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The Joint Force currently does not have a plan to conduct logistics operations in support of a no notice Joint Forcible Entry Operation (JFEO) from the littorals. The Maritime Prepositioned Forces are currently not postured to support operations along the Western Coast of Africa or either coast of Central and South America. A concept that calls for a variety of submersible cargo craft that can be both manned or unmanned would benefit offensive operations in the type of environment described above. Additionally, the technology currently exists to complete the building of new or retrofitting old craft that can meet the prescribed criteria.

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MASTER OF MILITARY STUDIES

TITLE:
OPERATION ATLANTIS

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Preface

The following report is an attempt to offer a solution of logistics support in a contested environment or where landing sites are not or cannot be easily established. The military problem of sea-based logistics is one that may come to fruition in the near future. There are currently several concepts that address logistics in an amphibious setting, but there is not, at the time of this publication, a concept that addresses a no-notice JFEO scenario. The research that when into this concept yielded surprising information, this concept could become a reality with some integration of current technology. My hope is the reader finds it as interesting or useful as I do.

I would like to thank Dr. Anne-Louise Antonoff for her persistent guidance and mentorship, without which this paper would have likely never gotten passed the introduction. Also an acknowledgment should be extended to CDR Russell Evans for his mentorship and ability to maintain levity in an otherwise chaos-filled group. I would be remiss if I did not acknowledge the Conference Group 1 Faculty Advisors for their guidance and motivation to complete this research. Finally, I want to thank my wife for always saying yes when I asked her to proof or review any of my driveling.

Executive Summary

Title: OPERATION ATLANTIS

Author: MAJ Tim R. Barcus

Thesis: Given the assumption that the United States Military will likely be involved in a conflict that will occur in a contested environment where the US may not have established advanced bases, the Joint Force should reconsider how it plans, prepares, and conducts logistics operations in support of expeditionary warfare.

Discussion: The Joint Force currently does not have a plan to conduct logistics operations in support of a no notice Joint Forcible Entry Operation (JFEO) from the littorals. The Maritime Prepositioned Forces are currently not postured to support operations along the Western Coast of Africa or either coast of Central or South America. A concept that calls for a variety of submersible cargo craft that can be both manned or unmanned would benefit offensive operations in the type of environment described above. Additionally, the technology currently exists to complete the building of new or retrofitting old craft that can meet the prescribed criteria.

Conclusion: Using past projects and concepts, current technology and future fighting environments the United States can develop a feasible concept for underwater logistics basing in support of a future JFEO mission conducted in a location where infrastructure is not available.

OPERATION ATLANTIS

The United States Joint Force is currently not postured to conduct expeditionary operations from the littorals in a contested environment where there is no existing logistical infrastructure established. Certainly, the Joint Force has proven their proficiency in logistics operations over the last 15-plus years in a mature theater such as Iraq and Afghanistan. The US was able to rely on partnerships with neighboring countries to open the theaters in both Iraq and Afghanistan, which led to the sustained logistics flow in both countries through neighbors like Turkey, Kuwait, and Kyrgyzstan. Committing responsive, flexible, and rapid logistics resources from a sea-based platform will prove to be a new challenge in the future operating environment.

The proliferation of long-range, precision-guided, networked munitions (known as "Anti-Access/Area Denial" or "A2/AD" systems) will, in the case of near-peer competitors such as Russia, undoubtedly result in contested regional access and local areal denial. To the extent that near peer competitors and state sponsors of terror such as Iran undertake to support non-state actors hostile to the United States and its allies and partners (the "VEO/TCO" threat), a US-led coalition will face increasing hurdles in crisis response, counter-terrorism and foreign humanitarian relief. Whether the US and its allies and partners are competing with near-peer adversaries or countering non-state actors, their forces and their supplies will be vulnerable if maintained in a large formation. Operational maneuver from the sea (OMFTS), ship-to-objective maneuver (STOM) and sea-basing will all entail a heightened danger of detection and destruction by enemy A2/AD systems. If the US were required to conduct a Joint Forcible Entry Operation (JFEO) in an area where there is no logistics infrastructure, such as the triple canopy jungle of Central and South America or sub-Saharan Africa, there are few options that can sustain an expeditionary force for any length of time.

Idea, Inspiration, and Concept Introduction

How can we develop new expeditionary logistics concepts that enable US forces to operate in places without bases? The Defense Advanced Research Projects Agency (DARPA) has been working on submersed cargo containers that can be recalled at a moments notice for use, but these systems have largely been focused on Intelligence, Reconnaissance and Surveillance assets.[1] This concept can be expanded and further developed to encompass long-term logistics stores that can be utilized during JFEO missions that are conducted in areas where we may not have a robust infrastructure to open theaters and sustain operations. There are historical cases that point to the use of submersible cargo vessels and even submarine aircraft carriers that lend credence to the fact that this concept could be developed further.

Using past projects and concepts, current technology, and future fighting environments the United States can develop a feasible concept for underwater logistics basing in support of a future JFEO mission conducted in a location where infrastructure is not available. The research conducted to support this concept has taken the Joint Principles of Logistics into heavy consideration. A logistics concept that cannot meet any of the Joint Principles of Logistics will not be suitable, feasible, or acceptable to invest in further. This concept has the potential to be suitable, feasible, and acceptable given historic examples and current technology, it is merely a matter of integrating the future with the past to create the required components.

