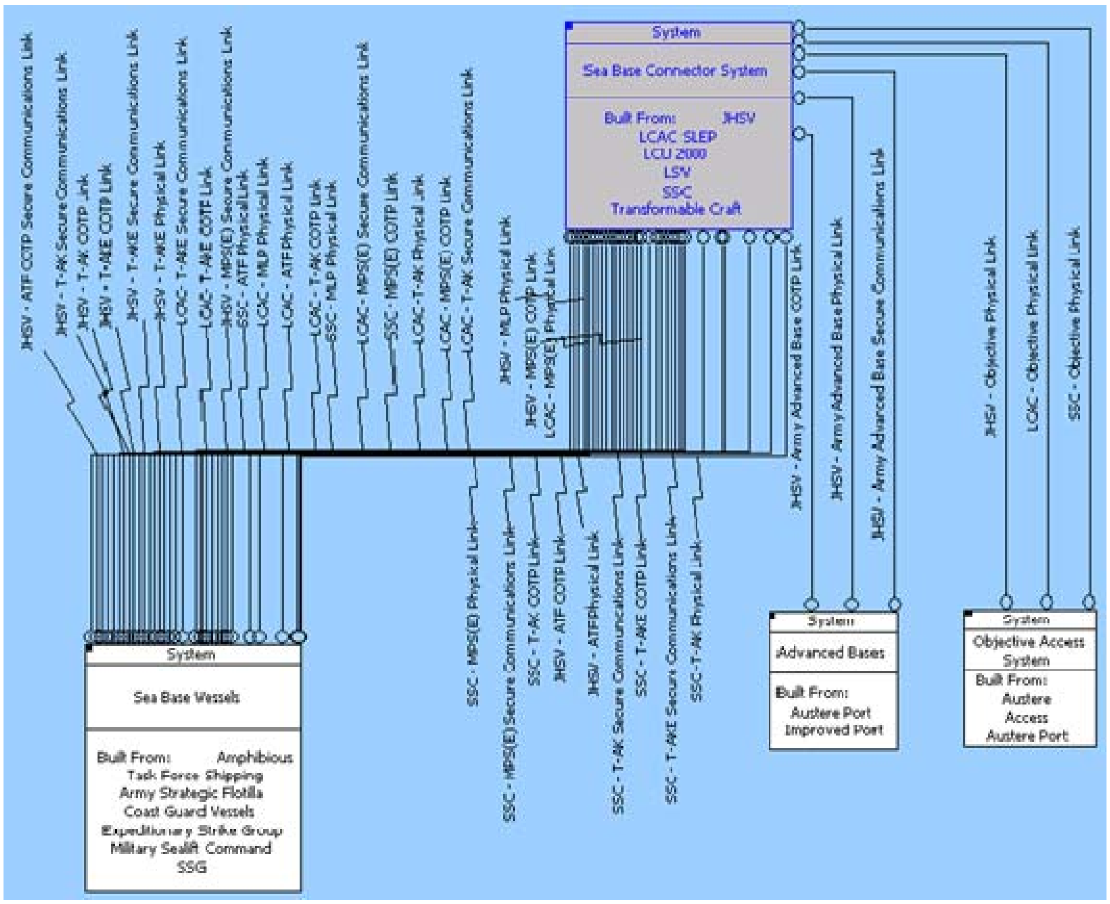

Figure 29. General linkage description between the SBCS and external Sea Base systems (SV-2). Each physical linkage was evaluated to model the load exchanges occurring at-sea, in ports, and austere accesses.

3. Operational Resource Flow Requirements

A key aspect of defining alternative SBCS is to identify and define operationally required physical connections to enable further M&S efforts. The OV-2 details the resource exchanges and relevant attributes of the exchanges. It identifies who exchanges what resources, with whom, why the resource is necessary, and how the resource exchange must occur. Each before mentioned physical linkage aggregates multiple physical exchanges. Figure 30 is an OV-2 tree diagram of the essential mission task "Provide Consumables" that illustrates the resource flow from provider to consumer and in some cases the intermediary platform and physical connection method used to conduct the exchange. Each essential mission task within the phased operational activities was diagrammed to assist in identification of deficient resource exchange capabilities.

It must be noted that not every physical connection is necessary or preferred and is highly dependent upon coinciding vessel functions such as conducting flight deck or well-deck operations. The logistics distribution and deployment strategy used from the large vessel to SBCs also has a large impact on which interconnection is utilized. Additional assembly and sustainment LOO resource exchange diagrams are included in Appendix F.

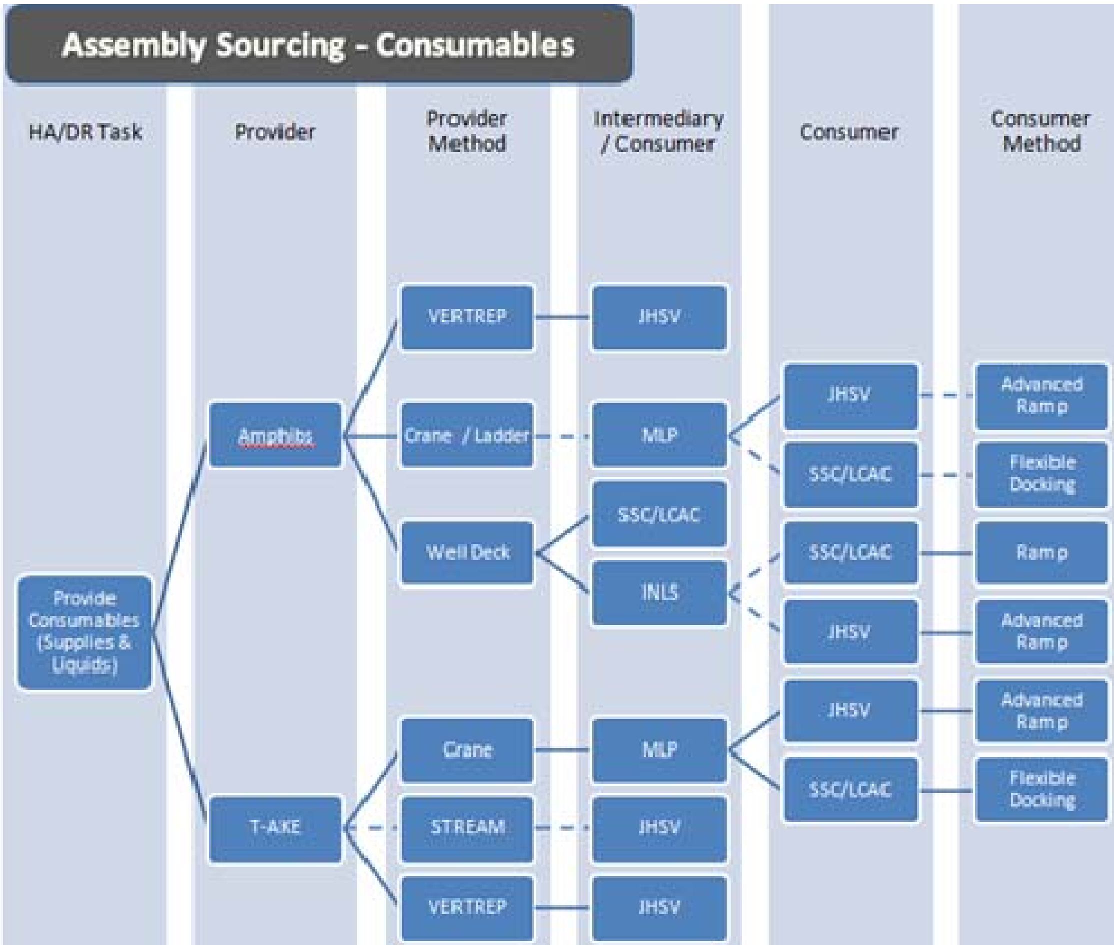

Figure 30. Assembly resource exchange diagram of provide consumables to Delta state (OV-2). Existing and assumed load exchanges were modeled to define potential paths for SBCS loading and unloading. The dashed lines indicate a redundant physical interface that would be likely inferior to alternative exchange methods unless strategically advantageous.

VI. SBCS FUNCTIONAL MODELING

The SBCS's functional modeling was generated keeping continuity with the amphibious operation's lines-of-operation nomenclature (Figure 31). The analytical review of Seabasing guidance and doctrine supported application of the same five LOO to missions-other-than war and provided descriptions that aided in functional flow modeling of the Seabasing elements. The assembly and employment functions were modeled as independent functions. Functional modeling of the sustainment LOO duplicated the assembly and employment functions, but included tailored sustainment operational activity inputs, constraints, mechanisms, and outputs. The resulting functional modeling could be applied to any scenario given the context of the HA/DR CONOPS. While the operational activity to functional modeling was not modeled one-to-one, every function supported at least one essential mission task or supporting task. Functional modeling emphasis was placed upon load exchanges and not upon SBCS communication or self-defensive systems.

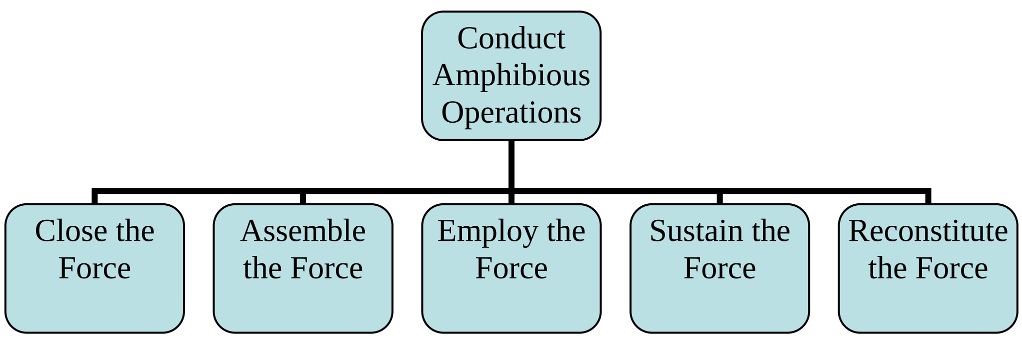

Figure 31. Functional Decomposition of Conduct Amphibious Operations. Assembly, Employment, and early Sustainment operations were further evaluated to determine the SBCS operational activities.

Figure 32 illustrates a high-level view of the assemble function that includes in-port and at-sea load exchanges and supporting functions. Assembly functions were constructed to align with the assembly CONOPS phase operational requirements. Supporting functions include establishing a docking interface, establishing generic load exchange interfaces, moving task specific items into appropriate positions for secure storage or seating, removing those load exchange interfaces, and then undocking. Load exchange functions were selected to capture the large quantity and diversity of SBC load exchange interfaces, loading rates, and storage/seating capacities required to interoperate with Seabasing platforms and provide discernable points to conduct dynamic analysis.

The employ the force function includes transporting the secured items to or from the objective area and the same previously described load exchange functions (Figure 32). However, objective access loading functions were constrained by limitations that would be evident in Delta state's flooding crisis (i.e., not offering pier services or pier rigging). Additionally, transit functions were decomposed to capture operational area limitations of the SBCs in accessing navigationally fouled or draft limiting waterways.

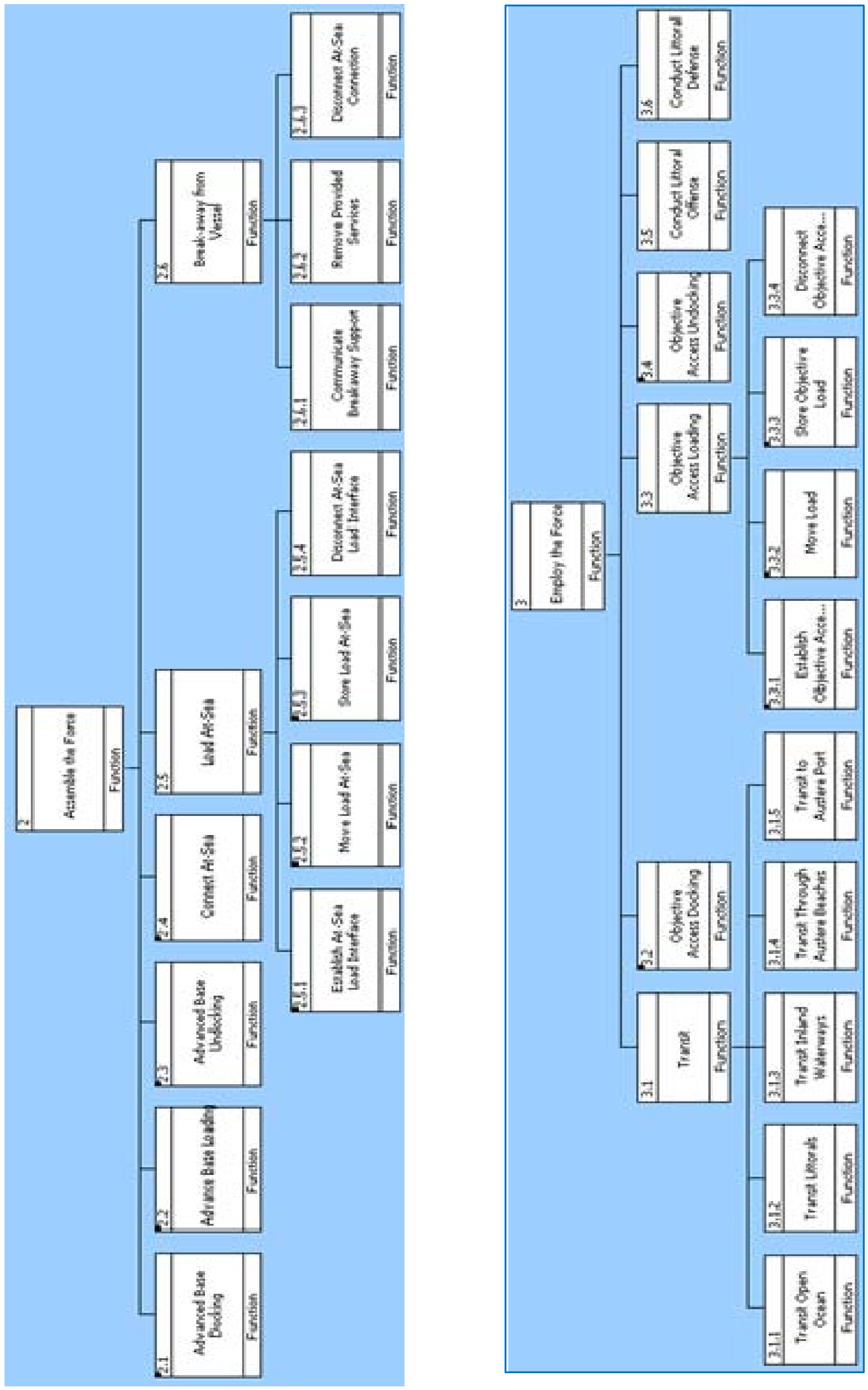

Figure 32. Modeling of SBCS "Assemble the Force" function (left). Modeling of "Employ the Force" function (right). Further decomposition provided detailed functional mapping and M&S insight.

A. FUNCTIONAL DECOMPOSITION OVERVIEW

Functional modeling was created using Integrated Definition language zero (IDEF0) methodology. Functional input and output items represented essential mission task loads such as vehicles, personnel, palletized cargo, or ammunition. Potential input/output items that would require special loading, storage, or seating considerations were selected. Functional controls and mechanisms were detailed to establish some of the known modeling constraints and scenario specific SBCs performing the function, respectively. Each load exchange function was decomposed to a level that ultimately revealed a generic physical connection type such as providing or receiving a ramp or crane. The intent of the LOO FFBD was to simplify the complex distribution activities to a manageable and repeatable process better adapted to simulation modeling.

While each function was described using a basic functional flow body-diagramming (FFBD) format, even at the intermediate decomposition level modeling required great system articulation as it grew greatly in complexity. Such modeling is the desired result of dynamic M&S analysis and can only be accomplished by further developing the scenario details and SBCS configurations. The generated IDEF0 models and item definitions, included in Appendix J. System Functionality Description (SV-4), are intended to provide an elementary functional description applicable to the defined SBCS components in a HA/DR mission context. The majority of the functional diagramming is best viewed digitally through the CORE© database or digital documents.

B. ASSEMBLY AT-SEA IDEF0 MODELING

The scope and complexity of the functional decompositions do not lend themselves well to viewing by the reader. However, a few sample descriptions of a key SBCS functionality, load at-sea, are highlighted and discussed below in Figure 33. The function 2.5.1, "Establish an at-sea Load Interface," makes the input items capable of being transported at-sea through the establishment of a physical load exchange interface. A cursory examination reveals that an at-sea load interface is established for the essential mission tasking transport of consumable cargo, MEB force units, infrastructure repair items, medical and veterinarian support units, and Riverine units from the Sea Base by the SBCS. Additionally, personnel recovered from NEO objectives ashore have been positioned to on-load onto a Sea Base platform. Its sub-functions are performed by the 2020 legacy JHSV, SSC, and LCAC SLEP surface connectors.

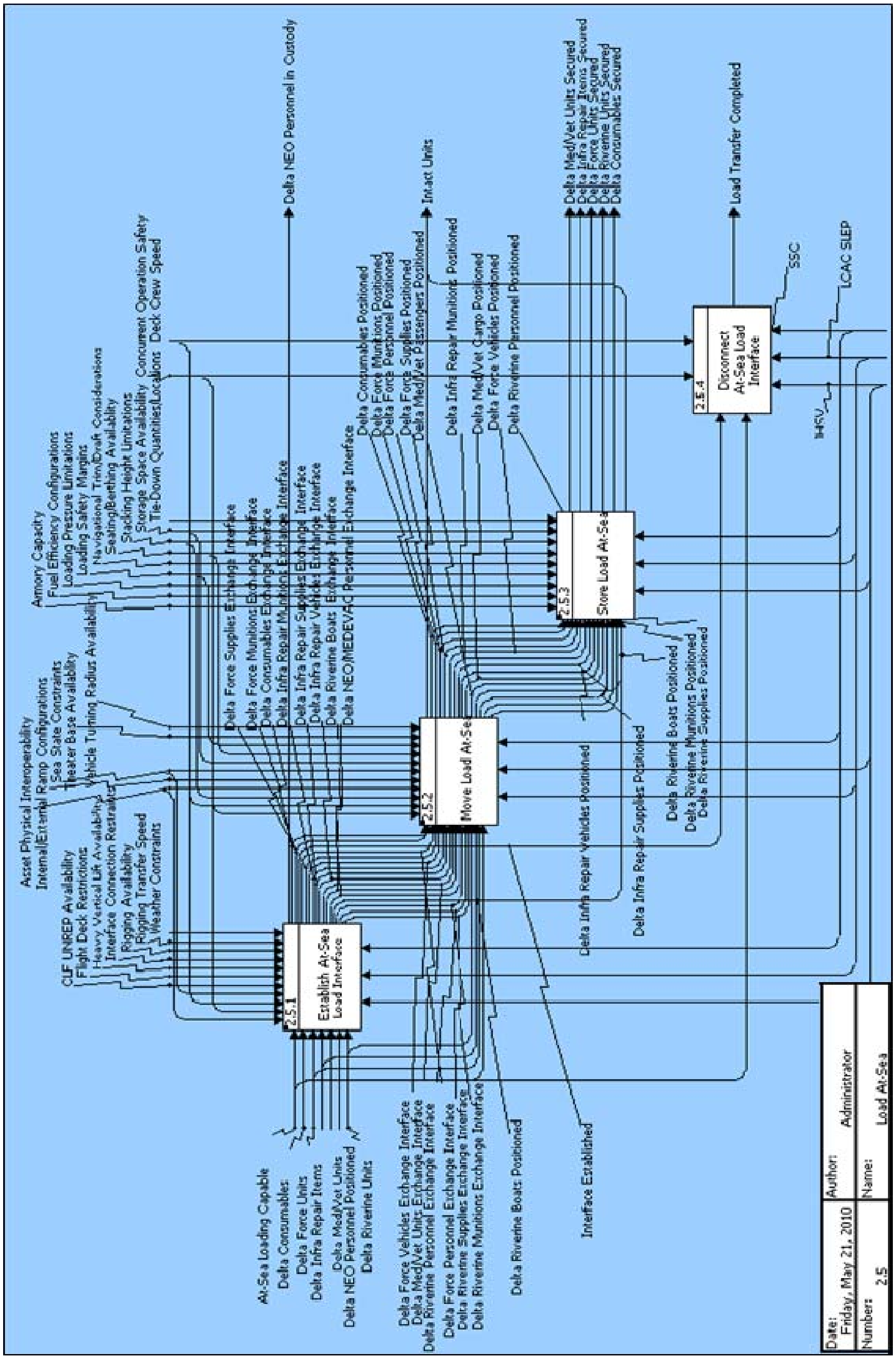

Figure 33. IEF0 modeling of the assembly function "Load at-Sea" (Level 2). Detailed descriptions of the SBCS's inputs, outputs, controls, and mechanisms provided insight into the load requirements of each connector.

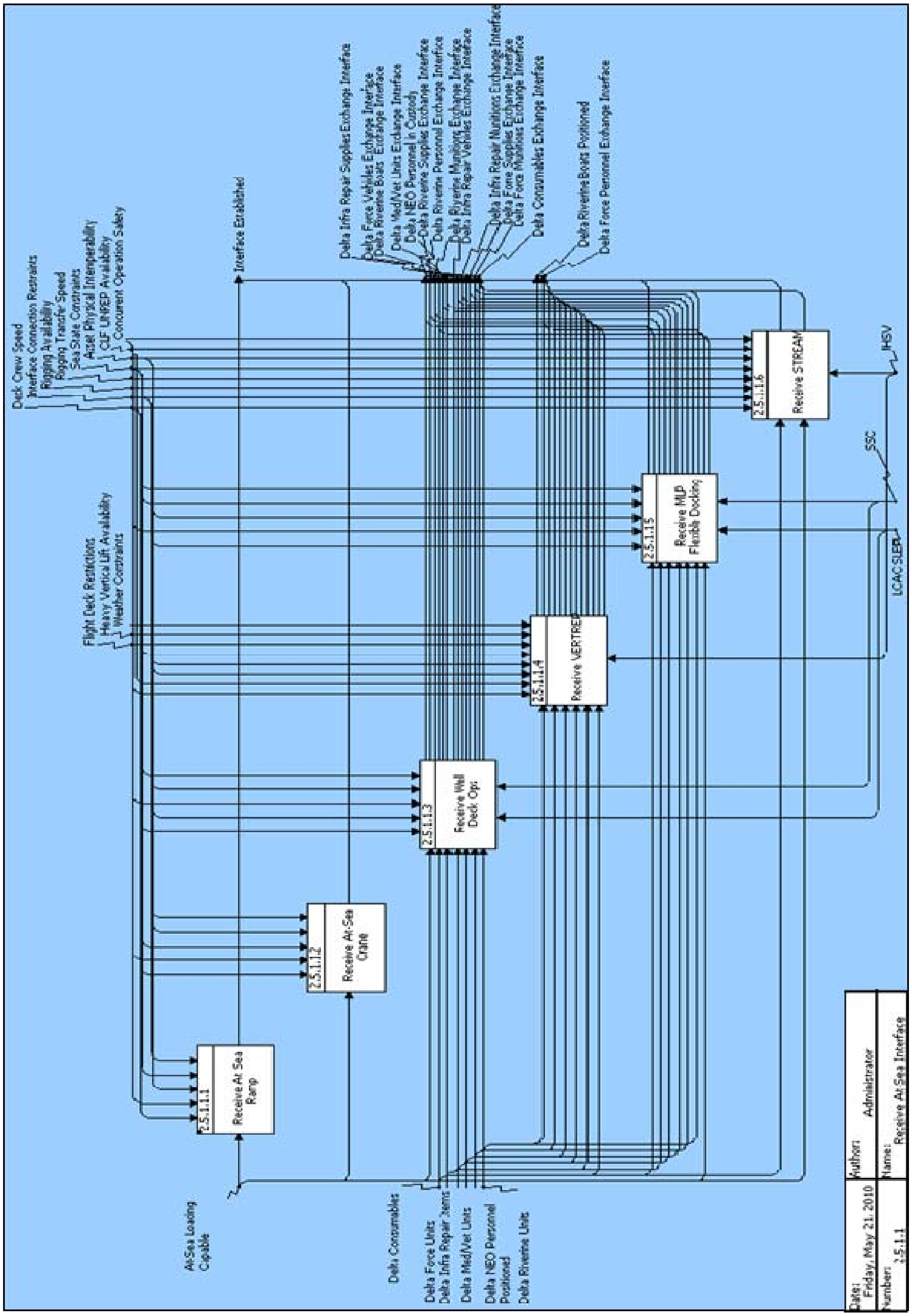

Figure 34. IEF0 modeling of assembly "Load at-Sea" (Level 4). A detailed IDEF0 description provided descriptions of load resource exchange interfaces between the SBCS and external systems.

An at-sea load exchange interface can be created by the Sea Base connector or for it. Figure 34 above, "Receive at-sea Interface," is the lowest decomposition level of function 2.51 with the Provide at-sea Interface being an equivalent. This decomposition level provides atomic level functions required to receive at-sea load exchanges such as Receiving Well Deck Operations or Vertical Replenishment (VERTREP). For example, the input item "Delta Force Units," composed of heavy construction vehicles, equipment, supplies, and munitions have the opportunity to be transferred via well deck operations, heavy-lift helicopter VERTREP, or MLP supported flexible docking for SSC/LCAC. Again, the legacy SBCs that support each function are identified. Such modeling will provide standardized and repeatable constraints to measuring the completion of operational activities. Equivalent modeling to depict essential mission tasking specified in sustainment operations was generated and analyzed in the same way.

VII. CONCEPTUAL PHYSICAL ARCHITECTURE ALTERNATIVES

A. OPERATIONAL CONOPS ASSUMPTIONS

A determination of feasible Sea Base surface connector system alternatives requires detailed strategic and operational concept-of-operations development. The multitude of at-sea load exchange interfaces available to the SBCS to conduct essential mission tasks and undefined future logistics strategies necessitate refinement of HA/DR Sea Base operations and tactics to further evaluate potential surface connector systems. As previously discussed, Naval assets are assumed to be tasked with HA/DR support of Delta state and are supplemented with MSC assigned vessels such as the JHSV and T-Craft. The operational characteristics of these vessels and those whom source provided goods, services, personnel, and support define the SBCS alternatives. The operational CONOPS utilized in this assessment, drafted by the author from Seabasing war fighting doctrine and wargame implications, should be considered a proximate solution to defining the SBCS alternatives that meet requisite mission essential tasks (USMC Wargaming Division, Marine Corps Warfighting Laboratory, 2010). Applications of the Sea Base in HA missions and resulting Joint sanctioned operational or tactical level CONOPS are either classified or non-existent given the scope of this analysis. Operational level assumptions to supplement the broader CONOPS assumptions are further highlighted in Appendix K. Alternative SBCS Configurations for the Operational CONOPS.

B. SYSTEM ARCHITECTURE ASSESSMENT

The objective of SBCS alternative configuration assessment is to determine the key T-Craft capabilities required to enhance the capability of the currently planned system. Evaluation of the SBCS utilizing only 2020 legacy components provides a baseline to justify any further acquisitions to enhance operational effectiveness. The following steps were used to determine potential T-Craft variant SBCS configurations:

1. A thorough review of the SBCS's operational activity decompositions (OV-5), resource exchange diagrams (OV-2), and a defined set of operational level assumptions that complement the operational overviews (OV-1) respective to the assembly, employment, and early sustainment phases was conducted. It provided insight into the initial SBCS configurations.

2. The author determined potential ideal interfaces using these diagrams and assessment tools by evaluating potential at-sea load exchange interfaces that met the operational activity requirements and planned or existing physical system interfaces. This is highly dependent upon operational strategies utilized in deploying unprecedented amounts of cargo and personnel at sea, but the traditional or intended roles of the watercraft or enablers were incorporated into each operational strategy. For instance, the SSC/LCAC is ideally suited to service amphibious shipping and yet have an extended role of servicing MLP load exchanges. The JHSV follows operational concept principles implying its use as a long range and high speed medium lift transport.

3. After determining the T-Craft variant(s) with the higher likelihood of maximizing at-sea throughput for each essential mission task, the legacy SBC watercraft and their complementary roles to fulfill the mission task were assessed and noted. Additional configurations exist that justifiable shift the SBCS's roles to legacy craft, but given the essential mission tasking those selected should be evaluated foremost (Annotated in Appendix K).

4. Lines-of-operation specific T-Craft variant capabilities were then combined to meet the SBCS requirements for the assembly, employment, and early sustainment phases.

Through evaluation of the resultant configurations it becomes evident that this is a cyclical process that advocates further justification of operational and tactical CONOPS assumptions. Inclusion of the T-Craft in the SBCS alters traditional and planned at-sea logistics distribution doctrine; therefore, evaluative metrics will be satisfied through one or more combinations of a logistics distribution strategy fitted with the most suitable operational and tactical strategies and alternative T-Craft variants. For example, the elimination of the SBCS' MEDEVAC and priority transport role resulting in a dedicated JHSV transport could allow the distribution of such duties to shuttle T-AKE, amphibious shipping, or even to operations not considered in this analysis such as the improved long-range lift capacity of at-sea VSTOL assets.

1. Legacy Baseline Alternatives

All phased assembly and employment operations were achievable through employment of the unaccompanied SSC/LCAC combination from amphibious shipping or the MLP; however, not every combination was ideal. Some combinations were found to constrain support of the NEO/SAR activities. Regional utilization of the JHSV in assembly/employment provides high speed transport and austere access of early response forces within the JOA such as the NEO/SAR and security supporting Riverine squadrons that would be otherwise unavailable. The JHSV also provides valuable helicopter personnel transfer functions, with obvious C2 implications also, that are valuable to spearhead local small boat NEO/SAR efforts. With the exception of providing force projection, limited by heavy vertical lift only vehicle transfer requirements, each essential task was potentially benefitted by the addition of the JHSV to complete a SSC/LCAC SBCS in assembly/employment phases. The JHSV and LCAC platforms also offered at least feasible solutions to meeting early sustainment resource exchange requirements.

The early sustainment operations of providing consumable items (palletized & containerized) and force support were seemingly achievable by the SSC/LCAC combination. However, the movement of personnel required from austere objectives accesses to medical platforms and non-emergency transport among Sea Base platforms required a SBC with the ability to at least conduct helicopter landings and take-offs. Sustainment operations with legacy SBC platforms are characterized by an increase in connector roles for the SBCs as the dependence upon the JHSV's embarked helicopter and open ocean transfer capabilities increase to provide a high speed line-of-communication between the Sea Base and the advance base. The burden of Sea Base to objective load transport is still held with the LCAC/SSC but increasingly reliant upon Sea Base enablers such as the MLP and INLS. A coarse evaluation of the early sustainment legacy SBCS reveals that the JHSV and SSC/LCAC configuration continues well suited to meet the directed tasks, but ability of this SBCS to meet logistics throughput requirements is highly questionable.

2. T-Craft Variant Alternatives

The addition of T-Craft variants increases the complexity of evaluating the effectiveness of each within the legacy SBCS. Available surface connector enablers such as the INLS and MLP act as intermediaries between the SSC/LCAC and other MSC platforms, but the load exchange interoperability between the enablers and the T-Craft are yet defined. One of the major assumptions are that an at-sea load exchange from a T-Craft ramp will restrict simultaneous SSC/LCAC operations with the available beam of the MLP and to a lesser degree the INLS. These factors are dependent upon many T-Craft specifications such as the T-Craft size and mooring line requirements. Additionally, the long and precarious transit into flooded inland waters results in a long duration round-trip transit for the SSC/LCAC boat group and T-Craft. Alternatively, the relatively faster loading/unloading operations of the SSC/LCAC with the Sea Base may allow the avoidance of conflicting operations with different SBC watercraft. Three T-Craft variants with independent capabilities were considered to have niches within the existing legacy SBCS capabilities.

Three variations of a “standard” T-Craft were evaluated within the operational CONOPS. An at-sea load exchange interface of a standard T-Craft allows a bow ramp connection with the INLS and RRDF combinations in moderate sea state. Mutually exclusive variants to the standard T-Craft include the same functionality with the following additions: 1) Side-ramp or bow/stern ramp interface with an LMSR, 2) VERTREP without the ability to launch or recover helicopters, 3) and improved DPS capability allowing skin-on-skin transfers with vessels capable of at-sea crane operations.

Further inclusion of the UHAC as an alternative displacement craft showed to be fruitless as it was determined to be incapable of transport into flooded inland waterways, but the platform characteristics should prove significantly beneficial in open ocean transport operations into Lagos. A single T-Craft variant was not determined capable of meeting all essential task transport requirements alone in the assembly/employment phases.

Key VERTREP and amphibious shipping well deck interoperability prevented any one T-Craft variant from feasibly achieving all resource exchange requirements. The JHSV continued to be irreplaceable in its NEO/SAR role and the LCAC/SSC was essential in extraction of heavy lift cargo from amphibious shipping at-sea. The T-Craft variant required for each task was appropriately complementary to the designated roles of the SSC/LCAC. The two alternative SBCS configurations were characterized by the VERTREP or LMSR capable T-Craft variants. The VERTREP capable T-Craft configuration was best suited for the assembly/employment phases. It relied upon the SSC/LCAC for heavy infrastructure equipment and vehicle lift from the MPS(E) and LMSR that was already necessary or ideal. Alternatively, a T-Craft variant configuration with a direct side/stern ramp to the LMSR well complemented the SSC/LCAC also. However, this comes at the expense of setting up and conducting extra intermediary operations with SBC enablers. These enablers, the RRDF/INLS and MLP, allow the T-Craft and SSC/LCAC the ability to remove palletized consumables from the amphibious ships and T-AKE, respectively. As the surface vessels and resource inputs of the non-SBCSs transitioned to support early sustainment operations, the ability of the T-Craft variants within the SBCS to meet those requirements also changed.

Two potential T-Craft variant defined SBCS configurations, the DPS and the direct LMSR gate connection capable vessels, surfaced from the sustainment phase assessment with equal prospect. In order to meet the priority and MEDEVAC transport mission tasks, each variant was considered to also complement the SSC/LCAC and JHSV SBCS. Inclusion of the JHSV was required to provide high-speed open ocean transport of passengers and embarked helicopter operations that are only suited for the JHSV platform within the SBCS. A DPS T-Craft variant SBCS configuration allows removal of palletized and containerized cargo from the primary providers, commercial LO/LO ships, in the harbor or cleared river outlets without conflicting with concurrent INLS offloads from their sterns. A DPS T-Craft also supports amphibious shipping and T-AKE pallet transfer operations at sea. However, this configuration requires any removal of vehicle items from the LMSR to be enabled by a MLP or RRDF/INLS at-sea which may better be used as a dedicated asset to container offload. A secondary configuration characterized by the T-Craft capable of a direct LMSR connection was feasible. The T-Craft would be designated to provide force support stock from the LMSR and containerized consumable offload from the MLP or RRDF/INLS. This configuration requires that the SSC/LCAC be primarily dedicated to the at-sea exchange and transport of palletized consumable items. An at-sea connection with these varied providers requires considerable availability of the MLP for at-sea crane operations from the LOLO vessels and the T-AKE. These connections with the MLP are potentially restricted by sea state. The resulting phased SBCS alternatives were synthesized to provide a combination of robust T-Craft variant alternatives.

