Engineer Amphibious Capabilities Development in World War II: Lessons in Rapid Force Development

A Monograph

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14. ABSTRACT

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Abstract

Engineer Amphibious Capabilities Development in World War II: Lessons in Rapid Force Development, by MAJ Stephen F. Schuyler, 49 pages.

At the Arcadia Conference in December 1941, the United States pledged to conduct operations in North Africa by the end of 1942. This decision directly influenced a rapid force generation of amphibious troops. This proved challenging as the US Army had no existing amphibious units, no trained leaders in amphibious operations, no amphibious equipment, and no amphibious doctrine. With these significant handicaps, it took eighty-five days to man, train, and equip the first 7,000 man 1st Engineer Special Brigade and ship them to England in preparation for the North African Operations.

The Engineer Regiment, initially tasked by the War Department to study the opposed beach landings, sought to become the principal proponent for training and execution of amphibious operations for the US Army. Brig. Gen. Daniel Noce and Col. Arthur Trudeau, as leaders of the Engineer Amphibious Command synthesized decades of US Marine Corps and Navy amphibious doctrine, prototyping, and experimentation into fighting formations influencing all of the amphibious operations during World War II.

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Contents

Acronyms

ADP	Army Doctrine Publication
BCR	Bureau of Construction and Repair
BSC	Boat Services Company
CCDR	Combatant Commander
CNO	Chief of Naval Operations
CMC	Commandant United States Marine Corps
FDB	Fleet Development Board
FMF	Fleet Marine Force
JOAC	Joint Operational Access Concept
LBB	Landing Boat Development Board
MCEF	Marine Corps Expeditionary Force
MCS	Marine Corps Schools
NATO	North Atlantic Treaty Organization
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
USMC	United States Marine Corps

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Structure and Introduction

Background

Amphibious force is a necessity for civilizations that venture out to sea. Amphibious operations planning and development began before its maturity in World War II. The collective thinking of both the US Army and US Navy following World War I suggested that there would always be a friendly port on which to offload troops and supplies. The Gallipoli Campaign proved that amphibious warfare could capture terrain from the sea. However, the ultimate failure to capture the Dardanelles, considerable loss of life, and subsequent retreat only reinforced negative opinions of amphibious assaults. The US Marine Corps (USMC), seeking to maintain size and structure following World War I, conducted a series of landing exercises in the 1920's to demonstrate the potential to assault and capture enemy naval bases/ports. In 1934, the Fleet Marine Force was established and worked diligently to develop the set of techniques for amphibious landings. These methods included the use of preliminary reconnaissance, integrated fires, assault zone selection, personnel organization, beach control, and preparation for exploiting the beachhead. The USMC served as the earliest adopter and innovator of how the US military fights amphibiously, and the US Army would get involved in the 1930-40's.

Before the US Army's full involvement in amphibious warfare, the US Army Engineer School directed a study in late 1939 and early 1940. The study examined the problem solely through the engineer functions and advocated a more significant role for the US Army when conducting amphibious assaults. Findings from the study display an inherent lack of trust between the US Army and the US Navy regarding mission command and the employment of beach clearing parties to enable large formations to breakout from the beachhead. Since the existing doctrinal writers were from the Department of the Navy, the US Army constituted support roles in all primary functions, including obstacle reduction and construction operations. The US Army

Engineer School study found this arrangement unacceptable and submitted their findings to the War Department; the results would wait two years before being considered.

Following the Pearl Harbor attacks, the War Department accelerated war preparations and capabilities development. In late 1941 through early 1942 joint US Army-Navy exercises were held on both coasts. An Atlantic Fleet Amphibious Corps consisted of the 1st Marine Division and the 1st Infantry Division. A Pacific Fleet Amphibious Corps consisted of the 2nd Marine Division and the 3rd Infantry Division. The landing forces were under US Navy control.[1] The Atlantic and Pacific Amphibious Forces were created under US Navy leadership with US Army and USMC commanders in charge of land components based on geography. The US Army commanded in the Atlantic, and the USMC commanded in the Pacific regardless of troop task organization. The results proved that neither force was capable of conducting large-scale operations due to inadequate communications, poor control of shore parties, and general service rivalries. Much of the available amphibious equipment was inadequate to conduct large-scale operations. With the results of these exercises, military planners sought to task organize military service responsibility on functional and geographic lines.

