POWER PROJECTION OPERATIONS AND URBAN COMBAT: AN AVOIDABLE COMBINATION?

A Monograph
by
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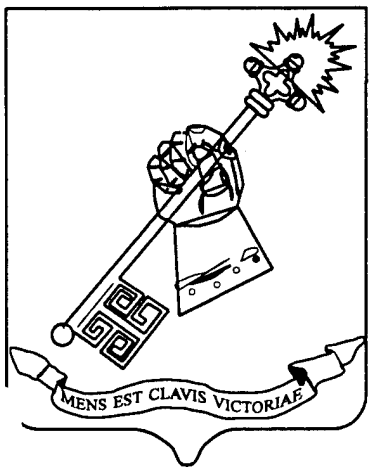

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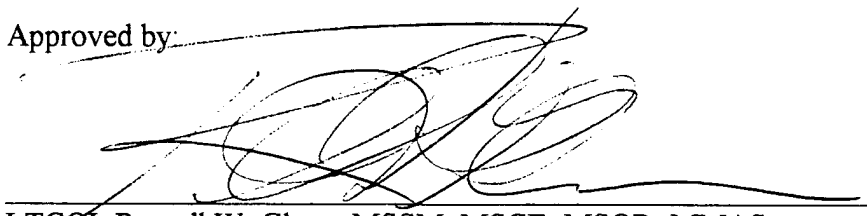

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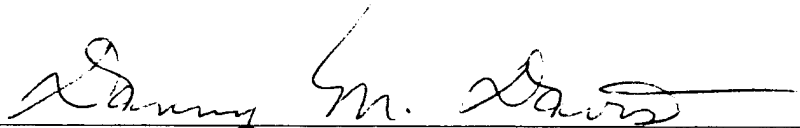

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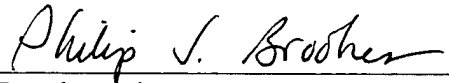

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ABSTRACT

POWER PROJECTION OPERATIONS AND URBAN COMBAT: AN AVOIDABLE COMBINATION? by Major Frank R. Boynton, USMC

This monograph addresses the relationship between power projection operations and urban combat. The facilities which are required for a power projection operation are typically located in urban areas. US doctrine for urban combat is to bypass urban areas whenever possible due to the difficulty and cost of urban combat operations. The hypothesis of this monograph is that there is a conflict between US force projection doctrine, which is based on the use of theater arrival facilities (typically located in urban areas), and US urban combat doctrine.

The monograph investigates whether Logistics Over the Shore (LOTS) offers a capability to conduct force projection operations while avoiding urban areas. It investigates whether the US possesses adequate capabilities to conduct Logistics Over the Shore operations, and what US options are if such capabilities are not present.

This monograph first investigates the nature of urban combat focused on historical examples. The examples include the Battle for Hue, the Battle for Khorramshahr, the Battle for Manila, the Normandy Campaign, and the Battle for the Falklands. The monograph next investigates the US doctrine for urban combat, with a discussion of both US Army and US Marine doctrine. A discussion of the validity of this doctrine in light of the nature of urban combat follows. The monograph then reviews the US doctrine for force projection operations, focused primarily on the seaborne leg of the strategic mobility system.

Finally, what follows is a detailed discussion of Logistics Over the Shore which is proposed as a means for conducting force projection operations in the absence of fixed facilities, thereby avoiding urban areas and the inherent risk of urban combat. Logistics Over the Shore is described, limiting factors are delineated, and the nature of these operations is discussed.

Table of Contents

I. Introduction

Future US military operations will demand the projection of power from the continental United States (CONUS) to world-wide areas of operations. By 1999, ninety-three percent of US Army forces will be located in CONUS.[1] The projection of credible, sustainable combat forces from CONUS bases to areas of operations will require the capability to project power both *to* and *into* the area of operations. Force projection which only gets to the periphery of the area of operations is not successful; a force projection operation of ten thousand miles is irrelevant if the forces cannot actually be landed on the foreign shore. The final leg of the operation, which is the actual delivery of forces, equipment, and supplies into the theater, is at least as important as any of the other phases of the deployment operation. The projection of force from CONUS throughout the world requires certain specialized facilities: seaports and airports, or both, combined with a rail and/or road network to allow for follow-on intra-theater movement. US force projection operations have come to depend on those facilities. Denial of those facilities to US forces will have dramatic impacts on such operations. The Allied Expeditionary Force which conducted Operation Overlord was irrelevant as a combat force as it sat in England aside from its potential to be deployed onto the continent of Europe. Without the means to project that force onto and then beyond the beaches of France, it was strategically and operationally of no consequence. Just as importantly, it was the ability for continuous projection of that force which allowed the ensuing campaign to liberate Europe to continue.

Force projection operations are defined as the demonstrated ability to rapidly alert, mobilize, deploy, and operate anywhere in the world.[2] Inherent in that lists of tasks is the

requirement to conduct entry operations to deliver that force into the theater. US military entry operations are categorized as either unopposed or opposed.[3] American capability for forced entry operations generally rests in the United States Army's airborne units and the United States Marine Corps with its capability for amphibious assault. Forced entry capability grants the attacker the initiative to select the time and place (within limits) of the entry operation. Unopposed entry operations require sites or areas beyond the reach of enemy forces which allow an administrative, vice tactical, entry of US forces which then organize for combat and move to an assigned area of operations. Unopposed entry operations are typically conducted in the vicinity of facilities capable of receiving the ships and aircraft upon which force projection is based.

Any decline in US forced entry capability is a zero sum issue: as capability for forced entry declines, the requirement for unopposed entry operations increases, there being no decrease in total force projection requirements. The heavy forces and huge tonnages of fuel, ammunition and other supplies and equipment require sealift to carry them. Up to ninety percent of the total tonnage for a force projection operation will be carried by sealift, much of it in commercial cargo vessels. Nearly all the personnel will fly-in with the great majority of those personnel carried in commercial passenger airlines. These considerations increase the need for unopposed force projection capability.

It is this requirement for unopposed entry operations which is the primary focus of this paper. Unopposed force projection operations as currently envisioned will flow through ports and airfields in secure locations. This paper will address what the author feels is a flaw in this doctrine: the assumption that we can depend on the unopposed use of critical theater arrival facilities. FM 100-5, *Operations*, states that US forces seek unopposed entry whenever possible;

deploying units will seek to flow through ports and seaports into a lodgment area.[4] A potential adversary can conduct Intelligence Preparation of the Battlefield and discover those facilities essential for force projection operations. Should an adversary wish to contest our force projection operation, it would be logical for him to do it by interdicting the flow of forces into theater prior to the marriage of personnel with their equipment rather than facing a fully formed and combat ready US expeditionary force on the battlefield. The means by which the enemy can achieve this interdiction are fairly straightforward. The airfields and ports upon which we depend for force projection are located almost exclusively in urban areas. Should the enemy wish to deny us the facilities for force projection, he could seize and defend the urban area in which they are located and force us to conduct an opposed entry into the urban area. One need only consider the impact of the Iraqi Army seizing and defending the port complex of Al Jubail, Saudi Arabia during Operation Desert Shield to recognize the potentially decisive consequences of such actions.

This paper addresses the issue of US dependence on specialized facilities to support force projection in light of the fact that those facilities are typically located in urban areas. The author considers the nature of urban combat, US doctrine for urban combat operations, US doctrine for force projection operations, and lastly, a means to support force projection operations while avoiding urban combat: Logistics Over the Shore (LOTS). It is the hypothesis of this paper that Logistics Over the Shore, in combination with the ability to deliver personnel over the shore, allows the operational commander flexibility in selecting the point of entry for a force deployment operation. This will allow him the option of bypassing defended urban areas and complete the force deployment operation even if air and seaport facilities are unavailable. The following section provides several historical examples to facilitate analysis and demonstrate the challenges

confronting American forces.

II. Historical Backdrop: The Nature of Urban Combat

The Battle for Hue

The Battle for Hue was part of the Tet Offensive which began January 31, 1968. Hue was the ancient capital of the Vietnamese emperors; it contained a walled city, or citadel, on the north side of the Perfume River. The Citadel was enclosed by a wall 20 feet thick and 25-30 feet high, was approximately two and one half kilometers square, and included a small airfield. On the south side of the river was the rest of the city, an area of approximately three by ten city blocks. The total size of the city of Hue was roughly sixteen square kilometers and it had a population of nearly 140,000 people.[5] For purposes of comparison, the developed portion of the city of Leavenworth, Kansas covers a comparatively larger twenty-six square kilometers.

Enemy maneuver forces which made the initial attack in the Battle for Hue included two NVA/VC regiments and two sapper battalions, a total of 6,000 men. This was subsequently increased to a total of sixteen battalions and an estimated 16,000 men, the equivalent of two divisions. A total of eleven Army of the Republic of Vietnam (ARVN) maneuver battalions and three US Marine infantry battalions (the 1st Battalion of the First Marine Regiment and the 1st and 2nd Battalions of the Fifth Marine Regiment) participated in the actual battle for the city. Three battalions of the US Army's 1st Cavalry Division participated in operations designed to isolate the city.[6]

The *thirty-two* day long battle destroyed about eighty per cent of the houses within the Citadel. The duration of the battle is significant when the reader considers the small size of Hue.