A combination of the phased T-Craft variant SBCSs results in four combinations: 1) direct LMSR side/stern port connection only, 2) VERTREP capable with a DPS, 3) VERTREP capable with a direct LMSR side/stern port, 4) or direct LMSR side/stern port connection with DPS. All combinations are illustrated in Figure 35. However, the last alternative may possibly offer redundant functionality between phased mission tasks. These variants would supplement the 2020 legacy JHSV, SSC, and LCAC SLEP connectors.

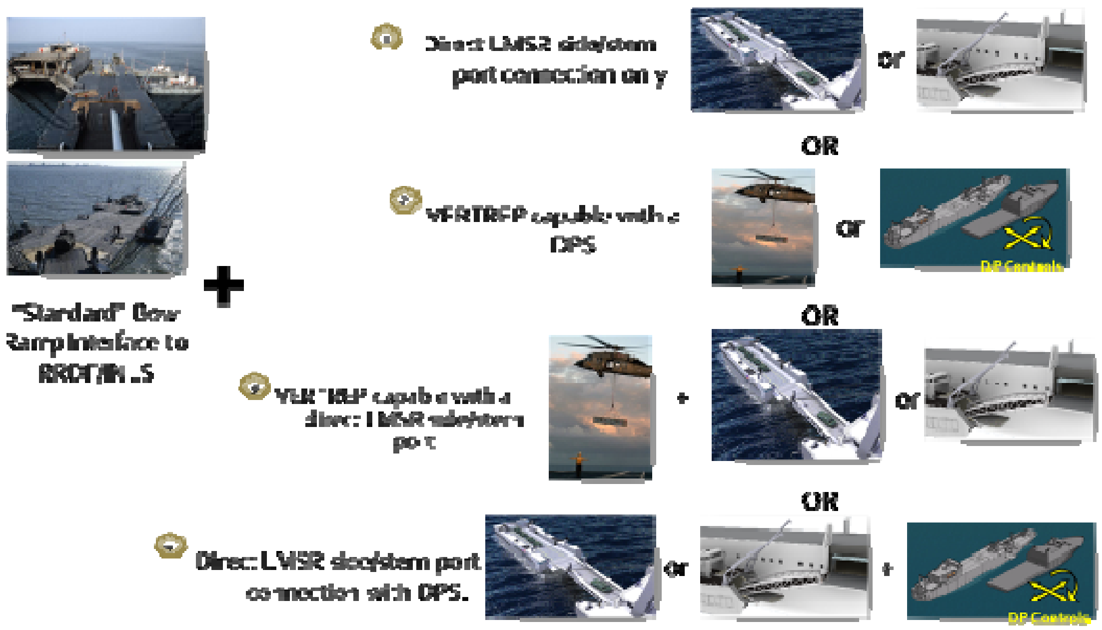

Figure 35. Prospective T-Craft Variants. The resulting variants complement the legacy SBCS and provide a potential throughput improvement and greater functional capabilities throughout the assembly, employment, and early sustainment phases. (Images from Main, 2010, pp. 45–67)

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VIII. CONCLUSIONS

The physical manifestation of the Seabasing Joint Operational Concept has gradually taken shape through recent Joint acquisitions. These pieces, whether they are the MSC's T-AKE fleet or MLP, or the Army and Navy variants of the JHSV, or the USMC's V-22 Osprey, have continued to define the Sea Base and allow progressive development of the Seabasing operational concept through the range-of-military operations. In the progressive conceptual development of ONR's transformable craft sponsored research the T-Craft program lead inquired to the identification of the physical connections, thus the platform's Seabasing interoperability characteristics, which would distinguish it among the future Sea Base surface connectors. Given such a transformational technology, it became evident that for continued success of the T-Craft acquisition program, the "who, what, when, where, why" and most importantly "how" the T-Craft would have to be formulated. Such questions may only be answered by taking a mere representative slice of an application of the Joint Operational Concept for Seabasing. This required the development of an operational concept that further derived a potential operational and physical SBCS architecture. This analysis has provided but one outcome of the T-Craft's at-sea interoperability characteristics, even to be further refined and possibly corrected through M&S, which will establish a foundation for further conceptual development.

Research questions were initially established to further the conceptual development of the Transformable Craft within a Sea Base Connector System. The following is a review of those questions.

- What are the mission, originating, and system requirements for a SBC system?
- What is the objectives hierarchy of the SBCS as seen from the primary stakeholders? Who are the stakeholders?
- What are the appropriate Measures of Effectiveness (MOEs) for the SBCS mission requirements?
- What are the appropriate Measures of Performance (MOPs) for the SBCS requirements?

- What is the operational concept of the SBCS over the lines-of-operation? How are surface connectors being used? What are the operational activities of the SBCS?
- What are the internal and external interfaces between SBCS elements?
- What is the functional behavior of the SBCS?
- What are the alternative families of SBCSs and their associated performance tradeoffs?

Each question was answered in detail within this thesis or appendixes.

The mission, originating and system requirements for the Sea Base Connector System were derived from Joint Seabasing doctrine and the assessed capability needs of Army watercraft. Joint Seabasing capabilities typically included objective and threshold values and were often characterized as surface connector requirements for all Seabasing assets that could ultimately be allocated to task specific load requirements for each connector Army watercraft capabilities were integrated to emphasize maintaining deployment momentum and force maneuverability (Appendix A. Sea Base Connector System Capabilities).

An objectives hierarchy of the SBCS was developed by converging the prioritized watercraft capability requirements as seen by major and minor stakeholders. The Joint Seabasing stakeholders were identified as a focused grouping of combattant commands, operational commands, and service commanders along with other minor Seabasing analysis groups. The Army watercraft stakeholders were identified as CASCOM, Army Strategic Plans and Operations, and other associated analysis directorates. The encompassing SBCS objective heirarchy list was generated: improving Joint and multinational C2 capacity, maximizing connector throughput, increasing OTH access to austere entry points to support distributed operations, improving at-sea interfaces for transfer of supplies and medium/heavy lift in SS4, and the ability to rapidly shift combat ready units.

The Sea Base Connector System measures-of-effectiveness and perfomance were linked to commensurate Seabasing and Army watercraft MOE/MOP and their parent Joint tasks. Appropriate SBCS MOE/MOPs were directly applied from overarching seabasing MOE/MOPs and again from the lowest level MOE defined by the Army and

Navy service specific tasks. Directed tasks, originating from a Uniform Joint Task List (UJTL) operational humanitarian assistance template, were decomposed from operational activities into their respective Joint and inter-service military tasks to provide lists of relevant and operationaly valuable metrics (CJCS, 2003).

A potential SBCS operational concept over the Seabasing lines-of-operation was determined from its directed and implied operational tasks in a HA/DR CONOPS to determine the simplest use-case. The simple use-case was progressively expanded to encapsulate the most complex scenarios. The simplest use-case for the SBCS was at-sea loading of cargo from CLF ships and deploying that cargo to shore facilities. This use case was expanded to eventually include the exchange of objective area personnel to and from the Sea Base. The CONOPS was guided by the humanitarian assistance template derived UJTLs. A MBSE approach to define a hierarchy of each service's operational tasks and appropriate measures-of-effectiveness (MOE) was used to simultaneously define the functions necessary for their fulfillment. While numerous Joint and multinational strategies to achieve the HA/DR tasking exist, a holistic view of these combined tasks and the limitations imposed by the crisis was used to formulate an operational plan of Seabasing activities. To quantitatively evaluate the capability of the SBCS the generic scenarios were applied to a Navy and USMC relevant and significant mission.

The lessons and the general strategic plan discussed in the Expeditionary Warrior 2010 war game's HA/DR mission provided a general description of anticipated Joint and multinational operations. The HA/DR CONOPS utilized in this analysis offered numerous scenarios differing by geographic limitations, local threat, and crisis severity across the entire coast and inland waterways of Nigeria, but a single scenario with accompanying constraints and assumptions was used to capture the bulk of LOO-phased SBCS capability requirements. The author derived operational and tactical level scenario descriptions and use cases to allow proportional adjustment of the Sea Base's resources available in the selected scenarios with respect to the entire Nigeria crisis response and a potential description of T-Craft tasking within the SBCS. While such operational analysis through potential scenarios is useful in constraining operational variables and defining performance requirements, it needs to be highlighted that these detailed activities are highly dependent upon the strategic, operational, and tactical plans and assumptions generated by the author. Although the basis for such strategic plans and assumptions are referenced in Seabasing doctrine and validated through USMC wargaming, the 2020 HA/DR Sea Base is still yet an evolving concept and specific operational plans are not publicly available.

A context diagram was created to describe the high-level interfaces between the SBCS and external systems. Through an extension of the context diagram, the architecture environment to include the internal and external interactions was described within the context of a general Seabasing mission. This operational view provided the broad overview of the inter-service contributions and their required mission tasks in the HA/DR campaign while foreshadowing the general assumptions of the CONOPS. Such analysis shaped the fundamental descriptions of the SBCS, external systems, and their interfaces. The interfaces were decomposed to physical and informational linkages that better defined the future necessary standards and external system interoperability considerations. As emphasis in this analysis was upon the physical linkages, it was a concern to develop and describe the external Sea Base load exchange links (Appendix E. Operational/Physical Context Diagram).

The author developed the functional behavior of the SBCS from the operational scenarios. Stated HA/DR tasking was decomposed, guided by the military task list(s) refining the operational activities, to define the necessary SBCS functions. IDEF0 modeling and FFBD modeling provided a means of decomposing the functions of the SBCS to appropriate levels while simultaneously allowing them to be traced to the operational activities hierarchy. From the operational scenarios, the data list of inputs, controls, mechanisms, and outputs of the SBCS's top-level functions were determined to model the conversion of the external Sea Base system's provided resources, to be consumed by the objective area system and vice-versa (i.e., delivering food to Lagos or civilian MEDEVACs to advanced base).

Alternative configurations of the SBCS were developed given the established HA/DR CONOPS. Through the scope of the assembly, employment, and early sustainment phases it was determined that the baseline SBCS configuration of LCAC SLEP, SSC, and JHSV met the functional requirements. However, through high level analysis possible advantages and disadvantages of an additional T-Craft variant were highlighted. The recommended system alternatives were as follows: 1) direct LMSR side/stern port connection only, 2) VERTREP capable with a DPS, or 3) VERTREP capable with a direct LMSR side/stern port.

A. KEY POINTS

The author is sensitive to the notion that not understanding the problem renders any effort impossible to solve it. This research's conceptual context was drawn from numerous Joint military Seabasing integration documents and joint experimentation to construct a feasible humanitarian assistance/disaster relief operational concept and coinciding requirements for further trade-off analysis of the T-Craft. While supporting Joint Seabasing references provide a general seabasing strategy, the operational concept and tactics employed by the U.S. Joint and multi-national forces are much more uncertain and naturally scenario specific. Therefore, the author has attempted to minimize the likelihood of implementing a problem without a needed solution by adopting a relevant and significant CONOPS from Joint Seabasing experimentation. Further analysis should be constantly aware that the prescribed operational and tactical level assumptions are merely assumptions and should be altered through trade-off analysis. This would consequently shift any underlying SBCS configuration assumptions as the system recalibrates to optimally balance the altered tasking.

Quantitative analysis of at least three T-Craft functional load exchange variants within the established architectural framework is recommended. Cursory qualitative analysis has provided feasible SBCS configurations that not only describe the physical platforms, but also a noted and illustrated shifting of operational load transport tasking within the system. The operational and physical viewpoints of the 2020 SBCS have been developed through the professionally recognized and powerful system architecting tools of DoDAF 1.5 and documented in CORE©, thus may easily be adopted and adapted as a foundation for a simulation based trade-off study. In review of the recommended system alternatives, 1) direct LMSR side/stern port connection only, 2) VERTREP capable with a DPS, or 3) VERTREP capable with a direct LMSR side/stern port, the author has noted possible advantages and disadvantages that a high-level top-down analysis would allow.

A T-Craft enabled with a direct LMSR port connection that does not require an intermediate connection is likely the most technologically achievable variant solution. It offers a greater throughput probability in the assembly phase and from the prepositioned LMSRs heavily laden with the resources needed for a quick response by the assembled early response security forces, medical teams, and engineers. However, its interfaces with the amphibious shipping and T-AKE provisions require painstakingly slow and awkward usage of MLP platform that would burden routine well deck and flight deck operations. However, this T-Craft variant could potentially offer a transformative sustainment solution of offloading palletized or containerized HA consumables from the Ready Reserve's LMSRs when combined with onboard MHE or LVSR trucking. This capability would presumably complement the same held by the MLP, yet offer a more flexible and maneuverable capacity for at-sea RSOI or direct objective delivery.

The DPS and VERTREP enabled T-Craft will likely provide the greatest diversity in load exchanges without disrupting coinciding surface connector operations that makes it likely the most robust solution. It includes the same benefits of the afore-mentioned T-Craft variant, but is increasingly dependent upon dynamic positioning system and possibly stabilized crane technology that are still being developed. It offers to greatly increase the throughput capacity of LMSRs, LO/LO vessels, and amphibious ships by offering an alternative cargo removal method through skin-on-skin crane operations that do not disrupt stern port/gate operations with the MLP, RRDF/INLS, or LMCS. Also, a VERTREP capable T-Craft poses the least amount of disruption to palletized consumable distribution methods heavily utilized by amphibious shipping and T-AKE vessels.

The advantages of a T-Craft equipped with a VERTREP capability and a direct LMSR side/stern port coincide with that of the DPS and VERTREP variant, except the over-dependence of all the SBCs and enablers utilizing the source vessel's stern port may conflict to effectively reduce load throughput. This would likely be more evident during the LMSR and LOLO vessel offload during the assembly and sustainment phases. The point is moot if all LMSR logistics operations are centrally fixated on the VTS-to-MLP interface or a side port interface with the T-Craft is also possible.

An alternative T-Craft variant not evaluated, but divulged itself in the assessment, was a T-Craft with the ability to launch and recover H-60 aircraft or alike would significantly increase its range of capabilities. This added ability could justify the substitution of the T-Craft in many essential tasks constrained to the organic helicopter capable JHSV. The utilization of this variation of the T-Craft for tasking requiring sustained helicopter support would rely upon ESG/CSG based or foreign military aircraft. This was not included in this analysis as a dedicated flight deck crew and flight deck requirements seemed to overburden the "aircraft light" and minimal manning model.

The core facets of the SBCS architecture, operational and functional models, create a foundation for further analysis. The generated operational activity model provides a scalable and easily implemented foundation for any Joint humanitarian assistance mission that envelops the current precepts of the Joint Operational Concepts. Additionally, the functional and physical models of the system architecture are equally transferable to other naval amphibious operations. While the functional modeling techniques used will likely not transfer directly to a M&S interface, it does provide an input/output and constraint defining roadmap to the SBC physical load exchanges in a recurring and easily duplicated structure that can be quantitatively evaluated. The included physical and capability descriptions of the Sea Base connectors define their role within the system and their relative stakeholder importance that provides insight into system MOE weightings.

B. AREAS TO CONDUCT FURTHER RESEARCH

The intent of this research was to enable further analysis of the T-Craft within the Sea Base connector system and is but one product of a top-down analysis. It offers an example of a proven methodology that validates the premise for further derived detailed analysis. This SBCS architecture has established the following framework and justification to enable further research of the T-Craft:

- Strategic and operational level CONOPs descriptions
- Notional Seabasing element quantities and characteristics
- Operational activity modeling and objectives hierarchy
- Identification of approved MOE & MOPs
- Functional modeling
- Physical Modeling

Established models are recommended to assist in the tailoring of M&S software tools appropriate to complex systems-of-system logistics distribution analysis. NPS's MOVES Institute's 2007 efforts in detailed logistics modeling of the Sea Base using NSS/COMBAT^{XXI}/SIMKIT/DIS tool kit is apt for HA/DR and surface connector system adaptation (Brutzman, Buss & Blais, 2004).

Without further mission analysis, these efforts to develop an architecture for the Navy centric humanitarian assistance mission set should be perceived as bisecting the entirety of the SBCS architecture. Full comprehension of the T-Craft's requirements definition will be better understood through continued development of the HA/DR mission from an Army conceptualization and a MCO mission set. A comparable set of Joint SBCS CONOPS and architecture of MCO should be completed and furthered in M&S analysis. This would offer exploration of the SBCS configuration from the Army centric CONOPS and the rigorous and intense demands of high frequency and heavy-armor vehicle lift capacity required of a JFEO.

APPENDIX A. SEA BASE CONNECTOR SYSTEM CAPABILITIES

The Sea Base Surface Connector System capabilities were derived from two JROC source documents. The Seabasing JCD capabilities relevant to the surface connector system were attributed to its capability portfolio. Not all Seabasing capabilities are directly applicable to the SBCS as some are generic requirements of the Sea Base concept, but should provide M&S objective MOEs that are valuable to Seabasing stakeholders. Applicable SBCS capabilities ranged from supporting Sea Base command and control, logistics distribution, and force application of Joint and multinational forces. Any acquisition to close SBCS capability gaps is assumed to be a Joint program; therefore, the author felt it was important to subsume the Army's watercraft capability gaps provided in the Army Watercraft FNA. These capability gaps provided a perspective relevant to forces that are primarily concerned about force application in a threat environment. Again, all capabilities based analysis documents are established on a common JROC approved process. All capabilities assigned to the SBCS were aligned to the current 2009 draft of the Joint Capability Area to provide categorization and emphasize a Joint interest in future acquisitions. At the current time, the Joint and inter-service task lists were not yet directly aligned to the tiered levels of the JCA, but were instead done so in the CADM operational activity analysis.

The SBCS capabilities continued the AO phase organization provided within the Seabasing JCD. Additionally, supporting capability gaps that were relevant to all phases were consolidated into a separate universal category (Table 6).

JCA		UJTL DESCRIPTION	Seabasing/AWC Task	Seabasing JIC/LOO Sub-Task/AWC Description	SBCS Originating Requirement (1st Tier)
Tier 1	**Tier 2**				
Net-Centric Operations / Battlespace Awareness	Information Transport	OP 5.1 Acquire and Communicate Operational Information and Maintain Status	Task C2—Provide Operational Command and Control	C2.1 Develop Common Operating and Tactical Picture (COTP).	Provide sea based forces real time/near real time COTP using strategic, operational and tactical C4ISR to detect, classify, identify and track surface CCOIs.
Battlespace Awareness	Environment	ST 2.2.3 Collect Meteorological and Oceanographic (METOC) ST 2.2.4 Conduct Theater Collection Assessment Information.	All: AW Task 9- Operate in a non-contiguous, uncertain threat environment to include extreme meteorological and maritime conditions.	Independent identification of severe and threatening meteorological and maritime conditions in their local environment and to interface with the Joint Force C2 and Battlespace Awareness systems to leverage similar information in the COP.	Provide independent identification of severe and threatening meteorological and maritime conditions in their local environment.
		ST 2.2.3 Collect Meteorological and Oceanographic (METOC) ST 2.2.4 Conduct Theater Collection Assessment Information.	All: AW Task 9 -- Operate in a non-continuous, uncertain threat environment to include extreme meteorological and maritime conditions.	The Joint Operational Environment requires platform based data collection and C4I systems that enable prediction and response to severe and threatening meteorological and maritime conditions. Should not reduce operational tempo.	Interface with the Joint Force C2 and Battlespace Awareness systems to leverage severe and threatening meterorological and maritime condition predictions and required responses in the COP.
		ST 2.2.4 Conduct Theater Collection Assessment	All: AW Task 2 -- Establish and maintain situational awareness and command & control with appropriate echelons in both maritime and land based domains (C4ISR)	Joint interoperability requires systems capable of accessing and feeding global meteorological and bathymetric data.	Provide independent collection of local bathymetric analysis data.
					Transmit local bathymetric data and access regional bathymetric data from Battlespace Awareness systems.

Logistics	Deployment & Distribution	OP 1.1.3 Conduct joint reception, staging, onward movement, and integration in the joint operations area	Assemble, AW Task 8 -- Conduct operations at a Seabase.	Waterborne platforms are capable of loading and unloading intact operational ready maneuver forces from the seabased vessels and platforms within the Sea Base.	Load and unload intact operationally ready BCT maneuver forces from and to external systems **(ship-to-ship/SPOD logistics)**.
		OP 1.1.3 Conduct joint reception, staging, onward movement, and integration in the joint operations area	AW Task 1 -- Conduct force closure.	Waterborne & operational lift platforms are capable of interfacing with and operating as part of JLOTS operations.	Interface with and operate as part of JLOTS operations.
Force Application / Logistics	Maneuver / Deployment & Distribution	SN 1.2.5 Move forces form Port of Embarkation (POE) to Port of debarkation (POD)	AW Task 4 -- Operate in open ocean and the littorals to include anti-access or area denial	Waterborne platforms are capable of surviving extreme sea state and meteorological environments.	Survive at-sea in extreme sea state and meteorological environments up to sea state 6.
		SN 1.2.5 Move forces form Port of Embarkation (POE) to Port of debarkation (POD)	AW Task 4 -- Operate in open ocean and the littorals to include anti-access or area denial	Waterborne platforms are capable of operating in elevated sea state and sever meteorological environments. Assured access and NMS swiftness guidelines require a fleet capable of operating in elevated sea states in excess of SS2.	Conduct personnel, cargo, and vehicle transfer operations in an elevated sea state (SS2 - SS4) and severe meteorological environments.

Close	Command and Control	Planning	OP 5.4.6 CONDUCT OPERATIONAL REHEARSALS	Task C2—Provide Operational Command and Control	C2.4.1 Provide enroute collaborative planning capability	Provide enterprise planning services and timely data and information transfer to conduct smart push/user pull support of enroute collaborative joint planning.
			OP 5.4.6 CONDUCT OPERATIONAL REHEARSALS	AW Task 3 -- Support embarked force battle command on the move to include continuous interface with the COP and en route mission planning and rehearsal.	Operational maneuver concepts require movement platforms to possess discrete systems to support embarked commanders and staffs to conduct en route mission planning and rehearsals.	
			OP 5.4.6 CONDUCT OPERATIONAL REHEARSALS	Task C2—Provide Operational Command and Control	C2.4.2 Provide virtual rehearsal and simulation	Conduct enroute virtual rehearsal down to the individual weapons platform/small unit.
	Logistics	Deployment & Distribution	SN 1 CONDUCT STRATEGIC DEPLOYMENT AND REDEPLOYMENT and ST 1.1 CONDUCT INTRATHEATER STRATEGIC DEPLOYMENT	Task C4—Conduct movement of forces	C4.1.3 and C4.1.4 Support movement of strategic, operational, and tactical forces through air and sea	Support movement of strategic, operational, and tactical forces through air and sea.
			SN 1 CONDUCT STRATEGIC DEPLOYMENT AND REDEPLOYMENT and ST 1.1 CONDUCT INTRATHEATER STRATEGIC DEPLOYMENT	AW Task 4 -- Operate in open ocean and the littorals to include anti-access or area denial environments.	Operational maneuver concepts require movement platforms to be capable of moving rapidly over strategic distances in order to meet COCOM responsiveness and NMS swiftness requirements.	
			SN 1 CONDUCT STRATEGIC DEPLOYMENT AND REDEPLOYMENT and ST 1.1 CONDUCT INTRATHEATER STRATEGIC DEPLOYMENT	AW Task 1 -- Conduct Force Closure	Waterborne operational lift platforms are capable of moving at speeds sufficient to meet NMS swiftness goals and COCOM responsiveness requirements.	

LOO Phase	JCA Tier 1	JCA Tier 2	UJTL DESCRIPTION	Seabasing/AWC Task	Seabasing JIC/LOO Sub-Task/AWC Description	SBCS Originating Requirement
Assemble	Logistics	Deployment & Distribution	OP1.2.3 ASSEMBLE FORCES IN THE JOINT OPERATIONS AREA (JOA)	Task A2—Assemble and Integrate Joint Forces on the sea base	A2.2.3 Receive cargo, equipment, supplies & personnel on and between sea base platforms	Receive and handle scalable, parallel arrival, transfer, reception (air & surface interfaces) and stowage of equipment, personnel, and supplies from external systems as required for each Bn sized equivalent in 24–48 hours **(ship-to-ship/SPOD logistics)**.
			OP 1.1.3 Conduct joint reception, staging, onward movement, and integration in the joint operations area	AW Task 1-- Conduct force closure	Waterborne operational lift platforms are capable of interfacing with and operating as part of Joint Seabasing operations to include ship-to-ship and ship-to-air interfaces.	
			OP1.2.3 ASSEMBLE FORCES IN THE JOINT OPERATIONS AREA (JOA)	Task A2—Assemble and Integrate Joint Forces on the sea base.	A2.2.2 Transfer cargo, equipment, supplies & personnel on and between sea base platforms	Cross-deck transfer (non-air) and handle SBCS cargo and equipment among identified CONOPS selected military and commercial platforms as required for each Bn sized equivalent in 24-48 hours **(ship-to-ship/SPOD logistics)**.
			OP 1.2.2 POSTURE JOINT FORCES FOR OPERATIONAL FORMATIONS	Task A2—Assemble and Integrate Joint Forces on the Sea Base	A2.4 Integrate joint forces for seabasing operations	Perform ship-to-ship transfer of personnel, equipment, and cargo while assembling and integrating Joint immediate and rapid response forces on the sea base to conduct sustained combat operations within 24 - 72 hours of arrival **(ship-to-ship logistics)**.
	Command and Control	Organize, Understand, Plan, Decide, Direct, Monitor	OP 5 PROVIDE OPERATIONAL COMMAND AND CONTROL	AW Task 8 -- Conduct operations at a Sea base.	Joint Seabasing concepts require a fleet that is fully interoperable with any vessel operating as part of a Joint seabasing operation.	Possess C2 capability to achieve interface requirements of ship-to-ship transfer and intermediary roles.

<table>
<tr><th rowspan="2">LOO Phase</th><th colspan="2">JCA</th><th rowspan="2">UJTL DESCRIPTION</th><th rowspan="2">Seabasing/AWC Task</th><th rowspan="2">Seabasing JIC/LOO Sub-Task/AWC Description</th><th rowspan="2">SBCS Originatinating Requirements</th></tr>
<tr><th>Tier 1</th><th>Tier 2</th></tr>
<tr><td rowspan="5">E m p l o y</td><td rowspan="5">Force Application</td><td rowspan="5">Maneuver</td><td>OP 1.2.4 CONDUCT OPERATIONS IN DEPTH and OP 1.2.5 CONDUCT OFFENSIVE OPERATIONS IN THE JOINT OPERATIONS AREA (JOA)</td><td>Task E4—Employ a scalable range of lethal and non-lethal joint force capabilities from the sea base to support JFC mission objectives</td><td>E4.8 and E4.12 Project to operational depths (OTH from the sea base to inland objectives) expeditionary task forces within a period of darkness(8-hours) using vertical and surface lift provided by sea-based assets.</td><td>Move up to one surface connector delivered 2015 MEB assault wave from OTH out to 25nm from the sea base within one period of darkness (8-10 hours) (ship-to-shore, shore intermediary logistics).</td></tr>
<tr><td>OP1.2.4 CONDUCT OPERATIONS IN DEPTH and OP1.2.5 CONDUCT OFFENSIVE OPERATIONS IN THE JOINT OPERATIONS AREA (JOA)</td><td>Task E4—Employ a scalable range of lethal and non-lethal joint force capabilities from the sea base to support JFC mission objectives</td><td>E4.13—Project Brigade sized task forces using austere access surface craft by coordinating and synchronizing maneuver through the sea base to objectives ashore</td><td>Employ a scalable combat configured force (Bn TF(+) through Heavy Brigade Combat Team (BCT)) from the sea base using austere access under the cover of darkness (8-10 hours) (ship-to-shore, shore intermediary logistics).</td></tr>
<tr><td>OP1.2.4 CONDUCT OPERATIONS IN DEPTH and OP1.2.5 CONDUCT OFFENSIVE OPERATIONS IN THE JOINT OPERATIONS AREA (JOA)</td><td>Task E4—Employ a scalable range of lethal and non-lethal joint force capabilities from the sea base to support JFC mission objectives</td><td>E4.13—Project Brigade sized task forces using austere access surface craft by coordinating and synchronizing maneuver through the sea base to objectives ashore</td><td rowspan="3">Employ scalable combat configured force (Bn TF(+) through Heavy Brigade Combat Team (BCT)) from strategic distances (10,000nm), through an austere access with minimal RSOI.</td></tr>
<tr><td>OP1.2.4 CONDUCT OPERATIONS IN DEPTH and OP1.2.5 CONDUCT OFFENSIVE OPERATIONS IN THE JOINT</td><td>AW Task 1 -- Conduct force closure.</td><td>Waterborne operational lift platforms possess shallow draft capabilities that enable interface with austere access operations.</td></tr>
<tr><td>OP1.2.4 CONDUCT OPERATIONS IN DEPTH and OP1.2.5 CONDUCT OFFENSIVE OPERATIONS IN THE JOINT OPERATIONS AREA (JOA)</td><td>AW Task 1 -- Conduct force closure.</td><td>Waterborne capabilities include operational lift platforms capable of moving intact operationally-ready combat forces over strategic distances.</td></tr>
</table>

Employ	Force Application	Maneuver	OP1.2.4 CONDUCT OPERATIONS IN DEPTH and OP1.2.5 CONDUCT OFFENSIVE OPERATIONS IN THE JOINT OPERATIONS AREA (JOA)	AW Task 4 -- Operate in open ocean and the littorals to include anti-access or area denial environments	Waterborne platforms are capable of operating throughout the littorals, to include austere, shallow-draft access points, rivers, and inland waterways, in order to meet COCOM assured access requirements.	Employ scalable combat configured force (Bn TF(+) through Heavy Brigade Combat Team (BCT)) from strategic distances (10,000nm), through an austere **access** with minimal RSOI.
			OP1.2.4 CONDUCT OPERATIONS IN DEPTH and OP1.2.5 CONDUCT OFFENSIVE OPERATIONS IN THE JOINT OPERATIONS AREA (JOA)	AW Task 5 -- Provide operational maneuver for combat configured forces throughout a JOA.	Tactical movement concepts require waterborne platforms that can enable maneuver commanders to leverage the littorals for tactical level operations.	
			OP1.2.4 CONDUCT OPERATIONS IN DEPTH and OP1.2.5 CONDUCT OFFENSIVE OPERATIONS IN THE JOINT OPERATIONS AREA (JOA)	AW Task 5 -- Provide operational maneuver for combat configured forces throughout a JOA.	Intra theater surface lift capability enables Joint Commanders to operationally maneuver intact combat units throughout the JOA littorals.	
			OP1.2.4 CONDUCT OPERATIONS IN DEPTH and OP1.2.5 CONDUCT OFFENSIVE OPERATIONS IN THE JOINT OPERATIONS AREA (JOA)	AW Task 5 -- Provide operational maneuver for combat configured forces throughout a JOA.	Joint high-speed intra theater surface lift and JETA capabilities enable maneuver commanders to rapidly load and offload combat configured units at austere littoral access points throughout the JOA.	
			OP1.2.4 CONDUCT OPERATIONS IN DEPTH and OP1.2.5 CONDUCT OFFENSIVE OPERATIONS IN THE JOINT OPERATIONS AREA (JOA)	AW Task 5 -- Provide operational maneuver for combat configured forces throughout a JOA.	Platforms are capable of maneuvering operationally ready units to any littoral access point necessary to meet COCOM operational requirements, to include austere, degraded, and bare beach sites.	

LOO Phase	JCA		UJTL DESCRIPTION	Seabasing/AWC Task	Seabasing JIC/LOO Sub-Task/AWC Description	SBCS Originating Requirements
	Tier 1	Tier 2				
S u s t a i n	Command and Control	Organize, Understand, Plan, Decide, Direct, Monitor	OP 6.2.6 Conduct Evacuation of noncombatants from the Joint Operations Area	AW Task 6 - Conduct distributed sustainment operations in support of Joint and Coalition Forces, and homeland security and emergency response operations.	National Strategy for Homeland Security dictates platforms and command centers capable of coordinating and operating with emergency response agencies.	Possess discrete C2 systems for embarked commanders, staff, and unit commanders to remain connected to Joint forces and civilian emergency response agencies to retain up-to-date mission information.
			SN 1.2.3 CONDUCT TERMINAL OPERATIONS	AW Task 6 - Conduct distributed sustainment operations in support of Joint and Coalition Forces, and homeland security and emergency response operations.	Waterborne platforms are capable of interfacing with and operating in support of Joint Force cargo and terminal operations units engaged in sustainment operations.	Conduct at-sea cross-deck transfer and handling of external system's logisitic ship transfer of all classes of supplies and equipment to support continuous seabased/shore objective operations.
	Logistics	Deployment & Distribution	SN 1.2.3 CONDUCT TERMINAL OPERATIONS	AW Task 7 -- Support terminal operations in fixed, austere, and degraded sea and water ports and during joint logistics over the shore operations.	Strategic responsiveness, distributed sustainment, and JETA concepts require a fleet capable of supporting cargo and terminal operations in improved, fixed seaports and water terminals	Support cargo and terminal operations in **improved**, fixed seaports, and water terminals.
			OP4.1 COORDINATE SUPPLY OF ARMS, MUNITIONS, AND EQUIPMENT IN THE JOINT OPERATIONS AREA (JOA)	Task S2—Establish and maintain minimum allowances of classes of supply based on expenditures needed to support sea based operations until other supply lines are opened.	S2.1 Maintain 15 DOS of supply at combat rates of expenditure within the distributed sea base to support sea based operations and selected joint forces operating ashore.	Deliver all requested replenishment stocks from advanced bases (2000 nm range) to the sea base within 21 days **(ship-to-ship/SPOD)**.
			OP1.1.2 CONDUCT INTRATHEATER DEPLOYMENT AND REDEPLOYMENT OF FORCES WITHIN THE JOINT OPERATIONS AREA (JOA)	Task S3—Sustain sea based forces. Provide seamless logistics flow of personnel, equipment, supplies, and materials from strategic to tactical levels.	S3.4.2 Provide means to interface with, receive, and transport equipment, supplies, personnel and materials using surface sea lift connectors operating between sea based platforms.	Sea base can conduct continuous surface interface operations across the sea base through Sea State 4 (JMDCM)

Sustain	Logistics	Deployment & Distribution, Logistics Services	OP1.1.2 CONDUCT INTRATHEATER DEPLOYMENT AND REDEPLOYMENT OF FORCES WITHIN THE JOINT OPERATIONS AREA (JOA)	Task S4—Provide continual sustainment to selected joint forces ashore, up to five brigades, from and through the sea base and reduce reliance on build up of large stockpiles ashore that have to be protected.	S4.1 Provide scalable, selectable offload, transfer and distribution of personnel, equipment, materials and all classes of supply (including fuel and ordnance) from sea based platforms to objectives ashore.	Transfer supplies to Bn TF equivalents out to a range of 110nm from the sea base without refueling, through sea state 4 (JMDCM standard) **(ship-to-SPOD/shore, shore intermediary)**.
			OP4.6 BUILD AND MAINTAIN SUSTAINMENT BASES IN THE JOINT OPERATIONS AREA (JOA)	Task S4—Provide continual sustainment to selected joint forces ashore, up to five brigades, from and through the sea base and reduce reliance on build up of large stockpiles ashore that have to be protected.	S4.1 Provide scalable, selectable offload, transfer and distribution of personnel, equipment, materials and all classes of supply (including fuel and ordnance) from sea base platforms to objectives ashore.	Provide 100 percent of the surface delivered daily sustainment cargo required for operations ashore (air & surface combined to 115 Stons per day per Bn TF) out to range of 110nm **(ship-to-SPOD/shore, shore intermediary).**
			SN 1.2.3 CONDUCT TERMINAL OPERATIONS	AW Task 6 -- Conduct distributed sustainment operations in support of Joint and Combined Forces throughout a JOA	Joint high-speed intra theater surface lift and JETA capabilities require rapid on/offload at austere and bare beach access points with little or not external cargo handling requirements	
			SN 1.2.3 CONDUCT TERMINAL OPERATIONS	AW Task 7 - Support terminal operations in fixed, austere, and degraded sea and water ports and during joint logistics over the shore operations.	Waterborne platforms are capable of accessing and interfacing with cargo handling capabilities and operations at austere littoral access points, degraded ports, and bare beach environments without the employing employment of cumbersome, logistics intensive causeway systems.	
			SN 1.2.3 CONDUCT TERMINAL OPERATIONS	AW Task 7 - Support terminal operations in fixed, austere, and degraded sea and water ports and during joint logistics over the shore operations.	Distributed sustainment concepts dictate a fleet capable of supporting multiple, often widely dispersed on/offload points, often in austere operational environments with little or no external cargo handling capability.	