In early May 1942, the US Army Corps of Engineers assembled at the War Department to develop the framework for an amphibious force. The War Department authorized the creation of the Amphibious Training Center and Engineer Amphibious Command. The Corps of Engineers determined a training location and negotiated a joint agreement for training landing craft (still in the naval acquisitions process). From May to August 1942, the Corps of Engineers defined a problem, established a training location, wrote doctrine, developed a task organization, equipped the force, and trained an entire engineer amphibious brigade for combat in the European theater of operations. This timeline is nothing short of miraculous considering the external pressures and internal conflict from Washington, the War Department, and the US Navy.

[1] Sid Berger, *Breaching Fortress Europe: The Story of US Engineers in Normandy on D-Day* (Dubuque, IA: Kendall/Hunt Publishing Company, 1994), 13.

Problem

Throughout history, nations have attempted amphibious operations with varying degrees of success. Usually, a navy is forced to provide transport in support of an army resulting in hostile feelings. Also, many of the landings were rarely opposed, as combatants sought to find a remote landing site close to their objective that would allow them the time to build sufficient combat power to attack the decisive point. Gallipoli changed this framework. Nations awoke to the possibility of assaulting a fortified position from the sea. With the United States declaring war on the Axis Powers in 1941, the strategic visions of the policy makers were translated into operational concepts by theater commanders and planners. The development of operational plans that support strategic objectives is the essence of operational art.[2] Operational art will serve as the framework to discuss the development of the engineer special brigades and their purpose providing operational tempo, operational reach, and mass to supported forces.

The real strength of the United States is our ability to force generate in support of just war. The United States maintains the post-World War II order created by the United Nations, Bretton-Woods, NATO and other international bodies/agreements. With troop reductions following the dissolution of the Soviet Union in 1991 and increased technological over-match exhibited during the War on Terror, general apathy has increased in the American public to serve in a defense capacity. The US Army must create a strategy to harness the skills of our nation to fill the future defense needs in the face of large-scale combat operations. The US Army needs to investigate its lost capabilities and how those forces were generated in the first place. The purpose of this study is to analyze the development of a special unit while its core functions are reinforced through decades of prototyping and exhaustive research by individual service branches.

[2] US Department of Defense, Joint Staff, *Joint Publication (JP) 3-0, Joint Operations* (Washington, DC: Government Printing Office, 2017), I-13.

Hypothesis

This study tests two hypotheses to determine if operational art structure is valid in the force generation of specialized combat units. First, the United States, in the event of global large-scale combat operations, will be able to force generate at a level similar to that of 1941-1942. Second, joint forces provided with the appropriate operational tempo, operational reach, and mass will ensure operational access to contested areas.

Methodology

The research methodology is exploratory and conducted using document analysis to answer the principle research question: How did the US Army and the War Department rapidly man, train, and equip its special engineer brigades for employment in the European and Pacific Theaters of Operations during World War II? Force management and the principles of operational art as they relate to the creation of a new fighting capability is the principle theme. Operational art relating to time, space, purpose, risk, and resources required the War Department to authorize the creation of these specialized units in 1941-42 to breach Europe and the Pacific. Specifically, it involves the interactions between joint force partners as they determine the necessary force structure to restore operational tempo in the contested theaters of the World War II. This study will provide theater commanders and planners with an understanding that specialized units may be required to provide conventional forces with necessary lodgments to project combat power during the next large-scale combat operation.