ARVN losses were 213 killed and 879 wounded. The US Marines suffered 53 killed and 380 wounded.[7] To provide an illustration of the intensity of the combat possible in such a small urban area, the Fifth Marine Regiment fought both during the campaign for Okinawa during World War II and during the battle for Hue. Okinawa was a sustained campaign against a determined, dug-in defender. There was significant urban combat during the liberation of the city of Naha. Okinawa was generally considered to be one of the toughest battles in the Pacific theater. Aspects of that battle resembled World War I, with small parcels of ground such as Sugar Loaf Hill changing hands five or more times in as many days. A comparison of casualty rates for the two battles is illustrative of the intensity of the urban combat in Hue. During the three month battle for Okinawa (1 April through 22 June 1945), the Fifth Marine Regiment sustained a daily **wounded in action** (WIA) rate of 6.75 per 1000 strength. The casualties ranged from 0 to 31.8 per 1000 strength on a daily basis. The daily **killed in action** (KIA) rate for Okinawa was 1.35 per 1000 strength and ranged from 0 to 6.4 per 1000. (See Table 1). The fighting in Hue resulted in daily WIA rates of 17.5 per 1000 and KIA rates of 2.2 per 1000. The fighting in the Citadel was particularly difficult, with wounded rates as high as 44.4 per 1000 per day and 7.8 killed in action per 1000 per day.[8] It is dramatic testimony to the violence of this urban battle that *during the battle for Hue the Fifth Marine Regiment sustained wounded in action casualties at over two and one half times the rate of the battle for Okinawa and killed in action casualties at over one and one half times the rate of the battle for Okinawa.*

Table 1.Casualties in The Fifth Marine Regiment[9]

Battle	Average Wounded in Action (per day per 1000)	Range	Average Killed in Action (per day per 1000)	Range
Okinawa	6.75	0.0 to 31.8	1.35	0.0 to 6.4
Hue	17.5	1.6 to 45.5	2.2	0.0 to 9.6

Hue City is used to illustrate the intensity of urban combat as measured in casualties when a determined defender is assaulted by an equally determined foe. Hue is a particularly significant example given that a Marine regiment, such as the Fifth Marines in Hue City, is normally the assault element of an amphibious assault.[10] When one considers that fact in the light of the small size of Hue, the duration of the battle, and the friendly casualties sustained in seizing and clearing the city, one can begin to picture the difficulty of projecting power directly into defended urban terrain. Decreases in the amount of amphibious shipping available for forcible entry operations limit the amount of force the Marine Corps can project in the assault echelon. Based on available shipping, there is an upper limit to how much force can be projected in the assault echelon. The option of overwhelming a defender in an urban environment with mass and sheer weight of numbers is probably not available. The surviving option would then be a costly, time consuming, block by block assault until sufficient area had been secured to allow the use of the traditional force reception facilities: airports and seaports. The requirement for sustained, intense combat on

urban terrain would similarly task the sustainment capability of Army airborne forces. High consumption rates of supplies, particularly ammunition, and the lack of armored vehicles would strain the ability of airborne forces to conduct urban combat.

What was it about the Battle of Hue which caused such difficulty for the Fifth Marines? Urban terrain provides the defender many advantages. These allow a defender to occupy well-fortified positions which offer cover and concealment in a three dimensional environment. A defending force need not be very well trained nor technologically sophisticated to realize those advantages. FM 90-10, *Military Operations on Urbanized Terrain (MOUT)*, describes an environment which precipitates what is possibly the most intense form of combat. Continuous close combat, high casualties, the fleeting nature of targets, and fires from a frequently unseen enemy produce severe psychological strain and physical fatigue. Additionally, the inevitable presence of civilians may constrain the use of firepower,[11] further limiting the options of the attacker.

B. The Battle for Khorramshahr

The Iran-Iraq war provides an example of a relatively unsophisticated defender making maximum use of these terrain advantages. Khorramshahr lies on the east bank of the Shatt al-Arag at its junction with the Karun River. It is the commercial port for the city of Abadan and is approximately eighteen square kilometers in area. At the time of the battle, Khorramshahr had a population of 175,000 and was Iran's largest commercial port. The city was evacuated by Iranian regular forces along with a large proportion of the civilian population. The Pasdaran Militia remained to defend the city. The militia was a poorly trained and hastily organized self defense force better known in the United States as Revolutionary Guards[12]. They were augmented with

volunteer militias as well as smaller groups of police and armed forces trainees for a total of perhaps two to three thousand defenders when the battle began. The Iraqis attacked on 28 September 1980 with elements of a reinforced armor division. Iraqi total strength was fifteen to twenty thousand troops and five to six hundred tanks, approximately a 6:1 force ratio advantage. Conducting the defense as a delaying action, the Iranians employed spoiling attacks, ambushes and counterattacks to slow the Iraqi advance. The Iraqis employed methodical block by block, firepower intensive attacks in an effort to avoid casualties, and eventually succeeded in destroying the Iranian defenders. The city was cleared from October 16-24. While Iraq eventually controlled the city, the Iranians had imposed a month-long delay on the Iraqi southern offensive.[13] The Iraqis suffered an estimated 1,000 to 5,000 killed in action and another 3,000 to 4,000 wounded. The Iranian casualties have not been estimated.[14]

This example reflects how a fairly small, low tech force was able to maximize the time it took for a relatively well organized and equipped force, operating in a manner designed to reduce casualties, to seize and clear an urban area. What is particularly significant in this example is that Khorramshahr is a port. As such it demonstrates the potential difficulty in securing a port for the introduction of US forces should the enemy seek to challenge an entry operation. A month-long delay in a force projection operation may be unacceptable. If a delay in a force projection operation caused by urban combat is unacceptable, the only alternative may be to use a method such as Logistics Over the Shore to bypass the city.

The US military currently seeks to win quickly with a minimum of casualties. FM 100-5, *Operations* describes decisive victory as an expectation of the American people. It also describes how much the American people abhor unnecessary casualties.[15] Lacking the ability

to bypass the urban areas, US forces could be forced to assault, seize and clear force reception facilities. Khorramshahr provides an example of an urban battle that was costly both in terms of casualties and time. It is significant to note that the amount of damage and delay which can be imposed by a professional and well trained force is significantly higher than that imposed by the group of irregulars in Khorramshahr. While US forces demonstrated a significant qualitative advantage over Iraqi forces in Operation Desert Storm, an essential fact of the terrain advantages inherent in urban warfare is that they generally accrue to the defender. The relative qualitative differences between Iraqi army units and untrained Iranians indicates the strength to be found in an urban defense. US forces should not assume a qualitative advantage would dramatically alter the calculus of urban combat. Very superior US forces which fought in the city of Mogadishu, Somalia were decisively engaged by irregular forces in the most intense infantry combat involving US forces since Vietnam.

C. The Battle for Manila

The US Army's XIV Corps fought for the city of Manila as part of the overall campaign to liberate the Philippine Islands. The campaign began with the 9 January 1945 landing of Lieutenant General Krueger's Sixth US Army. Two corps landed at Lingayen Gulf on the island of Luzon. The mission of the XIV Corps, under Major General Griswold, was to attack south towards the capital city of Manila. Campaign plans for the liberation of the Philippine Islands dictated the liberation of Manila to secure the use of the port facilities in order to supply the campaign and future operations in the islands.

The attack to liberate Manila lasted from 3 February until 4 March 1945. At the time of the attack, Manila covered approximately 30 square kilometers and had a population of nearly one

million people. The Japanese decision to defend Manila caught US planners by surprise.[16] While the Japanese Army was pulling out of Manila and establishing mountain strongholds, Japanese navy troops were moving in. Practically none of these naval troops had any unit training in ground combat operations, and many had very little individual infantry training. Japanese naval orders were to hold Nichols airfield and the Cavite naval base, mine Manila Bay, and ultimately assure the destruction of all Japanese naval installations and supplies in the Manila and Cavite areas.[17]

The campaign to liberate the city of Manila cost the US XIV Corps over 1,000 men killed and 5,000 wounded in the metropolitan area from 3 February to 3 March 1945. The Japanese lost an estimated 16,000 men. Tragically, an estimated 100,000 Filipino civilians were killed in the urban combat. On 15 March, after heroic engineering efforts, the first US supply ship entered Manila . It was a full two months later that the port was operating at full capacity with a throughput of 90,000 tons per week.[18] It is significant to consider that this city is now approximately ten times larger than it was in 1945.

Manila provides yet another example of the ability of even poorly trained troops to take advantage of the defensive advantages of urban combat to delay an attacker and inflict (and sustain) huge casualties. What allowed the Japanese to conduct this battle of attrition was the knowledge that the major port of Manila would be necessary for MacArthur's forces' sustainment plan. MacArthur had the ability to project forces and logistics over the shore at Lingayen Gulf, but even his massive capability was inadequate; only a true port had the essential facilities. The Japanese Navy's decision to defend Manila had no lasting impact on the course of the campaign itself. The outcome, however, again demonstrates the horrors of urban warfare. The Japanese

defenders likely had little difficulty in determining MacArthur's operational objectives. The requirement for the port facilities of Manila was obvious. The urban terrain surrounding the port areas provided excellent defensive terrain to delay and inflict casualties on the attacking American forces.