Sustain	Force Support	Force Health Protection	OP4.5 MANAGE LOGISTIC SUPPORT IN THE JOINT OPERATIONS AREA (JOA)	Task S7—Provide joint medical support	S7.3 Provide capability to support evacuation and onward movement of casualties from the sea base to medical facilities at an advance supporting base.	Provide transport and care of casualties moving from sea base to medical facilities at distances up to 2000nm **(ship-to-ship/SPOD)**.
			OP4.4 COORDINATE SUPPORT FOR FORCES IN THE JOINT OPERATIONS AREA (JOA)	Task S7—Provide joint medical support	S7.2 Provide capability to support immediate evacuation of casualties from ashore to medical facilities within the sea base.	Provide immediate (within 1-hour) MEDEVAC requirements for a minimum of five brigades operating ashore during "seize the initiative", to exclude those MEDEVACed via air lift **(ship-to-ship/SPOD/shore, shore intermediary)**.
			OP1.1.2 CONDUCT INTRATHEATER DEPLOYMENT AND REDEPLOYMENT OF FORCES WITHIN THE JOINT OPERATIONS AREA (JOA)	Task S4—Provide continual sustainment to selected joint forces ashore, up to five brigades, from and through the sea base and reduce reliance on build up of large stockpiles ashore that have to be protected.	S4.1 Provide scalable, selectable offload, transfer and distribution of personnel, equipment, materials and all classes of supply (including fuel and ordnance) from sea based platforms to objectives ashore.	Transfer supplies to Bn TF equivalents out to a range of 110nm from the sea base without refueling, through sea state 4 (JMDCM standard) **(ship-to-SPOD/shore, shore intermediary)**.

Sustain	Logistics	Deployment & Distribution, Logistics Services	OP1.1.2 CONDUCT INTRATHEATER DEPLOYMENT AND REDEPLOYMENT OF FORCES WITHIN THE JOINT OPERATIONS AREA (JOA)	Task S4—Provide continual sustainment to selected joint forces ashore, up to five brigades, from and through the sea base and reduce reliance on build up of large stockpiles ashore that have to be protected.	S4.1 Provide scalable, selectable offload, transfer and distribution of personnel, equipment, materials and all classes of supply (including fuel and ordnance) from sea based platforms to objectives ashore.	Transfer supplies to Bn TF equivalents out to a range of 110nm from the sea base without refueling, through sea state 4 (JMDCM standard) **(ship-to-SPOD/shore, shore intermediary)**.
			OP4.6 BUILD AND MAINTAIN SUSTAINMENT BASES IN THE JOINT OPERATIONS AREA (JOA)	Task S4—Provide continual sustainment to selected joint forces ashore, up to five brigades, from and through the sea base and reduce reliance on build up of large stockpiles ashore that have to be protected.	S4.1 Provide scalable, selectable offload, transfer and distribution of personnel, equipment, materials and all classes of supply (including fuel and ordnance) from sea base platforms to objectives ashore.	Provide 100 percent of the surface delivered daily sustainment cargo required for operations ashore (air & surface combined to 115 Stons per day per Bn TF) out to range of 110nm **(ship-to-SPOD/shore, shore intermediary).**
			SN 1.2.3 CONDUCT TERMINAL OPERATIONS	AW Task 6 -- Conduct distributed sustainment operations in support of Joint and Combined Forces throughout a JOA	Joint high-speed intra theater surface lift and JETA capabilities require rapid on/offload at austere and bare beach access points with little or not external cargo handling requirements	
			SN 1.2.3 CONDUCT TERMINAL OPERATIONS	AW Task 7 - Support terminal operations in fixed, austere, and degraded sea and water ports and during joint logistics over the shore operations.	Waterborne platforms are capable of accessing and interfacing with cargo handling capabilities and operations at austere littoral access points, degraded ports, and bare beach environments without the employing employment of cumbersome, logistics intensive causeway systems.	
			SN 1.2.3 CONDUCT TERMINAL OPERATIONS	AW Task 7 - Support terminal operations in fixed, austere, and degraded sea and water ports and during joint logistics over the shore operations.	Distributed sustainment concepts dictate a fleet capable of supporting multiple, often widely dispersed on/offload points, often in austere operational environments with little or no external cargo handling capability.	

LOO Phase	JCA		UJTL DESCRIPTION	Seabasing/AWC Task	Seabasing JIC/LOO Sub-Task/AWC Description	SBCS Originating Requirements
	Tier 1	Tier 2				
Reconstitute	Logistics	Deployment & Distribution	OP4.3 PROVIDE FOR MAINTENANCE OF EQUIPMENT IN THE JOINT OPERATIONS AREA (JOA)	Task R2—Recover/re-embark personnel and equipment back to Sea Base.	R2.1 Transport to, re-embark, and stage personnel and equipment on Sea Base platforms.	Move repairable damaged equipment from expeditionary surface landing zones to the sea base within 48-hours **(ship-to-ship/SPOD, shore intermediary)**.

Table 6. LOO Phased SBCS Requirements

APPENDIX B. DESIGN REFERENCE MISSION

The following is a direct excerpt from the Expeditionary Warrior 2010 player handbook (U.S. Marine Corps Wargaming Division, Marine Corps Warfighting Laboratory, 2010).

A. BACKGROUND

1. Organization

- Multi-National Humanitarian Task Force (MNHTF)
- DoS Lead, DoD supporting

2. Scope of Effort

Plan to conduct relief operations until the Host Nation, United Nations, U.S. GOV, Non-GOV and International Relief Agencies get in place and are ready to fully support relief efforts.

3. Scenario Context

- Spring 2020: Exceptionally heavy rains across the Gulf of Guinea region during the first half of 2020 lead to widespread flooding and damage throughout Nigeria's southern, coastal regions. This year's flooding is worse than normal. Across the coastal region, flooding resulting in: loss of life and the spread of waterborne diseases; displaced tens of thousands of people; and damaged crops, roads, bridges and other infrastructure. Poor sanitation and drainage is affecting the clean water supply in many areas. The Government of Nigeria (GON) and international aid agencies are so far able to manage the situation, but strained resource capabilities are a growing problem.
- June 2020: A slow moving front moved through the Bight of Benin region of Nigeria and into Benin. Seventy-two hours of torrential rain caused a second wave of severe flooding -particularly along the Ogun River system, in the southwest region, and throughout the Niger Delta, in the south-south region. Total affected population is estimated to be 3.3 million people spread across 13 states. Flooding is the worst seen in living memory. Seventy-five percent of the city of Warri is under 2-3m of water and large portions of Lagos are under water. Drainage from inland water moving downstream is likely to raise water levels in coastal regions and along the Niger River. Reservoirs and lakes are filling to capacity. Cases

of disease and infections are rising throughout the southern region. Waterways are clogged with debris making transit hazardous (Figure 36 and Table 7).

- Looting, crime and ethnic violence are on the rise as the Nigerian military and security forces cope with this emergency. AQIM is claiming responsibility for a string of attacks against non-Muslim Nigerians and foreign relief workers. GON is seen to be slow in responding in some areas. MESS filled the public service vacuum in many areas by providing aid, services and security. MESS is also conducting an information operations (IO) campaign against the GON.
- The GON and international aid agencies are not able to handle this crisis, causing the GON to actively seek global support. Other neighboring African states have also been affected by heavy rains and flooding and are not able to assist.
- Multinational Humanitarian Task Force, termed Combined Support Force, assists the GON conducting Foreign Humanitarian Assistance and Disaster Relief Operations throughout the coastal region of southern Nigeria.

4. General Situation and GON Requirements

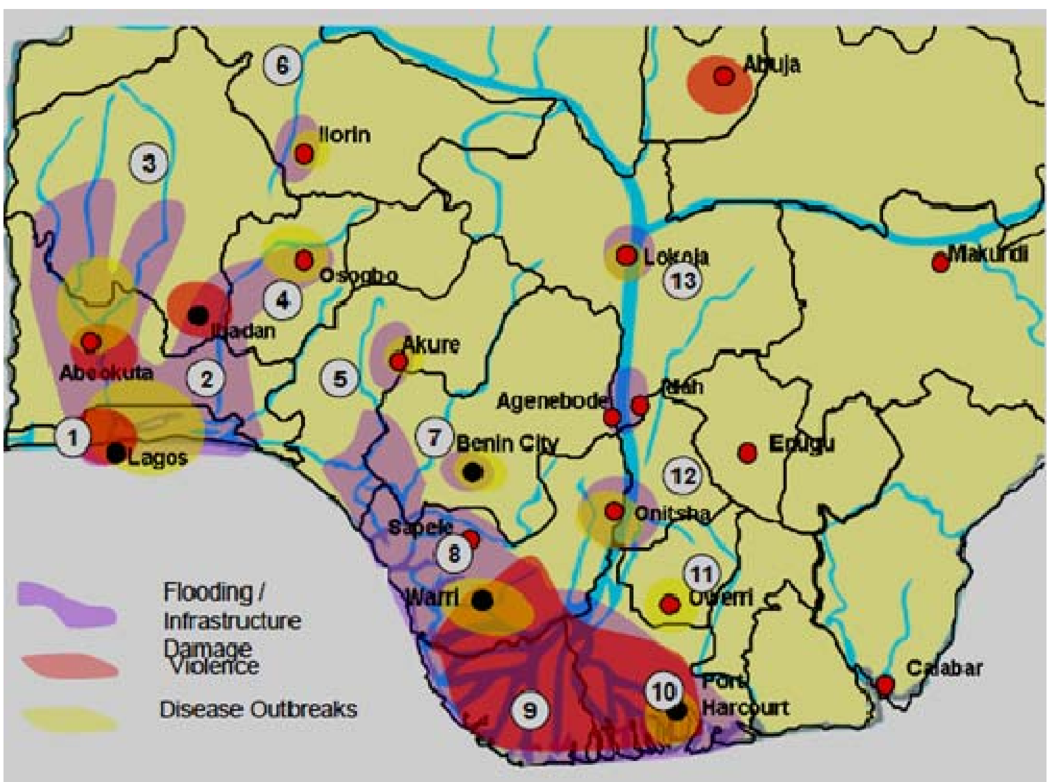


Figure 36. Scenario Boundaries and Situation

	State	Pop (millions)	Dead	Injured	Diseased	IDP	People Affected
1	Lagos	18	80	900	3000	275,000	2,750,000
2	Ogun	3.7	20	275	800	30,500	28,000
3	Oyo	5.5	15	300	1000	22,700	61,000
4	Osun	3.4	10	25	100	19,000	35,000
5	Ondo	3.4	5	100	400	8,500	18,000
6	Kwara	2.4	5	87	540	10,000	50,000
7	Edo	3.2	15	425	515	27,900	124,000
8	Delta	4.1	85	750	2000	97,000	243,000
9	Bayelsa	1.7	5	150	300	17,000	25,000
10	Rivers	5.2	35	350	600	19,600	34,000
11	Imo	3.9	5	50	125	7,500	31,000
12	Anambra	4.2	10	175	350	11,000	48,000
13	Kogi	3.3	15	205	175	28,000	50,000
	Total	62	305	3617	9905	573,700	3,497,000

Table 7. Quantities and Descriptions of the Affected Nigerian State Populations

There are 80+ local and international NGO / PVO organizations active in Nigeria supporting relief efforts. A Civilian-Military Operations Center (CMOC) has been previously established in Lagos, but the increasing scale of multi-national involvement and severity of the crisis has already surpassed the limited facilities available to support the necessary coordination and communication.

GON requires:

- Medical / Veterinarian supplies and services
- Water and food supplies; water purification
- Shelter, Clothing, Hygiene supplies
- Power generation and Fuel
- Infrastructure repair
- Transportation (Air, Ground, Sea)
- Air & Seaport repair and Control

a. Southwest Region Situation and GON Requirements

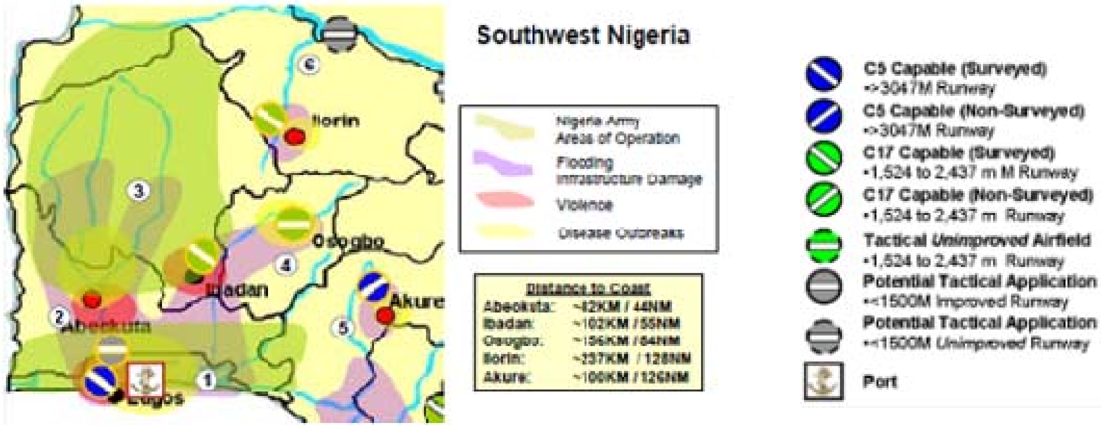


Figure 37. Affected areas of the southwest region

	State	Pop (millions)	Dead	Injured	Diseased	IDP	People Affected	FHA Operating Environment
1	Lagos	18	80	900	3000	275,000	2,750,000	Uncertain
2	Ogun	3.7	20	275	800	30,500	28,000	Permissive
3	Oyo	5.5	15	300	1000	22,700	61,000	Permissive
4	Osun	3.4	10	25	100	19,000	35,000	Permissive
5	Ondo	3.4	5	100	400	8,500	18,000	Permissive
6	Kwara	2.4	5	87	540	10,000	50,000	Permissive

Table 8. Quantities, Descriptions, and Threat Environment of the Affected Nigerian State Populations

- GON & NGOs running IDP camps.
- GON & NGOs responsible for distributing supplies from distribution centers to population.
- GON requests the following assistance shown in Table 9.

	State	Distro Center	EVAC People & SAR	Deliver Food, Water, Medicine	Deliver Clothes, Shelter, Supplies	Provide MED / VET Services	Repair / Open Airfields / Ports	Provide Air Traffic Control Support	Repair / Engineer Support
1	Lagos	Lagos	X	X	X	X	X	X	X
2	Ogun	Abeokuta		X	X	X	X		
3	Oyo	Ibadan		X	X	X	X		X
4	Osun	Osogbo	X	X	X	X	X		X
5	Ondo	Akure		X	X	X	X	X	
6	Kwara	Ilorin		X	X	X	X	X	X

Table 9. State Specific FHADR Needs Requested

b. Southeast and South-South Regions Situation and GON Requirements

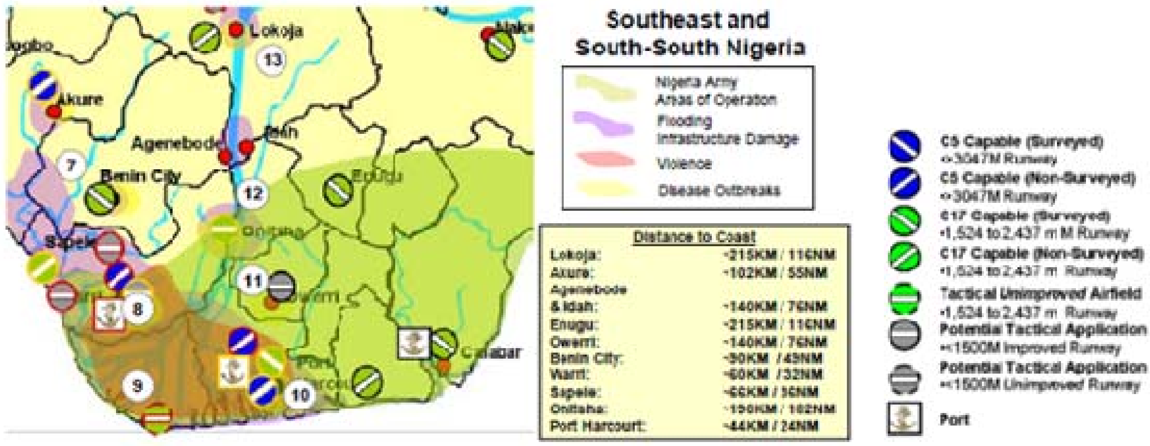


Figure 38. Southeast and South-South Nigeria Crisis Assessment and Straight-Line Distances

	State	Distro Center	EVAC Pax and SAR	Deliver Food, Water Medicine	Deliver Clothes, Shelter, Supplies	Provide MED / VET Services	Repair / Open Airfields / Ports	Provide Air Traffic Control Support	Repair / Engineer Support
7	Edo*	Benin City*	X	X	X	X	X	X	X
8	Delta	Warri / Benin City	X	X	X	X	X	X	X
9	Bayelsa	Port Harcourt	X	X	X	X	X		
10	Rivers	Port Harcourt		X	X	X	X	X	X
11	Imo	Owerri		X	X	X	X		
12	Anambra	Onitsha	X	X	X	X	X	X	X
13	Kogi	Lokoja	X	X	X	X	X		

	State	Pop (millions)	Dead	Injured	Diseased	IDP	People Affected	FHA Operating Environment
7	Edo	3.2	15	425	515	27,900	124,000	Permissive
8	Delta	4.1	85	750	2000	97,000	243,000	Uncertain
9	Bayelsa	1.7	5	150	300	17,000	25,000	Hostile
10	Rivers	5.2	35	350	600	19,600	34,000	Uncertain
11	Imo	3.9	5	50	125	7,500	31,000	Permissive
12	Anambra	4.2	10	175	350	11,000	48,000	Permissive
13	Kogi	3.3	15	205	175	28,000	50,000	Permissive

Table 10. State Specific FHADR Needs Requested

- GON & NGOs running IDP camps.
- GON & NGOs responsible for distributing supplies from distribution centers to population.
- GON requests international assistance to take over relief efforts in Benin City until international NGOs and GON can take over.
- GON requests the following assistance shown in Table 11.

	State	Pop (millions)	Dead	Injured	Diseased	IDP	People Affected
7	Edo	3.2	15	425	515	27,900	124,000
	Benin City	1.1	10	185	250	14,500	87,000

Table 11. Quantities and Descriptions of the Affected Population in the State of EDO and Benin City

- GON is lacking resources and manpower to effectively manage the situation in Benin City.
- GON requests international assistance to take over relief efforts in Benin City and Edo State until international NGOs and GON can take over.
- Establish and sustain IDP camps to support 14,500 people for 30 days until GON and NGOs can effectively take over.
- Deliver food, water, medicine, shelter and other supplies.
- Provide veterinary and medical services.
- Repair damaged infrastructure / general engineer support.
- Distribute supplies and services throughout Edo state until GON and NGOs can effectively take over.
- Evacuate 1,100 people from flood areas.

B. GENERAL THREAT

- Biggest threat to foreign relief workers is from Al-Qaeda in the Islamic Maghreb (AQIM).
- AQIM will look for targets of opportunity against foreign workers and military personnel.
- All threat groups are stealing / hijacking relief supplies.
- All threat groups will avoid confrontations with host nation forces above squad strength.

- MESS and other groups will monitor and assess foreign forces' TTPs, ROE, etc.

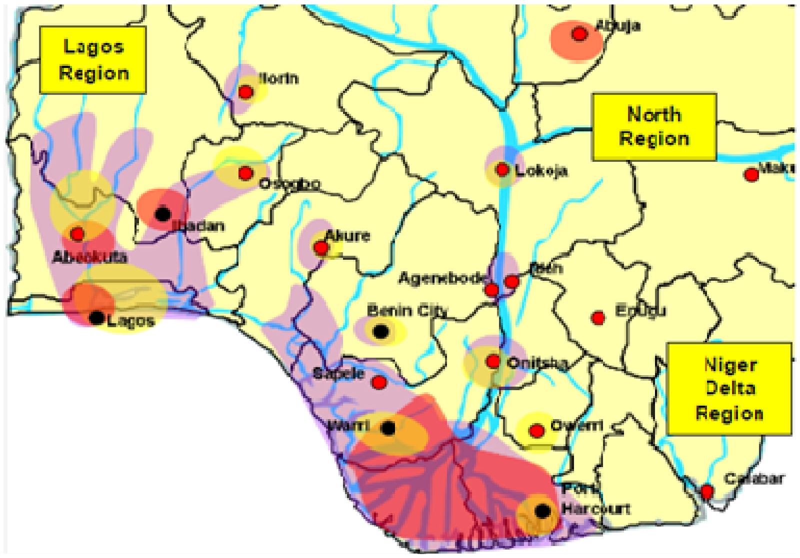


Figure 39. Scenario Threat Situation

C. AIRPORT AND SEA PORT STATUS

- Air Traffic Control Radars in Lagos, Ilorin and Port Harcourt down because of storm damage, flooding, absent personnel, power outages, or possible computer network attacks.
- Runways in Lagos & Niger Delta regions closed or degraded by debris on runway, flooding/mud, temporary IDP camps.
- Port of Lagos closed.
- Port of Warri closed – severe flooding; heavy amount of debris in main channel.
- Port of Sapele closed – heavy amount of debris in main channel.
- Port Harcourt port operations degraded.
- Port of Calabar fully operational
- Autonomous Port of Cotonou, Benin, closed

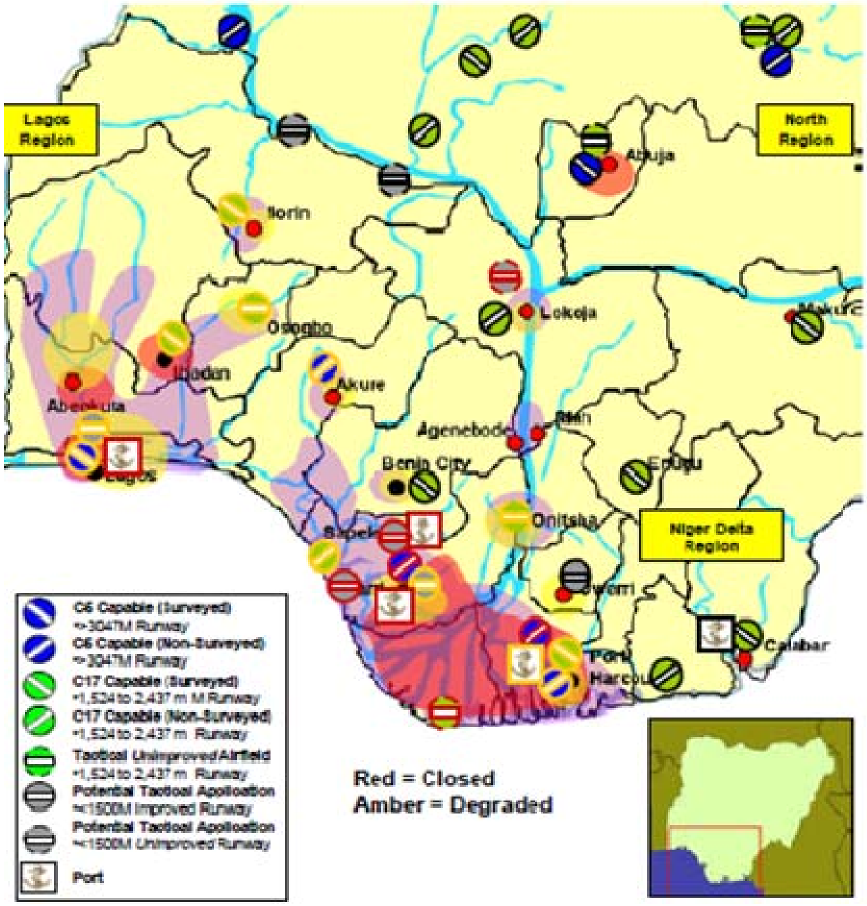


Figure 40. Scenario Airport and Sea Port Status

D. NIGERIAN NAVY

- Navy facilities at Lagos damaged
- Navy facilities at Calabar operational
- Operational Vessels and Craft
    - 1 x Frigate
    - 1 Corvette
    - 2 x Minesweeper
    - 3 x Fast Missile Craft
    - 4 x Ocean Patrol Craft
    - 1 x Coastal Patrol Craft
    - 12 x Patrol Boats

- 1 x LST
- 5 x Log / Support ships

E. MISSION STATEMENTS AND AGREEMENTS

In accordance with all the relevant UN General Assembly Resolutions, MNHTF supports the Government of Nigeria in order to provide aid and assistance to the affected populations of the coastal region.

1. U.S. Security Agreement

- U.S. forces (USF) operate in support of NAF command
- Authorized Operations : Train NAF and police, and participate in combined exercises and conduct FHA/DR
- USF may not undertake any operations outside those listed
- USF utilize existing Nigerian military bases; airfields; ports, civilian ports and airfields and can construct temporary HA/DR support facilities
- Article 98 in effect (Bilateral Immunity Agreement)
- USF under U.S. legal jurisdiction

2. Multinational Security Agreement

- Other multinational forces operate in support of NAF command
- Authorized Operations: Train NAF and police, and participate in combined exercises and conduct FHA/Dr
- OMNF may not undertake any operations outside those listed
- OMNF utilize existing Nigerian military bases; airfields; ports, civilian ports and airfields and can construct temporary HA/DR support facilities
- OMN equivalent to Article 98
- OMNF under OMN legal jurisdiction

F. EXECUTIVE OUTLOOK

In 2020, Nigeria is the second most powerful economy on the African continent, a leading African military power and a demographically diverse nation. Nigeria gets 95% of its revenue from oil exports, although industry only consumes 10% of its labor force. Oil wealth, a surge of development loans from China; India; and the West, and a concentration of political and economic power in a few hands make Nigeria one of the world's most corrupt nations. Nigeria's Armed Forces (NAF) are among Africa's best equipped and trained troops, deployed to multiple United Nations peace-keeping operations. Demographically, Nigeria has a population of 179 million people – this is Africa's largest population. Nigeria has over 250 ethnic groups; each group divided into multiple tribes and sub-tribes. The four main ethnic groups are the Hausa-Fulani, Yoruba, Igbo and Ijaw.

Figure 41. Nigeria

Each of Nigeria's four main ethnic groups congregates in specific geographical areas, but has representation throughout all of Nigeria's major cities. The Hausa-Fulani dominate northern Nigeria and control Nigeria's economic, military and political life. The Yoruba primarily reside in the southwest. Lagos, Nigeria's most populous city (18 million) is in what Yorubans call Yorubaland. Politically, Yorubans follow the political elite in the nearest city. The Ijaw reside in the Niger Delta, in southern Nigeria. The Ijaw are consistently at odds with the government of Nigeria (GON) over oil revenue distribution, leading to militant attacks against Nigeria's oil industry. Finally, the Igbo primarily live near Enugu and the areas just north of the Niger Delta. During the 1960's, Igbo officers of the NAF rebelled against the Hausa-Fulani dominated government and military. These officers started the Biafra Separatist Movement, which the GON put down by 1970. All four ethnic groups continue to fight amongst themselves and against each other, causing levels of violence in Nigeria to remain elevated – even during times of stability.

Nigeria’s social situation remains unstable with a growing youth bulge, urban sprawl and poor health. Nigeria has over 100 million people under the age of 64 and a population density rate of 150 people per square kilometer. Most Nigerians live in densely populated urban centers along the coast – which is under constant threat of flooding due to its low-level to the sea. Additionally, urban centers lack economic opportunity; regular sewage, electricity and other infrastructure; and security and public health services. Nigeria’s cities are prime locations for criminal; terrorist; and militant recruitment, gang activity, and disease outbreaks.

Although Nigeria faces multiple challenges from corruption, violence and societal and infrastructure dilapidation, the country is stable in 2020. It is working with the U.S. and other multinational countries in security force assistance; maintains diverse economic relations with many countries, to include the United States, China, India, South Africa and the United Kingdom; and is striving to consolidate leadership of a Pan-African role on the global stage.

G. OVERVIEW

Decaying infrastructure, especially acute in cities, is one of the deficiencies that Nigeria’s Vision 2020 policy seeks to address. Currently, few roads are capable of supporting much beyond a standard, compact car, only 40% of the population has access to electricity; 72% to acceptable drinking water, and only Lagos and Abuja have workable sewage systems. The government is attempting to repair the country’s poorly maintained road network. However, a continued short-fall in available funds means that repairs are slow and ineffective. Nigeria’s railroads are also deteriorating, causing the GON to ask for Chinese loans to repair and expand the system. The government is also pursuing a strategy of total port privatization. By granting concessions to private port operators, the Nigerian government hopes to improve the quality of port facilities and operations. Because of strong worker protests and strikes, privatization of ports and other transportation infrastructure is slow. Nigeria's airports and civil aviation system have a poor reputation for efficiency and safety, and government-owned Nigerian Airways is struggling. In 2015, rumors suggested the GON considered a private-public joint venture with either South African airlines or China Air.

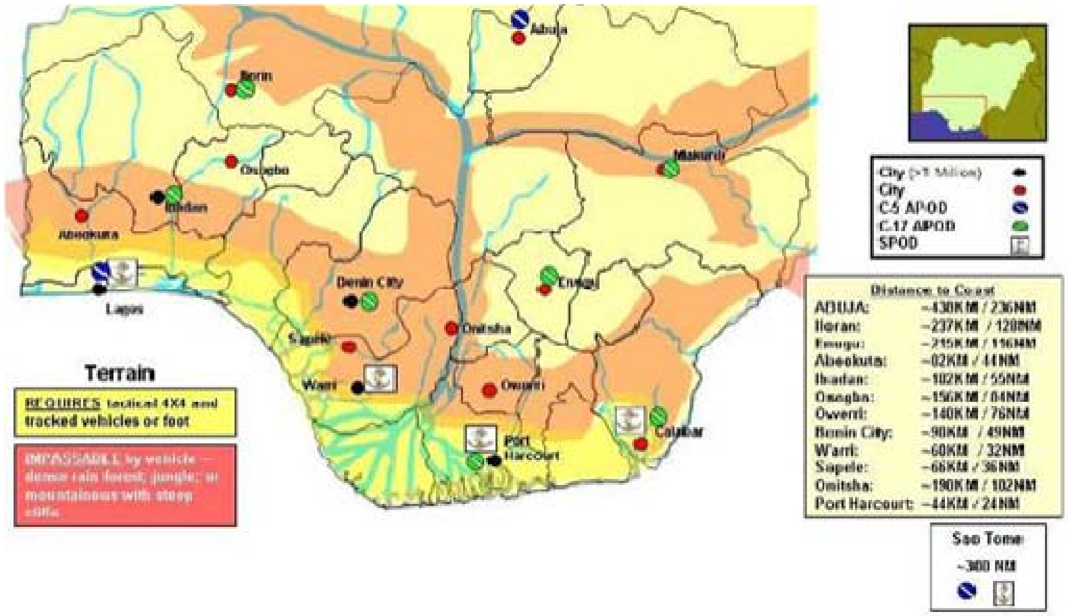


Figure 42. Nigerian Interior is Primarily Inaccessible by Vehicles from the Coast

1. Health

The poor condition of health and health care in Nigeria are two of the factors responsible for an average life expectancy of only 47 years. Poor overall living conditions are another factor. In 2019, only 72% of urban residents and 49% of rural residents had access to safe drinking water. Only 48% of urban residents and 30% of rural residents had access to adequate sanitation. Many Nigerians devote one to three hours of their day to the chore of collecting water for domestic use. In addition, the incidence of human immunodeficiency virus/acquired immune deficiency syndrome (HIV/AIDS) is very elevated. As of the end of 2019, about 7 million Nigerian adults had HIV/AIDS, representing a prevalence rate of 4 percent. During 2019, about 310,000 Nigerians died from HIV/AIDS. Tuberculosis, polio and malaria also pose challenges. In 2019, the World Bank found that Nigeria had the third highest TB burden in the world and the second highest in Africa. In 2017, Nigeria accounted for 63% of polio cases worldwide. No improvement was registered in 2019, when polio cases rose to 801. Malaria remains a serious problem, with 3 million cases and 6,000 related deaths in 2019.

General Data: Health

- Total: 99.52 deaths/1,000 live births
- male: 104.44 deaths/1,000 live births
- female: 88.38 deaths/1,000 live births
- Life expectancy at birth
- total population: 47.44 years
- male: 46.83 years
- female: 48.07 years
- Total fertility rate: 5.45 children born/woman

HIV/AIDS

- deaths: 310,000
- Major infectious diseases
- degree of risk: very high

Food or Waterborne Diseases:

- bacterial and protozoal diarrhea
- hepatitis A
- typhoid fever
- vector borne diseases: malaria
- respiratory disease: meningococcal meningitis
- aerosolized dust or soil contact disease: one of the most highly endemic areas for Lassa fever

2. Community and Ethnic Violence

Nigeria has many cultures, constituting several different communities. Communities, from small villages to large urban areas can have any number of ethnic groups residing in them. As a result of historical tensions between competing ethnic groups, internal community violence is a persistent concern. Community violence can also flare because of differences in economic practices, such as farming vs. ranching; landowners vs. workers; and community access to oil resources

Insurgencies/Terrorist Groups

The Movement for the Emancipation of Southern States (MESS)

- Formation: Summer of 2015
- Goal: Political party and opposition group
- Political platform: democratic reform, anti-corruption and better representation and recognition of Southern Nigerian economic, social, environmental & ethnic rights and concerns.
- Support: The MESS has a growing popularity that cuts across socio-ethno-economic-religious demographics in the 19 southern states, Abuja and amongst Southerners living in the north and Southern Nigerians living abroad.
- Leadership: former Governor of Lagos State and former vice president. He is a popular public figure with a clean record; a firm believer in the democratic process; and wants to reform Nigeria.
- 2017 establish MESS Vigilante Force (MVF)
- MVF description: MVF is designed to augment local law enforcement activities in the south and is composed almost exclusively of Western trained former NAF and police personnel. The MVF is registered with the GON and benefits from the British government's Security Justice and Growth Program.
- For more detail see Threat Overview

Al-Qaeda in the Islamic Maghreb (AQIM)

- Goal: establish an Islamic state in Nigeria as part of the ultimate goal of an Islamic state across the entire Trans-Sahel region and the Islamic Caliphate.
- Operations: IED attacks, suicide bombings, assassinations and kidnappings against foreign civilian and GON targets.
- Force: 2,900 operatives
- Support: Muslim gang members and disaffected youths living in the urban slums of Lagos and Ibadan.
- For more detail see Threat Overview

H. TRANSPORTATION

1. Ports

The Nigerian Port Authority is responsible for managing Nigeria's ports, which have fallen behind international standards in terms of the quality of facilities and operational efficiency. Recognizing that the government lacks the funding and expertise to modernize facilities and to run the ports efficiently, the NPA is pursuing partial port privatization by means of granting concessions to private port operators. Under the terms of concession agreements, the government has begun to transfer operating rights to private companies for 10–25 years without relinquishing ownership of the port land. Nigeria's principal container port is Lagos Port, which consists of separate facilities at Apapa and Tin Can Island and has a rail connection to points inland. Lagos Port, which has a container handling capacity of 22,000 twenty-foot equivalent units (TEUs), handles two-thirds of Nigeria's non-oil trade. The main petroleum outlets are Delta Port Complex, including Burutu, and Port Harcourt, a transshipment port located 66 kilometers from the Gulf of Guinea along the Bonny River in the Niger Delta. Relatively modern and efficient onshore and offshore terminals managed by multinational oil companies handle most oil and gas exports.