The author has chosen to utilize different primary and secondary source material throughout the study. The study will begin at the conclusion of the Spanish-American War, as it represents US resolve to enforce territorial claims in the Western Hemisphere. In the first chapter the study will utilize British and USMC sources to discuss the development of modern amphibious warfare concepts. Gallipoli is used as it represents the single most significant event that serves as a framework for much of the development during the interwar period. Interwar

development will combine the lessons learned from the previous two chapters as the United States continues to emerge as a global power. The US Army and the Engineer Regiment chapter will utilize sources from the US Army Engineer Regiment as they represent the best body of knowledge concerning the engineer special brigades. The final section will be concerned with the possibility of the implementation of a specialized unit in the context of the US Army force management system and the joint relationships that would be required to implement the concept.

Missing from this study is the operational usage of the special engineer brigades. While primary source material is plentiful on the subject, it does not help in the structure of the doctrine or equipment development prior to the war. As each theater commander utilized the units in different tactical and operational capacities during World War II, it is not necessary to speculate on unit performance as a measure for the study.

This study will provide definitions of commonly discussed vital topics/concepts throughout the monograph. The Joint Operational Access Concept (JOAC) is the reference for the definition of operational access. Joint publications are the reference for operational tempo, operational reach, and mass. Operational access is the ability to project military force into an operational area with sufficient freedom of action to accomplish the mission. Operational access is the joint force contribution to *assured access*, which is the unhindered national use of the global commons and select sovereign territory, waters, airspace, and cyberspace.[3] Operational tempo in warfare refers to the joint force commander's election to maintain a metronomic pulse stretching the capabilities of both friendly and enemy forces or to conduct operations at a reduced pace.[4] Operational reach is the distance and duration across which a force can successfully employ military capabilities.[5] Military classes of supply are integral to maintaining a long reach,

[3] US Department of Defense, Joint Staff, *Joint Operational Access Concept (JOAC)* (Washington, DC: Government Printing Office, 2012), i.

[4] US Joint Staff, *JP 3-0*, *Joint Operations* (2017), III-12.

[5] Ibid., GL-13.

however, there are factors out of the control of combatants that restrict their reach such as weather, terrain, diplomacy, civilian populace, and military law. Mass is the concentration of combat power at the most advantageous place and time to produce decisive results. In order to achieve mass, appropriate joint force capabilities are integrated and synchronized where they will have a decisive effect in a short period of time. Massing combat power, rather than concentrating forces, can enable even numerically inferior forces to produce decisive results and minimize human losses and waste of resources.[6] The study explores these concepts as they are integrated into the capabilities under development during the course of the research.

This monograph surveys the process of creating a particular capability. The US private sector and US military are continually experimenting with new trade concepts and doctrine. Not all of this research is initially recognized as groundbreaking, but it provides valuable insight to future commanders and planners as they attempt to build a specialized force to project combat power. The catalyst for this force creation is the Japanese attack on Pearl Harbor, which resulted in the United States declaring war on the Axis Powers. The planners in the War Department had to determine how they would bring the fight to Germany and Japan, requiring these planners to revisit the amphibious doctrine developed by the USMC during the interwar period. With the potential of large-scale combat operations, planners must examine formations and concepts abandoned upon the dissolution of the Soviet Union in 1991, so we may develop a force that is capable of dealing with 21st century threats.

[6] US Joint Staff, *JP 3-0*, *Joint Operations* (2017), A-2.

Context and Narrative

Defense of the American Empire

The story of amphibious engineers and their development begins following United States involvement in the Spanish-American War, April-August 1898. The US found itself in control of colonial possessions and was determined protect its newly acquired territory. President Theodore Roosevelt, seeking to continue America's march towards international recognition, boldly upheld the Monroe Doctrine by adding his 1904 corollary. "The 1904 Roosevelt Corollary essentially turns the Monroe Doctrine on its head and says the Europeans should stay out, but the US has the right, under the doctrine, to go in to exercise police power to keep the Europeans out of the way."[7] The US involvement in world affairs energized the Navy and War Departments with time, money, and resources to force generate. "[Naval leaders] influenced by the doctrines of Alfred Thayer Mahan, directed their shipbuilding programs and training activities toward creation of a battlefleet able to take command of the sea…as a part of the Navy, the USMC also had to find a specific role towards which it could direct its own organization and training."[8] This new role would be advance base force doctrine and serve as a basis for future amphibious doctrine.