The key point to be derived from this example is that the XIV Corps was fully organized for combat when it attacked Manila. The attacking divisions had the opportunity to transition from the formations employed for the amphibious assault into the formations employed for the deliberate ground assault against the Japanese defenders. The fighting was admittedly severe. What allowed that buildup, and what allowed the attack of Manila at the time of the Allies choosing, was the ability to project force, troops, equipment, and supplies over the beach.

D. Normandy and the Overlord Campaign

Planners who design a campaign based upon seizing port and other facilities have been frustrated in the past. Perhaps no more notable example exists than the Normandy landings during Operation Overlord. On 19 June 1944, the three division VII US Corps attacked northward from the Normandy beachhead toward the port of Cherbourg. Capture of the port was considered important by planners in order to allow supplies and equipment to flow into the theater through the port rather than via the fragile over the shore system which was in use. An English Channel storm and high tides jeopardized the flow of supplies and equipment over the beach and increased pressures to open the port. German defenders in Cherbourg and its outlying defenses totalled between twenty-five and forty thousand men. It was a mixed force of dubious fighting quality, comprised of ad hoc groups of anti-aircraft crews, V-1 rocket crews, and workers from the *Todt* labor organization. Stubborn resistance and a "masterful job" of demolition prevented

Allied use of the piers until 6 August 1944, *two full months* after D-Day.[19]

The Germans recognized the critical role the ports would play for a cross Channel assault. They decided that their essential task was to deny the use of the Channel ports to the Allies. The emphasis of the massive engineering effort for the defense of "Fortress Europe" was on the ports. It was here that the bulk of German artillery and fortifications were located. The German planners felt it was impossible for the Allies to sustain a campaign in Europe across the beaches of Normandy. Without the use of port facilities, the Germans concluded that a campaign in Europe was not sustainable.[20]

The Allies drew a conclusion opposite that of the Germans.[21] They felt that they could ill-afford to assault the heavily defended ports. Allied forces would instead land on the less defended beaches, establish their own artificial harbors, mass their forces and logistics, and *then* maneuver to seize the ports.[22]

What allowed the Allied Expeditionary Force to continue high intensity combat operations without a port facility, essentially nullifying German defense plans? The planners of Operation Overlord had ensured there was the capability to flow required personnel, equipment, and supplies *across the Normandy assault beaches until the ports were opened.* Artificial harbors, or Mulberry's, were instrumental in facilitating this flow.[23] This capability allowed the Allies to sustain forces and operations during the break out of Northern France's *bocage* country. The requirement to deliver combat forces, their equipment, and supplies across the shore in the absence of ports is no less important today.

E. The Battle for the Falklands

The British utilized their capability to project force over the San Carlos Water beaches rather than relying on ports and airports during their 1982 Falkland Islands campaign. This allowed them to establish their entire expeditionary force ashore prior to commencing the major phases of their campaign. The ability to land force over the shore also allowed the British to avoid having to project the force directly into the defended port city of Stanley on the eastern coast of the island. They thereby avoided urban combat.[24] The British use of commercial passenger vessels in combination with amphibious assault ships and commercial cargo vessels was notable. These vessels augmented the lift capacity of the amphibious ships and allowed the British to conduct their force projection operation without the requirement for an airport in the theater.[25]

This capability to project their combat power over the shore allowed the British to avoid the city where port facilities and the Argentine defenders were located. As seen in the earlier examples, urban warfare can be slow and costly in terms of men, material, and time. The capability of the British to move over the shore in the Falklands, and of the Allies to project force directly over the shore at Normandy, allowed these expeditionary forces to avoid urban combat until *the time and place of their choosing*. The option of bypassing urban areas during an operation may not be available. The ability to operate without port facilities grants the commander the flexibility of attacking those urban areas when and where it is most advantageous or avoiding them altogether.

F. Conclusions

Force projection operations eventually require a secure environment. The initial phases of the operation may include a forcible entry operation, but the size of the force projection effort will eventually require forces, supplies and equipment in excess of the forcible entry capability the US possesses. The forces executing the forcible entry operation will therefore be directed to secure the facilities required for the continued inflow of personnel, supplies and equipment. The preponderance of supplies and equipment will come not in Navy amphibious assault vessels, but in commercial cargo vessels. These vessels are not designed to operate safely in a combat environment. They are much more vulnerable to attack than military ships and aircraft. The British experience in the Falklands War demonstrates the hazards of using commercial vessels in a hostile environment. Anti-ship missiles and air-delivered ordnance are much more effective against a commercial vessel than a warship. Commercial vessels are not heavily compartmentalized and have much less system redundancy than warships. The British experience with the *Atlantic Conveyor* illustrates this danger.[26] Similarly, the fly-in component of a force projection operation in large part arrives on commercial airliners. These aircraft have no self-defense capability and are very vulnerable to attack whether on the ground or in flight. The personnel who are scheduled to fly into the theater are not combat ready when they arrive, and as such also require a secure environment in the vicinity of the arrival airfield.[27]

III US Doctrine for Urban Combat.

Current doctrinal manuals reflect the belief that urban combat is to be avoided if at all possible. The 1993 version of FM 100-5, *Operations*, devotes only eleven lines to urban operations. The passage notes that military operations on urban terrain (MOUT) can constrain technological advantages; impact tempo; force units to fight in small, decentralized units; and can also present moral and operational dilemmas due to the proximity of large numbers of civilians.[28] This brief description of urban warfare speaks volumes about American attitudes towards this type of warfare. The 1993 version of FM 100-5 fails to recognize the increasing likelihood of urban combat.

The 1979 FM 90-10, *Military Operations on Urbanized Terrain (MOUT)*, states in the introduction:

> Tactical doctrine stresses that urban combat operations are conducted only when required and that built-up areas are *isolated and bypassed* rather than risking a costly, time consuming operation in this difficult environment. Adherence to these precepts, though valid, is becoming increasingly difficult as urban sprawl changes the face of the battlefield. (Emphasis in original.)[29]

The introduction goes on to state that:

> Urban combat operations may be conducted in order to capitalize on the strategic or tactical advantages which possession or control of a particular urban area gives or to deny these advantages to the enemy. Major urban areas represent the power and wealth of a particular country in the form of industrial bases, *transportation complexes*, economic centers, and political and cultural centers. [30] (Emphasis added.)

US Marine Corps doctrine differs somewhat from Army doctrine, perhaps reflecting the expeditionary nature of US Marine operations. Fleet Marine Force Manual 1 (FMFM 1), *Warfighting*, is similar to FM 100-5 in that it is the theoretical underpinning of Marine Corps warfighting doctrine.[31] As such it does not address the effects of terrain on warfare, dealing with

warfighting at a more theoretical level. Operational Handbook (OH) 8-7, *Military Operations on Urbanized Terrain (MOUT),* signed in November of 1980, provides the doctrinal foundation for United States Marine Corps operations on urban terrain. Much more aligned with the 1976 version than the 1993 version of FM 100-5, OH-8-7 reflects the Marine Corps belief that increasing global urbanization makes urban combat more, rather than less, likely. The topic of increasing urbanization is addressed in the introduction to OH 8-7:

> "The rapidly increasing urbanization throughout the world has heightened the chances of military operations in an urban environment. This is simply because of the unprecedented gain in strategic significance of a city within a country whose principal income is derived from urban based manufacturing and trade. More often than not, these metropolitan centers are within striking distance of the sea, or are situated along the sea lines of communication. Early amphibious seizure of these port cities may readily aid overall United States objectives in the conduct of follow-on operations. *That these forces, to include Marine Air Ground Task Forces, will fight in an urban environment is a near certainty*[32] (Emphasis added).

There is a dichotomy in the doctrine regarding urban combat. The reader is told that bypassing urban areas is the preferred method of dealing with them while simultaneously being told that increasing urbanization makes this more difficult. What is telling about the US Marine Corps doctrine is its consideration of urban combat as *a necessary and natural part of force projection operations*. Based on past experiences fighting on urban terrain and in recognition of the trends towards increasing urbanization, this author feels US doctrine is just about right. While specific doctrine for tactics, techniques and procedures for urban fighting may be dated, the overall doctrine is correct: while not always possible, *avoidance of urban combat should be the goal*. The difficulties discussed in the previous historical examples highlight the difficulties US and other forces have encountered during combat in urban areas. There is no reason to believe the trends of increasing urbanization and ever higher levels of weapons lethality reduce the risks

and hazards posed by combat in an urban environment. While the doctrines differ between services and over time, the essential truth remains that urban combat is something which should be avoided if possible. Growing world urbanization makes avoidance more difficult, and urban combat more likely but no more desirable. Three cities which are centers of national power and prestige or which saw heavy fighting in past wars reflect this trend of growing urbanization:

Table 2. Population in Millions[33]

City	1950	1975	2000
Manila	1.5	4.4	12.8
Paris	5.4	9.2	12.4
Seoul	1.0	7.3	18.7

Urban complexes have proliferated to such an extent that maneuver room is limited and opportunities to maneuver between or around urban areas are increasingly limited.[34] Commanders who have to attack urban areas need the capability of selecting the time and place of their attack. Having to project force directly into defended urban areas as the first phase of an operation should be the least preferred method of operation. It would be much more advantageous to establish the complete force ashore and then maneuver against the urban area. A discussion of the US doctrine for force projection amplifies the discussion of the doctrinal flaw found in the introduction of this monograph.