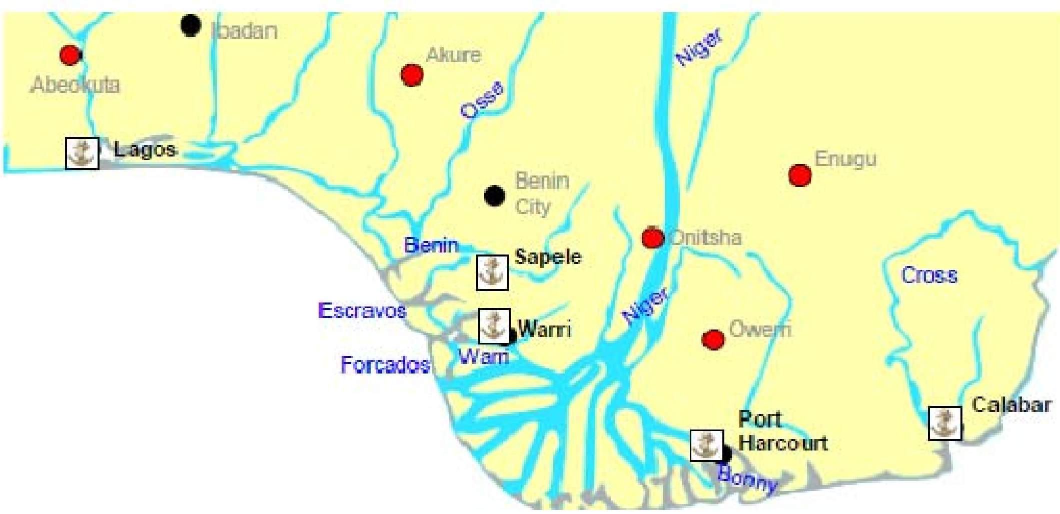


Figure 43. Nigeria's major ports normally operational

2. Inland Waterways

Nigeria has 8,600 kilometers of inland waterways. The most important are the Niger River and its tributary, the Benue River. The Niger Delta makes up 7.5% of Nigeria's land mass covering over 70,000 sq km. The delta is series of interconnected rivers, canals and creeks. Since 2010, Nigeria has invested heavily in the dredging of important waterways to improve access to inland ports and cities. Pollution of waterways remains a major issue for Nigeria. In the Niger Delta extreme erosion and water pollution go hand in hand, especially around large cities like Port Harcourt and Warri. Water deterioration severely reduces the population's access to fresh, drinkable water. In Nigeria's southwest, continued water shortages, with poor water management, pollution and erosion around Lagos and other major cities, threatens the long-term stability of the public's health. Additionally, only 72% of the population has access to acceptable water and only Abuja and Lagos have a community sewage system. Outside of these two cities, 48% of the population has access to some kind of sanitation facilities.

Figure 44. Nigeria waterways

All Year Traffic[4]

- Benin River: Access via Escravos River navigable up to Sapele / Channel width no further info (NFI) x 6.1m deep; can handle ships up to 500ft in length with a 4.9m draft.
- Escravos River: Channel Width NFI x 30m deep.
- Forcados / Warri Rivers: Access via Escravos or Forcados River navigable up to Warri / Channel width NFI x 11.5m deep; can handle ships up to 500ft in length with a 6.4m draft.
- Niger River: Navigable from Warri to Baro / Channel width 100m x 2.5m deep.
- Bonny River: 66km upstream from coast to Port Harcourt / Channel width NFI 10+m deep; can handle ships up to 500ft in length with a 9m draft.
- Cross River: 47km upstream from coast to Port of Calabar / Channel width NFI x 11m deep; can handle ships up to 500ft in length with a 9m draft.

Seasonal Traffic[5]

- Ogun River: Channel depth 2.5m (rainy) and 1m (dry)
- Osun River: Channel depth 2.5m (rainy) and 1m (dry)
- Osse River: Channel depth 2.5m (rainy) and 1m (dry)
- Benue River: Channel depth 3m (rainy) and 2m (dry)

I. STRATEGIC OVERVIEW OF NIGERIA

1. Summary

Nigeria is a leading African country in peace-keeping operations, regional bodies, military and economic strength. However, political corruption, a lack of economic diversity and social mistrust between groups continuously undermines Nigeria's prospects for stability, security, and sustainable growth.

[4] All information is approximate based upon open source data and assumptions and future dredging projects.

[5] I All information is approximate based upon open source data and assumptions and future dredging projects.

2. Background

Nigeria has a long history of supporting peace-keeping operations throughout the world. In African, the country uses its leadership positions in the Economic Community of West African States and the African Union to support United Nations' resolutions in Africa. As a result of continued international deployments, the NAF maintains a relatively high level of operational level proficiency over its African brethren. Much of Nigeria's political and military strength evolved from the country's possession of vast oil and natural gas reserves. These reserves not only provide 95% of the government of Nigeria's (GON) revenue, but they also contribute to violence throughout the Niger Delta region, in southern Nigeria.

Oil theft and pipeline destruction are common occurrences in the Niger Delta. A complex matrix of ethnic, tribal, criminal and community violence and government corruption result in the use of oil to settle old political and personal scores. Financial windfalls, from oil related theft and destruction provide useful funds in arming and recruiting youth in depressed communities and slums. Nigeria's dependence on oil for a preponderance of its revenues makes oil related violence not only a threat to domestic stability and tranquility but can also pose an existential threat to the Nigerian government, if political patronage fails to successfully manipulate competing violent actors. Violence is also common throughout the southern coast at large, as corrupt politicians and criminal actors utilize city slums, disenchanted youth and traditional tribal; ethnic and community tensions to increase their political and criminal power. Underlying the threat to these tensions is Nigeria's rising youth bulge: a plentiful reserve of potential armed insurgents.

APPENDIX C. COCOM RESOURCE POOL AND EVOLUTION

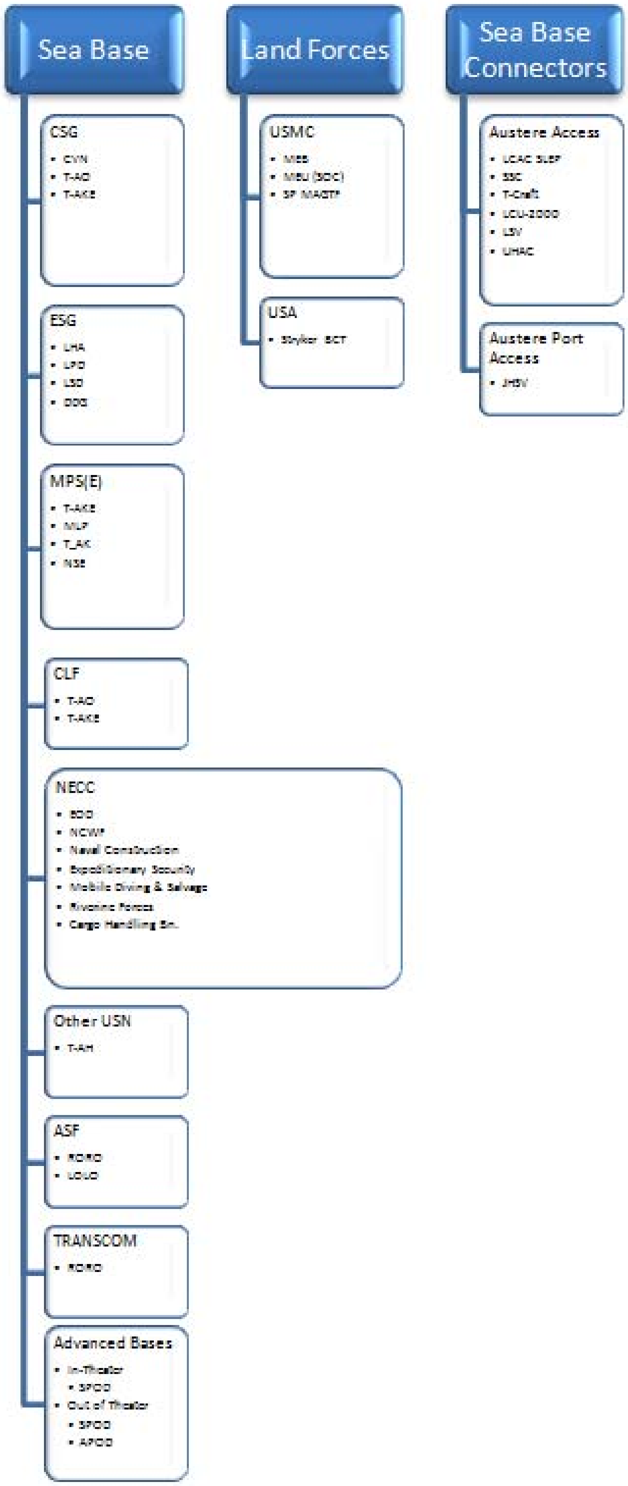


Figure 45. Assumed External and SBCS Component Utilization for the HA/COIN

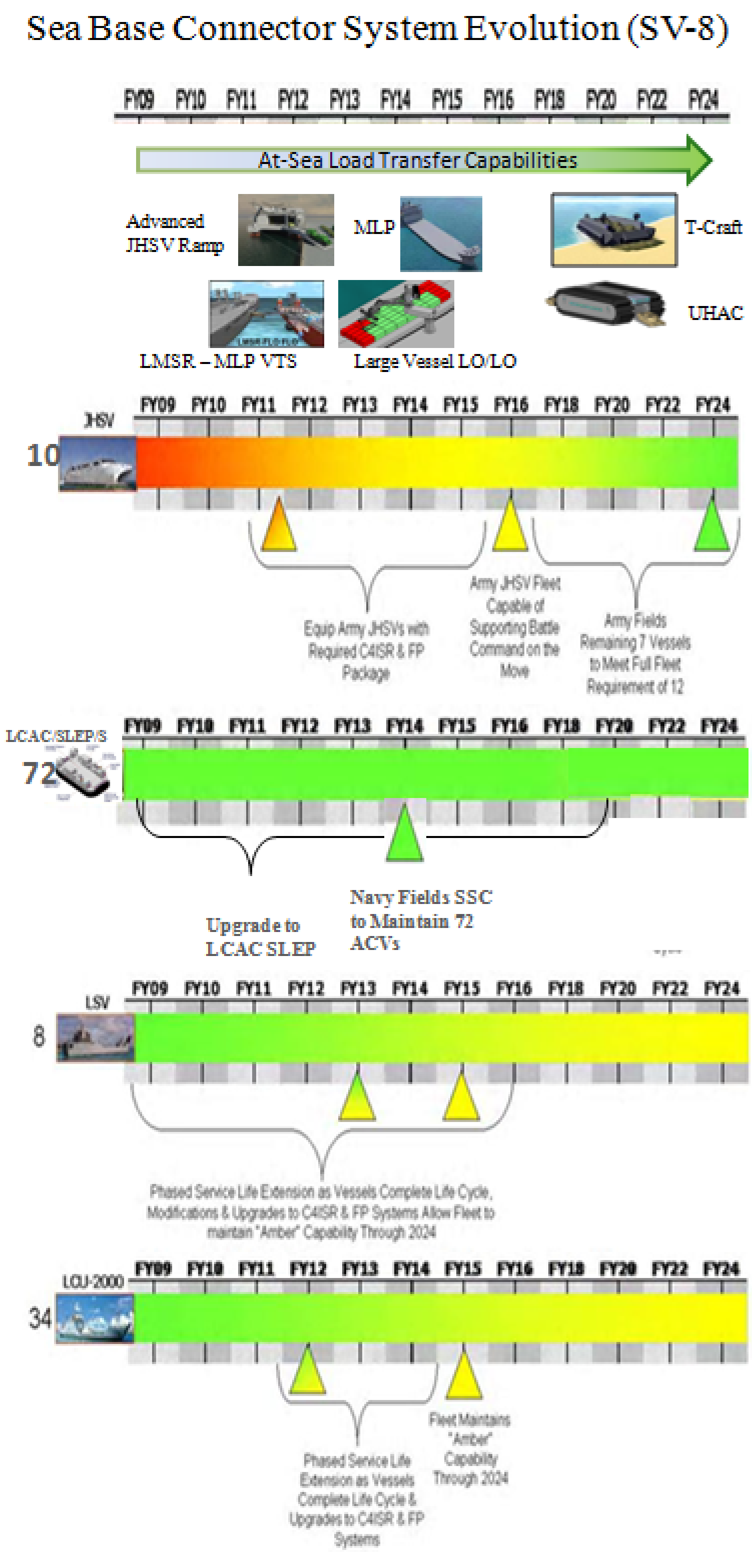


Figure 46. The Current Plan of SBCS Evolution (After U.S. Army Transportation Office, 2008)

APPENDIX D. STRATEGIC LEVEL CONOPS

A. ASSEMBLY/EMPLOYMENT PHASES

1. Delta Consumable Cargo

Configured units of humanitarian assistance cargo. Provide class 1, 2, 6, & 8 cargo. Cargo meets tasking requirements of delivering food, water, medicine, clothes, shelter, and supplies.

Items are compiled from amphibious shipping initially and then T-AKE shuttle ships. Cargo may also be provided indirectly from amphibious shipping/T-AKE cranes to an intermediate platform that is capable of acting as a skin-to-skin assembly area (MLP, T-Craft). Consumable items are delivered to Warri or distributed to multiple sites along the western bank of the Niger, Warri, or Forcados rivers.

2. Delta Medical/Vet Providers

Medical/Veterinarian staffs are provided from the fly-in forces dispersed via aerial assets to the Sea Base and made available through aerial PAX to amphibious shipping. All MEDEVACs in the assembly phase will be removed via airlift or routine consumable transports.

The medical equipment and complementary supplies are equipped from the MPS(E) AK-3016 vessel's Naval Expeditionary Medical Support System (NEMMS) either directly or indirectly. The AK-3016, with its maneuverable stern gate and SS3 crane can deliver skin-to-skin to a SBC or the MLP. This is a one-time on load during the assembly phase. Veterinary animal specific equipment and supplies will be transferred with the staff via amphibious shipping. Temporary medical camps will be established and supplied in the city of Warri or in multiple sites along the western bank of the Niger, Warri, or Forcados rivers.

3. Delta Infrastructure Repair

The MPS(E) AK-3016 vessel's prepositioned Naval Mobile Construction Battalion (NMCB) equipment and supplies can be provided via the maneuverable stern ramp to a SBC. Use of the MPS(E) crane may be available for some of the lighter vehicles. Prepositioned equipment may be used by accompanying Naval Construction Battalions or USA Core of Engineers forward deployed in Forward Engineering Support Teams.

The Naval Construction Division is assumed to be provided via amphibious shipping. The division consists of the Naval Construction Regiment (NCR), Naval Mobile Construction Battalion (NMCB), and Underwater Construction Teams (UCT). These forces will be transferred via amphibious shipping. Both the prepositioned NMCB and amphibious shipping is anticipated to provide class 4 cargo/equipment for enabling infrastructure repair of the port of Warri.

The follow-on Amphibious Co*nstruction Battalion (ACB) is not assumed to be available until the Sustainment phase.*

4. Delta Force Projection

Force projection is the MC personnel and equipment originating from the amphibious shipping. Prepositioned vehicles, supplies, fuel, and munitions are provided from the AMSEA class AK–3008/9 via a stern ramp discharge or 29 ton crane. An at-sea assembly area is preferred, but not required for administrative offload of vehicles and cargo. MC personnel, limited petroleum products, and supplies are available amphibious shipping and can be offloaded via well-deck operations, ship crane, or INLS/LMCS configuration. The core of force projection will be the NECC forces employed to provide initial SAR assistance of the Delta region and continued security for the SBC lines-of-communication within the Warri and Niger waterways. Additional force projection forces will provide local security of HA aid distribution that occurs during the day and will be transported back to afloat vessels overnight.

5. Delta NEO/SAR

Given the regional flooding of the state of Delta, SAR operations need to be conducted by small boats co-located with an afloat station. The rain forest region of Delta state is anticipated to be very difficult to transit especially at increasing ranges from the city landscape of the city of Warri. Pockets of Nigerian citizens in distress are anticipated to be located in areas on the outskirts of the Delta region in difficult to access areas even without above normal flooding. Some areas within the city and inland rivers are anticipated to be accessible by ACVs and primarily limited by size. The task is achieved by employing Army or Navy Riverine forces that posses the initial capability to assist aerial assets in SAR, but conduct follow-up river security of surface craft communication lines between the sea and upriver distribution points. While Al-Qaida does not pose a direct threat to Delta operations in support of HA, the vulnerability of the U.S. forces in this environment exists and the opportunities to strike are abundant.

The Navy Riverine Forces could be provided from many sources. If CONUS forces are surged from the east coast Riverine forces and their equipment would be transported via the CVN, amphibious shipping, or airlifted to destinations such as Lome. If provided from deployed forces, such as currently in Iraq, the Riverine forces would be expected to be air lifted. Relocating the Army/Navy's Small Unit Riverine Craft (SURC) can be accomplished as a boat/trailer unit via CH-53 or independently with the trailer unit being limited to skin-to-skin or crane deployment or SH delivery. The SURC are capable of being recovered in trailer to LCAC/SSC craft or hoisted onto the JHSV. T-Craft is anticipated to have similar bow/stern ramp characteristics as the SSC that allow recovery onto a trailer. NEO personnel will transported to logistic distribution centers such as Warri or Port Harcourt for placement into IDP camps.

Figure 47. Operational Level CONOPS of Delta Assembly/Employment by Naval and Joint SBCs. Fouling of Inland Waterways Restricts Access to Non-Amphibious Vessels.

B. SUSTAINMENT (EARLY)

1. Delta Consumables (Palletized)

Palletized consumables are sourced from amphibious shipping and GO/NGO providing HA relief supplies. Within the CONOPS amphibious shipping conducts a logistics circuit to load palletized consumable cargo from the deep water ports of Lome and Sao Tome. This palletized cargo in the advanced port facilities by civilian or MSC provided LMSR or cargo ships and the containerized cargo is broken out and palletized in Naval, Army, or contracted host nation facilities. Palletized cargo is loaded via LOTS operations, as allowed by the in-harbor sea conditions, from typical commercial international relief agency shipping vessels. These vessels are typically older, medium draft vessels equipped with organic rigging for shore offloading into austere ports. In combination with vessels equipped with dynamic positioning systems higher sea state offloading could feasibly occur.

2. Delta Consumables (Containerized)

Containerized cargo is sourced from NGO/GO and MSC owned or contracted LOLO vessels. Skin-to-skin container transfer via crane would occur to recipient or intermediate platforms ideally in low sea state harbor operations. As container offloading will be limited by offload areas, recipient or intermediate platforms must possess a container Material Handling Equipment (MHE). While this is available in many methods it could occur in at least these manners. 1) Onboard MHE stacking containers for at-sea transport or onto MK14 LVSR trailers. 2) Direct loading onto USMC MK14 container trailers. 3) Indirect loading of containers from unloading area onto the MK48/18 (self-loading) LVSR. All combinations could occur with the Army's LVSR equivalent capability trucking.

3. Delta Force Support

Force support is the MC personnel and equipment originating from the amphibious shipping. Prepositioned vehicles, supplies, fuel, and munitions are provided from the AMSEA class AK–3008/9 via a stern ramp discharge or 29 ton crane. An at-sea assembly area is preferred, but not required for administrative offload of vehicles and cargo. MC personnel, limited petroleum products, and supplies are available from amphibious shipping and can be offloaded via well-deck operations, ship crane, or INLS/LMCS configurations. The core of force projection will be the NECC forces employed to provide initial SAR assistance of the Delta region and continued security for the SBC lines-of-communication within the Warri and Niger waterways. Additional force projection forces will provide local security of HA aid distribution that occurs during the day and will be transported back to afloat vessels overnight.

4. Delta MEDEVAC

The first line of medical aid and triage will be performed at shore locations dispersed within the IDP camps within the Delta. Medical emergencies that are beyond the capability of the shore assets will be transported to the T-AH medical ship, ESG, or CSG. The T-AH vessels primarily receive cases from helicopter personnel exchanges although small boat transfers do occur. However, large groups of non-emergency cases may be transported via surface connectors equipped with surface connectors ideally capable of helicopter personnel transfers.

5. Delta Priority Transport

Priority transport includes high speed surface movement of personnel, low risk MEDEVACs, and essential parts to and from the Sea Base. High speed and medium capacity transport acts to alleviate the medium-range shipment of such items within the theater. While typical medium range shipments are conducted by COD/VOD aircraft, these surface connectors provide a short to medium duration alternative. This transfers some of the logistics deployment and distribution requirements from the CVN directly to any of the amphibious shipping vessels without the use of as many intermediate transfer assets. Priority transport is to and from advanced bases equipped with major airports such as Lome and Sao Tome. Such efforts would create another layer of distribution options for personnel transfers, MEDEVAC, and essential parts that currently can only be achieved with aerial assets.

Figure 48. Operational Level CONOPS of Delta early Sustainment by Naval and Joint SBCs. Fouling of Inland Waterways Restricts Access to Non-Amphibious Vessels.

APPENDIX E. OPERATIONAL/PHYSICAL CONTEXT DIAGRAMS (OV-2, SV-1, AND SV-3A)

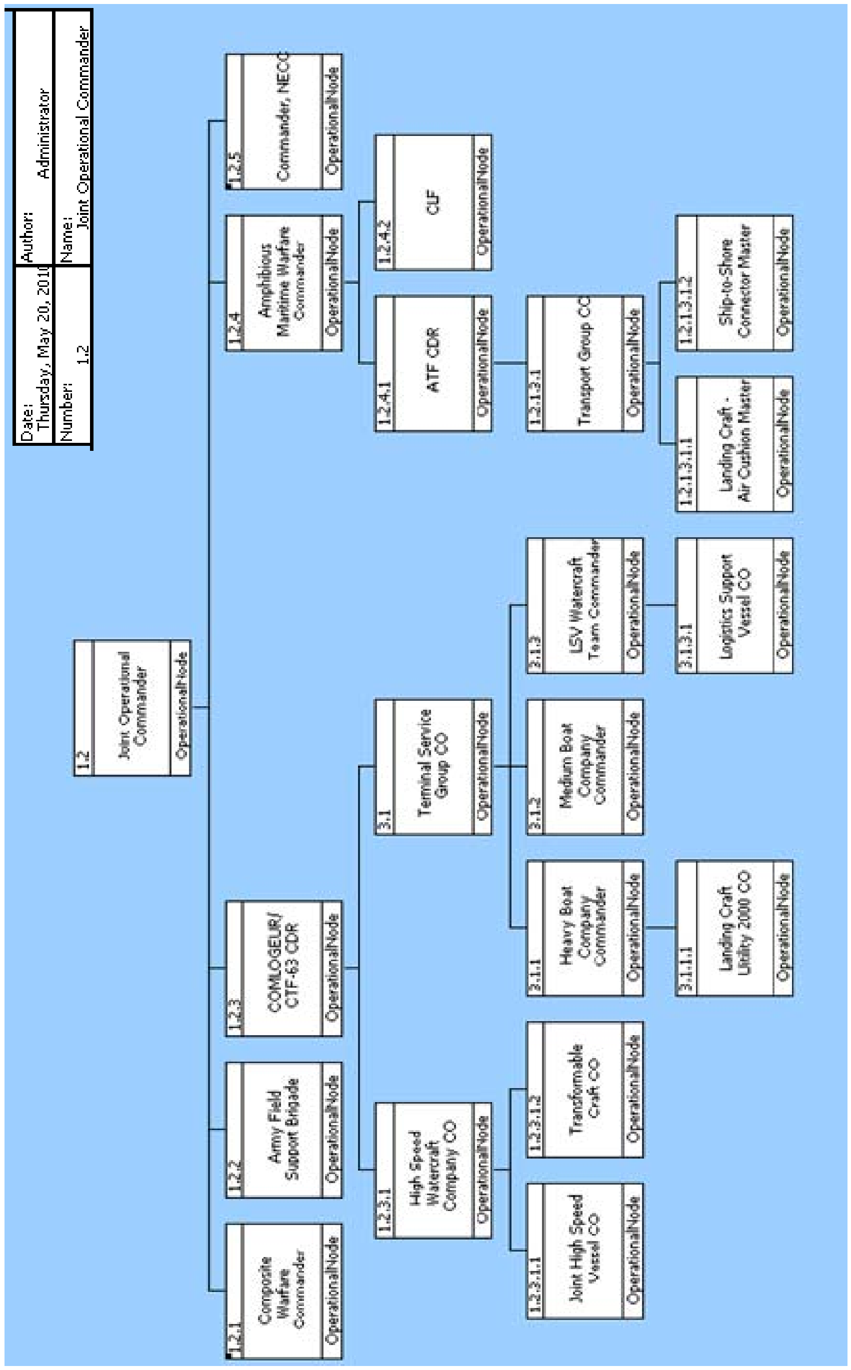


Figure 49. All of the defined SBCS Defined Operational Nodes are within the Joint Operational Commander Node

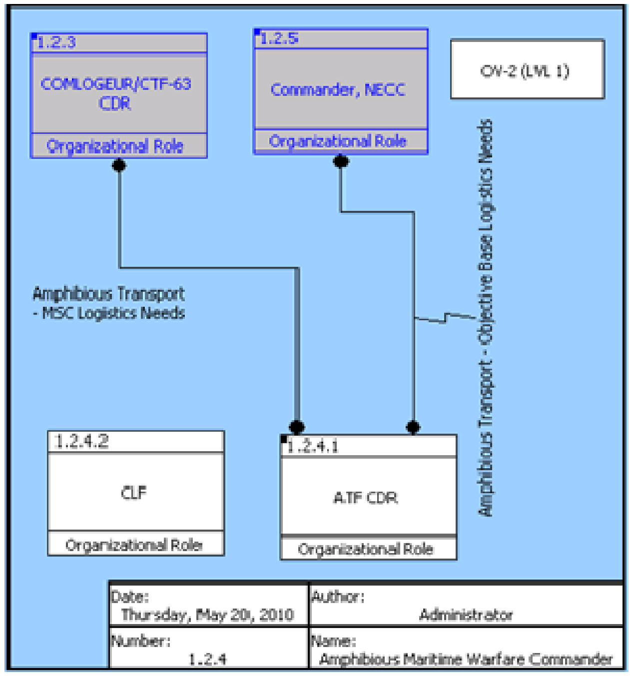


Figure 50. OV-2 Depicting the Need Lines Between Internal SBCS Nodes

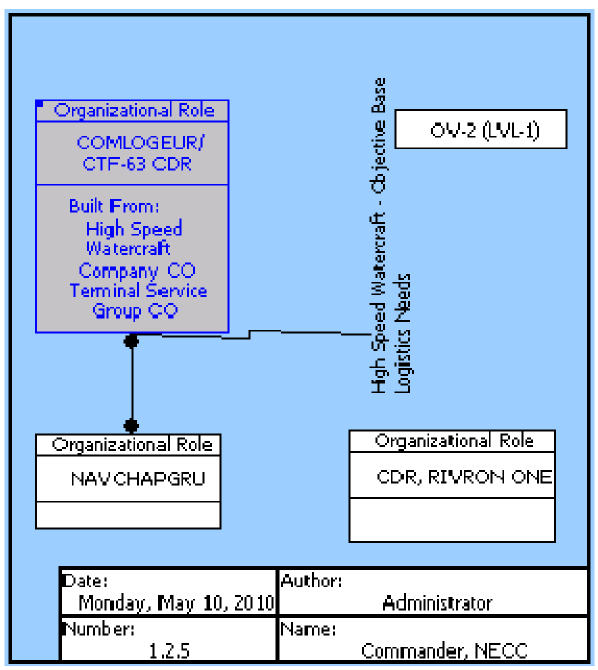


Figure 51. NECC Commander Nodes OV-2 Depicting Need Lines Between Internal SBCS Nodes

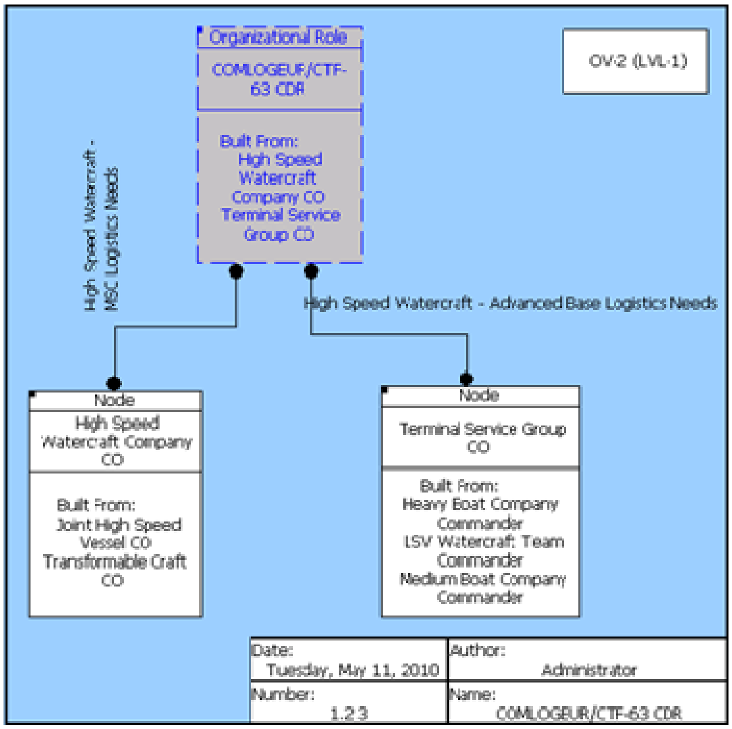


Figure 52. Regional MSC, COMLOGEUR/CTF-63, OV-2 Depicting Need Lines Between Internal SBCS Nodes

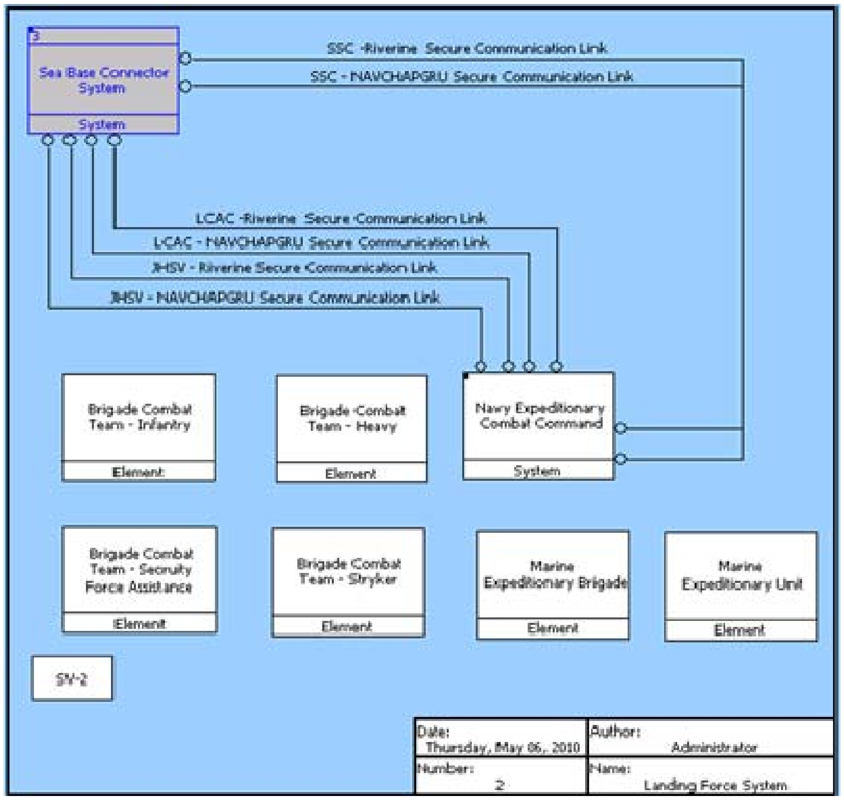


Figure 53. SBCS General Linkage Descriptions to the External Landing Force System (SV-2)