While USMC Commandant Brig. Gen. Charles Heywood pledged his support for the new plan, he recognized that it would be expensive and time consuming. The strategic planning and advisory board for the Secretary of the Navy, known as the General Board, worked alongside the Navy War College and the USMC from 1900 to 1912 to develop the advanced base concept. Their efforts created two thirteen hundred-man regiments; the first regiment would focus on the establishment of fixed defenses and the second would be equipped to conduct a mobile defense.

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[7] *American Experience: TR: The Story of Theodore Roosevelt*, directed by David Grubin, written by David Grubin and Geoffrey C. Ward (Corporation for Public Broadcasting, 1996), DVD (2006).

[8] Graham A. Cosmas and Jack Shulimson, "The Culebra Maneuver and the Formation of the US Marine Corps's Advance Base Force, 1913-1914," in *Assault from the Sea: Essays on the History of Amphibious Warfare*, ed. Merrill L. Bartlett (Annapolis, MD: Naval Institute Press, 1993), 121.

One formation was designed for speed and rapid deployment while the other was designed with permanency in mind. The concept required testing, however Congress never appropriated funds to support its creation, the semi-independent bureaus of the Navy gave it low priority, and the USMC could not force generate enough men to fill the billets.

To solve the USMC manning problems, enterprising US Navy Capt. William F. Fullam suggested that marines be pulled from warships that would have released approximately twenty-five hundred marines to serve in the advance base force concept. "In 1908, Capt. Fullam and his cohorts persuaded President Roosevelt to issue an executive order withdrawing the Marines from battleships and redefining the marine mission in terms of naval base defense and expeditionary duty."[9] The USMC launched an intensive lobbying program to reinstate marines on warships and succeeded in 1909 to overturn the presidential decree. By 1913 the General Board decided to test its advance base concept with field maneuvers. Capt. Fullam, by this time an aide for naval inspections and bitter from reversal of the 1908 Presidential decree, conducted numerous evaluations of the USMC Advance Base School in Philadelphia, PA, citing faults and lack of preparation. The heated discussion finally required the General Board to "reject out of hand any removal of marine ships' detachments," remarking that, "this action, if persisted in, may eventually cause the loss of the USMC to the US Navy and its absorption by the US Army."[10] Following this action, the Navy went through a base realignment and closure program that consolidated the necessary number of marines on the US coasts.

With the matter of manning resolved, the General Board and Assistant Secretary of the Navy Franklin D. Roosevelt settled on the island of Culebra, sixteen miles east of Puerto Rico, for the maneuvers. Culebra was not randomly selected; the island was identified in the Joint

[9] Cosmas and Shulimson, "The Culebra Maneuver and the Formation of the US Marine Corps's Advance Base Force, 1913-1914," 123.

[10] Ibid., 125.

Army and Navy Board color-coded war plans.[11] "Culebra is the key to the Western Atlantic and Caribbean regions, either as a concentration point for the US fleet or an advance base for the attacking German fleet."[12] From 1 November 1913 – 15 February 1914 the marines conducted marshalling activities, forward deployment, and dry-fire & live-fire exercises. US Navy Capt. William S. Sims served as chief umpire for landing exercises commenting on the thoroughness of the defenses established by the fixed and mobile defense regiments. The land-based regiments repulsed two attacks from a twelve hundred sailor/marine mixed regiment and a Fleet Marine Battalion. "The Marines had learned many practical lessons, including the need for expeditionary packaging of supplies and equipment, a more accurate assessment of the proper number and types of landing craft, the importance of adequate ground transportation once a shore, and the value of aircraft for reconnaissance and possibly for bombing enemy ships."[13]