IV. Doctrine for Force Projection

The 1993 version of FM 100-5 defines force projection as the "demonstrated ability to rapidly alert, mobilize, deploy, and operate anywhere in the world."[35] FM 100-5 goes on to discuss entry operations and divides entry operations into two categories: unopposed entry and opposed entry.[36] What is left completely unmentioned in the discussion of force projection units will enter the area of operations. FM 100-7, *Decisive Force, The Army in Theater Operations* also leaves considerations of force projection entry points unaddressed.[37]

Force projection operations may differ in a wide range of specifics, but they have one element in common: forces will come via a combination of airlift and sealift. The great preponderance of tonnage will come via sealift while airlift will carry most of the personnel. In the deployments in support of Operation Desert Storm, fully 95% of the tonnage deployed came by sea.[38] The methods of force projection are essentially a *combination of modes* of transport, varying combinations of airlift and sealift along with the use prepositioned equipment and supplies, either afloat or ashore. The common factor among the different modes is the requirement for arrival infrastructure to facilitate the offload of the airlift and sealift. Operation Desert Storm was a force projection operation into a secure environment with established facilities which supported the arrival of those forces. It is these facilities which are the key. There are many less developed countries where such facilities are lacking or non-existent. These countries require that US forces possess the ability to project force into a primitive or undeveloped theater regardless of enemy defensive positioning.

The doctrinal references do not completely address all aspects of the theater arrival side of a force projection operation into a primitive theater. With the reduction in Navy and Air Force

transport, the US has lost some ability to operate in primitive or austere theaters. The United States also has limited forcible entry capabilities which would be the most appropriate means of entry for operations in such a theater. Many lift assets now utilized are commercial cargo vessels and civilian airliners.[39] These ships and airplanes require developed arrival facilities much more than do tactical vessels and aircraft.

This reliance on commercial transportation systems and assets and limited forcible entry capability presents a dichotomy: *How can the American armed forces be consistent with both doctrine for force projection (which essentially requires facilities located in urban areas), and that for urban combat (which recommends avoidance of urban areas)*? When possible, a theater reception site may be selected away from the area of operations in a secure environment where the arriving forces can be received, organized and then moved to the area of operations. This is a worthy goal, but the limitations of geography and politics may render it impossible to accomplish.

A study of the availability of theater arrival facilities is instructive. There are far more airports suitable for receiving a force projection operation than seaports. A study of continental sub-Saharan African and Southwest Asian ports reflects the accessibility of those ports to the vessels in the Marine Corps Maritime Prepositioning Program, the Army Afloat Prepositioning Program, and Ready Reserve Force Ships.[40] There are twenty-eight littoral nations in sub-Saharan Africa. Each has at least one port. There is a total of one hundred and twenty-five ports in the region, of which only forty-five (36%) are accessible to the vessels the US would use for a force projection operation. The vessels' draft is too deep for the port in nearly 60% of the cases of inaccessibility. In another third of these cases, the vessel is too long to fit pierside. Southwest Asia has thirteen littoral states, each with at least one port, and a total of fifty-five ports in the

region. Accessibility is much better; ninety percent of the ports are accessible to force projection vessels, but particular countries have specific limitations. Bahrain, for example, has only one port with no limitations for receiving US force projection vessels. A second port is too shallow for many of the vessels, and the third major port in the nation is completely inaccessible.[41]

It is the requisite *combination* of airport and seaport which dramatically reduces the options for force projection reception sites. Kenya has only one port and airport combination suitable for US force projection. Somalia has only two. Saudi Arabia has many airports, but only three are associated with a seaport. The United Arab Emirates has eleven ports; only three have the requisite ship facilities and associated airport.[42] A reduced number of options for US force projection operations results in a concurrent increase in the enemy's accuracy in estimating where the US force projection will arrive. The option of bypassing an urban area defended by an enemy may be nullified if the urban area contains the only facilities capable of supporting US force projection requirements of the US forces. The enemy may have the option of challenging an American force projection operation by attempting to preempt theater arrival. Should an adversary seize and defend the urban areas associated with the facilities required for force projection, he could delay the timetable of the US operation, inflict high casualties in the initial stages of the operation when it is at its militarily and politically most vulnerable point, or preclude the operation altogether.

Even in benign or friendly environments, the geographical limitations on force projection can be significant. US Army force projection for Operation Restore Hope provides an example.[43] The Army normally maintained three prepositioned ships in Diego Garcia loaded with supplies and equipment. One of the three vessels, the *American Cormorant,* was in the port of Hamburg

undergoing maintenance when the vessels were ordered to proceed to Somalia. The *American Cormorant* carried, as part of her cargo, watercraft which could be used to offload prepositioned vessels while they were still at sea (in-stream offload). The other two vessels proceeded to Somalia as directed. The draft of the two vessels was too great to allow them to enter the shallow port of Mogadishu. Even had the depth of the port been sufficient, the port itself had insufficient pier space for the offload of the ships' cargoes. The high sea state off shore caused an in-stream offload to be a dangerous and risky operation; that option was rejected by the operational commander. One of the Army vessels, the *Green Valley*, was ordered to the port of Mombasa to transload her cargo onto the Motor Vessel *Lummus*, a Marine Corps prepositioned vessel which had earlier unloaded her cargo. This could not be accomplished because the *Green Valley* was too long to be accommodated in the port of Mombasa. The *Green Valley* was then ordered to the Somalian port of Kismayu, but the weather and sea state again precluded her offload. Finally, the decision was made to send the two ships back to Diego Garcia to offload non-essential material until they were light enough to enter the port of Mogadishu. Rather than executing that plan, their cargoes were transloaded onto another ship instead of selectively offloaded per the original plan. A commercial container ship received the cargo and sailed to Mogadishu. After her maintenance was complete, the *American Cormorant* sailed to England to reload her cargo. She proceeded to the Mogadishu area only to find she had the same difficulty unloading as did the other vessels.[44]

D-day for Operation Restore Hope was 9 December 1992. The two vessels sailed from Diego Garcia on D + 1 and arrived off the coast of Mogadishu four days later, 14 December 1992. It was 21 December when the *Green Valley* was ordered to Mombasa, Kenya. She was

reordered to Kismayu on 1 January 1993. The two ships subsequently returned to Diego Garcia on 11 and 12 January 1993. The cargo transferred to the commercial cargo vessel actually arrived in Mogadishu on 15 February (D + 68)[45]. The *American Cormorant's* first cargo delivery was on 10 January (D + 34). In contrast to the Army offload, the US Marine Corps offload was completed on D + 7 using organic offload equipment both over the shore and through the port of Mogadishu. The difference in offload duration was that the US Marine vessels carried a complete set of lighterage and other essential logistics over the shore equipment. Taking advantage of their roll on/roll off (RO/RO) design, the Marine vessels were able to unload in-stream. The Army offload equipment was stowed on one vessel which unfortunately was out of theater at the time it was most needed. The Army vessels were not RO/RO configured and required cranes to unload cargo from the ship and to place it either on lighterage or on the pier.[46] This requirement for crane offload made the Army vessels much more sensitive to sea state and port capabilities than the Marine vessels. This is a significant issue for the current Army Prepositioned Afloat program. Several of the vessels used in this program draw less than ten meters of draft, three draw greater than ten, one draws greater than eleven, two draw more than eighteen meters, and one draws in excess of nineteen meters of water, requiring a port with nearly sixty feet of depth at pierside[47]. Drafts this deep will require unusual port capabilities or a robust capability to deliver cargoes without port facilities. The potential requirement for an in-stream offload is much higher with vessels that require such well developed facilities. The number of ports which can support vessels of this draft is limited.

Political considerations may limit access to ports as much as do geographical constraints. The Arabian Gulf region offers an example of an area with very complicated politics where

planners may not be able to depend on access to available port facilities. Planners may have a very restricted list of available facilities and be forced to select a poor operational option due to its being the only available choice. US dependence on facilities limits the port choices to those few which have the essential facilities we require and the use of which is politically acceptable. These reductions in options raise the risk of having to seize a port in the initial phase of a force projection operation or attempting to use a port without the capability to accept the vessels we currently have for force projection operations.

The operation would have been even more difficult had the only two useable ports in Somalia been defended. It would have dramatically increased the delays for the entire operation. US Army Ranger and Pakistani Army experience in Mogadishu testify to the difficulty combat with even the irregular forces present in Somalia would have caused for the operation. No enemy action caused the delays evident in the case of the Army prepositioned supplies. They were simply due to the geography in a primitive theater in combination with vessels which require developed facilities.

V. LOGISTICS OVER THE SHORE

What is the solution to this dilemma? One solution is to maintain, develop, procure, and field those systems essential for the offload of both prepositioned vessels and other shipping *without the requirement for port facilities*. These systems fall generally under the heading of Logistics Over the Shore, or LOTS.