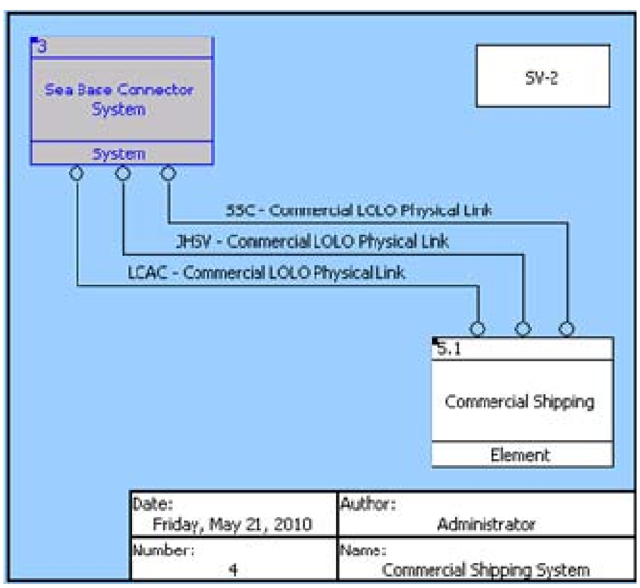
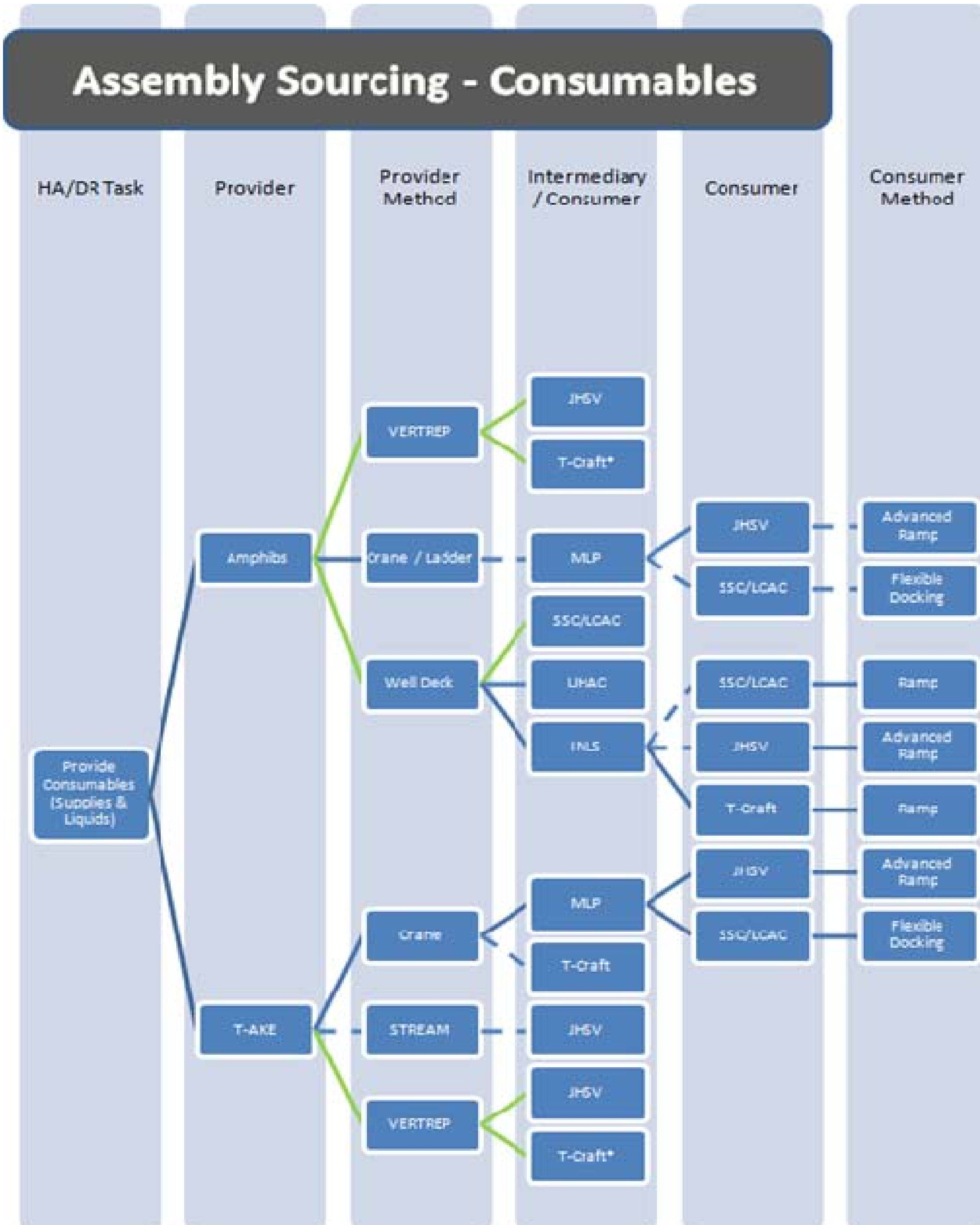
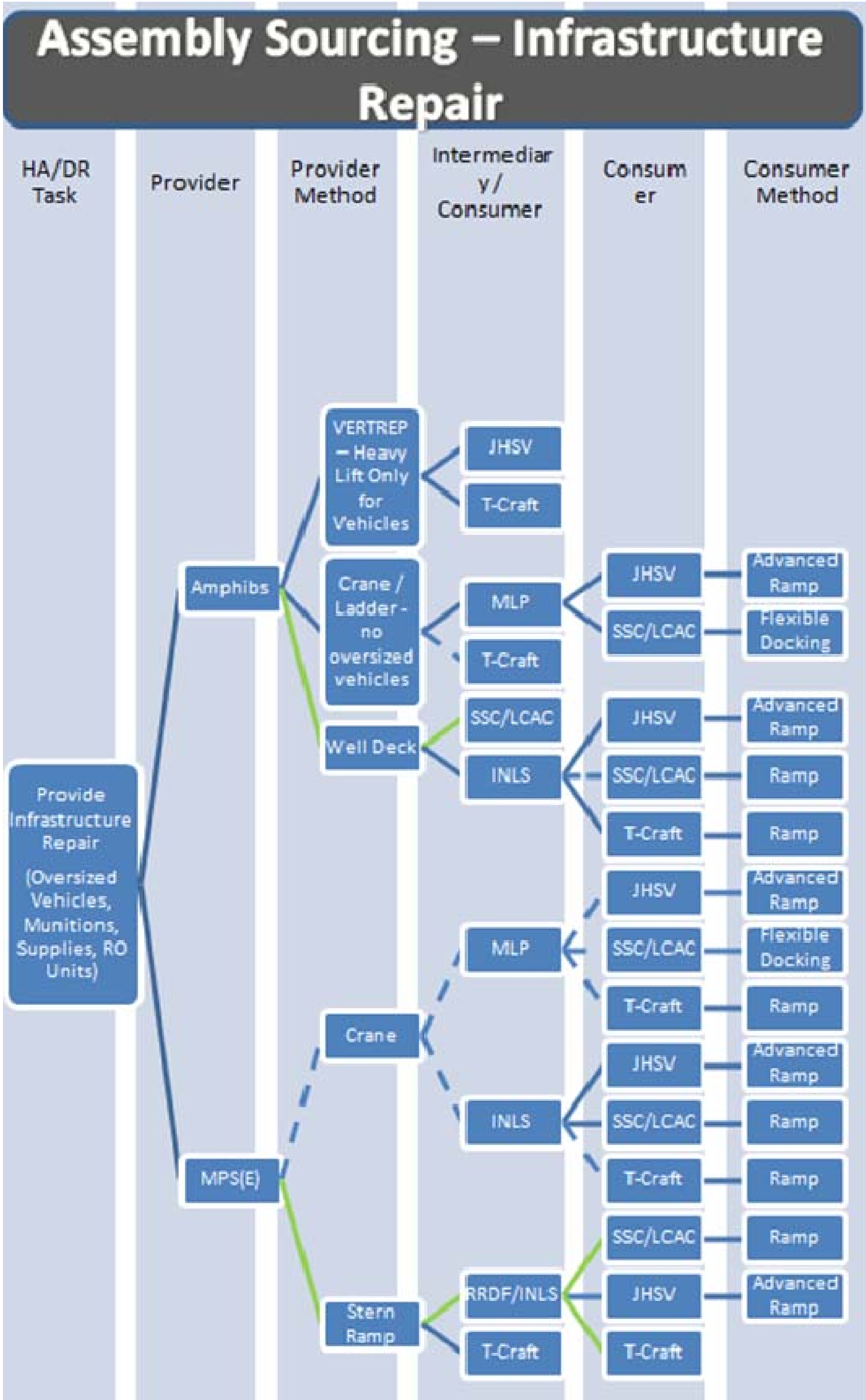


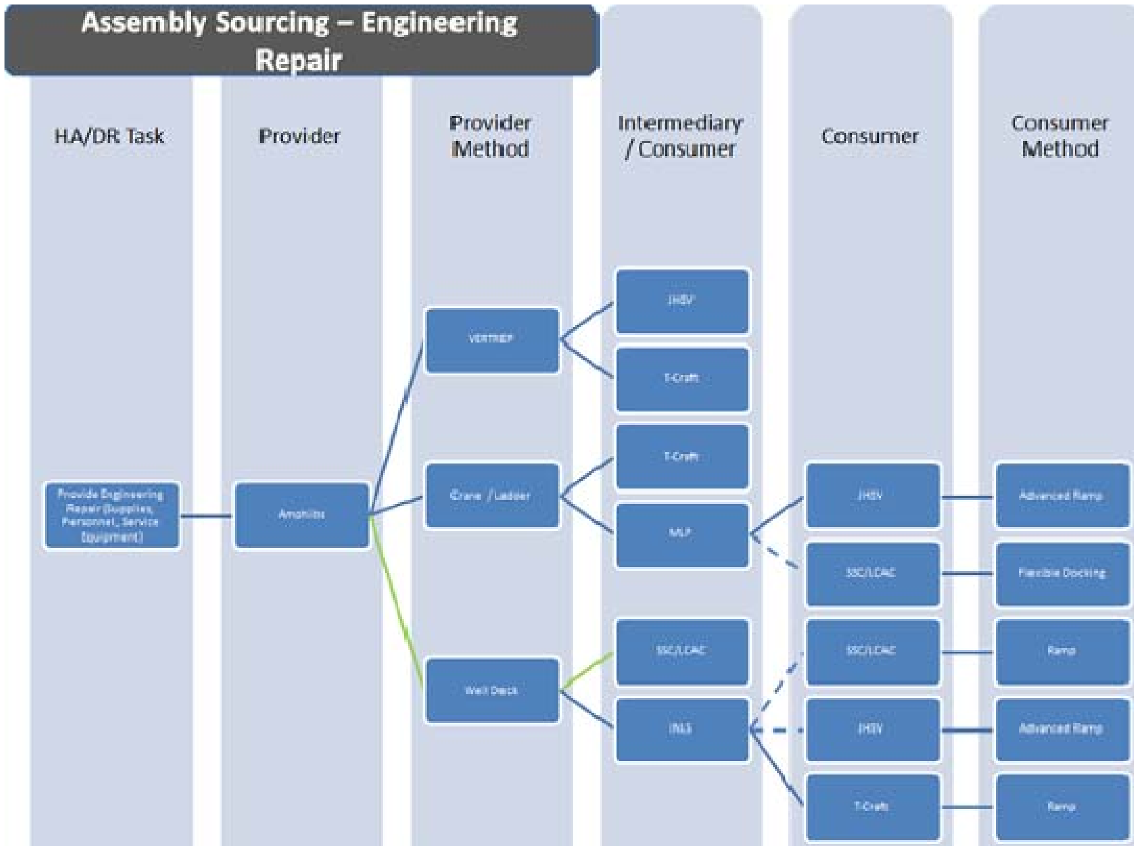
Figure 54. General Linkage Descriptions to the External Commercial Shipping System. Note That These Physical Linkages Only Occur in the Sustainment LOO Phase (SV-2).

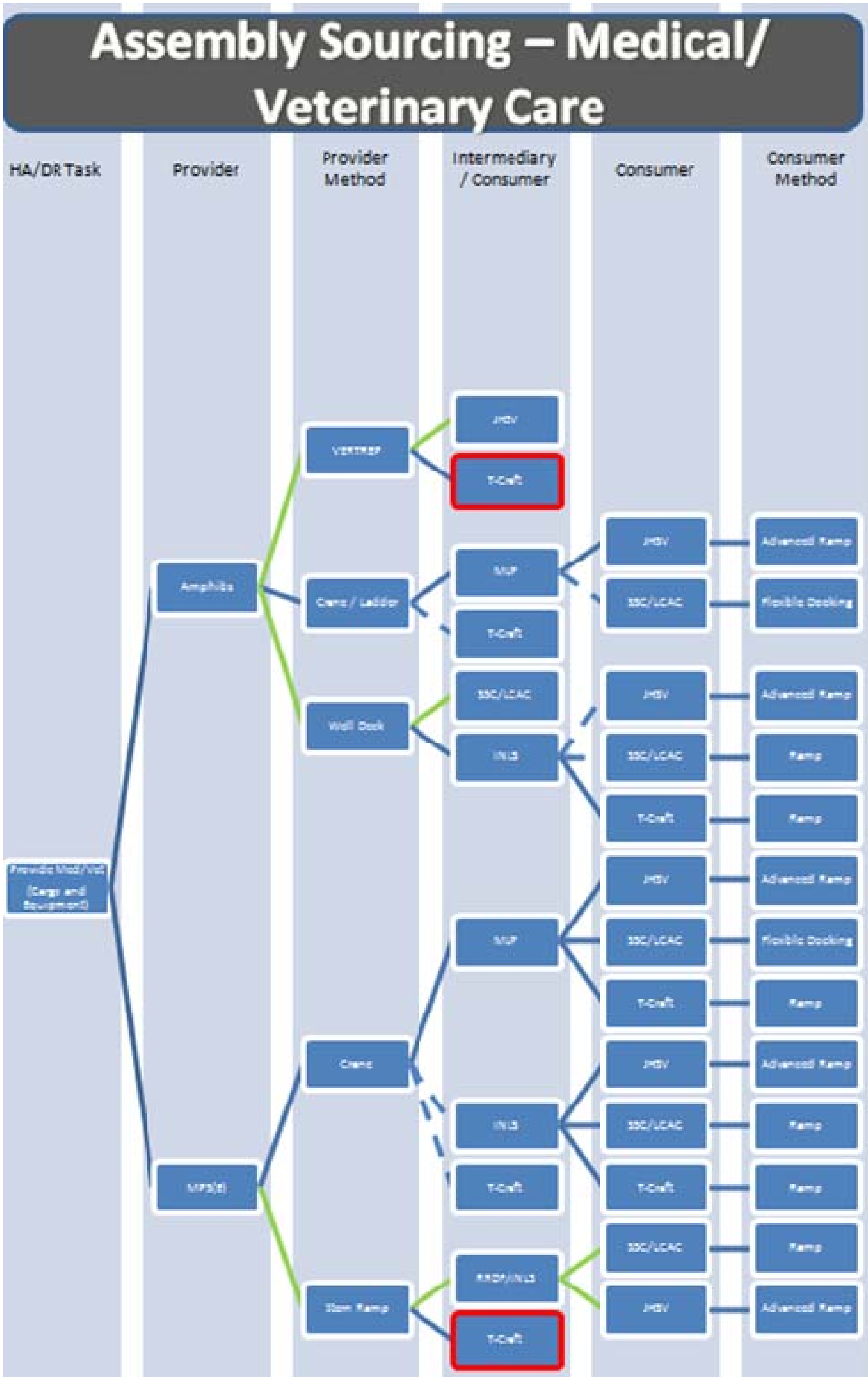
APPENDIX F. RESOURCE EXCHANGE DIAGRAMS (OV-3)

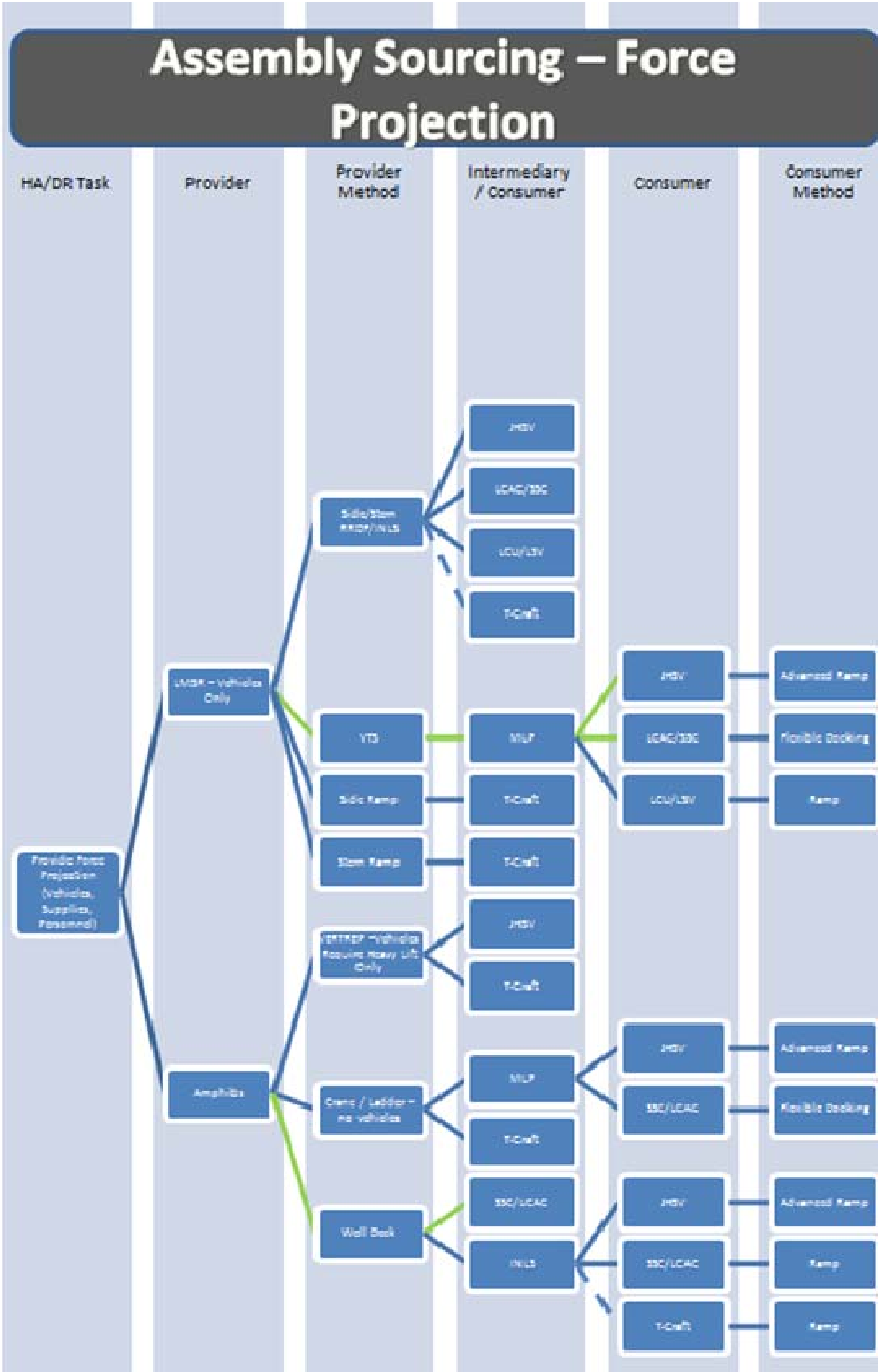




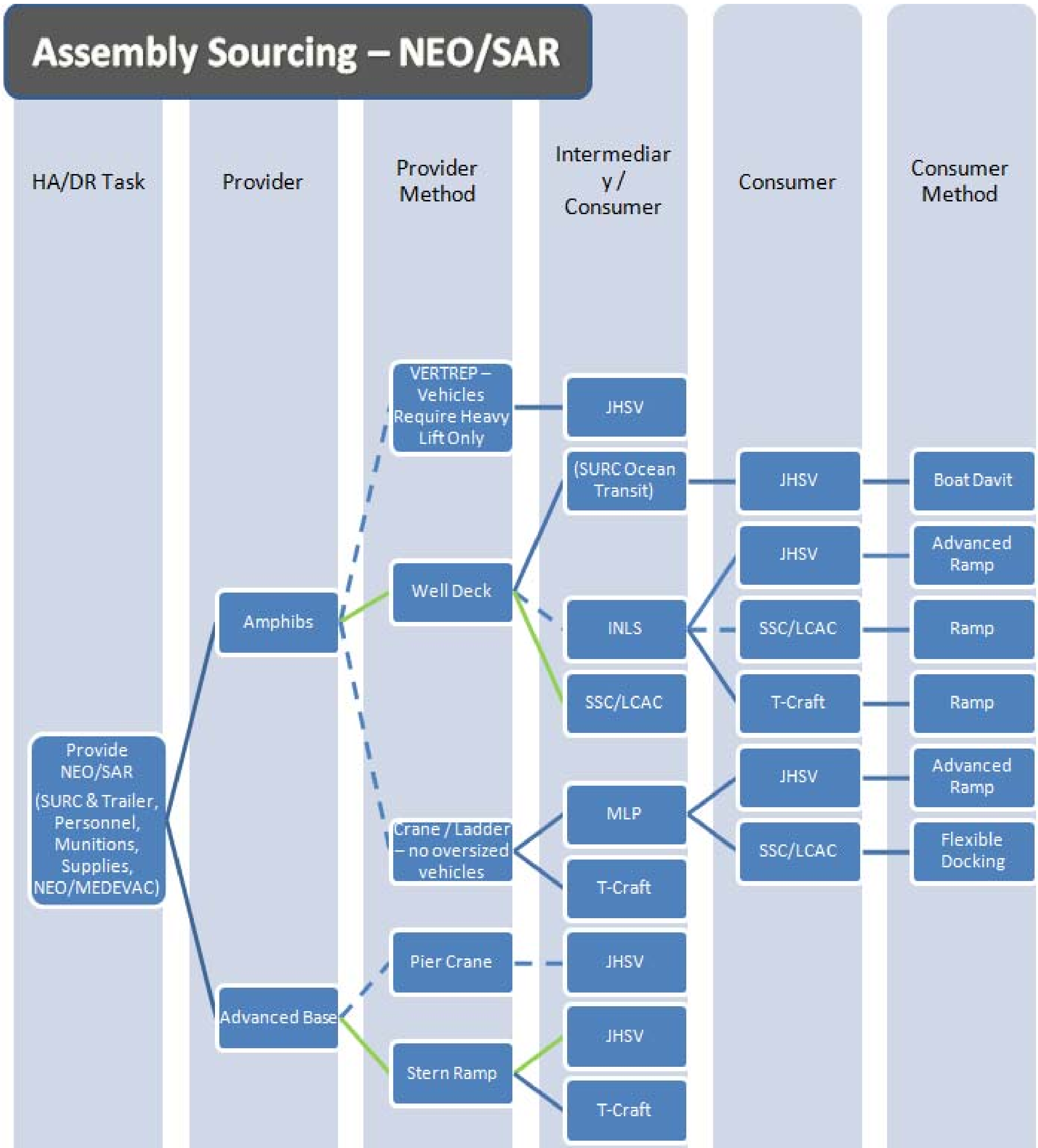
Assembly Sourcing – Infrastructure Repair
HA/DR Task
Provider
Provider Method
Intermediary/ Consumer
Consumer
Consumer Method
Provide Infrastructure Repair (Oversized Vehicles, Munitions, Supplies, RO Units)
Amphibs
MPS(E)
VERTREP – Heavy Lift Only for Vehicles
Crane / Ladder - no oversized vehicles
Well Deck
Crane
Stern Ramp
JHSV
T-Craft
MLP
T-Craft
SSC/LCAC
INLS
MLP
INLS
RRDF/INLS
T-Craft
JHSV
SSC/LCAC
JHSV
SSC/LCAC
T-Craft
JHSV
SSC/LCAC
T-Craft
JHSV
SSC/LCAC
T-Craft
SSC/LCAC
JHSV
T-Craft
Advanced Ramp
Flexible Docking
Advanced Ramp
Ramp
Ramp
Advanced Ramp
Flexible Docking
Ramp
Advanced Ramp
Ramp
Ramp
Ramp
Advanced Ramp


Assembly Sourcing – Engineering Repair
HA/DR Task
Provider
Provider Method
Intermediary / Consumer
Consumer
Consumer Method
Provide Engineering Repair (Supplies, Personnel, Service Equipment)
VERTREP
Crane / Ladder
Well Deck
JHSV
T-Craft
T-Craft
MLP
SSC/LCAC
INLS
JHSV
SSC/LCAC
SSC/LCAC
JHSV
T-Craft
Advanced Ramp
Flexible Docking
Ramp
Advanced Ramp
Ramp

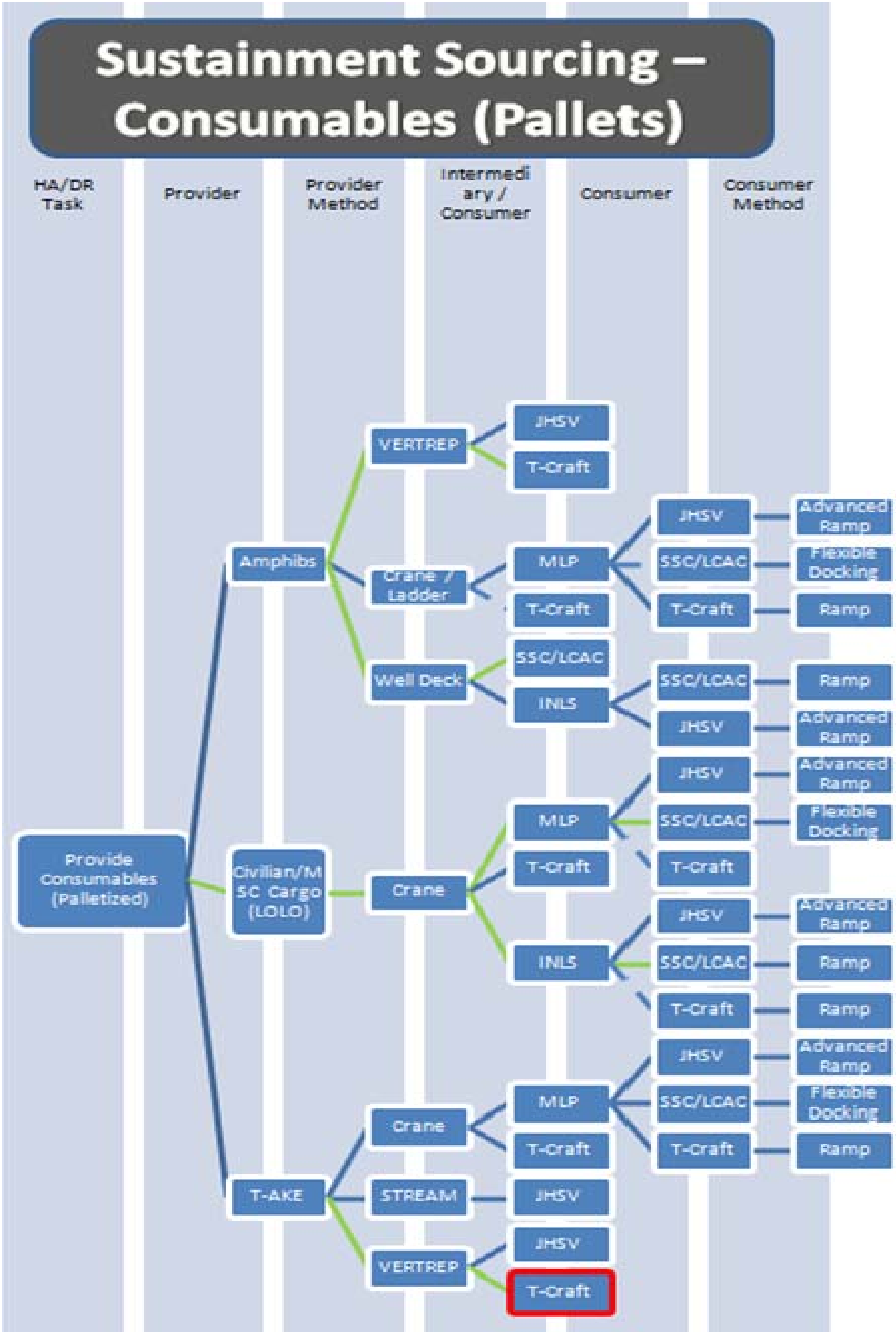

Assembly Sourcing – Medical/ Veterinary Care
HA/DR Task
Provider
Provider Method
Intermediary / Consumer
Consumer
Consumer Method
Provide Med/Vet (Cargo and Equipment)
Amphibs
MPS(E)
VERTREP
Crane / Ladder
Well Deck
Crane
Stern Ramp
JHSV
T-Craft
MLP
SSC/LCAC
INLS
RRDF/INLS
Advanced Ramp
Flexible Docking
Ramp



Assembly Sourcing – Force Projection
HA/DR Task
Provider
Provider Method
Intermediary / Consumer
Consumer
Consumer Method
JHSV
LCAC/SSC
LCU/LSV
T-Craft
VTS
MLP
Side Ramp
Stern Ramp
Advanced Ramp
Flexible Docking
Ramp
Amphibs
Crane / Ladder – no vehicles
Well Deck
SSC/LCAC
INLS



Assembly Sourcing – NEO/SAR
HA/DR Task
Provider
Provider Method
Intermediary / Consumer
Consumer
Consumer Method
Provide NEO/SAR (SURC & Trailer, Personnel, Munitions, Supplies, NEO/MEDEVAC)
Amphibs
Advanced Base
VERTREP – Vehicles Require Heavy Lift Only
Well Deck
Crane / Ladder – no oversized vehicles
Pier Crane
Stern Ramp
JHSV
(SURC Ocean Transit)
INLS
SSC/LCAC
MLP
T-Craft
JHSV
JHSV
T-Craft
JHSV
JHSV
SSC/LCAC
T-Craft
JHSV
SSC/LCAC
Boat Davit
Advanced Ramp
Ramp
Ramp
Advanced Ramp
Flexible Docking



Sustainment Sourcing – Consumables (Pallets)
HA/DR Task
Provider
Provider Method
Intermediary / Consumer
Consumer
Consumer Method
Provide Consumables (Palletized)
Amphibs
Civilian/MSC Cargo (LOLO)
T-AKE
VERTREP
Crane / Ladder
Well Deck
Crane
Crane
STREAM
VERTREP
JHSV
T-Craft
MLP
T-Craft
SSC/LCAC
INLS
MLP
T-Craft
INLS
MLP
T-Craft
JHSV
JHSV
T-Craft
JHSV
SSC/LCAC
T-Craft
SSC/LCAC
JHSV
JHSV
SSC/LCAC
T-Craft
JHSV
SSC/LCAC
T-Craft
JHSV
SSC/LCAC
T-Craft
Advanced Ramp
Flexible Docking
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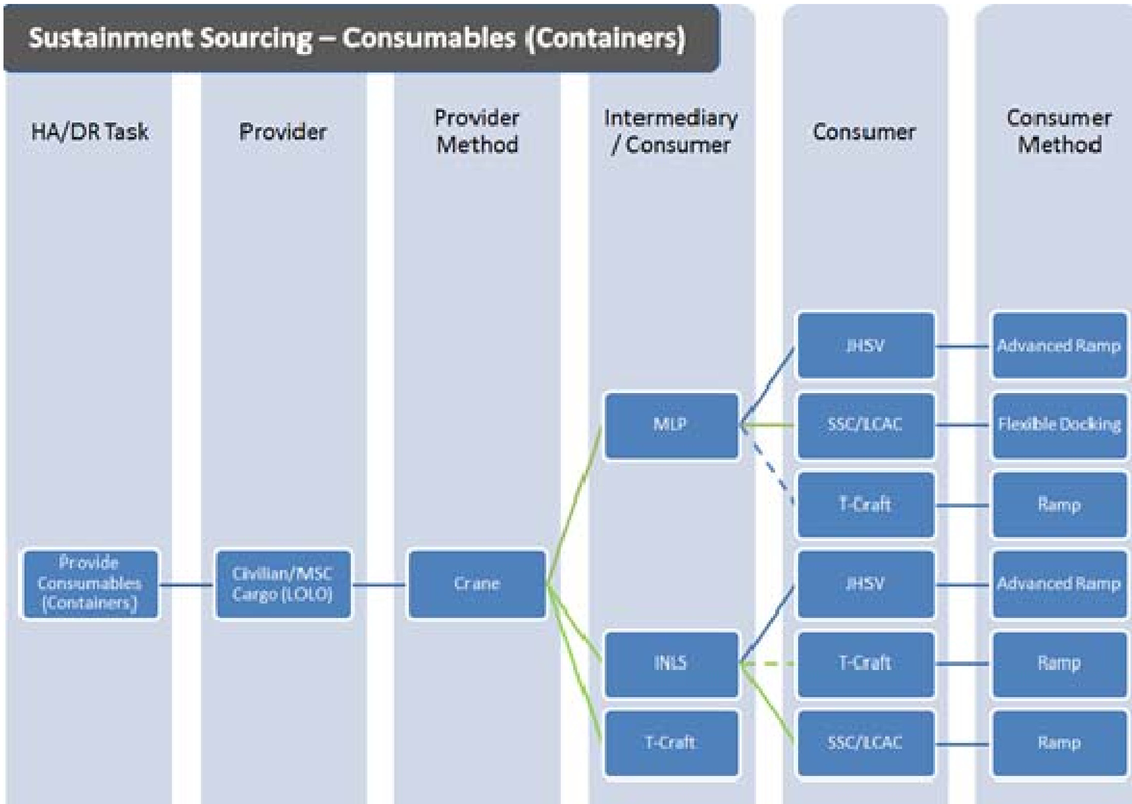
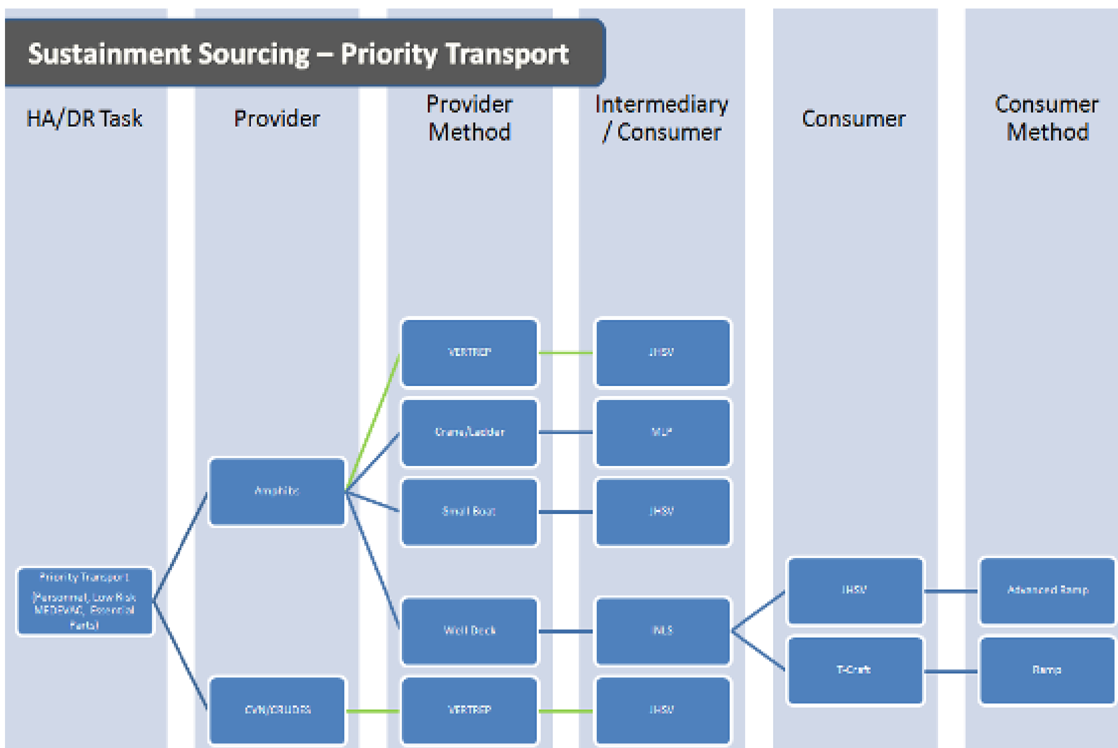
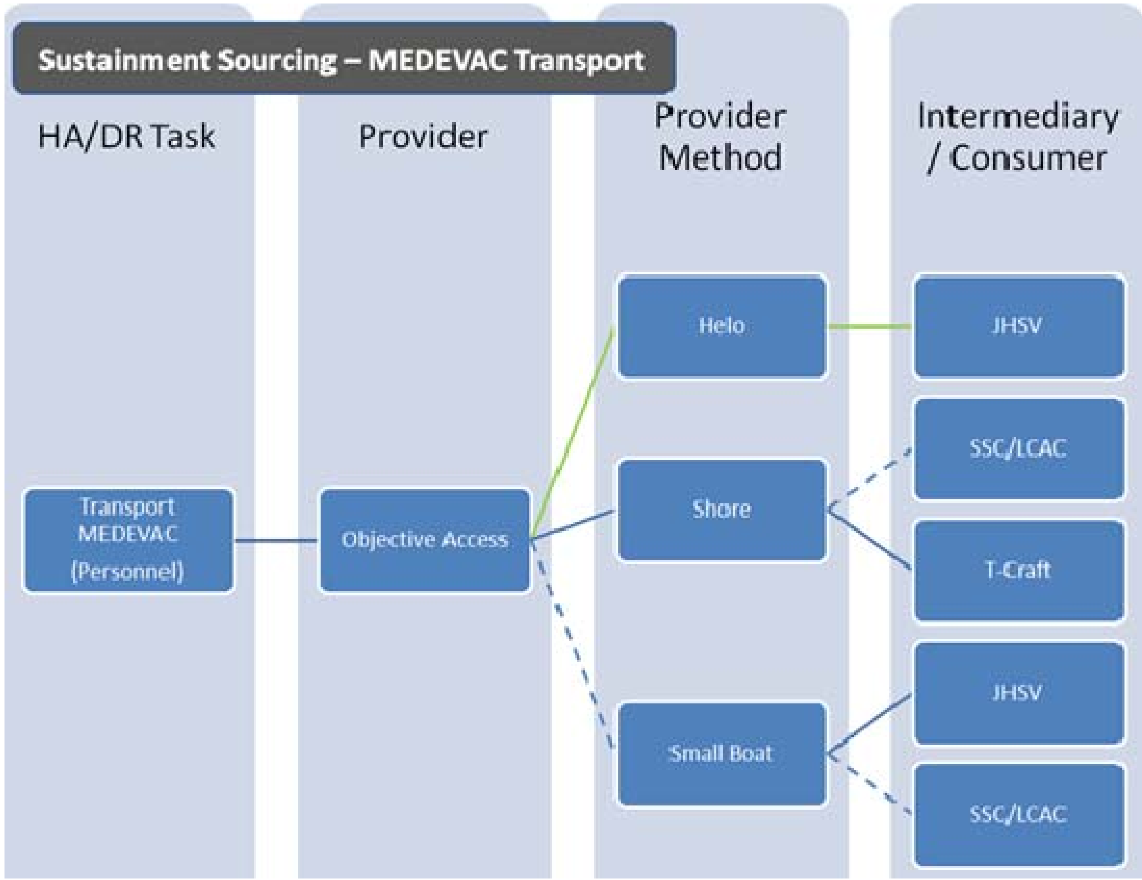
Advanced Ramp
Flexible Docking
Ramp