The USMC did not have to wait long for a chance to test the operational deployment capabilities of the advance base force. President Woodrow Wilson sought to remove the military dictator, Gen. Victoriano Huerta, who murdered the revolutionary leader Francisco Madera to gain control of Mexico. On 9 April 1914, "a group of American sailors was detained by federal soldiers in Tampico, sparking a contest of protocols and ultimatums in which President Wilson refused to compromise as he considered them affronts and indignities committed against the

[11] "The Army Staff and the Navy General Board created the Joint Army and Navy Board in 1903. The Joint Board had no independent planning authority, it could however act as a board of final review for plans submitted to it by the individual services. From 1903 until the United States' entry into World War I the Joint Board focused its attentions on a series of war plans designed to protect the nation's interests. Planners assigned each major state a color, and logically enough the plans were known as color plans. Britain – Red; Germany – Black; France – White; Spain – Yellow; Japan – Orange; Italy – Grey; Russia – Green; Austria – Crimson; and China – Saffron." Steven T. Ross, *American War Plans: 1890-1939* (Portland, OR: Frank Cass Publishers, 2002), 38.

[12] Cosmas and Shulimson, "The Culebra Maneuver and the Formation of the US Marine Corps's Advance Base Force, 1913-1914," 127.

[13] Ibid., 130.

United States."[14] The US Army and US Navy sprang into action. The US Army assembled at the Rio Grande River and Galveston under the command of Brig. Gen. Frederick Funston. The US Navy, fresh off their maneuvers on Culebra, were able to force project thousands of sailors and marines to Vera Cruz. The invasion was launched at 0600 on 21 April 1914 and was strictly a US Navy/USMC affair. By the time the Army arrived on 29 April 1914, the shooting had ceased, and the Army and the USMC settled into garrison duties in the city until the American withdrawal of forces on 23 November 1914. The US Navy and the USMC quickly capitalized on the assault of Vera Cruz by using the techniques pioneered during the previous fourteen years. The advance base concept proved its worth during the conflict, but the Navy and War Departments would learn from the efforts of the European nations' amphibious efforts at Gallipoli.

Gallipoli

Three months following the American actions at Vera Cruz, continental Europeans began World War I. Modern battle techniques caused a trench warfare stalemate on the western front that had the British looking for a way to regain operational tempo. The Dardanelles Straits separating the Mediterranean Sea and Black Sea were strategically importance to the British during the World War I. "The straits provided Russia with her only year-round 'warm water' maritime access and were thus critical to her trade and to her lines of communication to her wartime allies, Britain and France."[15] First Sea Lord Winston Churchill demanded that Britain attack this strait to quickly neutralize the Turkish threat providing the Entente Powers with control of the Dardanelles. The British were mainly concerned with their possessions in Egypt and less so about the mobility of the Russians, but capturing the straits would be beneficial to

[14] James H. Alexander, "Roots of Deployment – Vera Cruz 1914," in *Assault from the Sea: Essays on the History of Amphibious Warfare*, ed. Merrill L. Bartlett (Annapolis, MD: Naval Institute Press, 1993), 133.

[15] Dermott P. Monteith, *Cultural Arrogance and Blind Faith: The Strategic Origins of the Dardanelles Campaign* (Fort Leavenworth, KS: School of Advanced Military Studies Monograph, 2015), 8.

both nations. The British War Council supported the idea on the grounds that it did not send more men into the trenches of the European stalemate and the Royal Navy could show its dominance against a weak opponent. The War Council, however, when they approved the plan on 13 January 1915, did not consider a major amphibious operation as the primary means for the capture of the Gallipoli Peninsula. Secretary of State for War Field Marshall the Lord Herbert Kitchener, already stated that no additional troops could be spared for the opening of an additional theater, so the entire enterprise would have to be naval. Historian Robin Prior sums up these early planning efforts: "there was little to be lost in an option that diverted no troops or ships (of any consequence) from the main theatre of war. In that sense Britain's decision makers had not made a decision of any vast consequence."[16]