The following will define the anticipated threat that will necessitate a requirement for a new logistics concept that supports JFEO missions where infrastructure does not exist to support such operations. Additionally, this paper will examine the types of logistics operations that have been conducted over the last 15 years in Afghanistan and Iraq and show an evolutionary trend in

logistics operations. From mass-based to just-in-time to sense and respond, this paper will make the case that further evolution is necessary to support JFEO operations with a lack of infrastructure. Next, historical and current examples of technology from which this concept has been inspired will be examined. Finally, the concept will be outlined to include critical capabilities and risks associated with the concept. The intent is to establish an alternative or a supplement to current logistics support items that can be utilized where land-based infrastructure may not exist.

Central and South American Cartels and West African Instability

The conventional wisdom is that if we were to engage in war with Russia, it would be a ground war. If we engage in a ground war with Russia there are plenty of allied nations from which we can launch. The same would hold true for China or North Korea, though the chances of an amphibious operation may increase in a fight against China if a landing is required on their Eastern coast. An argument could be made that an amphibious assault would be a better method of attack than a conventional ground deployment. Beyond Russia and China there are two places in which an amphibious operation would require non-static logistics infrastructure. Those two places are Central and South America and the Western coast of Africa.

Cartel activity has steadily been moving from Mexico deeper into Central and South America. Most recently, Los Zetas, a violent cartel from Mexico, moved operations into Guatemala in order to control the distribution networks and cut out any middlemen or obstacles to their bottom line.[2] The push of the Zetas into Guatemala has the authorities in El Salvador and Honduras on notice. Further expansion south could create a dire situation in which military intervention is required because the infiltration of the Zetas into the local police and corruption of government officials create an environment in which law and order is upended. If the Zetas

are able to infiltrate the security forces it could create a situation where a JFEO is required. The Western coast of Guatemala and El Salvador provide a few prospective landing sites between the mountainous terrain and triple canopy jungle.

On the other side of the Atlantic resides another threat. Social conflicts and loss of Muslim power in the Western African nations of Ghana, Nigeria, and the Cote d'Ivoire are leading to an increase in tension and the increased probability of terrorist activities in the region.[3] Monitoring the expansion of the Islamic State into Africa may require the US to respond to these increased terror activities. The infrastructure required to sustain expeditionary operations or a JFEO mission does not exist in that region of Africa. Largely, outside of Egypt or South Africa, one would be hard-pressed to find a suitable solution to sustain logistics operation in support of expeditionary operations in Africa.

These two examples of operating environments are greatly different than the environments the US is accustomed to operating in. Though areas of Afghanistan and Iraq can be austere, the robust infrastructure allowed for several types of logistics operations. The environments afforded by West Africa and the jungles of Central and South America do not allow the luxury of a developed logistics infrastructure. The importance of good logistics planning cannot be understated. Logistics considerations must be at the forefront of operational planning in order to maximize the chance for success, especially in environments that do not have established infrastructure.

The Evolution of GWOT Military Logistics

Operations support and force sustainment are definitively important to the success of combat operations but are often afterthoughts in the planning process. Examples of poor logistics planning exist throughout the history of war and conflict. In the 2003 push to Baghdad,

the maneuver forces advanced so rapidly that they outpaced their communication reach back. This eliminated the ability to send a LOGSTAT (Logistics Status Report), which caused delays and unpredictability in resupply operations.[4] A better communications and logistics plan would have ensured the combatant commander had a table of logistics options to choose from. In the future, the United States military will likely conduct expeditionary operations in order to improve the security situation in austere conditions in the CENTCOM (Central Command) AOR (Area of Responsibility) or in other areas that afford fewer infrastructures such as Africa and South America. Lessons learned over the last 15 years can ensure that logistics is not just an afterthought, but an integral part of operational planning at all levels of war.

In anticipation of future expeditionary operations, the Department of Defense should invest in adapting and transforming joint logistics operations to better operate in an expeditionary advanced base setting. This will provide combatant commanders and the warfighter the tools to make accurate decisions and enhance the security situation. There are currently three main methods that all military services use to conduct logistics operations. The military could also make an improvement to these methods by applying tactics, techniques and procedures from the business world. The intent of this section is to provide a historical and business example of those three methods, analyze the infrastructure, threat, and missions in CENTCOM and beyond to determine the best option for the joint force to adopt to sustain the effort of improving security in hostile areas.

The Iron Mountain

The first type of logistics operations to explore is mass-based logistics. Mass-based logistics is the school of thought that more is better and has been aptly named the "Iron Mountain." Mass-based logistics does not require logisticians to maintain accurate forecasts and

removes the guesswork from supply and demand of any particular item. Another advantage to mass-based logistics is that more often than not, the required item is on hand, shortening the wait time of the end user.[5] However, a key problem with mass-based logistics is the mass. Warehouses and stockyards leave a large footprint that becomes almost impossible to move with haste and require personnel to operate. The key metric of the mass-based system is days of supply. Some instances showed a recorded 60 days of supply on hand. The mass-based system was widely used from the Cold War period to just after Operation Desert Storm, but budget cuts and force reductions caused the military to change its way of conducting logistics.