Sustainment Sourcing – Consumables (Containers)
HA/DR Task
Provider
Provider Method
Intermediary / Consumer
Consumer
Consumer Method
Provide Consumables (Containers)
Civilian/MSC Cargo (LOLO)
Crane
MLP
INLS
T-Craft
JHSV
SSC/LCAC
T-Craft
JHSV
T-Craft
SSC/LCAC
Advanced Ramp
Flexible Docking
Ramp
Advanced Ramp
Ramp
Ramp


Sustainment Sourcing – Priority Transport
HA/DR Task
Provider
Provider Method
Intermediary / Consumer
Consumer
Consumer Method
Priority Transport
(Personnel, Low Risk MEDEVAC, Essential Parts)
CVN/CRUDES
VERTREP
Crane/Ladder
Small Boat
Well Deck
VERTREP
JHSV
MLP
JHSV
INLS
JHSV
JHSV
T-Craft
Advanced Ramp
Ramp



Sustainment Sourcing – MEDEVAC Transport
HA/DR Task
Provider
Provider Method
Intermediary / Consumer
Transport MEDEVAC (Personnel)
Objective Access
Helo
Shore
Small Boat
JHSV
SSC/LCAC
T-Craft
JHSV
SSC/LCAC

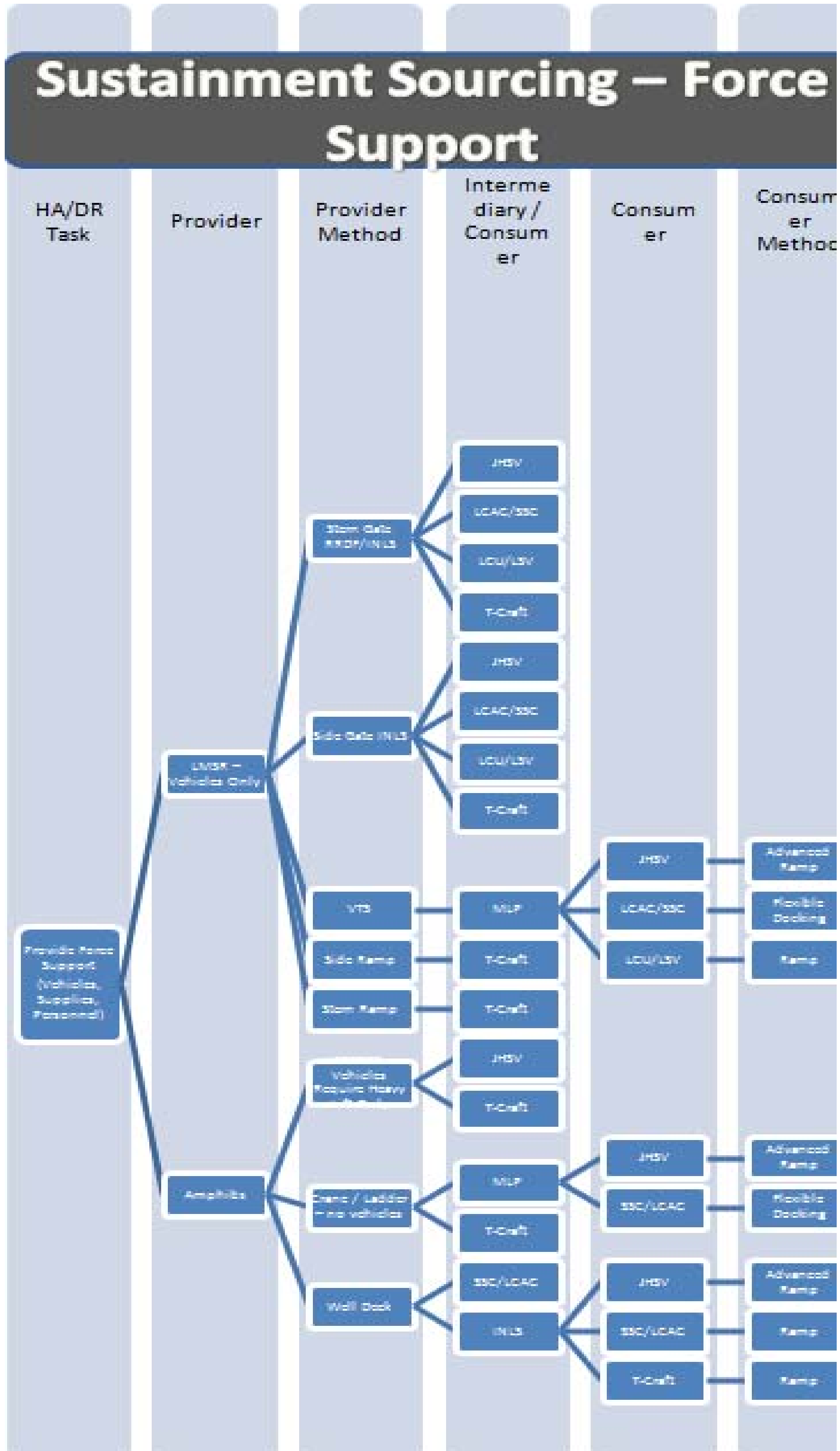


Figure 55. Resource Exchange Diagrams

APPENDIX G. OPERATIONAL ACTIVITY HEIRARCHY DESCRIPTIONS (OV-5)

Element	Definition
Operational Activity	
1 Provide Delta State Aid	Delta State Narrative "The GON is lacking resources and manpower to effectively manage the situation in the state of Delta. GON requests international assistance to provide crisis aid to distributed locations within the flooded state of Delta. The flooding has extended beyond the traditional Niger flood plains and has since displaced large numbers of people. International forces are asked to deliver food, water, medicine, shelter and other supplies. - Provide veterinary and medical services. - Repair damaged infrastructure/general engineer support. - Evacuate people from flood areas" (U.S. Marine Corps Wargaming Division & Marine Corps Warfighting Laboratory, 2010). Delta state's main harbor is Warri. While Warri typically provides an austere port access, it is inaccessible due to flooding and therefore will be considered to only provide austere access likely to a concrete pier or quay wall. No port provided offloading capability is assumed. The austere access point of Port Warri is located approximately 60 nm from the Escravos River outlet. The Benin River access is "via Escravos River navigable up to Sapele/Channel [with a] width no further info x 6.1 m deep; can handle ships up to 500 ft in length with a 4.9m draft" (U.S. Marine Corps Wargaming Division & Marine Corps Warfighting Laboratory, 2010). However, the river system and adjacent planes are flooded and contain large amounts of debris that make the river and flood plains inaccessible by propeller vessels.
1.1 Provide Delta State NEO & SAR	Tasking Evacuate 1,100 people from flood areas. Narrative It is assumed that these people are distributed across the flood plain area in highly inaccessible locations likely distant from the city center. The Warri is primarily a rain forest region; however, the city is considered to be abundant with cleared areas common of city landscapes. While some of the more difficult to access locations can be accomplished via aerial SAR the sheer number of personnel in the flood areas requiring evacuation results in the need for a means of conducting surface based SAR. Such a task is best accomplished mainly by small craft or in limited scenarios ACVs equipped with personnel carriers. This task is includes recovering personnel and delivering them to the distributed IDP camps in Delta state for temporary housing and health services and in a smaller scale delivery of personnel to the Sea Base. mph. The objective area accesses are austere and at-sea assembly is only constrained to taking on the Riverine Squadron's forces personnel, equipment, and vehicles initially for expanded SAR. As these forces are positioned on CONUS they will be transported in amphibious vessels or deployed in high speed craft from CONUS. The

Element	Definition
	personnel, cargo, and small boats, and trailers, are best transferred via direct well-deck operations or indirectly via intermediary transfer operations. The capable vessels need to be austere access capable and have no limitations on rigging (organic or not).
1.1.1 Transport Personnel and Cargo	To provide the means for and to transport personnel and/or cargo **(JP 1, 4-0, 4-01, 4-01.2, NDP 1, 4, NWP 4-01 Series).** M1 Number Passengers transported per day. M2 Percent Of passengers arrive on time at final destination. M3 Number Passengers stranded in transit each day.
1.1.2 Deploy/Conduct Maneuver	To move forces to achieve a position of advantage with respect to enemy forces. This task includes the employment of forces on the battlefield in combination with fire or fire potential. Maneuver is the dynamic element of combat, the means of concentrating forces at the decisive point to achieve the surprise, psychological shock, physical momentum, and moral dominance which enables smaller forces to defeat larger ones. This task includes the movement of combat and support units **(JP 3-0, 3-01.1, 3-02.2, 3-03, 3-09, 3-50.21)** (JP 3-05, 3-05.3, 3-07.1, 3-15, 5-0, CJCSI 3202.01, CJCSM 3122.03A). Task expanded to include HA mobility in an uncertain environment.
1.1.3 Conduct Joint Personnel Recovery	Report, locate, support, recover, and repatriate isolated personnel to friendly control. Execution of the mission includes the full spectrum of PR personnel, weapons systems, and methods from benign recoveries in permissive environments to Combat Search and Rescue (CSAR) and Nonconventional Assisted Recovery (NAR). It is a requirement for components to conduct joint CSAR task force operations. Joint Doctrine specifies for components in a Joint Force, at the direction of the JFC, to provide specific CSAR capabilities to support joint CSAR operations (JP 3-50.2, 3-50.21). M1 Percent Of Personnel for which a designated mission has been approved are recovered. Service Tasks: AFT 2.3.1 Perform CSAR Functions. AFT 2.3.2 Perform CSAR Functions. ATM 5.30 Conduct Combat Search and Rescue (CSAR). ATM 3.5.2 Conduct Unconventional Warfare (UW). ART 2.6 Employ Survival, Evasion, Resistance, and Escape (SERE) Techniques. NTA 6.2.2 Perform Combat Search and Rescue (CSAR). NTA 6.2.3 Perform Rescue and Recovery in a Non-hostile Environment. NTA 6.2.4 Perform Combat Search and Rescue (CSAR).
1.1.4 Conduct Noncombatant Evacuation	Tactical operations involving land, sea and air forces to evacuate U. S. dependents, U. S. Government employees, and private citizens (U. S. and Third-country) from locations in a foreign country or HN to a designated area within the theater. Includes preparing evacuated personnel for follow-on repatriation to the United States or home nation-state **(JP 3-07).** M1 Percent Of personnel evacuated that were meant to be evacuated in accordance with the plan within 72 Hrs or other acceptable timeframe as determined by NEO commander. **Service Tasks:** AFT 4.4.1 Perform Special Operations Forces Employment Functions. AFT 6.5.1.4 Support External Organizations.

Element	Definition
	ATM 3.8 Perform Noncombatant Evacuation Operations (NEO). NTA 6.2.1 Evacuate Noncombatants from Area.
1.2 Provide Delta Food, Water, & Med.	<u>Task</u> - Deliver food, water, medicine, shelter and other supplies. <u>Narrative</u> SBCs conduct at-sea transfer of Class 1, 6, 8, and conduct temporary lashing of cargo for transit. If available, conduct package preparation for distribution while in-transit. May initially require the ability to transfer trucking capable of carrying palletized loads. Cargo classes are initially provided from amphibious ships and the CVN (VETREP). They are later sustained in the Assembly by T-AKE vessels supporting shuttle ship operations. An additional option is receipt of stores via VERTREP on the JHSV or T-Craft and could include follow-on intermediary transfer operations to other SBCS vessels.
1.2.1 Prepare Configured Loads	Configure a load at a supply activity for a user (FM 63-11) (CASCOM). ***No. Scale Measure*** 01 Yes/No Configured loads support the unit in accomplishing its mission. 02 Yes/No Procedures to prepare configured loads do not negatively impact on the supported unit's ability to accomplish its mission. 03 Time Required to develop or update plans to establish support operations after receipt of warning order. 04 Time Longevity of each type of projected mission in AO. 05 Percent Difference between planned and actual demand by supply line in AO. 06 Percent Of host-nation support available in AO. 07 Number Of personnel in AO requiring support. 08 Number And type of vehicles requiring support in AO. 09 Number Of composite items within a single request for each type of unit in AO. 10 Number And type of weapons systems and other equipment in each supported unit that require resupply. 11 Number Of rounds of ammunition each weapon system in the supported unit consumes per mission. 12 Number And types of transport used to move supplies. 13 Number Of days of supply for all classes/line numbers of supply on hand.
1.2.2 Provide Class VI	Coordinate and provide personal demand items, such as health and hygiene products and nonmilitary sales items (FM 10-1) (CASCOM). ***No. Scale Measure*** 01 Yes/No Unit has the necessary class VI supplies to conduct its mission. 02 Yes/No The unit does not have to wait for class VI supplies before it can conduct its mission. 03 Time Required to develop or update plans to establish support operations after receipt of warning order. 04 Time To develop concept of support sustainment requirements after receipt of warning order. 05 Time To achieve time-phased operating and safety levels of supply in AO. 06 Percent Difference between planned and actual demand by supply line in AO. 07 Percent Of class VI supplies available in AO compared to requirements. 08 Percent Of replenishment stocks delivered on time in AO.

Element	Definition
	09 Percent Of shortfalls in class VI supply in AO that have acceptable alternatives. 10 Percent Of required class VI supplies in AO delivered. 11 Percent Of planned class VI supply support achieved in AO. 12 Percent Of operations degraded, delayed, or modified due to delays in moving class VI supplies. 13 Number Of days of class VI supply stockpiled in AO to support campaign. 14 Number Of days of sustainment supply in AO supported by available facilities. 15 Number Of tons per day of class VI supply in AO delivered to operating forces.
1.2.3 Provide Class VIII	Provide class VIII medical materiel to include medical supplies, equipment, and medical peculiar repair parts (FM 4-02.1) (USAMEDDC&S). ***Note:*** ART 6.5.3 (Provide Medical Logistics) addresses the other aspects of combat health logistics. ***No. Scale Measure*** 01 Yes/No Unit has class VIII supplies to conduct its mission. 02 Yes/No The unit does not have to wait for class VIII supplies before it can conduct its mission. 03 Yes/No Unit has Class VIII medical unique repair parts to conduct its mission. 04 Yes/No Unit does not have to wait for Class VIII medical peculiar parts before it can conduct its mission. 05 Time Required to develop or update plans to establish support operations after receipt of warning order. 06 Time To transship class VIII supplies and medical equipment upon receipt of warning order. 07 Time To provide emergency shipment of class VIII supplies within AO. 08 Time To refine medical equipment maintenance and repair support program after receipt of warning order. 09 Time To receive medical equipment peculiar repair parts after requisition. 10 Time An average piece of medical equipment is not mission capable (awaiting parts). 11 Time To requisition, procure, and provide critical medical equipment peculiar repair parts. 12 Percent Difference between planned and actual demand by supply line in AO. 13 Percent Of planned class VIII supply support achieved in AO. 14 Percent Of class VIII supplies require replenishment per day. 15 Percent Of shortfalls in Class VIII supply in AO that have acceptable alternatives. 16 Percent Of required Class VIII supplies in AO delivered. 17 Percent Of operations degraded, delayed, or modified due to delays in moving Class VII supplies. 18 Percent Of Class VIII supply requisitions filled in AO. 19 Percent Of required delivery date (RDD) for Class VIII supplies in AO achieved. 20 Percent Of critical replenishment stocks in AO that experienced late delivery. 21 Percent Of Class VIII supplies (meeting regulatory requirements) provided by host nation. 22 Percent Of average medical equipment down. 23 Percent Of TPFDL medical logistics units deployed and operational. 24 Percent Of medical equipment dead-lined for supply. 25 Percent Of Class VII medical equipment peculiar repair parts requirements provided by the host nation. 26 Number Of instances when medical capability is unavailable due to shortage or lack of class VIII supplies or equipment. 27 Number Of tons per day of Class VIII supply (and medical peculiar repair parts) in AO delivered to operating forces.

Element	Definition
1.2.4 Provide Class I	Provide food in bulk or prepackaged rations and bottled water. This task also includes the provision of health and comfort packages, such as disposable razors and other personnel care items, other AAFES tactical field exchanges are operational. (FM 10-23) (CASCOM)
1.3 Provide Delta State Clothes, Shelter, & Supplies	Items not available in PREPO.
1.3.1 Provide Miscellaneous Supplies	Provide miscellaneous supplies and captured materials (FM 10-1) (CASCOM). ***No. Scale Measure*** 01 Yes/No Unit has miscellaneous supplies to conduct its mission. 02 Yes/No The unit does not have to wait for miscellaneous supplies before it can conduct its mission. 03 Time Required to develop or update plans to establish support operations after receipt of warning order. 04 Time To develop concept of support for miscellaneous supply requirements after receipt of warning order. 05 Time To achieve time-phased operating and safety levels of supply in AO. 06 Time To certify captured supplies as being safe substitutes for US supplies. 07 Percent Difference between planned and actual demand by supply line in AO. 08 Percent Of planned supply support for miscellaneous supplies achieved in AO. 09 Percent Of miscellaneous supplies available in AO compared to requirements. 10 Percent Of miscellaneous replenishment stocks delivered on time in AO. 11 Percent Of shortfalls in miscellaneous supplies that have acceptable alternatives. 12 Percent Of supply lines in AO that can be supported by using captured supplies. 13 Percent Of required miscellaneous supplies in AO delivered. 14 Percent Of operations degraded, delayed, or modified due to delays in moving miscellaneous supplies. 15 Percent Of miscellaneous supply requisitions filled in AO. 16 Percent Of RDD for miscellaneous supplies in AO achieved. 17 Percent Of critical replenishment stocks in AO that experienced late delivery. 18 Percent Of miscellaneous supplies provided by host nation. 19 Percent Of daily supply requirements for a particular item met by use of captured materiel. 20 Number Of days of miscellaneous supplies stockpiled in AO to support operations. 21 Number Of days of miscellaneous supplies in AO supported by available facilities. 22 Number Of tons of miscellaneous supplies per day delivered to operating forces.
1.3.2 Provide Class II	Provide clothing, individual equipment, tentage, organizational tool sets and kits, hand tools, geospatial products (maps), administrative and housekeeping supplies and equipment (FM 10-27) (CASCOM). ***No. Scale Measure*** 06 Time Of class I supply stockpiled in AO to support operations. 07 Time Of sustainment supply in AO supported by available facilities. 08 Percent Difference between planned and actual demand by supply line in AO. 09 Percent Of planned class I supply support achieved in AO. 10 Percent Of class I supplies available in AO compared to requirements. 11 Percent Of replenishment stocks delivered on time in AO. 12 Percent Of shortfalls in class I supply in AO that have acceptable alternatives. 13 Percent Of required class I supplies in AO delivered. 14 Percent Of operations degraded, delayed, or modified due to delays in moving class I supplies.

Element	Definition
	15 Percent Of class I supply requisitions filled in AO. 16 Percent Of RDD for class I supplies in AO achieved. 17 Percent Of critical replenishment stocks in AO that experienced late delivery. 18 Percent Of class I supplies provided by host nation. 19 Number Of tons per day of class I supply in AO delivered to operating forces.
1.3.3 Provide Class X	Provide material to support nonmilitary programs, such as agriculture and economic development (FM 10-1) (CASCOM). ***No. Scale Measure*** 01 Yes/No Unit has class X supplies to conduct its mission. 02 Yes/No The unit does not have to wait for class X supplies before it can conduct its mission. 03 Yes/No US and host-nation laws and regulations allow civilians to use the supplies provided. 04 Time To establish liaison with appropriate host-nation civilian government officials in AO after receipt of mission. 05 Time To coordinate host-nation support agreements on activation of the AO. 06 Percent Of sustainment supplies in AO procured from host-nation sources. 07 Percent Of logistic effort in AO provided by host nation. 08 Number Of facilities used by US units in AO provided by host nation. 09 Number Of host-nation support agreements in effect in AO. 10 Number Of US military units that have host-nation liaison officers assigned in AO. 11 Number Of tons per day of class X supplies in AO delivered for civilian use.
1.4 Provide Delta State Medl/Vet Services	
1.4.1 Coordinate Patient Movement	To coordinate the evacuation of the sick and wounded and to obtain consultation and assistance from remote sources. (JP 4-0, 4-02 Series, 4-02.2, NDP 4, NWP 4-02 Series, MCWP 4-11.1) M1 Percent Accountability of personnel entering the health services treatment pipeline. M2 Hours From wound or injury until person is in surgery or other appropriate care. M3 Percent Of casualties returned to duty.
1.5 Provide Delta State Infra. Repair	Includes provide Delta state Engineering Repair support functionality.
1.5.1 Provide Class IX	Provide any part, subassembly, assembly, or component required for installation in the maintenance of an end item, subassembly, or component. (FM 10-1) (CASCOM) ***No. Scale Measure*** 01 Yes/No Unit has class IX supplies to conduct its mission. 02 Yes/No The unit does not have to wait for class IX supplies before it can conduct its mission. 03 Time To refine supply support program after receipt of warning order. 04 Time To receive repair parts after requisition. 05 Time An average piece of equipment is not mission capable (awaiting parts). 06 Time To requisition, procure, and provide critical repair parts. 07 Percent Of average equipment downtime. 08 Percent Of TPFDD maintenance units deployed and operational. 09 Percent Of equipment dead-lined for supply. 10 Percent Of transportation units deployed and operational. 11 Percent Of class IX requirements provided by host nation. 12 Number Of tons per day of class IX supply in AO delivered to operating forces.

Element	Definition
1.5.2 Provide Packaged Petroleum, Oils, and Lubricant Products	Provide packaged products—including lubricants, greases, hydraulic fluids, compressed gasses, and specialty items—that are stored, transported, and issued in containers with a capacity of 55 gallons or less (FM 10-67)(CASCOM). ***No. Scale Measure*** 01 Yes/No The unit has class III supplies to conduct its mission. 02 Yes/No The unit does not have to wait for packaged class III supplies before it can conduct its mission. 03 Time To refine the supply support program for an AO after receipt of warning order. 04 Time Of operational delay due to fuel shortages. 05 Time Of supply of required packaged petroleum products in place to support operations. 06 Percent And type of daily class III packaged petroleum products provided by host nation. 07 Percent And type of required packaged petroleum products delivered to theater. 08 Percent Of packaged petroleum products deliveries completed compared to forecasted requirements. 09 Percent Of attempted deliveries destroyed by enemy action. 10 Number Of gallons per day and type of packaged petroleum products delivered to theater.
1.5.3 Transport MHE/WHE	To provide specialized mechanical devices to assist in rapid handling (offloading aircraft, landing craft, and shipping, and uploading to other means of transportation or storage) of supplies, materiel, and equipment. This task includes providing qualified personnel to operate MHE/WHE. **(JP 4-0, 4-01.5, NDP 4, NWP 4-01 Series, MCWP 4-1, MCWP 4-11, NAVSUP PUB Series, FMFM 4- 1)** M1 Hours To attain all required MHE. M2 Percent Of authorized MHE. M3 Percent Of required personnel qualified to operate MHE.
1.5.4 Provide Retail Fuel	Provide retail fuels to individual systems from tankers, rail tank cars, hose lines, or bulk transporters. (FM 10-67) (CASCOM) No. Scale Measure 01 Yes/No Unit has the necessary bulk class III supplies to conduct its mission. 02 Time That the supply of required fuel in place to support campaign. 03 Percent And type of daily class III retail fuel requirements provided by host nation. 04 Percent Of retail fuel deliveries completed compared to forecasted requirements. 05 Percent Of available retail fuel lost to spills. 06 Number Of gallons per day of retail fuel lost to spills. 07 Number Of gallons and types of retail fuel delivered to users within the AO.
1.5.5 Provide Class IV	Provide construction materials including installed equipment and all fortification and barrier materials. ART 6.1.4 includes the conduct of quarry, sawmill, and rock-crushing operations, and the production of asphalt and concrete. (FM 10-27) (CASCOM) ***No. Scale Measure*** 01 Yes/No Unit has class IV supplies to conduct its mission. 02 Yes/No The unit does not have to wait for class IV supplies before it can conduct its mission. 03 Time Required to develop or update plans to establish support operations after receipt of warning order.

Element	Definition
	04 Time To develop concept of support sustainment requirements after receipt of warning order. 05 Time To achieve time-phased operating and safety levels of supply in AO. 06 Percent Difference between projected engineer construction material requirements and actual requirements in AO. 07 Percent Of planned class IV supply support achieved in AO. 08 Percent Of class IV supplies available in AO compared to requirements. 09 Percent Of replenishment stocks delivered on time in AO. 10 Percent Of shortfalls in class IV supply in AO that have acceptable alternatives. 11 Percent Of required class IV supplies in AO delivered. 12 Percent Of operations degraded, delayed, or modified due to delays in providing class IV supplies to the right locations in the right quantities. 13 Percent Of class IV supply requisitions filled in AO. 14 Percent Of RDD for class IV supplies in AO achieved. 15 Percent Of critical replenishment stocks in AO that experienced late delivery. 16 Percent Of class IV supplies provided by host nation. 17 Number Of days of class IV supply stockpiled in AO to support campaign. 18 Number Of days of sustainment supply in AO supported by available facilities. 19 Number Of sawmills operating within the AO. 20 Number Of rock crushing facilities/quarries operating within AO. 21 Number And types of class IV supply in tons/day delivered to forces within the AO.
1.5.6 Provide Water Support	Provide water. ART 6.1.11 includes purification, distribution, storage, and quality surveillance of water. (FM 10-52) (CASCOM) ***Note:*** ART 6.10.3 (Provide Engineer Construction Support) addresses construction, repairing, maintenance, and operations of permanent and semi-permanent water facilities, such as the drilling of water wells. ***No. Scale Measure*** 01 Yes/No Unit has potable/non-potable water supplies to conduct its mission. 02 Yes/No The unit does not have to wait for potable and non-potable water before it can conduct its mission. 03 Time Required to develop or update plans to establish support operations after receipt of warning order. 04 Time To develop concept of support sustainment requirements after receipt of warning order. 05 Time To achieve time-phased operating and safety levels of supply in AO. 06 Percent Difference between planned and actual demand by supply line in AO. 07 Percent Of planned potable water support achieved in AO. 08 Percent Of potable water generation equipment available in AO compared to requirements. 09 Percent Of shortfalls in potable water generation and distribution equipment in AO that have acceptable alternatives. 10 Percent Of required potable water in AO generated. 11 Percent Of operations degraded, delayed, or modified due to delays in generating and distributing potable water. 12 Percent Of potable water (bottled) provided by host nation. 13 Number And types of potable water generation equipment stockpiled in AO to support operations. 14 Number Of days of sustainment supply in AO supported by available facilities. 15 Number Of gallons per day of potable water in AO delivered to operating forces.
1.6 Provide Delta State Engineering	Functional modeling inputs included in Providing Delta State Infrastructure Repair Functionality.

Element	Definition
Repair	
1.7 Provide Delta State Supporting Activities	
1.7.1 Exercise Command and Control	To exercise authority and direction over assigned or attached forces in the accomplishment of a mission. C2 involves maintaining visibility over and arranging personnel, equipment, and facilities during the planning and conducting of military operations **(JP 3-0, 3-01.1, 3-03, 3-09, 4-01.1, 5- 00.2)** (JP 0-2, 3-03, 3-05, 3-08v2, 3-09.3, 3-10.1, 4-01.1, 4-01.3, 6-0, 6-02, CJCSM 6120.05).
1.7.2 Provide Information Transport	The ability to transport information and services via assured end-to-end connectivity across the NC environment.
1.7.3 Conduct ISR	The ability to conduct activities to meet the intelligence needs of national and military decision-makers.
1.7.4 Provide Combat Identification	Combat identification (CID) is the process of attaining an accurate characterization of unknown detected objects to the extent that high confidence, and timely application of military options and weapon resources can occur. Depending on the situation and the operational decisions that must be made, this characterization may be limited to, "friend," "enemy," or "neutral." In other situations, other characterizations may be required including, but not limited to class, type, nationality and mission configuration. CID characterizations, when applied with combatant commander's Rules of Engagement (ROE), enable engagement decisions and the subsequent use, or prohibition of use, of lethal and nonlethal weaponry to accomplish military objectives. CID is used for force posturing, command and control, situational awareness as well as shoot, no-shoot employment decisions (JP 3-52, JP 3- 56.1). Note: CID of enemy and neutral objects is heavily dependent on successful detection, which is often very difficult, near real-time fusion/correlation of data from multiple sensors, and a number of other critical ISR capabilities. The end goal (i.e., correct identification of objects) depends considerably on the success of the detection function. Further, the ability to identify and characterizeenemy and neutral objects, even if detected, depends extensively on successful collection and analysis of target signatures, etc. Warfighters must be at least 95% certain that an object or entity has been correctly characterized since any greater than 5% uncertainty creates an unacceptable level of risk of fratricide or enemy penetration." (Capstone Requirements Document for CID, 19 March, 2001). M1 Percent Of friendly air forces following established procedures to identify themselves CJCSM 3500.04C. M2 Percent Of friendly ground forces, following established procedures to identify themselves. M3 Percent Of friendly naval (surface, subsurface) forces following established procedures to identify themselves. M4 Percent *Of friendly air forces, ground forces, and/or naval forces detected friendly objects/entities. M5 Percent *Of friendly air forces, ground forces, and/or naval forces detected enemy objects/entities. M6 Percent *Of friendly air forces, ground forces, and/or naval forces detected neutral objects/entities. Service Tasks: AFT 7.1.4 Monitor Status of Friendly Forces.

Element	Definition
	ART 5.3.1.5 Provide Positive Identification of Friendly Forces. NTA 6.1.1.3 Positively Identify Friendly Forces.
1.8 Support Delta State Operational C2	
1.8.1 Execute Plans/Orders	Given plans/orders, execute the plan is executed by the issuance of an OPORD.
1.8.2 Conduct Operational Movement and Maneuver	Given operational or strategic objectives, dispose joint and/or multinational forces, conventional forces, and special operations forces (SOF) to impact the conduct of a campaign or major operation by either securing positional advantages before battle is joined or exploiting tactical success to achieve operational or strategic results.
1.8.3 Control Operationally Significant Areas	Given operational or strategic objectives, control areas of the JOA whose possession or command provides either side an operational advantage, or denying it to the enemy.
1.8.4 Monitor Execution and Adapt Operations	Given situational awareness requirements, maintain visibility over friendly unit decisions and monitor and react to changes in adversary status.
1.8.5 Capture, Obtain, and Distribute Lessons Learned	Given an operation, capture, obtain, and distribute lessons learned.
1.9 Provide Rear Area Security	
1.9.1 Conduct Rear-Area Security	TA 6.3 Conduct Rear Area Security Security operations of designated rear area units that contribute to the security of the entire joint force. For example, bases may contain aircraft or missiles capable of performing defensive counter-air missions, radars, and other equipment critical to air defense or units conducting counterintelligence (CI), executing electronic protection, or guarding enemy prisoners of war (EPWs). The Joint Rear Area (JRA) is a specific land/sea area within a joint force commander's operational area designated to facilitate protection and operation of installations and forces supporting the joint force (JP 3-10.1, ATM 6.1.4, NTA 6.3.1.1, NTA 6.3.1.3, FM 100-5). M1 Percent Key LOCs/Points in which threat forces are incapable of inflicting Level II Damage with less than 12 hour indicators being picked up by Rear Area Intel Forces within JOA rear area. Service Tasks: AFT 4.4.1 Perform Special Operations Forces Employment Functions. ART 5.3.5.4.1 Conduct Rear Area and Base Security Operations. NTA 1.5.5.5.4 Provide Area Security. NTA 6.3.1 Protect and Secure Area of Operations. NTA 6.3.2 Conduct Military Law Enforcement Support (Afloat & Ashore).
Operational Node	
Amphibious Maritime Warfare Commander	Amphibious Task Force Commander. Historically, the AMWC is a command role that has been divided between two individuals, dependent on the particular phase of an amphibious operation. When the amphibious landing assets were embarked, the CWC or CVBG commander served as the AMWC. Tactical command then shifted to the senior shore-based CO once the amphibious forces secured the beachhead. Currently, United States Naval and Marine forces are transforming to meet future operations with the creation of the Expeditionary Strike Group Forward Deployed Naval Force (ESG-FDNF). With the marriage of the Marine Expeditionary Unit (MEU) and the CVBG, operational command is now fully integrated with the CWC

Element	Definition
	concept. Although the CWC retains the authority to act as the AMWC, the creation of the ESG-FDNF provides for the senior Marine Commanding Officer embarked with amphibious forces to serve as the AMWC.
CDR, RIVRON ONE	Commander, Riverine Group One. Participates in theater security cooperation through joint or multi-lateral exercises, personnel exchanges, and humanitarian assistance in Riverine area of operations or other suitable environments. – Conducts Maritime Security Operations, providing Riverine area control and denial through protection of critical infrastructure, preventing the flow of contraband, and disrupting movement of enemy forces or supplies on rivers and waterways. – Enables power projection by providing fire support through either direct fire or coordination of supporting fires and insertion/extraction of joint and coalition ground forces.
COMLOGEUR/CTF-63 CDR	MSC Logistics Europe Commander is dual hatted. COMLOGEUR is the operational commander of the MPSRON One's Prepositioned ships (includes high speed vessels) and CTF-63 MSC sealift ships. Sealift Logistics Command Europe, or SEALOGEUR, is one of five Military Sealift Command operational commands worldwide. In addition to its headquarters in Naples, Italy, SEALOGEUR has representatives stationed in Rota, Spain; Rotterdam, The Netherlands and Souda Bay, Greece. Military Sealift Command Sealift ships in SEALOGEUR's theater move military equipment, supplies and fuel for U.S. European Command and the Navy's 6th Fleet in Europe and Africa. SEALOGEUR reports to Military Sealift Command, which is headquartered in Washington, D.C. Commander, Task Force 63 SEALOGEUR's commander is double-hatted as Commander, Task Force 63, or CTF-63. CTF-63 is the operational commander of all U.S. 6th Fleet air and sea logistics assets. While in theater, Military Sealift Command's Naval Fleet Auxiliary Force and Special Mission ships report to CTF-63 along with a cadre of cargo planes that support 6th Fleet and U.S European Command logistics missions. CTF-63 is also responsible for ordering and tracking spare parts and supplies being delivered to ships in theater. CTF-63 is the immediate operational commander of MSC's Maritime Prepositioning Ship Squadron One, or MPSRON One, based in the Mediterranean Sea. The ships of MPSRON One are forward deployed year-round prepositioning U.S. military cargo at sea. Should a military or humanitarian crisis arise in theater, the squadron is positioned to quickly deliver its cargo ashore, ensuring a fast U.S. response to contingency situations. While SEALOGEUR and CTF-63 are technically separate commands, they are co-located and work as a unified staff under a single commander. This combined effort streamlines logistics operations in the European theater, allowing the CTF-63/SEALOGEUR organization to provide superior customer service to U.S. and NATO military forces in the area of responsibility. CTF-63 reports to Commander, U.S. 6th Fleet.