Joint Publication 4-01.6, *Joint Tactics, Techniques and Procedures for Joint Logistics Over the Shore,* defines Logistics over the Shore (LOTS) as:

> ... the loading and unloading of ships without the benefit of fixed port facilities in either friendly or undefended territory and, in time of war, during phases of theater development. LOTS operations are conducted over unimproved shorelines, through fixed ports not accessible to deep draft shipping, and through fixed ports that are inadequate without the use of LOTS capabilities.[48]

As defined, LOTS addresses many of the issues raised earlier in this monograph. The capability provides a means for bypassing defended urban areas. It provides a means for projecting force into primitive theaters in which facilities are incapable of or inadequate for supporting ships and aircraft. LOTS addresses the issue of how to offload vessels which cannot be accommodated in the available ports. Logistics Over the Shore would also allow the operational commander a greater number of options as to where to project his force into a theater, thereby complicating the Intelligence Preparation of the Battlefield task for the enemy.

LOTS operations may include loading and unloading of breakbulk materials, roll-on/roll-off (RO/RO) vehicles, containers, and bulk fuel and water from ships. Shoreside operations, stevedoring, water and fuel hoseline operations, and the operation of ships, watercraft, and lighterage in the loading and unloading area can also be a part of such operations.[49]

Beginning in the 1960's, the types of cargo ships employed in military force projection

operations have gradually shifted from breakbulk ships and small tankers to large RO/RO ships, and deep draft tankers. This transition has complicated the task of force projection. What is efficient for commercial operations may not be desirable for military operations. One example of the impact of new technology is the container.

Prior to the transition to containerized cargo, ships were capable of discharging cargo with self-contained equipment: booms and cranes. This offload could be conducted either pierside or onto lighters or landing craft for transit to the shore. The cargo itself was breakbulk, meaning that individually packaged items were loaded on pallets or sling loaded in cargo nets into the vessel's holds by stevedores or longshoremen. This was an extremely inefficient method of handling cargo, yet it allowed for military cargo to be offloaded by a variety of methods to include massed manpower if required.

Modern vessels must have pierside equipment for the same task, self-contained offload equipment having been removed in the search for lower operating costs. The key factor in this change in configuration was the arrival of the container ship. The container revolution was started by the US Army in 1950.[50] The Army introduced the Container Express or CONEX box. The utility of containers is in their reduction of the handling required to move cargo. Cargo is handled only twice, during the loading and unloading of the container. The next step in the container revolution was again an Army innovation, the military container or MILVAN.[51] While the CONEX box was an easily handled 8' by 6' by 7', the MILVAN grew to a more unwieldy 8' by 8' by 20'. The maximum gross weight of the MILVAN is forty thousand pounds, originating a requirement for specialty handling equipment. The transportation industry developed the commercial use of containers in the 1960's. These containers were intermodal in nature and paid

huge dividends in saved costs of handling. For the military, these efficiencies paid dividends in speed of handling. Containerized cargo can be moved from the loading site to the unloading site faster than bulk cargo. This sped up the deployment process and allowed a faster rate of force projection. These containers grew to 20 feet, 35 feet, and even 40 feet long. These ever larger containers brought huge efficiencies in the handling of cargo. Each container could be packed and loaded onto trucks, trains, ships, and back again without the internal cargo of the container ever being handled. This reduced pilferage, protected the cargoes from the elements, and simplified monitoring of shipments.[52] While still posing some difficulties for a LOTS operation, the relatively handy twenty foot container is the most frequently used size in the US military. The twenty foot container is the standard measure of LOTS system carrying capability. Cargo loads are expressed in terms of twenty foot equivalent units, or TEU.[53]

These increases in the use of the container caused a concurrent increase in the problems encountered by the military planner. How are twenty foot containers to be offloaded from ships which do not have organic cranes unless the ships are alongside established pier facilities? This is one of the key driving issues for the selection of theater arrival facilities. Pierside cranes capable of handling twenty and forty foot containers weighing forty thousand pounds are not found except at well-developed port facilities. Road nets capable of supporting the tractor trailers required to carry the same twenty and forty foot containers need to be well developed as well. Storage areas for offloaded containers need to be large enough to accommodate considerable numbers of these containers and must also provide room for the offload and storage of the container's contents, as well as providing adequate space for a circulation network. The reader is reminded of the Operation Restore Hope discussion on pages 20-22. The port of Mogadishu is the major seaport

for the country and yet it did not have adequate space for the offloaded containers during Operation Restore Hope let alone for space to disperse their contents.[54] This issue simply cannot be addressed by abandoning container use. The US Army Container Handling Company is capable of handling over four times as much cargo as an Army breakbulk Terminal Service Company (as measured in short tons).[55] These efficiencies simply demand the continued use of containers. To turn away from containers would require enormous increases in the time it takes to move the cargo required to support a force.

One of the first steps in the Logistics Over the Shore system is therefore the task of unloading containers from ships and onto either lighterage or causeways. The Auxiliary Crane Ship (T-ACS) was developed to fill the need for cranes to unload vessels lacking their own organic cranes. There are eleven total T-ACS ships planned for procurement. It is the primary function of the T-ACS to provide the crane service needed to move cargo, primarily containers, from container ships to the offload lighterage. A T-ACS has the capability to carry 20 and 40 foot cargo containers as well as outsized cargo. T-ACS cranes are capable of lifting 33 short tons per boom, or 65 short tons if the booms are operated in pairs, necessarily at one half the rate of offload. The T-ACS will self-offload her cargo and then act as a floating pier crane to offload other container ships. The Auxiliary Crane Ship can complete the mooring to a container ship and the subsequent offload by one of two methods: either with the ships at anchor or underway.[56] Factors which can influence the choice of method are:[57]

(a) Sea state

(b) Weather conditions

(c) Current set and drift (the direction of flow) of the tide and coastal currents

(d) Availability of tugs

(e) Ship maneuvering room

(f) Experience level of the ship handlers.

By definition, LOTS forgoes the security of a port and is therefore much more vulnerable to ocean conditions. Sea state, wind, and other conditions will impact on whether an offload can be done at all, or whether it can be accomplished at a reduced rate. It is the pendulum effect of the cranes which is the greatest limiting factor. That pendulum effect causes offloads to become unworkable as the Sea State approaches Sea State 3.[58] It is this susceptibility to environmental conditions which most restricts the planner's ability to predict volume of ship-to-shore transfer in a LOTS operation. What is possible in Sea State 2 is impossible in Sea State 4.

Another factor influencing offload rates is distance from the shore. The depth of the offload site determines how close to shore the ships can be placed. This distance is the determining factor for turn around time of lighterage. A vessel six miles off-shore will require twice as long to offload as a vessel three miles off-shore, all other factors remaining constant.

Offload lighterage are those systems which are used to offload cargo from ships and then transfer that cargo to shore. The systems include traditional landing craft, powered and unpowered causeway ferries, barges and stationary pier systems. The following chart will provide a general overview of lighterage systems.

Table 1: Lighterage Systems[59]

Lighterage	Army Owned Pres/Planned	Navy Owned Pres/Planned	Total	Capacity (Tons)	Speed (Knots)
LCM-8	114/77	26/26	140/103	65	11
LCU-1600	13/13	41/41	54/54	160	12
LCU-2000	35/35		35/35	350	12
LCAC		74/91	74/91	54	40
CSP 2+1		64/64	64/64	350	7

Pres=Presently Available. Planned=Identified as a requirement and procurement is planned.

Offload operations are typically conducted with the containership alongside and secured to the T-ACS, which can either be underway or at anchor. The cranes on the T-ACS lift those containers within reach onto either lighterage (which bring it ashore) or onto a causeway or pier where vehicles take it ashore. The Auxiliary Crane Ship may have to reposition multiple times in order to be in position for its cranes to be able to reach the cargo. The time required to reposition is a factor in determining the offload rate but it is the aforementioned environmental factors which are the dominant concerns in determining those rates.

The rate of container offload was measured in the Office of the Secretary of Defense sponsored exercise, JLOTS I in 1977 and JLOTS II conducted in 1983-1984. The goal for the JLOTS II offload exercise was to offload three hundred containers in a workday.[60] The maximum number of containers which could be offloaded per day was 219 in a twenty hour day during the JLOTS II Exercise.[61] The independent variable was Sea State. The rate of container offload was directly proportional to Sea State.[62] As Sea State approaches Sea State 3 (as defined in the

Pierson-Moskowitz Sea spectrum,[63] See Appendix II), meaning significant wave heights in the range of 3.5 to 5.0 feet, the rate of offload decreases. Again, it was the pendulum effect of the cranes mounted on the rolling and pitching ship which was the determining factor. In none of the exercises was the goal of three hundred containers per day achieved. The rate achieved was only two-thirds of the stated objective rate on the best day for container offload.[64]

The High Sea State Container Transfer System (HISEACOTS) is a system which has been developed to offload containers in higher sea states. The system consists of a floating platform consisting of 56 feet by 120 feet floating pontoons. This platform is fitted with a specially designed crane which has a pendulation attenuation device. The crane is capable of offloading containers and cargo weighing up to 50,000 pounds in Sea State 4. This system was successfully tested in the 1991 JLOTS III tested, but has not been funded for production.[65]