In Desert Storm, there was a call for 60 days of supply to be on hand and ready prior to the ground invasion. The military found that it could move that amount of material, but it had no way to track what was in each container when they were in transit or worse when they arrived at the port.[6] This made it impossible to prioritize what items went where. The Enterprise Resource Planning (ERP) systems that the DoD and Service Components use today were non-existent in the early 1990s. Now with programs like In-Transit Visibility (ITV), there is a process to see not only where a shipping container is in the world, but also the inventory of the contents of that container. At the end of Desert Storm, only half of the 80,000 shipping containers were ever opened. This case only proved the point that even the best items available to the war-fighter are irrelevant if they never see them.[7]

It is difficult to find any current business literature on mass-based logistics because the cost of warehousing makes this style of logistics unattractive to most businesses. In 2012, Amazon lost $39 million, fulfillment being the main operating cost of that figure.[8] Amazon is not stockpiling inventory in their warehouses either. The goal is to only stock inventory that consistently moves and then has a plan for promptly filling the rare requests that arise. Amazon

has had an annual inventory turnover rate as high as 16 and is currently turning over inventory about 8 times per year.[9] Mass-based logistics operations do not monitor inventory turnover or limit stockpiling to frequently used items, but instead focus solely on always having the required material on hand. Logistics operations at Amazon and even Wal-Mart come closest to mass-based logistics in the military because of the need for large warehouse space, but the difference is that the business world considers warehousing short-term storage and the military uses warehousing as a long-term solution. The cost of warehousing alone is a major reason most businesses avoid mass-based logistics and today's resource conscious climate is a key reason the military has also shied away from mass storage, in favor of a more cost-friendly and swift option with just-in-time.

Just-In-Time

Just-in-time (JIT) logistics was the answer to the sluggish and expansive iron mountain. JIT keeps inventory reduced to the bare minimum operating level and is much more anticipatory than mass-based logistics. JIT requires very concrete and accurate demand signals as well as detailed inventory records. JIT maintains that having a required part or sustenance item on time is better than having a massive stock of those items. One issue with JIT is that when the system failed, the end user did not get their required items on time, if at all.[10] JIT is still in practice today in the Army logistics system. The biggest issue facing the military is the supply chain of command. In the business world, the supply chain works almost seamlessly. Items move from the distributor to the customer often through a third party carrier. In the military, external chains of command are at play so an item cannot simply move from distributor to end user it has to be routed through extra steps, such as a Supply Support Activity before it gets to the user. This

process can add days to weeks to the process flow. A deployed environment is not ideal for JIT. There are too many factors that can disrupt the supply chain.

JIT is not a new concept to the military. General Patton was supported by a version of JIT in World War II. Patton moved at such a rapid pace that he often outran his supply lines of communication.[11] The supply network would catch up a day or so later and replenish his units with what they needed. This is more of a JIT by necessity than plan, however, the principles hold true. In the recent conflicts, JIT has been the predominant choice for logistics operations. The use of ERP systems such as Battle Command Sustainment Support System (BCS3) has allowed logisticians to track all major classes of supply and order re-supplies at the appropriate intervals to avoid overstock and stock-outs. The major downfall to BCS3 is the human-in-the-loop. The real-time data in BCS3 is only as accurate as what is input. If it is not updated, it is useless. Other key challenges to JIT in combat are the enemy and weather. If a re-supply convoy gets ambushed or hits an IED it clearly affects the end user. Disruptions in the JIT supply chain are not ideal in combat. Weather, especially in mountainous terrain, can make some routes impassible, thereby requiring alternate transportation methods such as rotary or fixed-wing aircraft. The limitations to JIT make it less than ideal in a combat setting, yet still more attractive than the mass-based system.

One of the greatest adopters and practitioners of JIT in modern business is Toyota. Toyota developed the Toyota Production System (TPS) largely based on Lean and JIT principles. Toyota's system signals what items to make, schedules on how frequently to make them, and metrics that determine the quantities of production.[12] Essentially, this process uses the rate of demand for any particular item to signal the production of replacements. TPS ensures there is a continual response at every level of the supply chain. If there is any weak link it is quickly

identified and solved.[13] The Toyota system thrives on consistency and predictability in the market and uses historical data to plan for future logistical needs. Military operations are purposefully unpredictable and require flexibility instead of consistency, so it is not difficult to see why such a system is not ideal for combat logistics operations. The response time in JIT is appealing to military logisticians, but the reliance on the accuracy of the LOGSTAT to drive resupply is worrisome. Sense and Respond logistics aims to remove that worry.

Sense and Respond

Sense and respond (S&R) logistics is an application in expeditionary logistics. S&R allows logisticians to precisely predict and deliver sustainment materials, through a network-centric system, to the warfighter. S&R can provide the combatant commander with a litany of logistics options that can be tailored to any operation, at any level. S&R is an ideal form of logistics in the uncertainty of an expeditionary environment.[14] S&R is adaptive because it relies on inventory that is strategically placed throughout the battle space and is tracked through a dynamic IT infrastructure. The key metric of S&R is the speed and quality of the effects achieved from responsive logistics. A major downside to S&R is that it relies heavily on flexible transportation and a robust IT network. If transportation is degraded or the network is interfered with, S&R as a logistics solution is not effective.

While JIT is still the flavor of the week, S&R has developed an insurgent foothold in military logistics. The use of ITV and the Logisticians Information Warehouse (LIW), an online repository that shows current SSA inventories across the globe, parts tracking information, and countless other tracking tools, makes S&R a viable option now. S&R is being used on the battlefield today, and has been for a few years now, but still falls under the JIT umbrella. As early as 2008 ingress routes from Turkey, Kuwait, and Lebanon allowed for distribution

flexibility and reduced operational risk because of the unpredictable nature of the resupply routes.[15] Reliable ground and aerial transportation options are keys to the success of S&R operations.