Element	Definition
Composite Warfare Commander	Composite Warfare Commander The officer in tactical command is normally the composite warfare commander. However the composite warfare commander concept allows an officer in tactical command to delegate tactical command to the composite warfare commander. The composite warfare commander wages combat operations to counter threats to the force and to maintain tactical sea control with assets assigned; while the officer in tactical command retains close control of power projection and strategic sea control operations.
High Speed Watercraft Company CO	An assumed JHSV company CO organized under MPSRON.
Joint High Speed Vessel CO	
Landing Craft – Air Cushion Master	
NAVCHAPGRU	Commander, Navy Expeditionary Logistics Support Group. A deployable command and control element comprised of 25 reserve personnel. The NAVCHAPGRUs serve as the forward deployed headquarters for all deployed NAVELSG forces.
Ship-to-Shore Connector Master	
Transport Group CO	An ATF transport group commander that is assigned to the Joint Task Force. They are assigned strategic control of embarked assault craft units aboard the ATF shipping during ATF operations.

Table 12. Operational Activity Descriptions to include MOE/MOP

APPENDIX H. STATE TRANSITION DIAGRAM (OV-6B)

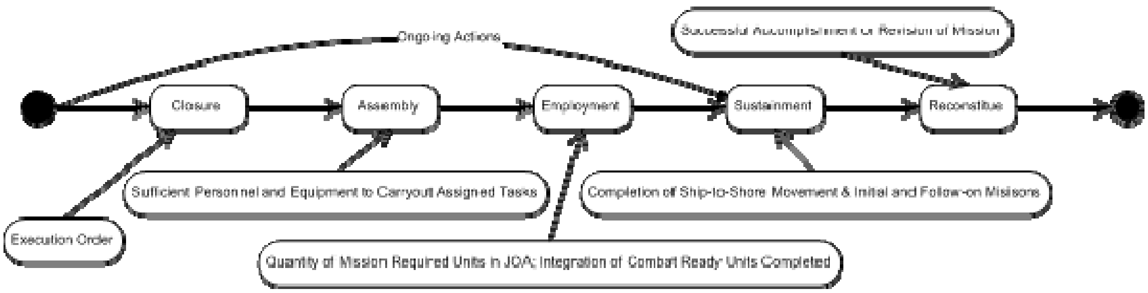


Figure 56. General Seabasing LOO Phasing with Phase Initiatives and Termination Definitions

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APPENDIX I. SYSTEM-TO-SYSTEM MATRIX (SV-3A)

	JHSV	LCAC SLEP	LCU 2000	LSV	SSC	Transformable Craft	Landing Force System	Sea Base System
JHSV							X	X
LCAC SLEP							X	X
LCU 2000								
LSV								
SSC							X	X
Transformable Craft								
Landing Force System	X	X			X			
Sea Base System	X	X			X			

Table 13. Sea Base Connector System System-to-System Matrix Traces Physical Components to Their Respective Operational Nodes

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APPENDIX J. SYSTEM FUNCTIONALITY DESCRIPTION (SV-4)

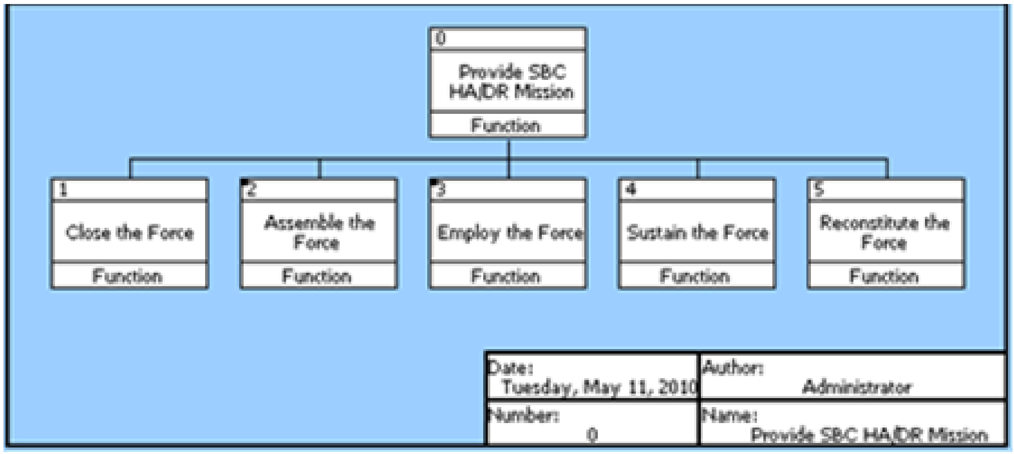

Figure 57. Application of the Amphibious Operation's Lines-of-Operation to the SBCS Functionality

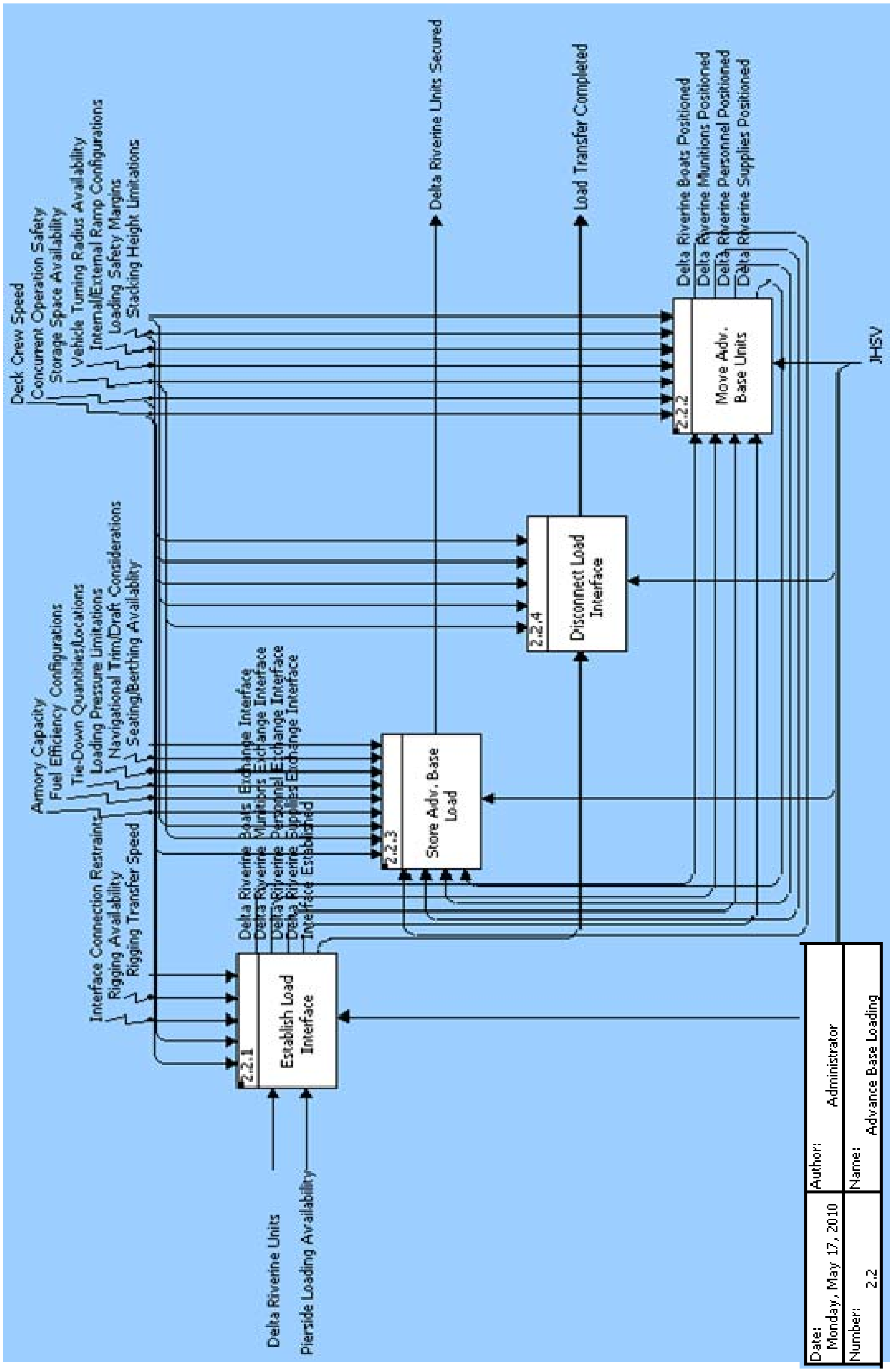

Figure 58. **The "Advance Base Loading" level 1 functions within the SBCS function "Assemble"**

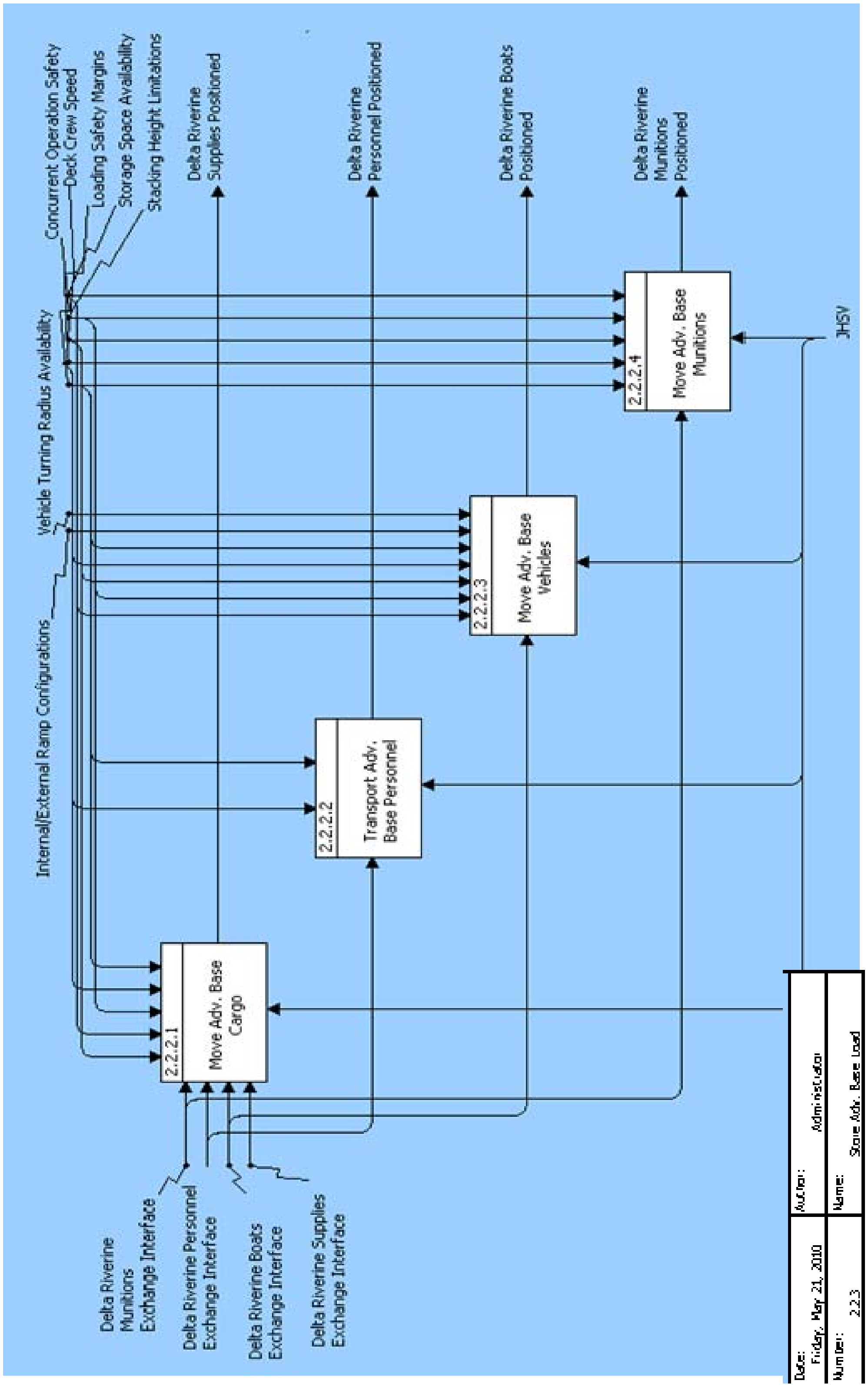

Figure 59. The "Move Advanced Based Units" functions within the SBCS function "Assemble"

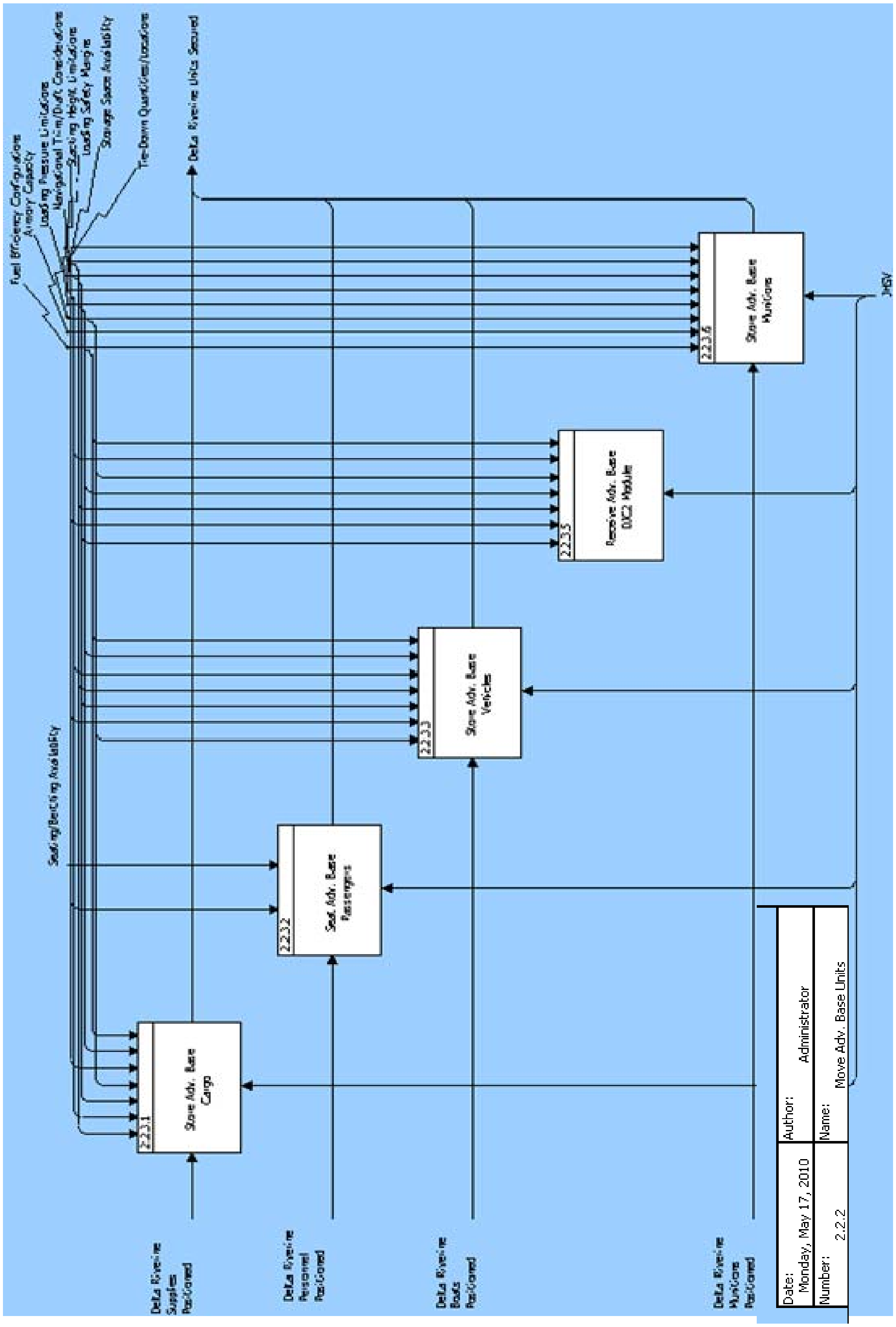

Figure 60. The "Move Advanced Based Units" functions within the SBCS function "Assemble"

A. ASSEMBLE PHASE ITEM DESCRIPTION

Assembly Item	Assembly Definition
1.1 Delta Consumables	HA/DR consumable items (class 1,2, 6, & 8). Cargo meets tasking requirements of delivering food, water, medicine, clothes, shelter, and supplies.
1.2 Delta Consumables Exchange Interface	The existence of a load exchange interface such as a ramp, crane, or well deck established that is sufficient to support the transfer of the respective load.
1.3 Delta Consumables Positioned	Item moved from origin to destination.
1.4 Delta Consumables Secured	All classes of items secured for at-sea transfer appropriately for their respective travel durations.
2.1 Delta Med/Vet Units	Units consist of personnel and accompanying equipment and supplies.
2.2 Delta Med/Vet Units Exchange Interface	The existence of a load exchange interface such as a ramp, crane, or well deck established that is sufficient to support the transfer of the respective load.
2.3 Delta Med/Vet Cargo Positioned	Item moved from origin to destination.
2.4 Delta Med/Vet Passengers Positioned	Item moved from origin to destination.
2.5 Delta Med/Vet Units Secured	All classes of items secured for at-sea transfer appropriately for their respective travel durations.
3.1 Delta Infra Repair Items	Items consist of equipment/vehicles, construction material, supplies, and munitions.
3.2 Delta Infra Repair Vehicles Exchange Interface	The existence of a load exchange interface such as a ramp, crane, or well deck established that is sufficient to support the transfer of the respective load.
3.3 Delta Infra Repair Munitions Exchange Interface	Infrastructure supplies. The existence of a load exchange interface such as a ramp, crane, or well deck established that is sufficient to support the transfer of the respective load.
3.4 Delta Infra Repair Supplies Exchange Interface	Infrastructure supplies. The existence of a load exchange interface such as a ramp, crane, or well deck established that is sufficient to support the transfer of the respective load.
3.5 Delta Infra Repair Munitions Positioned	Item moved from origin to destination.
3.6 Delta Infra Repair Vehicles Positioned	A mix of over-sized vehicles and non-oversized vehicles. Item moved from origin to destination.
3.7 Delta Infra Repair Supplies Positioned	Item moved from origin to destination.

Assembly Item	Assembly Definition
3.8 Delta Infra Repair Items Secured	All classes of items secured for at-sea transfer appropriately for their respective travel durations.
4.1 Delta Force Units	Items consist of equipment/vehicles, supplies, munitions, personnel, and petroleum products.
4.2 Delta Force Vehicle Exchange Interface	Includes infrastructure repair vehicles/equipment (assumed to be a mix of over-sized vehicles that are not VERTREP capable). The existence of a load exchange interface such as a ramp, crane, or well deck established that is sufficient to support the transfer of the respective load.
4.3 Delta Force Munitions Exchange Interface	Infrastructure munitions. The existence of a load exchange interface such as a ramp, crane, or well deck established that is sufficient to support the transfer of the respective load.
4.4 Delta Force Supplies Exchange Interface	Infrastructure supplies. The existence of a load exchange interface such as a ramp, crane, or well deck established that is sufficient to support the transfer of the respective load.
4.5 Delta Force Personnel Exchange Interface	The existence of a load exchange interface such as a ramp, crane, or well deck established that is sufficient to support the transfer of the respective load.
4.6 Delta Force Vehicles Positioned	A mix of over-sized vehicles and non-oversized vehicles. Item moved from origin to destination.
4.7 Delta Force Munitions Positioned	Item moved from origin to destination.
4.8 Delta Force Supplies Positioned	Item moved from origin to destination.
4.9 Delta Force Personnel Positioned	Item moved from origin to destination.
4.10 Delta Force Units Secured	All classes of items secured for at-sea transfer appropriately for their respective travel durations.
5.1 Delta Riverine Units	Items consist of equipment/vehicles, supplies, munitions, personnel, and petroleum products.
5.2 Delta Riverine Boats Exchange Interface	Includes infrastructure repair vehicles/equipment (assumed to be a mix of over-sized vehicles that are not VERTREP capable). The existence of a load exchange interface such as a ramp, crane, or well deck established that is sufficient to support the transfer of the respective load.
5.3 Delta Riverine Munitions Exchange Interface	Infrastructure munitions. The existence of a load exchange interface such as a ramp, crane, or well deck established that is sufficient to support the transfer of the respective load.
5.4 Delta Riverine Supplies Exchange Interface	Infrastructure supplies. The existence of a load exchange interface such as a ramp, crane, or well deck established that is sufficient to support the transfer of the respective load.
5.5 Delta Riverine Personnel Exchange Interface	The existence of a load exchange interface such as a ramp, crane, or well deck established that is sufficient to support the transfer of the respective load.

Assembly Item	Assembly Definition
5.6 Delta Riverine Boats Positioned	Item moved from origin to destination.
5.7 Delta Riverine Munitions Positioned	Item moved from origin to destination.
5.8 Delta Riverine Supplies Positioned	Item moved from origin to destination.
5.9 Delta Riverine Personnel Positioned	Item moved from origin to destination.
5.10 Delta Riverine Units Secured	All classes of items secured for at-sea transfer appropriately for their respective travel durations.
5.15 Delta NEO/MEDEVAC Personnel Exchange Interface	Non- injured NEO personnel. The existence of a load exchange interface such as a ramp, crane, or well deck established that is sufficient to support the transfer of the respective load.
5.17 Delta NEO Personnel Positioned	Item moved from origin to destination.
5.18 Delta NEO Personnel in Custody	NEO personnel in a temporary waiting status by Seabasing assets and provided adequate protection and health services.
Armory Capacity	The capacity of the ship's approved armory to safely and securely store munitions. Some platforms do not possess a designated armory, but do have the capability to store munitions per designated instructions.
Asset C2 Interoperability	Includes Joint, multi-national, and international crisis organization vessel interoperability to establish secure/unsecure communication linkages to support at-sea cargo or personnel transfer, offensive/defensive communications, and general C2/ISR.
Asset Physical Interoperability	Includes Joint, multi-national, and international crisis organization vessel interoperability to establish physical linkages at-sea for cargo or personnel transfer.
At-Sea Connection Needs	The physical connections required to make secure and safe interconnections to conduct at-sea load exchange under an approved standard operating procedure.
At-Sea Loading Capable	A platform capable of conducting at-sea loading due to proper at-sea connection exchange interfaces with another source or providing platform.
CLF UNREP Availability	Availability of regionally stationed CLF UNREP ships within inter/intra-theater areas.
Concurrent Operation Safety	Inherent loading and storage constraints imposed upon specific vessels that decrease the speed of an alternative activity. Such considerations are flight quarters, well deck operations, LCAC/SSC fan operation on the cargo deck loading, UNREP STREAM, and ordnance loading.
Deck Crew Speed	Operational speeds highly vary by operational experience. Secondary factors are stowage capacity and configurations. Availability of heavy equipment loaders may have a large impact.
Docking	The state of receiving, understanding, and storing communication messages

Assembly Item	Assembly Definition
Communication Received	supporting current or advanced docking needs.
Docking Needs	The general watercrafts needs required to be filled for docking operations such as linehandlers, support power, sewage, water, fueling, personnel transfer equipment, and load exchange equipment requirements.
Docking Plan	The resulting at-sea docking platforms or base agreement and coordination plan.
Employable Units	Units that are characterized by cohesive units equipped with the required equipment and supplies to conduct tasked operational activities.
Flight Deck Restrictions	Vessels are limited in flight operations platforms that it can embark, temporarily land, and conduct VERTREP.
Fuel Efficiency Configurations	Loading to ensure long-range fuel efficiency. i.e., Forward loading weight on LCAC.
Global Maritime Communication Standards	Common Marine Radio standards and acceptable practices.
Heavy Vertical Lift Availability	H-53 or replacement availability from ESG/CSG or land based units.
Inland Waterway Accessibility	A general categorization of a platform with a draft that does not restrict its ability to conduct inland waterway operations. The inland waterway depth is defined by operational activities and austere access depths.
Intact Units	Whole or complete units that retain independent unit level functionality.
Interface Connection Restraints	At-sea connection and load transfer configurations that can occur.
Interface Established	At-sea or port load exchange established.
Internal/External Ramp Configurations	Internal/External ramp slopes, turning radiuses, and dimensions that restrict the availability of vehicle transport to/from SBC vessels.
Load Transfer Completed	The completion of assigned operational activity load transfer of personnel, equipment, cargo, vehicles, or munitions.
Loading Pressure Limitations	Deck pressure as appropriately measured.
Loading Safety Margins	In consideration of load pack densities, dry cargo storage area, and configurations that provide required accessibility.
Navigational Trim/Draft Considerations	Load placement considerations to ensure the SBC is within level trim standards for safe operation.
Pierside Loading Availability	A platform capable of conducting advanced base supporting loading from or to the pier.
Rigging Availability	Availability of deck rigging that enables load transfer operations.
Rigging Transfer Speed	The inherent differences in speed as a product of the type of rigging available (transfer speed and capacity) and operational experience.

Assembly Item	Assembly Definition
Sea State Constraints	Imposed SBC limitations on at-sea connections, load exchange interfaces, and load transfer weights to maintain stability under the assumed sea state definitions. Includes combined effects of wave height, sea spray, swell height, and wind velocities aggregated into standardized measurement scales.
Seating/Berthing Availability	Capacity of long term or short term berthing availability. Includes necessary functions of sanitation, meal preparation, and lodging.
Security Resource Availability	The availability of the Sea Base to provide security assets to minimize the threat condition to an acceptable level.
Services Filled	A platform that has had planned fuel, water, and sewage requirements filled by austere or advanced base services.
Stacking Height Limitations	ISO container or pallet stacking height and limitations.
Storage Space Availability	In consideration of load pack densities, dry cargo storage area, and configurations that provide required accessibility. A function of usable storage area and height.
Theater Base Availability	In-theater advanced base availability. Territorial access is influenced by political standing between host nation and U.S./MN forces.
Threat Conditions	Threats imposed by adversarial forces consistent with the CONOPS assumptions.
Tie-Down Quantities/Locations	Load limits can be imposed by the number and available locations of tie-downs required for griping. Oversized vehicles/heavy vehicles require are likely to impose constraints.
Undocking Needs	The number and availability of the linehandlers or flight deck crew. May also require additional tug assistance, navigational pilots, or route clearances.
Undocking Support Provided	The ability of the vessel to obtain the required number and availability of the linehandlers or flight deck crew. May also require additional tug assistance, navigational pilots, or route clearances.
Unrestricted Vessel	A vessel that is not limited in at-sea movement by docking or load transfer operations.
Vehicle Turning Radius Availability	The onboard SBC dimensions restricting maneuverability of vehicle placement.
Weather Constraints	Weather constraints affecting the safety of flight of Joint aerial assets.

Table 14. Assemble Phase Functional Input, Output, and Control Item Description

Employ Item	Employ Item Definition
1.2 Delta Consumables Exchange Interface	The existence of a load exchange interface such as a ramp, crane, or well deck established that is sufficient to support the transfer of the respective load.
1.4 Delta Consumables Secured	All classes of items secured for at-sea transfer appropriately for their respective travel durations.
1.6 Delta	Item transferred to destination ashore to be transferred by its own means or external.

Employ Item	Employ Item Definition
Consumable Ashore	
2.2 Delta Med/Vet Units Exchange Interface	The existence of a load exchange interface such as a ramp, crane, or well deck established that is sufficient to support the transfer of the respective load.
2.5 Delta Med/Vet Units Secured	All classes of items secured for at-sea transfer appropriately for their respective travel durations.
2.7 Delta Med/Vet Units Ashore	Item transferred to destination ashore to be transferred by its own means or external.
3.2 Delta Infra Repair Vehicles Exchange Interface	The existence of a load exchange interface such as a ramp, crane, or well deck established that is sufficient to support the transfer of the respective load.
3.3 Delta Infra Repair Munitions Exchange Interface	Infrastructure supplies. The existence of a load exchange interface such as a ramp, crane, or well deck established that is sufficient to support the transfer of the respective load.
3.4 Delta Infra Repair Supplies Exchange Interface	Infrastructure supplies. The existence of a load exchange interface such as a ramp, crane, or well deck established that is sufficient to support the transfer of the respective load.
3.8 Delta Infra Repair Items Secured	All classes of items secured for at-sea transfer appropriately for their respective travel durations.
3.10 Delta Infra Repair Items Ashore	Includes supplies and munitions. Item transferred to destination ashore to be transferred by its own means or external.
3.11 Delta Infra Repair Vehicles Ashore	Item transferred to destination ashore to be transferred by its own means or external.
4.2 Delta Force Vehicles Exchange Interface	Includes infrastructure repair vehicles/equipment (assumed to be a mix of over-sized vehicles that are not VERTREP capable). The existence of a load exchange interface such as a ramp, crane, or well deck established that is sufficient to support the transfer of the respective load.
4.3 Delta Force Munitions Exchange Interface	Infrastructure munitions. The existence of a load exchange interface such as a ramp, crane, or well deck established that is sufficient to support the transfer of the respective load.
4.4 Delta Force Supplies Exchange Interface	Infrastructure supplies. The existence of a load exchange interface such as a ramp, crane, or well deck established that is sufficient to support the transfer of the respective load.
4.5 Delta Force Personnel Exchange Interface	The existence of a load exchange interface such as a ramp, crane, or well deck established that is sufficient to support the transfer of the respective load.
4.10 Delta Force Units Secured	All classes of items secured for at-sea transfer appropriately for their respective travel durations.
4.12 Delta Force Vehicles Ashore	Item transferred to destination ashore to be transferred by its own means or external.
4.13 Delta Force Units Ashore	Includes supplies, munitions, and personnel. Item transferred to destination ashore to be transferred by its own means or external.

Employ Item	Employ Item Definition
5.2 Delta Riverine Boats Exchange Interface	Includes infrastructure repair vehicles/equipment (assumed to be a mix of over-sized vehicles that are not VERTREP capable). The existence of a load exchange interface such as a ramp, crane, or well deck established that is sufficient to support the transfer of the respective load.
5.3 Delta Riverine Munitions Exchange Interface	Infrastructure munitions. The existence of a load exchange interface such as a ramp, crane, or well deck established that is sufficient to support the transfer of the respective load.
5.4 Delta Riverine Supplies Exchange Interface	Infrastructure supplies. The existence of a load exchange interface such as a ramp, crane, or well deck established that is sufficient to support the transfer of the respective load.
5.5 Delta Riverine Personnel Exchange Interface	The existence of a load exchange interface such as a ramp, crane, or well deck established that is sufficient to support the transfer of the respective load.
5.10 Delta Riverine Units Secured	All classes of items secured for at-sea transfer appropriately for their respective travel durations.
5.12 Delta Riverine Boats Ashore	Item transferred to destination ashore to be transferred by its own means or external.
5.13 Delta Riverine Units Ashore	Item transferred to destination ashore to be transferred by its own means or external.
5.14 Delta NEO/MEDEVAC Personnel	Includes injured and non-injured personnel.
5.15 Delta NEO/MEDEVAC Personnel Exchange Interface	Non- injured NEO personnel. The existence of a load exchange interface such as a ramp, crane, or well deck established that is sufficient to support the transfer of the respective load.
5.16 Delta NEO/MEDEVAC Personnel Positioned	Item moved from origin to destination.
5.17 Delta NEO Personnel Positioned	Item moved from origin to destination.
Active Threats	Threats characterized by those that are not relying upon passive detection and engagement systems such as waterborne IEDs or mines.
Amphibious Access	Capable of conducting transportation activities on land as well as in the water.
Amphibious Conversion Constraints	A delay caused from a required slowing of the vessel's transit speed to conduct amphibious to open ocean or vice-versa transition.
Armory Capacity	The capacity of the ship's approved armory to safely and securely store munitions. Some platforms do not possess a designated armory, but do have the capability to store munitions per designated instructions.
Asset C2 Interoperability	Includes Joint, multi-national, and international crisis organization vessel interoperability to establish secure/unsecure communication linkages to support at-sea cargo or personnel transfer, offensive/defensive communications, and general

Employ Item	Employ Item Definition
	C2/ISR.
Austere Access	Unimproved points ashore, including pier, beach, landing zone, etc.
Concurrent Operation Safety	Inherent loading and storage constraints imposed upon specific vessels that decrease the speed of an alternative activity. Such considerations are flight quarters, well deck operations, LCAC/SSC fan operation on the cargo deck loading, UNREP STREAMing, and ordnance loading.
Deck Crew Speed	Operational speeds highly vary by operational experience. Secondary factors are stowage capacity and configurations. Availability of heavy equipment loaders may have a large impact.
Docking Communication Received	The state of receiving, understanding, and storing communication messages supporting current or advanced docking needs.
Docking Needs	The general watercraft's needs required to be filled for docking operations such as linehandlers, support power, sewage, water, fueling, personnel transfer equipment, and load exchange equipment requirements.
Employable Units	Units that are characterized by cohesive units equipped with the required equipment and supplies to conduct tasked operational activities.
Flight Deck Restrictions	Vessels are limited in flight operations platforms that it can embark, temporarily land, and conduct VERTREP.
Fuel Efficiency Configurations	Loading to ensure long-range fuel efficiency. i.e., Forward loading weight on LCAC.
Global Maritime Communication Standards	Common Marine Radio standards and acceptable practices.
Heavy Vertical Lift Availability	H-53 or replacement availability from ESG/CSG or land based units.
Inland Waterway Accessibility	A general categorization of a platform with a draft that does not restrict its ability to conduct inland waterway operations. The inland waterway depth is defined by operational activities and austere access depths.
Intact Units	Whole or complete units that retain independent unit level functionality.
Interface Connection Restraints	At-sea connection and load transfer configurations that can occur.
Interface Established	At-sea or port load exchange established.
Internal/External Ramp Configurations	Internal/External ramp slopes, turning radiuses, and dimensions that restrict the availability of vehicle transport to/from SBC vessels.
Littoral Accessible	A platform capable of accessing littoral waters to conduct assigned operational activities.
Load Transfer Completed	The completion of assigned operational activity load transfer of personnel, equipment, cargo, vehicles, or munitions.
Loading Pressure Limitations	Deck pressure as appropriately measured.