The Navy has the primary responsibility for providing forces and equipment and conducting strategic sealift cargo offload operations incident to amphibious operations and maritime prepositioned force deployments. The Army has the primary responsibility for providing forces and equipment and conducting strategic sealift offload operations incident to base, garrison, or theater development operations.[66] It is the responsibility of the Joint Logistics Over the Shore or JLOTS commander, regardless of service, to ensure that the offload systems, cargo, and vehicles are prepared for offload.[67]

To provide an illustration of the scale of the container offload task, consider the Army's Afloat Prepositioned Program (APA). The current APA load plans provide for a balanced heavy brigade with habitual support and additional CS and CSS support units, and 15 days of sustainment less bulk fuel.[68] This force of 16 armored and mechanized company size sets of

equipment, with the appropriate support and a modest amount of support (15 days) requires 543 20 foot containers.[69] The containers are spread-loaded among seven separate vessels so that the APA can suffer the loss of a vessel without losing a specific force capability.[70] Based on the rate established in the JLOTS II offload exercise, an average of 150 containers offloaded per 12 hour shift is a working figure. Using that assumption, it would take four 12 hour shifts to offload the APA containers. Sea States approaching Sea State 3 could drop this offload rate to zero. This uncertainty regarding offload rates during a LOTS offload can challenge the planner. The heavy brigade in the APA is capable of being combat ready in 15 days if unloaded at pierside.[71] The planner can only make a projection for when an APA offload would be completed based on assumptions and forecasts regarding Sea State and wind conditions. Obviously fixed ports are the preferred method for force projection, but LOTS provides an alternative when those ports are unavailable. This option brings with it greater risk and uncertainty with regard to the duration of the offload phase, but it is the thesis of this paper that the reduction in the risk of urban combat is ample compensation.

VI Operational Readiness

The current state of operational readiness is mixed. Exercise results, as discussed earlier, have demonstrated the ability to perform the LOTS mission. Questions arise whether there is adequate capability to sustain high intensity operations ashore. The ability to sustain adequate container throughput to support a large deployed force has not yet been achieved.[72] New systems have been identified to support this requirement, such as the T-ACS, however in this era of reduced funding, it will be difficult to procure large numbers of new systems.[73]

One area where US forces can improve readiness is in the area of training. The Chief, United States Transportation Command, testified before the House Committee on National Security on 30 March 1995 that all of the warfighting Commanders in Chief with regional responsibilities had identified JLOTS as a required capability to support their operations and contingency plans.[74] However, JLOTS exercises, culminating in Exercise Ocean Venture 93, *demonstrated low operational proficiency due to a lack of training.* This lack of proficiency was identified as the foremost JLOTS problem. USTRANSCOM has proposed one dry cargo and one bulk liquid JLOTS exercise be conducted in each CINC's area of responsibility each year. The proposed exercises were approved by the CINC's and incorporated into the Joint Master Training Schedule.[75]

There is no way to avoid the issue of procuring new systems. The US Army's Logistical Capabilities Assessment detailed in the Army's 1995 Modernization Plan reports that there will be only a limited capability to perform the JLOTS mission. This assessment identified the biggest logistics-related shortcoming under the category of equipment for projecting the force.[76] The Army identified 20 major items considered essential for LOTS operations. Topping the list were

discharge causeways to support the offload from RO/ROs. There is a validated requirement for 7 causeways (the Army has one now) which the Army intended to start purchasing in 1995. The 13.5 million dollars which had been allocated to purchase these causeways was cut from the Army's five year procurement plan.[77] Eight ferry and five pier causeways survived the budget cuts. Four of six required heavy lift (100-250 ton) cranes have also been funded.[78]

Today, the total Army LOTS capability is one RRDF, one causeway pier, and one CSP.[79] More causeway systems have been identified as requirements. The Army has all of the surface craft it requires, and in fact has excess capacity. It is the opinion of the author that causeway and pier systems are preferable over surface craft due to their ease of strategic deployment. Causeway sections can be hung over the sides of LST's and transported in that fashion. Large craft such as LCU's either are very slow if self deployed, or require specially configured vessels to transfer them to the area of operations.

A second area of significance to Army planners is the location of their LOTS systems. The location of the Army LOTS offload systems are the key determinant of the real offload times for a seaborne force projection operation. The transit time of the offload equipment to the area of operations may be the determining factor for the duration of an offload operation.

The Army has identified Theater Opening Force Modules as a cornerstone of the Army Strategic Mobility Plan. The capability to offload a force capable of fighting a major regional contingency depends on the following offload equipment:

12 LCU 2000	4 CSP 3+1
15 LCM-8	3 RRDF
6 Large tugs	2 Pier Systems[80]

While the Army has identified the requirement for pier and causeway systems, it does not yet have the number of systems identified in the Major Regional Contingency (MRC) TOFM[81]. With the reduction in the Army LOTS funding request, this lack of capability would seem to be a major shortfall in force projection and LOTS capability in the near term[82]. The shortfall in pier systems can be made up in the short term with lighterage systems such as Army watercraft, but there will be a decrement in total throughput available. The location of the lighterage systems is key. The TOFM would be in place on C+10 if the lighterage (2 Heavy Lift Prepositioned Ships with embarked LCU-1600, 1 Seabee, and 1 or 2 T-ACS and their watercraft) were forward deployed. If the lighterage is not forward deployed, the timeline extends to the right until C+30.[83] The APA does have lighterage collocated with the cargo vessels, but it is located on one vessel[84]. This could lead to a situation similar to the Somalia experience where the one vessel was off-site and so the capability for a LOTS offload was removed.

Current Logistics Over the Shore capabilities provide the US military limited ability to conduct LOTS operations. Shortcomings have been identified through the JCS sponsored JLOTS series of exercises. Planners should be aware of the current shortfalls in systems and in training readiness before basing an operation solely on LOTS. At this point in time, LOTS provides a means to land a force and establish it ashore as a combat formation. LOTS has not been able to replace the eventual use of ports and airports in a force projection operation. LOTS is an option which allows US forces to avoid urban areas in the initial phases of a force deployment, and therefore provides a means to avoid urban combat until the time and place selected by the operational commander.

VII Recommendations and Conclusions

LOTS is a means to project forces into a theater without the use of fixed port facilities. As such it provides the operational commander flexibility in choosing the time and place of his entry into a theater of operations. Currently, US force projection is too heavily dependent on the use of easily identified ports. Adversaries can identify likely points of entry for US forces and seize or defend them. The continuing dependence on these facilities in the face of enemy resistance could result in the need to conduct urban combat operations as an initial phase of force projection. The historical examples cited provide ample illustration of the difficulty of conducting modern urban combat. Logistics Over the Shore provides a means of bypassing defended urban areas, at least in the initial phases of the operation. As such, it becomes much more important as the US military becomes increasingly CONUS-based.

The Maritime Prepositioned Force (MPF) has the capability to conduct a LOTS offload using organic offload equipment.[85] The MPF can conduct its offload as either a portion of the assault follow-on echelon or as an independent operation. This is a capability which the APA should have. Army planners and budgeters should procure the necessary lighterage and collocate that lighterage with prepositioned ships. All Army watercraft associated with the APA are currently stowed on two vessels.[86] The experience with the *American Cormorant* during the Somalia operations when that ship was off station for maintenance and the prepositioned cargoes were not offloaded until D+58 should convince planners of the requirement for redundant offload capability within the APA. The British experience in the Falklands with the *Atlantic Conveyor* should serve as a reminder to spread-load essential equipment over several different vessels to preclude the complete loss of a capability with the loss of a single vessel.[87]

The capability to deliver personnel in the absence of fixed facilities would be a complementary capability to LOTS. Personnel could be brought in on surface vessels, reducing or eliminating the need for an airfield. Personnel are certainly not logistics, but the capability to project forces similarly to LOTS without the need for an airfield is an obvious requirement for a regional CINC. The British experience in the Falklands demonstrates the utility of the concept. US forces could be flown to an airfield in-theater where they can be transferred to a passenger vessel. Once in-theater, they can be delivered to the objective area by ship, and then come over the beach in an administrative manner just as if they flew in. The removal of the requirement for an arrival airfield would complicate the enemy's analysis of where the US force would arrive in theater and remove the need to find an airfield in close proximity to the LOTS site or a port.

Amphibious vessels have long been able to perform the LOTS mission in support of the amphibious assault. The Marine Corps is uniquely equipped to interface with these systems. The Marine Corps Maritime Prepositioned Program has always been based around RO/RO's which greatly simplify the task of LOTS. The MPF also has bulk fuel and water, along with the required equipment to pump it ashore. The MPF is self-contained for offload lighterage. Army LOTS equipment is not prepositioned in theater and would have to be delivered to the area of operations. The Army Prepositioned Afloat vessels are better suited to LOTS than their predecessors in the old Army prepositioned program, but the type of vessel selected for the APA seem almost to require a LOTS offload in a primitive theater due to their aforementioned deep drafts.

LOTS systems associated with the current APA are currently located on a single vessel and so the LOTS capability for the entire program rests with the maintenance status of that vessel.

The experiences with the *American Cormorant* or the *Atlantic Conveyor* are again reminders how placing all of a certain capability on one vessel can cause trouble for an operation. Reconfiguraton of the APA loads is essential to acceptable combat readiness.