In corporate America, Sense and Respond are moving to the forefront of logistics operations. Companies such Sun Microsystems, Proctor and Gamble, and Caterpillar are all adopting S&R models for their logistics operations. These companies are not just focused on distribution operations, but are trying to understand their consumer better. Proctor and Gamble are effectively working to match real-time demand with real-time supply. The metrics they use are purchase frequency, distribution networks that can deliver a product within 72 hours of order, and operational efficiency in warehousing.[16] These metrics can also be used in the military. Monitoring the frequency of certain parts, rations, clothing items, and things of the like can help produce a predictive analysis of who is going to need what, and when. In theaters such as CENTCOM, SOUTHCOM, and AFRICOM authorities and responsibilities dictate how logistics operations are conducted. Furthermore, types of operations, infrastructure, and the enemy threat also impact the type of logistics operations that are conducted.

Theater Logistics Responsibilities

The J-4 is responsible for planning, coordinating and synchronizing Joint Theater Logistics for their respective Geographic Combatant Command (GCC). The GCC J-4 is also charged with communicating the Combatant Commander's logistics priorities to the Service level logisticians who are ultimately responsible for executing the joint logistics.[17] The GCC J-4 will also establish the Joint Logistics Operation Center and Joint Deployment and Distribution Operations Center, which monitor and control on-going logistics operations and synchronizes

and coordinates the supply, transportation, and distribution related activities at the strategic and operational levels, respectively.[18]

United States Army Central (ARCENT) is the Army Service Component Command (ASCC) and theater-level headquarters for CENTCOM. ARCENT has the responsibility of synchronizing logistics for Army and Sister Service elements within its command. The same principal holds true for each of the other GCCs. The Theater Sustainment Command (TSC) is the ASCCs logistics headquarters and command and control element. The TSC is responsible for theater opening, common user logistics functions, establishing the intra-theater surface distribution system, among other responsibilities.[19] The TSC is integral in establishing the operational level logistics in a theater of war.

Named task forces typically will report to their respective service headquarters for logistics and operational reporting. The command level of the task force will determine the next higher headquarters. For example, a Special Operations Task Force is typically a Battalion level command. The SOTF would report to and request from a Combined Joint Special Operations Task Force, an O-6 level command, who would report to a 2-star Special Operations Joint Task Force. The same would be true for a conventional task force. Ultimately the Joint Force Commander has theater responsibility for logistics, but there are also responsibilities at the subordinate levels.

The current operations in CENTCOM, particularly in Iraq and Syria are predominately conducted by special operations forces (SOF). SOF logistics is much more agile than conventional logistics, but can also carry more risk than conventional logistics. Most logistics support in Iraq and Syria is based out of Kuwait and Jordan currently. This support typically does not come from military ground, but rather contracted trucks. More often than not, the

distribution method of choice is an aerial drop or sling-load because it is quicker and puts fewer military members in harm's way. The infrastructure that the US forces enjoyed at the pinnacle of combat operations in OIF does not exist any longer. What was turned over to the Iraqi Army is largely decrepit or enemy owned.[20] If we were to establish prolonged combat operations in Iraq again we would have to rebuild almost everything, complicating logistics even further. It is paramount to a logistician to determine the best mix of methods to ensure the combatant commander is armed with choices, but most importantly to ensure the warfighter is postured for success on the battlefield. Operations in SOUTHCOM or AFRICOM would have similar logistics considerations as current operations in CENTCOM. Lack of infrastructure adds a new degree of difficulty to the already complex sustainment operations in each of these theaters. Conventional logistics will not likely be sufficient to sustain requirements demanded by the GCC and units on the ground.

The goal of any logistician should be to get the right equipment to the right place at the right time. Each of the previously mentioned logistics methods has qualities that make them beneficial, but also qualities that make them a liability to the warfighter. It is imperative that logisticians are afforded to the opportunity to be involved in the operational planning process to ensure the right logistics plans and packages are in place to support the warfighter. In an expeditionary environment, mass-based logistics is not feasible. JIT could work, but it is also very reactionary and relies too much on unpredictable forecasting. S&R is assuredly the most proactive option of the three. With an IT infrastructure that can track a LOGSTAT in real time through the Global Combat Support System – Joint (GCSS-J) all the information a logistician needs to provide timely, accurate items are available.[21] ITV and LIW provide accurate tracking mechanisms and depot stock objectives. The combination of these systems coupled with a

transportation network is the key to sustaining both expeditionary and prolonged operations. Ultimately, it is the warfighters who provide the security and stability in otherwise hostile areas. They cannot plan or execute these missions, especially in potentially austere conditions that CENTCOM, SOUTHCOM and AFRICOM offer, without the proper equipment and consideration. A new concept could be created that offers logistics support to units that may be called to serve in austere locations with limited infrastructure. The concept is not conventional by any means, but is inspired by examples of either current or prior technology and could potentially be adapted or developed further.

A Case for Continued Evolution

In anticipation of future expeditionary operations, the Department of Defense should invest in adapting and transforming joint logistics operations to better operate in an expeditionary advanced base setting, providing combatant commander and the warfighter the tools to make accurate decisions and enhance the overall security situation of their environment. Without a predictable, reliable sustainment plan, security of both US military members and local civilian populace will be degraded. In places like Baghdad or Kabul, the infrastructure is robust enough that an expeditionary option is less likely, but places like Raqqa Syria, Maktab Afghanistan, and San Luis Guatemala, require a smaller, dynamic sustainment force. Security can be affected in any of Joint Operations' six phases, but none of those phases can truly be successful without thoughtful logistics planning. It is recommended that the Joint Force and Army, as the theater-level logistics headquarters in CENTCOM, and Marine Corps as the theater-level logistics headquarters in SOUTHCOM take a concerted look at building and sustaining an S&R mentality with regards to combat logistics operations.