Employ Item	Employ Item Definition
Loading Safety Margins	In consideration of load pack densities, dry cargo storage area, and configurations that provide required accessibility.
Navigational Trim/Draft Considerations	Load placement considerations to ensure the SBC is within level trim standards for safe operation.
Neutralized Threat	Active or passive threat rendered incapable of causing harm.
Objective Loading Capable	A platform capable of conducting objective loading. The platforms capable are not limited by environmental factors.
Objective SPOE/SPOD Access	Within the HA/DR mission objective access is not constrained in the sustainment phase, but always subjected to engineering clearance.
Passive Threats	Threats such as waterborne IED or mines.
Rigging Availability	Availability of deck rigging that enables load transfer operations.
Rigging Transfer Speed	The inherent differences in speed as a product of the type of rigging available (transfer speed and capacity) and operational experience.
ROE	Rules of engagement or standing rules of engagement
RTB Vessel	A SBC on orders to return to base (RTB) or proceed to next assignment.
Sea State Constraints	Imposed SBC limitations on at-sea connections, load exchange interfaces, and load transfer weights to maintain stability under the assumed sea state definitions. Includes combined effects of wave height, sea spray, swell height, and wind velocities aggregated into standardized measurement scales.
Seating/Berthing Availability	Capacity of long term or short term berthing availability. Includes necessary functions of sanitation, meal preparation, and lodging.
Security Resource Availability	The availability of the Sea Base to provide security assets to minimize the threat condition to an acceptable level.
Services Filled	A platform that has had planned fuel, water, and sewage requirements filled by austere or advanced base services.
Shallow Draft Accessible	A general categorization of a platform with a draft that does not restrict its ability to conduct shallow water coastal operations. Shallow water depth is defined by operational activities and austere access depths.
Stacking Height Limitations	ISO container or pallet stacking height and limitations.
Storage Space Availability	In consideration of load pack densities, dry cargo storage area, and configurations that provide required accessibility. A function of usable storage area and height.
Theater Base Availability	In-theater advanced base availability. Territorial access is influenced by political standing between host nation and U.S./MN forces.
Threat Conditions	Threats imposed by adversarial forces consistent with the CONOPS assumptions.
Tie-Down Quantities/Locations	Load limits can be imposed by the number and available locations of tie-downs required for griping. Oversized vehicles/heavy vehicles require are likely to impose constraints.
Transit Speed Constraints	Imposed SBC transit speeds given navigational area, draft, and sea state.

Employ Item	Employ Item Definition
Undocking Needs	The number and availability of the linehandlers or flight deck crew. May also require additional tug assistance, navigational pilots, or route clearances.
Undocking Support Provided	The ability of the vessel to obtain the required number and availability of the linehandlers or flight deck crew. May also require additional tug assistance, navigational pilots, or route clearances.
Unrestricted Vessel	A vessel that is not limited in at-sea movement by docking or load transfer operations.
Vehicle Turning Radius Availability	The onboard SBC dimensions restricting maneuverability of vehicle placement.
Very Shallow Water Accessible	A general categorization of a platform with a draft that does not restrict its ability to conduct very shallow water coastal operations. Very shallow water depth is defined by operational activities and austere access depths.
Weather Constraints	Weather constraints affecting the safety of flight of Joint aerial assets.

Table 15. Employment Functional Input, Output, and Control Item Description

B. SUSTAINMENT PHASE ITEM DESCRIPTION

Assemble Item	Assemble Item Definition
1.1 Delta Consumables (Palletized) Items	Items consist of palletized construction material and relief supplies.
1.2 Delta Consumables (Palletized) Exchange Interface	The existence of a load exchange interface such as a ramp, crane, or well deck established that is sufficient to support the transfer of the respective load.
1.3 Delta Consumables (Palletized) Positioned	Palletized consumables have been moved into position to be secured for at-sea transfer.
1.4 Delta Consumables (Palletized) Items Secured	All classes of items secured for at-sea transfer appropriately for their respective travel durations.
2.1 Delta Consumables (Containerized) Items	Items consist of containerized construction material and relief supplies.
2.2 Delta Consumables (Containerized) Exchange Interface	The existence of a load exchange interface such as a ramp, crane, or well deck established that is sufficient to support the transfer of the respective load.
2.3 Delta Consumables (Containerized) Positioned	Containerized consumables have been moved into position to be secured for at-sea transfer.
2.4 Delta Consumables (Containerized) Items Secured	All classes of items secured for at-sea transfer appropriately for their respective travel durations.
3.1 Delta Force Units	Items consist of equipment/vehicles, supplies, munitions, personnel, and petroleum products.
3.2 Delta Force Vehicles	Includes infrastructure repair vehicles/equipment (assumed to be a mix of

Assemble Item	Assemble Item Definition
Exchange Interface	oversized vehicles that are not VERTREP capable). The existence of a load exchange interface such as a ramp, crane, or well deck established that is sufficient to support the transfer of the respective load.
3.3 Delta Force Munitions Exchange Interface	Infrastructure munitions. The existence of a load exchange interface such as a ramp, crane, or well deck established that is sufficient to support the transfer of the respective load.
3.4 Delta Force Supplies Exchange Interface	Infrastructure supplies. The existence of a load exchange interface such as a ramp, crane, or well deck established that is sufficient to support the transfer of the respective load.
3.5 Delta Force Munitions Positioned	Item moved from origin to destination.
3.6 Delta Force Vehicles Positioned	A mix of over-sized vehicles and non-oversized vehicles. Item moved from origin to destination.
3.7 Delta Force Supplies Positioned	Item moved from origin to destination.
3.8 Delta Force Units Secured	All classes of items secured for at-sea transfer appropriately for their respective travel durations.
3.12 Delta Force Personnel Exchange Interface	The existence of a load exchange interface such as a ramp, crane, or well deck established that is sufficient to support the transfer of the respective load.
3.13 Delta Force Personnel Positioned	Item moved from origin to destination.
4.1 Delta MEDEVAC at-Sea Personnel Exchange	The existence of a load exchange interface that is sufficient to support the transfer of the respective load.
4.5 Delta Objective MEDEVAC Seated	MEDEVAC personnel seated and monitored by qualified medical staffing.
4.6 Delta Objective MEDEVAC Personnel in Custody	MEDEVAC personnel transferred to at-sea or base medical facilities.
5.1 Delta Priority Transport Units	Items consist of personnel, low risk MEDEVACs, and essential parts necessary for sustained Seabasing operations.
5.2 Delta Priority Transport Supply Exchange Interface	The existence of a load exchange interface that is sufficient to support the transfer of the respective personnel.
5.3 Delta Priority Transport Personnel Exchange Interface	The existence of a load exchange interface that is sufficient to support the transfer of the respective personnel.
5.4 Delta Priority Transport Supplies Positioned	Item moved from origin to destination.
5.5 Delta Priority Transport Personnel Positioned	Items moved from origin to destination.

Assemble Item	Assemble Item Definition
5.6 Delta Priority Transport Units Secured	All classes of items secured for at-sea transfer appropriately for their respective travel durations.
5.7 Delta Priority Units Ashore	Item transferred to destination ashore to be transferred by its own means or external.

Table 16. Assemble Functional Input, Output, and Control Item Description within the Early Sustainment Phase (Redundant Assembly Items Excluded)

Employment Item	Employment Item Definition
1.2 Delta Consumables (Palletized) Exchange Interface	The existence of a load exchange interface such as a ramp, crane, or well deck established that is sufficient to support the transfer of the respective load.
1.4 Delta Consumables (Palletized) Items Secured	All classes of items secured for at-sea transfer appropriately for their respective travel durations.
1.6 Delta Consumables (Palletized) Items Ashore	Palletized items brought ashore onto an austere access in a manner that allows for feasible and economical consumable distribution.
2.2 Delta Consumables (Containerized) Exchange Interface	The existence of a load exchange interface such as a ramp, crane, or well deck established that is sufficient to support the transfer of the respective load.
2.4 Delta Consumables (Containerized) Items Secured	All classes of items secured for at-sea transfer appropriately for their respective travel durations.
2.6 Delta Consumables (Containerized) Items Ashore	Containers brought ashore onto an austere access in a manner that allows for feasible and economical consumable distribution. Packed containers may be broken out locally or transported to IDP camps or warehousing facilities for further distribution. All retrograde containers would be temporarily stored for follow-on return or semi-permanent storage.
3.2 Delta Force Vehicles Exchange Interface	Includes infrastructure repair vehicles/equipment (assumed to be a mix of oversized vehicles that are not VERTREP capable). The existence of a load exchange interface such as a ramp, crane, or well deck established that is sufficient to support the transfer of the respective load.
3.4 Delta Force Supplies Exchange Interface	Infrastructure supplies. The existence of a load exchange interface such as a ramp, crane, or well deck established that is sufficient to support the transfer of the respective load.
3.8 Delta Force Units Secured	All classes of items secured for at-sea transfer appropriately for their respective travel durations.
3.10 Delta Force Units Ashore	Includes supplies, munitions, and personnel. Item transferred to destination ashore to be transferred by its own means or external.
3.11 Delta Force Vehicles Ashore	Item transferred to destination ashore to be transferred by its own means or external.
3.12 Delta Force Personnel Exchange	The existence of a load exchange interface such as a ramp, crane, or well deck Established that is sufficient to support the transfer of the respective load.

Employment Item	Employment Item Definition
Interface	
4.2 Delta Objective MEDEVAC Personnel	Emergency personnel capable of self or minor assisted movement.
4.3 Delta Objective MEDEVAC Exchange Interface	The existence of a load exchange interface that is sufficient to support the transfer of the respective personnel.
4.4 Delta Objective MEDEVAC Positioned	MEDEVAC personnel moved from origin to destination.
4.5 Delta Objective MEDEVAC Seated	MEDEVAC personnel seated and monitored by qualified medical staffing.
5.2 Delta Priority Transport Supply Exchange Interface	The existence of a load exchange interface that is sufficient to support the transfer of the respective personnel.
5.7 Delta Priority Units Ashore	Item transferred to destination ashore to be transferred by its own means or external.

Table 17. Functional Input, Output, and Control Item Description within the Early Sustainment Phase. (Redundant Assembly Items Excluded)

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APPENDIX K. ALTERNATIVE SBCS CONFIGURATIONS FOR THE OPERATIONAL CONOPS

Supplementary Naval SBCS Scenario Configuration Assumptions during the Assembly/Employment Phase:
- HA of Delta state is tasked to Naval assets and assigned MSC assets.
- General strategy is to task high speed watercraft by load. Therefore a high speed watecraft assigned to amphibious cargo pickup will pickup all cargo and not just those required for a task.
- Embarked watercraft will have priority service to vessel that is embarked to.
- Sea basing logistics supply vessels are mobile at-sea conducting amphibious and flight deck operations along with T-AKE.
- MPS(E) will be anchored in the harbor conducting operations in addition to setting up RRDF/INLS. INLS will directly support MPS(E) ops.
- The MLP will be dedicated to Force Projection activities with the LMSR offload.
- Combinations selections are based upon source platform's organic assets and minimizing the quantity of vessel types.
- Due to the relative significance of transit time over loading time and staggering operations at-sea simultaneous well deck and flight operations are ideal but not necessary to maximize offload throughput.
- The transfer of personnel onboard LCAC/SSC platforms is superceded by the transfer of vehicles if alternative platforms are available.
- Transfer of Infrastructure Repair items of lowest priority in the Assembly/Employment phase.

	Legacy Configurations			**Future Configurations**		
	Preference			Preference		
Mission Task	Pri.	Sec.	Comments	Pri.	Sec.	Comments
Provide Consumables (palletized)	b	a	T-AKE - it alone with organic helo support can provide VERTEP inland. STREAMing or VERTREP to JHSV does not provide much beneifit unless it occurs at long ranges from objective area.	b+1*	b+1**	VERTREP of consumables from T-AKE and amphibs is ideal. A DPS assisted skin-to-skin transfer is secondary given well deck and/or flight operations. INLS transfer of cargo from amphibs to T-Craft dependent upon open ocean sea-state.
Provide Engineering Repair	b	a	VERTREP to JHSV does not provide much beneifit unless it occurs at long ranges from objective area.	b+1*		T-Craft with VERTREP capability provides inland objective access. Amphib - Transfer of large quantities of personnel is only met through intermediary INLS transfer to smaller vessels, direct or intermediate SSC/LCAC transfer, or DPS T-Craft. INLS transfer heavily dependent upon sea-state. **A LCAC/SSC to T-Craft interface would be valuable in heavy sea-state personnel transfer prior to moving to inland objectives.**
Provide Med/Vet Support	b	a	VERTREP to JHSV does not provide much benefit unless it occurs at long ranges from objective area.	b+1*, b+ 1^+		Amphib - VERTREP capable T-Craft offload with simultaneous well deck ops. MPS(E) - T-Craft offers distinct advantage to MPS(E) unload as it is not dependent upon RRDF/INLS setup or coinciding MLP crane operations. T-Craft (1 or 1*) can unload while MPS(E) crane sets up RRDF/INLS. Operations can be conducted with SSC/LCAC alone once the MPS(E) RRDF/INLS is established.
Provide Infrastructure Repair	b		MPS(E) - RRDF/INLS transfer of infra repair items to SSC/LCAC. Amphibs - Well deck operations. Quantities of accompaning NCB personnel from amphibs is considered minor.	b+1^+		SSC/LCAC are best for offloading heavy equipment from amphibious shipping. T-Craft offers distinct advantage to MPS(E) unload as it is not dependent upon RRDF/INLS setup or limited heavy vertical lift assets; however, **if the MPS(E) is simultaneously being loaded by SSC/LCAC a standard RRDF/INLS capable T-Craft will be effective.**
Provide Force Projection	b		LMSR - removal of vehicles to inland objectives via SSC/LCAC.	b + 1**, b + 1^+		LMSR - secondary T-Craft interface with stern gate allows simultaneous MLP ops. Alternative MLP to T-Craft connection for UNREP is alternative given extended transit times. T-Craft UNREP with MLP (LMSR) would disrupt SSC/LCAC transfer. Amphib - Transfer of large quantities of personnel is only met through intermediary INLS transfer to smaller vessels, direct or intermediate SSC/LCAC transfer, or DPS T-Craft. INLS transfer heavily dependent upon sea-state. **A LCAC/SSC to T-Craft interface would be valuable in heavy sea-state personnel transfer prior to moving to inland objectives.**
Provide NEO/SAR Support	a		Amphibs - SSC/LCAC onload of boats w/ trailers. Advanced base - JHSV onload of boats w/ trailers.	a+1		Transport of personnel and SURC w/ trailer to T-Craft is best done together with INLS from amphib. SURC transfer with trailer requires heavy lift.

Legacy Systems

SSC/LCAC, JHSV	a
SSC/LCAC	b
JHSV	c

* Requires regional heavy lift helicopter
** Requires regional aerial SAR support & RIVRON unit embarked on amphibs

Future Acquisitions

T-Craft w/ bow ramp	1
T-Craft w/ direct side/stern ramp LMSR connection	1^+
T-Craft w/ VERTREP	1*
T-Craft w/ DPS	1**
UHAC	2

Supplementary Naval SBCS Scenario Configuration Assumptions during the Sustainment Phase:
- HA of Delta state is tasked to Naval assets and assigned MSC assets.
- General strategy is to task high speed watercraft by load. Therefore, a high speed watecraft assigned to amphibious cargo pickup will pickup all cargo and not just those required for a task.
- Embarked watercraft will have priority service to that same ship.
- Sea basing logistics supply vessels are mobile at sea conducting amphibious and flight deck operations along with T-AKE. MSC and GO/NGO commercial LOLO vessels will be anchored in the harbor conducting MLP and INLS operations.
- Offload of vehicles and troop equipment from LMSR is assumed to be primarily completed, but still available as needed. LMSR could be used to supplement consumable transport for subsequent MLP distribution.
- Due to the relative significance of transit time over loading time and staggering operations at-sea simultaneous well deck and flight operations are ideal but not necessary to maximize offload throughput
- Assumes SSC/LCAC priority of vehicle transfer over personnel given other platform alternatives.

	Legacy Configurations			Future Configurations		
	Preference			Preference		
Mission Task	Pri.	Sec.	Comments	Pri.	Sec.	Comments
Provide Consumables (palletized)	b	a	ATF and LO/LO - offload is best accomplished via LCAC/SSC transport. T-AKE - JHSV provided helo that may not be available otherwise, provides transport of consumables inland to supplement LO/LO supplies. STREAMing or VERTREP to JHSV does not provide much beneifit unless it occurs at long ranges from objective area.	b+ 1*	b+1**	VERTREP of consumables from T-AKE and amphibs is ideal, but is not condusive to harbor operations with other platforms. INLS transfer of cargo from amphibs to T-Craft dependent upon open ocean sea-state. **A standard T-Craft capable of mooring to the LO/LO RRDF w/ INLS or MLP would be be required to also assist in additional LOLO throughput.** T-AKE offload constrained by LCAC/SSC only operations. T-Craft operation with the T-AKE constrained to have a VERTREP or DPS system.
Provide Consumables (Containerized)	b		Assumes consumable containers activities will be supplemented by additional INLS. GO/NGO sponsored LOLO vessels crane directly to MLP for subsequent LCAC/SSC distribution. MLP would need to provide MHE and container trailers such as the USMC Mk-14 LVSR trailers for subsequent offload of trailers from shore based MK-48 trucks or equivalent.	b+1**	b+1	Work area of MLP w/ required MHE is better suited for offload to LCAC/SSC transport. INLS offload of LOLO vessels from beam cranes offers smaller working space and thus the T-Craft is better suited to provide additional workinga area and the ability to stack containers. Similar container MHE and trucking constraints apply. The INLS and MLP configurations or direct offload to T-Craft vary by platforms available. **As the LOLO vessels will likely be restrained to working in mild sea state, a standard T-Craft capable of mooring to a MLP, INLS, or LOLO in low sea-state harbor operations is valuable.**

Provide Priority Transport	c		High priority personnel and cargo is best transported by helo operations from the ESG and CSGs.		c+1*	A VERTREP capable T-Craft would be capable of receiving cargo but still lack the ability to conduct personnel transfers and would be hard pressed to meet the same medium duration MEDEVAC or personnel berthing and support services.
Transport MEDEVAC		c	Typically MEDEVAC personnel are transferred to regional hospital ships or sea base medical support. The organic helo asset aboard the JHSV may provide local support to objective regions, but could well be supported by the same embarked aboard the more persistent ESG or CSG.		c	**The T-Craft would need to offer a fully certified flight deck to support helicopter personnel transfers.**
Provide Force Support	b		LMSR - needs of additional vehicles from LMSR is considered minimal. MLP supporting VTS may be better utilized at the LOLO offload of sustainment items. If such was the case the transport of these items could still be done via LMSR RRDF/INLS. Amphib - shuttle ship operations will be conducted and supported by embarked SSC/LCACs in objective-to-sea rotations.	b + 1^+		LMSR - standared T-Craft with LMSR stern gate or RRDF/INLS would be a valuable alternative if SSC/LCACs are in objective rotation or assigned with mothership MLP. May only be necessary if additional vehicles or stocks are needed. Sustained RRDF/INLS would negate need. Amphib - Routine transfer of large quantities of personnel is only met through intermediary INLS transfer to smaller vessels, direct or intermediate SSC/LCAC transfer, or DPS T-Craft. INLS transfer heavily dependent upon sea-state. **A LCAC/SSC to T-Craft interface would be valuable in heavy sea-state personnel transfer prior to moving to inland objectives.**

Legacy Systems

SSC/LCAC, JHSV	a
SSC/LCAC	b
JHSV	c

* Requires regional heavy lift helicopter
** Requires regional aerial SAR support & RIVRON unit embarked on amphibs

Future Acquisitions

T-Craft w/ bow ramp	1
T-Craft w/ direct side/stern ramp LMSR connection	1^+
T-Craft w/ VERTREP	1*
T-Craft w/ DPS	1**
UHAC	2

Table 18. Alternative SBCS configuration analysis

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APPENDIX L. CORE DEFINITIONS

Select terms and definitions were directly extracted from JIC and JCD definition tables (Department of Defense, Chairman, Joint Chiefs of Staff, 2005), (Department of Defense, Joint Requirements Oversight Council, 2007).

Glossary Term	**Definition**
Amphibious Construction Battalion	The ACB's primary mission is to provide ship to shore transportation of fuel, materials, and equipment in support of Amphibious Ready Group, Marine Expeditionary Force and Brigade sized operations, and Maritime Propositioned Force (MPF) operations. Transport of equipment and materials is accomplished primarily by means of barge ferry operations. ACB's construct elevated and floating causeway piers, install ship to shore fueling systems, erect 1300-man camps, and provide camp support, perimeter defense, and construction support to the Naval Support Element.
Naval Construction Regiment	The Naval Construction Regiment provides command and control of multiple expeditionary construction units of the Naval Construction Force in support of a Navy component commander, joint force commander or Marine air-ground task force commander. If required, the NCR can command and control multiple Navy Expeditionary Combat Command elements or other U.S. military services' engineer units.
Underwater Construction Team	An Underwater Construction Team (UCT) provides construction, inspection and repair of ocean facilities such as wharves, piers, underwater pipelines, moorings, boat ramps, etc. They are capable of diving to 190 feet using scuba or surface supplied air to perform work underwater.
Accessibility	The flexibility to bypass or operate within the physical constraints presented by terrain, hydrography, weather, depth of operations, and threat is an important attribute of Seabasing operations. Seabasing must be supportable both day and night, during fair weather or poor, and maneuver elements must be capable of conducting operations across different types of terrain and coastal boundaries in austere conditions to safely deliver combat forces, supplies, and materiel to achieve objectives at varying ranges of operations. (Ref: Seabasing JIC)

Advanced Base	A base located in or near an operational area whose primary mission is to support military operations. (Ref: JP 1-02). Advanced bases can include main operating bases (MOB), forward operating sites (FOS), and cooperative security locations (CSL) (Ref: National Defense Strategy 2005).
Amphibious Force	An amphibious task force and a landing force together with other forces that are trained, organized, and equipped for amphibious operations (Ref: JP 1-02).
Attribute	A testable or measurable characteristic that describes an aspect of a system or capability (JIC).
Austere Access	Unimproved points ashore, including pier, beach, landing zone, etc.
Austere Environment	An operational environment with the following characteristics: little or no host-nation support; limited pre-existing infrastructure and facilities; immature ports of debarkation; inadequate transportation and communications networks; unsophisticated medical, supply and other services. It is a particularly difficult environment for conducting operations of expeditionary joint forces. Derived to support Seabasing JIC Concept of Operations where little or no host nation infrastructure is available to support joint military operations (Ref: Seabasing JIC).
Austere Port	An austere port includes characteristics of degraded and minor ports and has one or more of the following limitations: loading/discharge capability; cargo handling; pier, quay or berth facilities (length and/or water depth); and access. Derived to support Seabasing JIC Concept of Operations where seaport of debarkation has limited capabilities (Ref: Seabasing JIC).
Capability	The ability to achieve an effect to a standard under specified conditions through multiple combinations of means and ways to perform a set of tasks (JIC).

Capacity	Describes the maximum degree to which Seabasing operations are able to receive, store, organize, integrate, project, support, and sustain a designated quantity of the joint force. It is a key attribute as it determines to some extent the size and the ability of the JFC to conduct Seabasing operations. Capacity describes the limits of joint force capabilities that can be supported from the Sea Base and is driven in large part by the functional limitations of the Seabasing infrastructure (i.e., volume, weight, radio frequency spectrum and associated bandwidth, workstations, skill sets, maintenance capability, etc.). Seabasing operations are scalable; the infrastructure can be configured to fit the force. Therefore capacity need not be a limiting factor, but must be planned for when employing a joint force from a Sea Base.
Combat Loading	Combat loading involves arranging personnel and stowing equipment and supplies in a configuration that conforms to the organization's anticipated tactical operation. Individual items must be positioned so that they can be readily unloaded at the time and in the sequence that most effectively supports the planned scheme of maneuver. The three types of combat loading are as follows: combat unit loading, combat organizational loading, and combat spread loading.
Combat Organizational Loading	This system allows units and equipment to debark and assemble ashore prior to tactical employment. Its use of ship space is more economical than combat unit loading.
Combat Spread Loading	The loading of troops, equipment, and supplies from a single organization onto two or more ships. This system is used to deploy organizations equipped with numerous vehicles and/or large amounts of heavy equipment. One of its key objectives is to preserve the tactical capability of the force in the event of loss or diversion of a single ship. Critical CS units such as artillery and armor are often loaded this way.
Combat Unit Loading	The loading of an assault troop organization – with its essential combat equipment and supplies – onto a single ship, in such a way that it will be available to support the tactical plan upon debarkation.
Command-Linked Tasks	Tasks performed by organizations/agencies outside the commander's direct control are "command linked tasks." (e.g., adjacent units, national intelligence, joint logistics activities, etc.).

Condition	The minimum proficiency required in the performance of a **task**. For mission-essential tasks of joint forces, each task standard is defined by the joint force commander and consists of a **measure** and **criterion**.
Condition (from Task Lists)	A variable of the operational environment or situation in which a unit, system, or individual is expected to operate that may affect performance.
Connector	A system, usually surface or vertical, that provides a means of movement for joint forces, equipment, materiel, supplies and parts, between two or more distributed units of the Sea Base (in this case units of the Sea Base may include fixed or unimproved points ashore, including pier, beach, landing zone, etc.) An inherent characteristic is an interoperable connection (e.g.,, interface) between the units that it connects. Derived to support development of Seabasing JIC (Ref: Seabasing JIC).
Counter-Insurgency Operations	Military, paramilitary, political, economic, psychological, and civic actions taken by a government to defeat insurgency (Ref: JP 1-02).
Deployment Momentum	A characteristic of a military campaign that seeks to close gaps between arrivals of deployed forces, and eliminate operational pauses caused by the need to secure lodgments/points of debarkation for follow-on forces. When these gaps are closed, deployment momentum is achieved, improving the capability of the force to expand initial operations and build combat power sufficiently to assume the offensive throughout the JOA (Ref: Seabasing JIC).
Essential	Absolutely necessary; indispensable; critical to mission success.
Forward Operating Base	A base usually located in friendly territory or afloat that is established to extend command and control or communications or to provide support for training and tactical operations. Facilities may be established for temporary or longer duration operations and may include an airfield or an unimproved airstrip, an anchorage, or a pier (Modified from JP 1-02 to capture air and maritime aspects of a forward operating base).

Humanitarian Assistance	Operations conducted to relieve or reduce the results of natural or manmade disasters or other endemic conditions such as human pain, disease, hunger, or privation that might present a serious threat to life or that can result in great damage to or loss of property. Assistance provided is designed to supplement or complement the efforts of the host nation civil authorities or agencies (Modified from JP 1-02).
Infrastructure	The measure of a family of systems and capabilities that provide essential services toward accomplishing the mission. It describes the physical plant, facilities, systems, services, manpower, and skill sets required to support Seabasing operations (i.e., receive, assemble, store, integrate, project, transfer, support, and sustain a designated quantity of the joint force). Infrastructure is a critical cornerstone of Seabasing operations. It supports the functional requirements of joint force operations, e.g.,, the movement of selected forces and equipment (by air and sea), berthing, equipment storage, net-centric environment, C2 capabilities, logistics (supply, sustainment and maintenance), rehabilitation, medical care, etc. The components of infrastructure are generally fixed sets of systems and capabilities that provide essential services, but can be configured to adapt to various mission packages
Interoperability	The capability of the Sea Base infrastructure and joint force to provide and accept assets and services from other units, systems, and forces, and to operate these exchanged assets and services together in an effective manner. Specifically, interoperability is the Sea Base capability to seamlessly operate with joint and a multinational force, i.e., the Sea Base infrastructure is designed to accommodate different forces, equipment, services, and still operate effectively. Derived to support Seabasing JIC attributes: measures and effectiveness (Modified from JP 1-02).
Joint Advance Force Operations	Military operations conducted within the Joint Operations Area (JOA) by the Joint Force Commander (JFC) in order to prepare the objective area for the main assault by forcible entry forces. JAFO may include operations to gain and maintain local domain dominance (Ref: JP 3-18 Joint Doctrine for Forcible Entry Operations dated Jul 2001).
Joint Forcible Entry Operations	Seizing and holding a military lodgment in the face of armed opposition (Ref: JP 3-18 Joint Doctrine for Forcible Entry Operations dated Jul 2001).

Joint Integration Concept	A description of how the Joint Force Commander 10-20 years in the future will integrate capabilities to generate effects and achieve an objective. A JIC includes an illustrative CONOPS for a specific scenario and a set of distinguishing principles applicable to a range of scenarios (Ref: CJCSI 3170.01E Joint Capabilities Integration and Development System (JCIDS)).
Combat Operations	Large-scale operations conducted against a nation state(s) that possesses significant regional military capability, with global reach in selected capabilities, and the will to employ that capability in opposition to or in a manner threatening to US National Security (Ref: Major Combat Operations Joint Operating Concept (MCO JOC) dated September 2004).
Marine Core Tactical List	Marine Corps Task List – a comprehensive list of Marine Corps tasks, doctrinally based, designed to support current and future METL development.
Measure	Quantitative or qualitative basis for describing the quality of task performance.
Measures of Effectiveness	Measures designed to correspond to accomplishment of mission objectives and achievement of desired effects.
Measures of Performance	Measures designed to quantify the degree of perfection in accomplishing functions or tasks.
Metric	A quantitative measure associated with an attribute.
Mission	The task, together with the purpose, that clearly indicates the action to be taken and the reason therefore.
Mission Essential Task	A task selected by a force commander from the Universal Naval Task List (UNTL) deemed essential to mission accomplishment.
Mission Essential Task List	A list of tasks considered essential to the accomplishment of assigned or anticipated missions. A METL includes essential tasks, conditions, standards, and associated supporting and command-linked tasks.

Naval Mobile Construction Battalion	Naval Mobile Construction Battalions (NMCBs) provide responsive military construction support to Navy, Marine Corps and other forces in military operations, construct base facilities and conduct defensive operations. In addition to standard wood, steel, masonry and concrete construction, NMCBs also perform specialized construction such as water well drilling and battle damage repair. They are able to work and defend themselves at construction sites outside of their base camp and convoy through unsecured areas. In times of emergency or disaster, NMCBs conduct disaster control and recovery operations. There are Nine active duty and Twelve reserve NMCBs.
Navy Tactical Task List	Navy Tactical Task List – the comprehensive list of Navy and Coast Guard (Department of Defense related missions) tasks, doctrinally based, designed to support current and future METL development.
Non-self Sustaining Ship	A non-self-sustaining vessel is one that is incapable of off-loading without cranes from external sources.
Operational Template	An operations template provides a graphical depiction of the activities performed as part of a military operation. It depicts activities and interactions among them. The activities represented in an operations template can include tasks performed by the commander and staff, tasks performed by adjacent commands (e.g.,, command-linked tasks), and tasks performed by subordinate commands or organizations (e.g.,, supporting tasks). Three basic types of task characteristics and interactions among tasks may be depicted in operations templates. They are temporal, informational, and spatial. A different view can be constructed to depict each of these types of characteristics and interactions.
Prime Mover	The units of the Sea Base that provide the primary means of movement to/from and in the JOA, for joint forces, equipment, supplies and parts. Prime movers also provide infrastructure to support joint forces and their equipment for a designated period of time. Derived to support description of Seabasing CONOPS (Ref: Seabasing JIC).

Rate	The Sea Base's maximum capability to receive, store, organize, integrate, forward, support and sustain, a designated quantity of the joint force over a period of time under a standard set of conditions. The joint force includes personnel, their equipment, organic lift (air and surface), organic strike, force protection, intelligence, information exchange, command and control, and the required logistics (supply, sustainment, and maintenance). The rate of the joint force that flow into and from the Sea Base will be driven in large part by the functional limitations of the Sea Base capacity and infrastructure (i.e., aircraft sortie generation rate and surface throughput rate as driven by embarkation/debarkation points (air, surface), speed of offload / on load / staging / integration / rehabilitation, baud rate, information processing speed, etc.). Rate is not normally scalable – that is to say physical infrastructure cannot be modified to support an increase in rate. Derived to support Seabasing JIC attributes measures and effectiveness (Ref: Seabasing JIC).
Reconstitute	Those actions that the JFC plans and implements to restore units to a desired level of combat effectiveness commensurate with mission requirements and available resources. Reconstitution operations include retrograde and regeneration. Derived to support development of Seabasing Lines of Operation (Modified from JP 3-35 Joint Deployment and Redeployment Operations).
Sea Base	The Sea Base of the future will be an inherently maneuverable, scalable aggregation of distributed, networked platforms that enable the global power projection of offensive and defensive forces from the sea, and includes the ability to assemble, equip, project, support, and sustain those forces without reliance on land bases within the Joint Operations Area. Derived to support synopsis of central idea and CONOPS (Ref: Seabasing JIC).

Sea State

A scale that categorizes the force of progressively higher seas by wave height. In accordance with the World Meteorological Organization (WMO) and Joint Meteorology and Oceanography (METOC) Conceptual Data Model (JMCDM), sea state is the code that denotes the roughness of the surface of the sea in terms of average wave height (Ref: Joint Metrology and Oceanography Conceptual Data Model).

0 – CALM, GLASSY	WAVE HEIGHT = 0 METERS
1 – CALM, RIPPLED	WAVE HEIGHT = 0 – 0.1 METERS
2 – SMOOTH, WAVELETS	WAVE HEIGHT = 0.1 – 0.5 METERS
3 – SLIGHT	WAVE HEIGHT = 0.5 – 1.25 METERS
4 – MODERATE	WAVE HEIGHT = 1.25 – 2.5 METERS
5 – ROUGH	WAVE HEIGHT = 2.5 – 4.0 METERS
6 – VERY ROUGH	WAVE HEIGHT = 4.0 – 6.0 METERS
7 – HIGH	WAVE HEIGHT = 6.0 – 9.0 METERS
8 – VERY HIGH	WAVE HEIGHT = 9.0 –14.0 METERS
9 – PHENOMENAL	WAVE HEIGHT = OVER 14.0 METERS

Seabasing

The rapid deployment, assembly, command, projection, reconstitution, and re-employment of joint combat power from the sea, while providing continuous support, sustainment, and force protection to select expeditionary joint forces without reliance on land bases within the JOA. These capabilities expand operational maneuver options, and facilitate assured access and entry from the sea (Ref: Approved at JCS Tank June 2004).

Seize the Initiative

Assuming offensive actions to confuse, demoralize, disrupt and defeat the enemy. Using knowledge superiority to achieve military advantage over the enemy (Ref: Joint Warfare of the Armed Forces of the United States (JP-1) dated November 2000).

Self Sustaining Ship

A self-sustaining vessel is capable of off-loading with organic cranes.

Standard

The minimum proficiency required in the performance of a task. For mission-essential tasks of joint forces, each task standard is defined by the joint force commander and consists of a measure and criterion.

Standard (from Task Lists)	The minimum acceptable proficiency required in the performance of a particular task under a specified set of conditions, expressed as quantitative or qualitative measures. The commander establishes standards.
Supporting Task	Tasks in the same chain of command that support the commander are “supporting tasks.” Senior METL tasks that a junior’s MET supports are supported tasks.
Task	An action or activity based upon doctrine, standard procedures, mission analysis or concepts that may be assigned to an individual or organization.(JIC)
Task (from Task Lists)	A discrete event or action, not specific to a single unit, weapon system, or individual that enables a mission or function to be accomplished.
Uniform Joint Task List	The comprehensive list of tasks at the strategic and operational levels of war. The UJTL defines some tactical level tasks that are performed by more than one Service component and relies on individual service task lists to define tasks at the tactical level of war. The MCTL and NTTL link to the top level tactical tasks (TA) in the UJTL, e.g., TA 1 equals NTA 1 and MCT 1; TA 2 equals NTA 2 and MCT 2, etc.
Universal Naval Task List	Universal Naval Task List (NTTL + MCTL)

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