The Army Prepositioned Afloat forces are very close to being fully LOTS capable. The RO/RO-based program enhances the potential for a LOTS offload. Causeway systems, when procured, should be stowed on multiple vessels to provide offload redundancy should one ship be absent. The training issue is beginning to be addressed both at the CINC and the Army level. Training rotations at the National Training Center now simulate an APA offload. These areas require continued attention to achieve true mission readiness.

The draft FM 100-17-1, *Army Prepositioned Afloat*, has only six lines devoted to LOTS, which are no more than the definition found in Joint Pub 4.01-6. LOTS will not be a viable US Army capability without a doctrine for it. The LOTS option for the APA is essential. The final version of FM 100-17-1 should include greater consideration of LOTS. This discussion should include a list of the planning factors involved in conducting an operation with the APA in the absence of adequate port facilities.

A capability to operate in Sea State 3 would allow much greater flexibility to the operational planner. Most of the LOTS systems were initially designed to perform in Sea State 3, but operational experience has shown them not to work in this condition. Sea State 3 conditions occur, on average, 20% of the time across the globe, and conditions above Sea State 3 occur approximately 15% of the time. In many areas of the world, Korea for example, sea conditions are Sea State 3 or above 50% of the time.[88] Continued research and development of systems which would allow a LOTS operation to continue in Sea State 3 would provide a marked increase

in US ability to conduct LOTS operations. This research and development should continue, and new systems should be fielded to allow full capability in Sea State 3. The APA and the MPS need to be fully capable of conducting an in-stream offload in Sea State 3. (Currently the capability of these vessels to conduct an offload are markedly degraded in any condition worse than Sea State 2.)

A passenger delivery capability would provide a complete set of options to the regional CINC and his planners. This passenger capability would allow precious strategic airlift to be focused on delivering the highest priority cargo and essential personnel. Most importantly, as LOTS frees the planner and commander from a dependence on seaports, a passenger capability over the shore would completely free them from the dependence on any reception facilities in the area of operations until the time and place of their choosing. This passenger capability need not involve tactical vessels, but could instead rely on charter ocean going vessels such as North Sea or Channel ferries. These vessels could also be prepositioned in-theater.

Logistics Over the Shore is a viable, yet incompletely developed, means of conducting force projection operations. LOTS may reduce or completely remove the threat of conducting urban warfare as part of the initial phase of a force deployment operation by permitting the operational commander to avoid urban areas and select the landing site which best suits his scheme of maneuver. LOTS is a force multiplier which justifies the expense of precious defense dollars. Equally as important, proficiency must be gained in the employment of existing systems. A rigorous exercise schedule would demonstrate to our potential enemies the US possesses a viable capability forcing them to counter it. Particularly significant contributions to US deployability would be made if the APA had a completely developed LOTS capability organic to

and spread-loaded within the program.

The dangers and potential costs of urban combat are evident. It is a reality of war, but one which should be avoided whenever possible. The dichotomy between US doctrine for urban combat and for force projection must be addressed. LOTS provides a means for rendering port facilities unessential to the initial phases of entry into an operational area, and therefore provides a means for projecting force while avoiding urban combat. LOTS provides an essential capability for a force projection military in the modern era.

Appendix I Lighterage

Lighterage for the offload of strategic sealift ships consists of landing craft, amphibians, and causeway ferries. The availability of lighterage for a particular operation is situation dependent. The delivery of lighterage to the theater varies based on the priorities of the CINC or JTF commander. Lighterage belonging to an Amphibious Task Force or Maritime Prepositioned Force may not be available for general offloading of strategic sealift ships following completion of the initial amphibious mission. These forces may be reconstituted to perform other amphibious assaults. The use of their organic LOTS systems in the general offload of the Assault Follow-On Echelon would remove the option of their use in future amphibious operations.

The effective use of lighterage in support of the ship-to-shore movement is primarily weather dependent. As sea state increases or temperature decreases, the productivity of the lighterage operation decreases. The capability of the discharge facilities is currently limited to Sea State 3. Breakbulk cargo discharge can continue to Sea State 3 to 4 if there are adequate lees, or areas out of the sea and wind. The key issue is the difficulty of craning cargo from a large vessel into a pitching and bobbing lighterage vessel. The sustained throughput will be dramatically reduced in high Sea States since the offload will be limited to the lee side of the ship only. A second limitation will be the surf conditions. A maximum effective surf of as little as six feet will begin to restrict throughput operations. See Appendix II for a description of Sea State conditions.

The lighterage types vary between traditional landing craft to floating causeways (a barge-like system). The TEU or twenty foot container equivalent unit is used to provide a means of comparison.

a. Landing Craft, Mechanized (LCM-8): The LCM-8 is a traditional landing craft with a bow ramp. These craft are organic to Navy Assault Craft Units (ACU) and to Army Transportation Medium Boat Companies. They are propelled by two diesel engines and have twin screws. They are capable of transporting personnel, cargo and vehicles from the offload vessel through the surf zone and onto the beach. The LCM-8 can carry one twenty foot container. Because of the single ramp on board the craft, the container must be craned on and off.

b. Landing Craft, Utility (LCU-1600 Class): Like the LCM-8, the LCU is a traditional landing craft fitted with a bow ramp. The LCU-1600's are attached to Navy ACU's and to Army heavy boat companies. They are capable of carrying a total of 160 tons and of transporting containers, breakbulk cargo, vehicles and personnel from offloading vessels through the surf zone and onto the beach. With a length of 130 feet and a beam of 29 feet, this class of vessel is capable of carrying up to 12 twenty foot containers. They are powered by twin diesels and driven by twin screws providing good maneuverability in and around the surf zone. The cargo deck of the vessel is clear; the pilot house and the crew quarters are located on the starboard side, allowing cargo to driven on and off through the bow and stern ramps.

c. Landing Craft, Utility (LCU-1466 Class): The LCU-1466 class is an older version of the LCU. The LCU-1466 class is assigned to Army Heavy Boat Companies. The most significant difference between the 1600 and 1466 classes is that the older 1466 class only has a bow ramp. Cargo must be loaded and unloaded through the bow ramp or by crane. Like the LCM, containers must be handled by cranes.

d. Landing Craft, Utility, (LCU-2000 Class): This class of vessel is assigned to Army Heavy Boat Companies and is capable of moving personnel, containers, or other cargo. Like the 1466 class, the 2000 class only has a bow ramp so cargo must be loaded and unloaded through the one ramp or by crane. The LCU-2000 has a carrying capacity of 350 tons. It is capable of carrying up to 5 M1A1 tanks, 6 M2A2 Bradley's, or 28 twenty foot containers. Its speed of only 10 knots restricts its ability to self-deploy.

e. Landing Craft, Air Cushion (LCAC): The Navy has procured LCACs and assigned them to ACUs. The LCAC is an air cushion vessel capable of speeds in excess of forty knots. The vessel can carry loads up to fifty-four tons consisting of wheeled and tracked vehicles, containerized cargo, and other equipment. The vessels are capable of crossing the beaches on seventy per cent of the world's coastlines.

f. Causeway Section, Powered (CSP)and Side Loadable Warping Tug (SLWT): Each CSP is powered by two 360 degree rotatable water jet propulsion assemblies. The causeway sections are used as ferries and can transport containers, vehicles, and other cargo from ship to shore. The minimum causeway configuration has two sections, one powered section and one beachend. The largest practical ferry size has one powered section, two intermediate sections, and one beach end. The powered section is capable of carrying seventy tons of payload. A non-powered causeway section has a capacity of one hundred tons. The normal configuration of piers is one powered causeway section and one non-powered causeway section which can carry seven containers at four knots. The causeway system is capable of carrying one M1A1 tank per section at a speed of five knots. One key advantage of the causeways is they are easily deployable.

g. Logistics Support Vessel (LSV): The Logistics support vessel transports

approximately 2,000 short tons of dry cargo in offload missions. The vessel has a beaching capability that allows its use in LOTS missions. This vessel has a roll on/roll off design which permits rapid loading and discharge of mobile equipment. It is self-deployable.

There are other landing craft systems available, primarily wheeled amphibians, but their utility in a LOTS operation is limited. They are capable of landing cargo and personnel but have significant operational limitations. The Lighter Air Cushion Vehicle, 30 Ton (LACV-30) is an Army vessel similar to the Navy's LCAC but powered by aircraft turbine (jet) engines which, while powerful, are very maintenance intensive. It is most suited to the transport of containers. The Lighter, Amphibious, Resupply, Cargo, 60 Ton (LARC-LX) is an Army wheeled amphibian driven by four diesel engines and twin propellers. It is capable of assisting in an offload, but has very low speeds and is impractical to transport cargo from vessels moored a great distance off shore.

Twenty foot containers can be transported to the beach in LACV-30s, LCUs (all classes), LCM-8's, LCAC's, the LARC-X, and causeway ferries. Weather and sea state determines the method of stowing containers on board the vessels. Containers are offloaded at the water's edge with a lightweight amphibious container handler (LACH) or a crane. Containers can be offloaded from a causeway ferry by a LACH if the long axis of the container is parallel with the centerline of the ferry. Containers can also be offloaded by a rough terrain cargo handler from a causeway ferry section if the container is loaded with its center line perpendicular to the center line of the causeway ferry.