Given the assumption that the United States Military will likely be involved in a conflict that will occur in a contested environment where the US may not have established advanced bases and key logistics infrastructure, the Joint Force should reconsider how it plans, prepares, and conducts logistics operations in support of expeditionary warfare. The United States Marine Corps Expeditionary Advanced Basing Operation (EABO) concept can be further developed in conjunction with the Marine Corps Hybrid Logistics Concept in preparation for the future-fighting environment. Currently, the Marine Corps has a Maritime Prepositioned Force (MPF) consisting of two Maritime Prepositioning Ships Squadrons (MPSRON) that can support a Marine Air-Ground Task Force (MAGTF) for up to 30 days. One MPSRON is located in the Pacific and the other in the Indian Ocean.[22] The response time of a MPSRON dispatched from the Indian Ocean to Western Africa will not be quick enough to support immediate expeditionary operations in Africa nor will the MPSRON in the Pacific be swift enough to meet the need in South or Central America. The sail time for the nearest MPSRON is upwards to 30 days[23] (See Appendix A).

The EABO concept utilizes small island chains in the Pacific to project combat power in support of operations in the Pacific theater. Even though there are not small chains of islands off the coasts of Africa and South or the Western Coast of Central America like there are across the Pacific Ocean, it does not mean that prepositioned logistics ships cannot be deployed and utilized in support of combat operations. The Marine Hybrid Logistics concept calls for a modular, distributed force that can sustain operations across the domains of land, sea, air, space, and cyberspace.[24] The OMFTS concept addresses logistics in these domains, however the problem with OMFTS and EABO is that they are prone to targeting because they are visible and in the

case of EABO static. OMFTS is not static but also is not very suitable because it is not long lingering. By design OMTFS operations need to keep moving in order to avoid targeting.

The following concept will outline a proposed solution to the problem of sustaining a JFEO in an environment where established bases are not available. This concept takes the Joint Principles of Logistics into consideration and the importance of their application to the war fight. This concept will seek to define and develop a new capability, the timeframe in which this capability should be utilized, risks, assumptions, and implications of the new capability, the application and integration of military functions, and necessary capabilities in order for the concept to be successful.

The spread of Boko Haram in West-Central Africa, ISIS into Northern Africa, and increased drug cartel activity in South and Central America may potentially accelerate the timeline in which an expeditionary force would be deployed to Africa or South and Central America. Currently, special operations forces are conducting combat operations around the Horn of Africa and other conventional forces are operating in Libya and various other parts of Africa.[25] Additionally, United States Special Forces conduct many counter narcotic operations in South and Central America.[26]

The military problem that is envisioned is a contested shore along the coast of Africa, more than likely Western Africa, the Eastern Coast of South America, or the Western Coast of Central America at which a JFEO mission is conducted. Currently, we have no landing sites established in those areas and a JFEO situation will require expeditionary sustainment. This concept aims to fill that gap by considering the Joint Principles of Logistics, The Marine EABO concept and utilization of technologies that have either existed or have been theorized. One major consideration for this concept is manning. Ideally, the manning would be at a minimum

and this would result in the military flexing that manpower elsewhere to maximize combat effectiveness and power projection.

Operation Atlantis Imagined

The Inspiration: Five Primary Sources

The inspiration for this concept comes from five primary sources. Russian Typhoon-class submarines, South American drug cartel narco-submarines, the British HMS Artful, the Falkland Island campaign as a logistics case study, to include the use of the Mexeflote cargo craft, and the International Space Station (ISS) as a proof of concept. Individually, each of these items provides the framework for the holistic approach of the proposed concept. Each of these ships, the ISS and the lessons learned from the Falklands will be discussed further.

Cargo submarines have been in existence for quite a while. The Russian Navy had developed a Typhoon-class submarine to be an answer to the US Navy Ohio-class submarine. These were nuclear capable ships that primarily served as a method to deliver nuclear munitions.[27] The Russian marine engineering center Rubin Design Bureau developed a plan to create a submarine cargo vessel out of the Typhoon-class submarine by removing the nuclear tubes and installing cargo wells. The projected storage capacity of the cargo holds is 15,000 long tons, roughly 33.5 million pounds, or the equivalent lift capacity of 196 C-17 cargo aircraft.[28] One ship of this size can easily carry a Division's worth of equipment. Scalable, tailorable packages would be easy to configure on a ship that size. That size of a ship would likely not be good in the application of expeditionary or a JFEO environment, but the idea remains worthwhile for further exploration.

The drug cartels, oddly enough, have provided a source of inspiration to this cargo submarine concept as well. In September 2000, Colombian authorities found a submarine that

was under construction outside the city of Bogota. The submarine was said to have the capacity to carry 200 tons of material and was only 100 feet long. The vessel was also equipped with a GPS for guidance and also the torpedo tubes were retrofitted to drop a homing device for later pick up of the material that was dropped.[29] This would be an ideal mechanism for a SEAL team or other special operations unit making a landing that needed to pick up gear along the way. If even a rudimentary model for narco-trafficking can be utilized while evading authorities, a military application with a sophisticated level of technology surely can be realized and used effectively in a combat scenario.

Having established that the technology is somewhat existent and a proof-of-concept has been tested by the narco-traffickers, the long pole in the tent is remaining underwater for decades at a time without having to surface to service the nuclear reactor that powers the ship. The British defense company BAE has created a submarine that can stay underwater for 25 years.[30] This would be a perfect solution for both the manned and unmanned vessels. For the unmanned vessels, the ships could stay submerged for just short of 25 years if you account for the time it takes to sail from the launch port to the destination and back. Currently, the US Navy operates a Virginia-class submarine that has a reactor that will last a reported 33 years, however the ship has to be serviced every eight years.[31] Eight years is a pretty lengthy time to stay submerged, but if one key capability is to stay undetected, minimizing movement should be a top priority. A 25-year service interval is integral to this effort and the technology already exists.

The Mexeflote is an additional inspiration for this concept that was used in the logistical operations in support of the Falklands Campaign. During the assault on Port Stanley, the British forces could not land enough support vehicles on shore due to rough sea conditions and other environmental considerations. The effect was that the British had to use combat vehicles to

conduct logistics resupply operations.[32] The British used pontoon boats called Mexeflotes to conduct their ship to shore operations. Mexeflotes are modeled after the United States Rhino Fairy barge. The Rhino fairy was used in World War II primarily at Normandy, but also in the African and Italian theaters. Both the Rhino and Mexeflote are used to ferry cargo to the shore, however were not built enough to power themselves to the shore and require a tug, the Mexeflote improved on this and the craft was self-propelled. This concept should improve upon both of these designs and design a craft that can land on a beach in any conditions with the ability to roll on and roll off wheeled or tracked vehicles that are stored in its' cargo holds. [33]

The final inspiration for this concept comes from the International Space Station. The ISS was commissioned in 1998 and has been in the Earth's orbit ever since.[34] It does not take a physicist to understand the effects of having no oxygen in space. The same holds true for underwater activities. Furthermore, there are at least 14 individual modules that marry one another to comprise the entirety of the ISS. If this concept can work in space then surely it can be applicable in an underwater environment. The principals of airtight seals on the ISS should translate directly to the seals of multiple submarines connected together. The thought of an underwater ISS could potentially work in practice.

As previously written, each of these five inspirations are unique on their own, but if their technologies or concepts could be wrapped up into one concept it would create the ideal vessel for a cargo submarine that could be utilized off any contested coast. Many of the required capabilities exist in some capacity or another, so it is not a far stretch to think that these could be engineered and integrated into the same vessel. Based on the research, the idea is not new, but the concept is relatively unique. Based on the research, it does not seem that anyone has

considered the application of this concept, except perhaps for the Russians and their cargo submarine, but even that was never intended to make shore landings.

Concept Synopsis

The basic synopsis of this idea is simple. Imagine the International Space Station, but under water instead of space. The concept would call for a configuration of both manned and unnamed, submersible cargo vessels that can be utilized in support of a JFEO situation along the coasts of interest. These vessels will be strategically placed in certain intervals so that no matter where a conflict arises, support is waiting off shore. Ideally, these vessels can remain submerged for extended periods of time and are easily maneuverable and can be configured and tailored for the specific needs of any situation. The vessels could interlock to create a method of passage to the manned crew from ship to ship to configure loads, rotate stocks, or conduct any other maintenance required, but could also be sealed to operate independently and unmanned. The concept is derivative of a few examples of past technology and operations each of which will be explored into further detail.

The Joint Principles of Logistics were heavily considered during the development of this concept. Chiefly, flexibility, responsiveness, and sustainability are the principals that were applied to the creation of this concept.[35] This plan allows for logistics support to be flexible to meet the needs of the commander in any type of combat operations. The concept can be used in any of the joint phases of operations. The support provided in this concept will be reliable and can quickly respond the needs of the warfighter on the ground. Logistic packages can be tailored to each specific mission set and waiting for the warfighter as the need arises. Finally, this concept will provide and maintain a sufficient level of logistics support required by whatever

operation is being conducted. This is at the heart of sustainability. All of the joint principles of logistics were considered, but these three are arguably the most heavily weighed for JFEO fight.

The concept that is proposed is a combination of manned and unmanned submersible cargo vessels that can be prepositioned in either the Eastern Atlantic along the entire coast of Western Africa, the Western Atlantic along the coast of South America, or the Eastern Pacific along the coast of Central America into Western South America. The vessels need not be a replacement to the MPF and MPSRON, but a supplement that can easily and quickly be utilized in the time that it takes for the MPF to arrive and establish operations. The preponderance of the vessels should be unmanned. The requirement for manned vessels will be low. Only a small number of ships will require a crew. This crew will be charged with the command and control of the submerged fleet. These ships must have certain capabilities in order to be effective as intended.

Seven Key Capabilities

First and foremost, the unmanned ships must be capable of remaining submersed at depth for extended periods of time. Instead of 90 to 180 days, these ships should be able to remain under water up to 20 years or more. Manned submarines can only stay under water only as long as their food stocks will allow. Typically manned submarines can stay under water for between 90 and 180 days, depending on the size of the ship.[36] Considerations will need to be made for the manned vessels and the time at sea. One would not expect a manned vessel to remain underway for a longer period than the current, customary deployment.