The causeway ferry is an ideal platform for transporting containers. The configurations can be varied and they are therefore very flexible. Of the lighterage systems, they are most able to

operate in the shallowest beach gradients. Two causeway ferries can be moored alongside a T-ACS simultaneously, greatly increasing the efficiency of the T-ACS.

Bulk Liquid Systems

The quantities of Class III bulk products required to sustain US forces in combat are immense. Bulk liquid systems differ from containerized cargo handling in LOTS in that the liquid is pumped from offshore shipping to the high water mark. It is then stored in beach holding facilities pending further transfer. Unlike containers and vehicles, bulk liquids require specialized storage equipment and facilities on the beach. Placing the ship for the offload of bulk liquid is more critical than for the offload of containers or vehicles. The hose systems which enable the bulk liquid to be pumped ashore determine how far offshore the ship may be. Other critical factors are the ship's draft and the hydrography of the offload site.

There are two systems for transfer of bulk liquids suitable for employment in a LOTS operation. The first is the Amphibious Assault Bulk Fuel System (AABFS). The AABFS is currently in use to support USMC amphibious assaults and Maritime Prepositioned Force (MPF) operations. The system is composed of 5,000 or 10,000 feet of buoyant 6 inch hose deployed from a Landing Ship Tank (LST) during amphibious operations or from each MPF ship in prepositioned operations. The AABFS is an integral part of the ships bulk fuel transfer system and provides the initial means of transferring the ships' fuel cargo ashore. The system is capable of pumping 600 gallons a minute. The system is rapidly installable, but has a limited life due to the floating nature of the hose. It must eventually be replaced by a more permanent system. Like most LOTS systems, it is limited to Sea State 3.

The second of the two systems is the Offshore Petroleum Discharge System (OPDS). It is

designed to provide large amounts of fuel over a sustained period of time. This is a Navy system which will deliver liquid products for all services to the high water mark. The OPDS consists of a modified tanker designed to transport, deploy and operate the system in water depths of from 35 to 190 feet. The ship carries a single anchor leg mooring, four miles of 6 inch conduit, pumps, and associated mooring and handling equipment. If sufficient water depth allows mooring within 2 miles of shore, a double discharge pipeline can be installed The system can be operated in up to Sea State 3, and is survivable up to Sea State 5. The original tanker ship remains connected to the system. It receives bulk liquid from other ships and transloads the bulk liquid into the OPDS. There are a total of five ships capable of being employed in the OPDS mode.

The OPDS is capable of delivering fuel at 1,000 gallons a minute, providing 1.2 million gallons per 20 hour operation. The standard pumping day is twenty hours; a planning figure of 4 hours per 24 hour cycle is allowed for maintenance down time.. The system is capable of sustained operation for at least 180 days.

Installation of the system requires a coordinated effort between the tanker, an underwater construction team, an LCM or LCU, a Side Loadable Warping Tug, and beach crews. The system can be operational with 48 hours of the tanker's arrival. The Marine Corps Amphibious Assault Bulk Fuel System is normally used to receive the bulk fuel over the beach from the OPDS for storage and use. The major components of the system are unloading assemblies, pump assemblies, five tank farm assemblies (120,000 gallon capacity each), and dispensing assemblies. The system can receive fuel at the rate of 1,250 gallons per minute and dispense it by hose for a distance of three miles. The system is installed and operated by the Bulk Fuel Company of the Force Service Support Group (FSSG). The Army system employed in receiving fuel from the

OPDS is the Tactical Petroleum Terminal or TPT. The system can receive fuel at the rate of up to 800 gallons a minute and has a 3.78 million gallon storage capacity. The system's components are eighteen fuel tank assemblies, each with a 210,000 gallon capacity, fifteen trailer mounted 600 gallon per minute pumps, a beach interface unit, and associated plumbing, including 42,000 feet of hoseline. The facility requires nearly forty acres of unobstructed land.

A significant planning consideration for the operational planner is that the Marine MPF units carry bulk fuel and water to provide those commodities during the first phases of the operation. Over 6.4 million gallons of bulk fuel and over 360,000 gallons of potable water are on board each of the three MPS squadrons. The Army Prepositioned Afloat Program carries no bulk fuel and must be supplied from other sources.

Tactical water systems comprise the second major portion of LOTS bulk liquid operations. The Reverse Osmosis Water Purification Unit (ROWPU) Barge is used to support tactical over the shore water operations. The barge has a 2,500 foot barge-to-shore water delivery system. The ROWPU purifies sea water and delivers the water to a shore based storage facility. The on shore storage system will consist of at least one 800,000 gallon system. The rated delivery capacity of the barge is approximately 300,000 gallons of fresh water per day. Shore based systems can be used to augment the fresh water production of the ROWPU barge.

New Systems

There are several new systems under development to improve US capabilities to conduct LOTS. JCS J-4 is supporting the development of a heavy lift Landing Craft Air Cushion (HL LCAC) to support JLOTS operations. The HL LCAC is a converted standard LCAC. It is designed to have a forty foot long hull extension. Additional thrusters will be used to aid in

control. The HL LCAC will improve on the current 40 ton LCAC capability. It will be capable of carrying a 60 ton payload at over 30 knots in Sea State 2 and a 150 ton payload at 12 knots. While supported by the JCS, this program suffers from the natural reluctance of the Navy to reduce the number of standard LCAC's by providing standard LCAC hulls for conversion to the extended configuration. Secondly, the extended length of the HL LCAC will impact its shipment in the well decks of amphibious ships, reducing the total number of LCAC's to support the amphibious assault. The well decks of the amphibious assault ships were designed to carry standard length LCAC's internally. The extra length of the HL LCAC impinges on the space required for additional LCAC's, causing the planners to choose between fewer HL LCAC or a greater number of standard LCAC's.

A second LCAC-based initiative is the Personnel Transport Module. Currently, there is only a very limited capability to transfer passengers on board an LCAC. The combination of wind, thruster blast, and the elements precludes carrying passengers on the cargo deck. The Personnel Transport Module (PTM) is a collapsible shelter which can be fitted on the cargo deck of an LCAC and provide a shelter allowing the transfer of up to 150 passengers.

A third LCAC-based development is the Air Cushioned Vehicle Landing Platform or ACVLAP. It is designed to allow the offload of RO/RO ships with an LCAC. It was demonstrated in June of 1994 with an M1A1 tank, a rough terrain fork lift, and various other types of rolling stock. The ACVLAP allows the LCAC to fly up out of the water onto a temporary landing platform which is moored side by side to the offload ramp of a RO/RO ship. Vehicles are driven onto the LCAC which then flies off of the ACVLAP.

An improved elevated causeway system is under development. It is specifically designed

to enhance the throughput of containers on austere beaches. The Elevated Causeway System Modular (ELCAS M) is up to 3000 feet long. It is capable of supporting 24 hour a day operations. Installation requires 7 days of 24 hour operations in Sea State 3 or less and less than 30 knot winds. Once installed, the ELCAS M can withstand 75 knot winds and 9 foot surf. This improvement will begin to free LOTS from the Sea State 3 limit.

Improvements in bulk Class III are also under development. The assault echelon of a Marine Expeditionary Force (MEF) requires 117,000 gallons per day at the intense rate. The sustained requirement is for 93,000 gallons per day. The AABFS is currently carried on the LST and on the MPS. With the scheduled retirement of the LST's, the MEF will lose the capability of AABFS support for the assault echelon. The MPS will still maintain the capability of delivering 900,000 gallons a day through its organic 5,000 foot pipeline. A replacement for the AABFS is under development to restore bulk fuel capability to the assault echelon of an amphibious assault, or to the first phases of a JLOTS operation. The Amphibious Bulk Liquid Transfer System (ABLTS) will be capable of delivering 500,000 gallons per day with a 6 hour or less installation time. The ABLTS is only-two thirds the size and one-third the weight of the AABFS with equal or greater capability to deliver fuel and is capable of interfacing with different classes of amphibious ships.

The Offshore Petroleum Discharge System currently has a total of 5 ships. They are considered a strategic asset. The OPDS can deliver up to 1.2 million gallons in a 20 hour pumping day up to four miles away. Under consideration to augment offshore or near shore fuel capability is the Dracone Barge. This is a British system, the British Amphibious Fuel System. It is a flexible tube barge coming in various sizes from 1200 up to 290,000 gallons. It is rolled and

boxed to simplify embarkation, and then deployed and pumped full. It can then be towed to the site and act as an afloat fuel farm.

Appendix II Sea State

Pierson-Moskowitz Sea Spectrum

Sea State	Significant Wave Height (ft)	Wind Speed (knots)
0	0.10 - 0.15	2.51 - 2.83
1	0.05 - 1.20	5.17 - 8.01
2	1.50 - 3.00	8.05 - 12.66
3	3.50 - 5.00	13.68 - 16.35

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58. Vaughters, this article specifically addresses the impact of increasing Sea State on the throughput available in a JLOTS operation, page 257.

59. This chart is a compilation of information found in Joint Pub 4-01.6, Appendix B.

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63. See Appendix II of this paper for a chart depicting the Sea State scale.

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65. This discussion is a compilation of information found in Hope, and Vaughters.

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