The second capability that these vessels require is a signature masking capability. Since these submarines are going to be submersed and largely unprotected it is imperative that the signature not be overtly identifiable as a military sub. The principal purpose of these submarines

is to provide an unknown expeditionary advanced logistics base. The fleet would be rendered useless if they were discernible to the adversary that they were, in fact, logistics bases. Technology, such as sounds refraction or deflection, exists that can mask sounds and deceive SONAR and other tracking devices that must be utilized in the design of these vessels. Another option is operating the submarines below the sound channel axis, where the speed of sound is at it's lowest, to reduce the signature of the submarines.[37]

The third capability requirement of the cargo submarines is that they must be able to accept the landing of any rotary wing cargo aircraft in the Joint fleet, to include the V-22. Ideally, if the flight deck can accept an Osprey it should be able to accept a CH-47 and CH-53. It can be deduced that this width needs to be approximately 84 feet. The beam of the USS Tripoli, an Iwo-Jima class amphibious assault ship was 84 feet and it was able to accept a CH-46, which has a width of 50 feet.[38] The V-22 Osprey has a width of 46 feet. Generally, the fuselage of any cargo helicopter does not exceed 18 feet. The typhoon class submarine has a beam of 75 feet.[39] It is not a stretch to think that a design could be engineered for an extra 9 feet of beam length and still remain able to submerge. The rationale behind the flight deck is that one the submarine surfaces, a cargo helicopter carrying troops can land and the troops can get to work preparing the ship's cargo for deployment. Additionally, the cargo that is being stored on the ship can be loaded onto the helicopters in the form of kicker pallets, speedballs, sling sets for air assault operations, or airdrop bundles to quickly deliver necessary critical supplies to the troops conducting the JFEO.

In addition to having the flight deck, a variation of the craft should also be designed with the ability to make an amphibious landing. In the event that an amphibious assault force is not available to make a beach landing, these craft should be able to surface and land on a beach

where troops can link up with the equipment and begin the offload for combat operations. Assuming the craft that makes the landing is an unmanned craft, an assault force can be landed on the craft via the flight deck or even an airborne assault force can be dropped onto the beach near where the craft-landing site is established. The landing capability builds in another layer of flexibility that can be considered during the planning phase of a JFEO.

Another key capability that these vessels must have is the ability to load and trans load cargo while at sea. This is where the interconnectedness of the International Space Station comes in to play. If these vessels can form a seal and interlock to allow passage of men and material it would allow for loads to be rapidly configured and prepositioned for landing. If certain stocks of rations or ammunition reach their expiration dates there needs to be a mechanism for the offload of the old materials and loading of the new materials. Also, in the event that the Geographic Combatant Commander (GCC) decides that a different set of materials, tailored to the current situation or anticipated warfight, the reconfiguration of the loads should be achievable. There is a likelihood that if the stocks are not used within a five to ten year horizon that the packages will need to be updated to reflect the current or future state of operations. Event as simple as technology or equipment upgrades could affect what is loaded on the ships. These items should be easily accessible and removable. The use of ISU 90 containers vice the 20-foot shipping containers would be the most viable option because an ISU 90 can be loaded and unloaded with a 10K forklift. A shipping container will require heavier equipment such as a container handling truck, which increases the space and lift requirements of the vessels. Ease of maneuver aboard the ships is key to the ability of a rapid trans load at sea.

An additional key capability is for the unmanned submarines to be controlled remotely. Remote operability is a key component to the use of the unmanned submarines. Instead of just

remaining static in one location for an indeterminate amount of time these craft can be controlled by the command and control vessel or at another echelon deemed appropriate by the GCC. Moreover, the remote capability allows an operator to conduct an amphibious landing without the need for a crew. The remote capability should consider not just speed and direction of travel but the ability to increase or decrease the depth at which the submarine is operating. The Control of the submarines would likely be conducted from Naval Station Norfolk, or even Naval Station Rota. These operations would be akin to a MQ-1 Predator Drone operator at Nellis Air Force Base controlling fire missions, but instead of lethal targeting it would be strictly maneuvering.

The final key capability is an active defense system. Each vessel does not necessarily need to be capable of an active deterrence measure, but there should be a ship in the vicinity that can provide active counter-measures. A guided missile capable submarine, such as the Ohio-class submarine, could protect the underwater vessels. The defense strategy is something that can be tailored depending on the size of the fleet. If there were only a few ships in an area, the defense coverage would likely be less.

Time Horizon, Assumptions, and Risks

The time horizon for this concept is realistically in the 2030 timeframe. There seems to be very good odds that the United States military will conduct a JFEO on the coast of Africa or South and Central America at some point in the next 20 years to combat terrorist networks and transnational criminal organizations in each region. If economic and governmental weakness factors are any indication of future instability and conflict, Central and South America and Africa will be prime for an outbreak by 2030[40] (See Appendices B and C).

A fundamental assumption associated with this concept is that current Ohio class submarines can be retrofit to accommodate the attributes previously mentioned. The cost

associated with building a brand new submarine with these attributes is in the range of $4-6 Billion.[41] Retrofitting the Ohio class submarines would likely be much less expensive. Associated with cost is the assumption that it would be more cost effective to build or retrofit this capability to store and deploy logistics assets than it would be to continue with the current logistics operations. Another key assumption is that the United States will continue to serve as an interdiction or global response force. There is no predictability of the role the United States will play on the global stage from president to president, let a lone the predictability of a concept 13 years into the future.

There are a few risks associated with this concept and the assumptions that have arisen from this concept. The largest risk is that an electromagnetic pulse could affect a high reliance on automation and technology, or any other cyber related threat could cripple the effectiveness of the vessel. The virtue of the stealth nature of the concept should be enough mitigation of that risk. The inability to target it would be a deterrent. Another risk is if a cloaking technology is available that it may not work as desired, leaving locations of friendly craft vulnerable and susceptible to attacks. Again, remaining submersed and only surfacing as required should mitigate this. An additional risk is leaving a crew at sea for an extended period of time that is outside of the norm. This risk can easily be mitigated with proper planning for a rotational basis and ensuring crews are not subjected to depths more than required or prescribed.

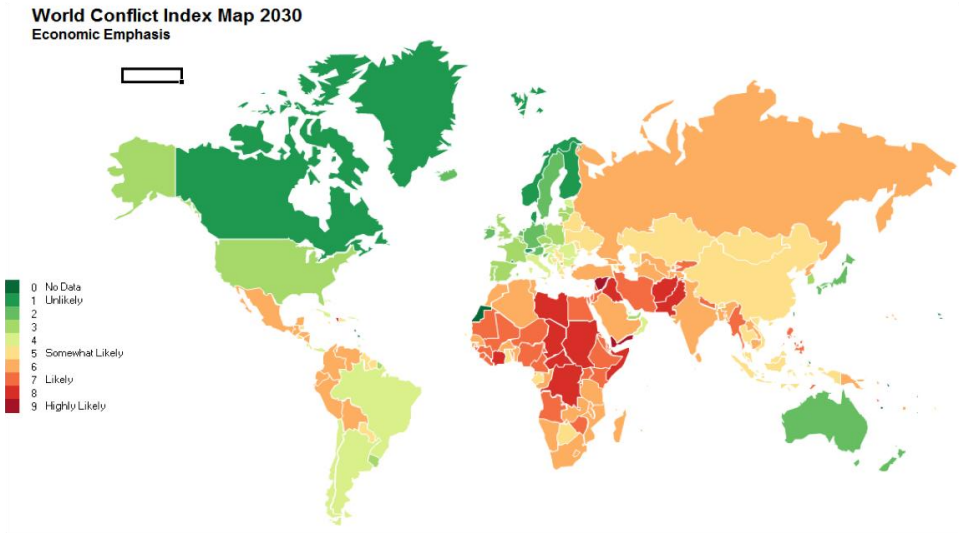
In conclusion, there is a foreseeable, viable need for a subsurface logistics base with regard to support of an expeditionary operation of the coast of Africa, or South and Central America. Given the assumption that the United States Military will likely be involved in a conflict that will occur in a contested environment where the US may not have established advanced bases, the Joint Force should reconsider how it plans, prepares, and conducts logistics

operations in support of expeditionary warfare. Using past projects and concepts, current technology and future fighting environments the United States can develop a feasible concept for underwater logistics basing in support of a future JFEO mission conducted in a location where infrastructure is not available. This concept provides the logistics tools to successfully support this type of operation, whether it is conducted on a contested coast in Libya or in the middle of sub-Saharan Nigeria, this concept will offer a viable solution. Preparations for such a conflict should be made early and refined often. The presented information should provide a relevant framework to support any Joint operation from the sea.

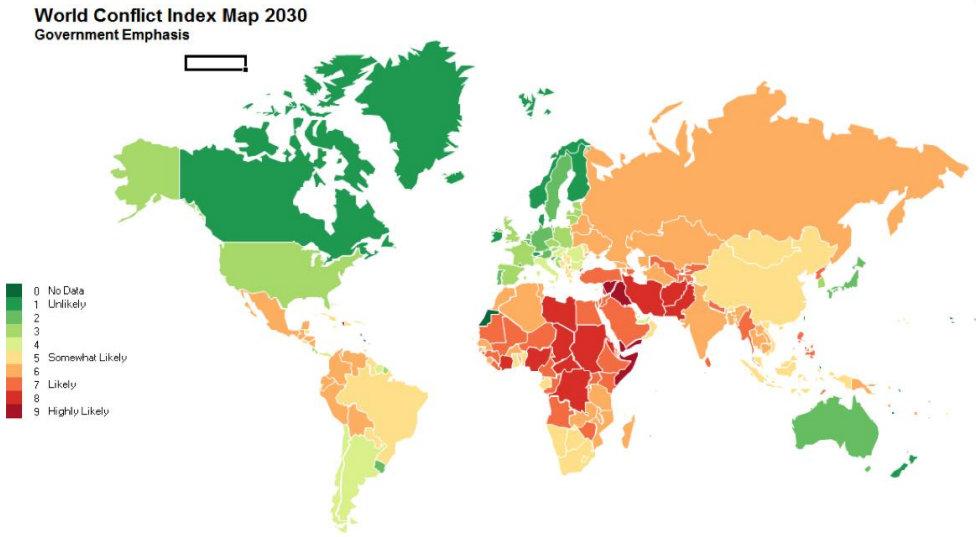
APPENDICES

Appendix A

Appendix B


World Conflict Index Map 2030
Economic Emphasis
0 No Data
1 Unlikely
2
3
4
5 Somewhat Likely
6
7 Likely
8
9 Highly Likely

Appendix C


World Conflict Index Map 2030
Government Emphasis
0 No Data
1 Unlikely
2
3
4
5 Somewhat Likely
6
7 Likely
8
9 Highly Likely

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