Very quickly it became apparent that sea power alone could not force the straits. "[Lord Kitchener] by 16 February 1915 decided to dispatch the 29th Division, a yet unspecified force from Egypt, shipping, and boats for fifty thousand troops to the Aegean in case of necessity to support the naval attack on the Dardanelles."[17] The War Council would also muster an additional 10,000-man Royal Naval Division and 30,000 troops from the Australian and New Zealand Army Corps (ANZAC). The British planning efforts were focused on supplying resources, before a commander and battle plan had been formulated. On 19 February 1915, an Anglo-French naval task force launched the first of a series of attacks on the straits meant to reduce Turkish defensive preparations and clear mines. Commanding the task force, Adm. Sir Sackville Hamilton Carden displayed confidence when intelligence hinted that Turkish forts were running low on ammunition. On 18 March, Adm. John de Robeck[18] launched the task force into an unsuccessful

[16] Robin Prior, *Gallipoli: The End of the Myth* (New Haven, CT: Yale University Press, 2009), 19.

[17] Monteith, *Cultural Arrogance and Blind Faith*, 30.

[18] Admiral Carden was placed on the sick list by his medical officer for stress related symptoms. Admiral de Robeck assumed command of the Anglo-French naval task force right before the critical assault on the straits.

assault on the straits, requiring the newly created Mediterranean Expeditionary Force (MEF) and Gen. Sir Ian Hamilton to neutralize land based Turkish guns to allow the Navy to capture the straits.

Upon his arrival in theater, Gen. Hamilton conducted a quick reconnaissance, while observing the final actions of the 18 March assault. His discussion with ANZAC commander, Lt. Gen. William R. Birdwood convinced him that the task of capturing the straits would require more than just the Navy. Despite the considerable pressure on the Royal Navy from Churchill to renew their efforts, the mindset of the commanders on the ground quickly grew to favor a significant combined arms operation utilizing all available military forces. "Rather than occupy the Gallipoli Peninsula and mop up after the navy had got through, the army would now aim to seize it to allow the navy to get through."[19] Adm. de Robeck agreed with Gen. Hamilton, who notified Churchill of the intentions for a combined campaign. Churchill agreed and within the span of one week from 18-24 March, the British decided to commit a 100,000-man force to a major amphibious assault on a fortified position. The decision to assault Gallipoli should have caused concern:

> It had been taken not by a Cabinet or War Council decision, not as a result of campaign planning by the British General Staff or Admiralty, but by a general who had been in theatre for less than a week and whose knowledge of the terrain was confined to what he could see from the deck of a swift sailing destroyer, and by an admiral who had been in command for less than a week whose only experience of battle command was a resounding defeat.[20]

The planning for the amphibious assault immediately ran into problems. Nobody in history had attempted to land a large international force on an opposed beach, with no reconnaissance, no specialized equipment, no established lines of communication, and no amphibious doctrine. Gen. Hamilton did not even have his full staff in theater before advising

[19] Monteith, *Cultural Arrogance and Blind Faith*, 42.

[20] Ibid., 42-43.

Lord Kitchener that 11 April 1915 would be the earliest he could attack. The port in Mudros Harbor, which was the closest to the assault site, could not support the proper loadout of troops. "Transports for the 29th Division were three weeks away, and those already in Mudros were not tactically loaded, guns were in one ship, limbers in another. The transports would have to be emptied and reloaded and though Mudros was an excellent anchorage, it boasted little else."[21] All the ships would sail for Egypt to reload for combat. Equally damning was the lack of landing craft, which required "British Officers to scour the Mediterranean ports to buy every small craft available, paid for in cash."[22] All of these efforts to prepare logistically were conducted in full view of enemy intelligence apparatus that would have full display of Allied capabilities.

[21] T. A. Gibson, "Gallipoli, 1915," in *Assault from the Sea: Essays on the History of Amphibious Warfare*, ed. Merrill L. Bartlett (Annapolis, MD: Naval Institute Press, 1993), 144-145.

[22] Eugene Rogan, *The Fall of the Ottomans: The Great War in the Middle East* (New York, NY: Basic Books, 2015), 142.

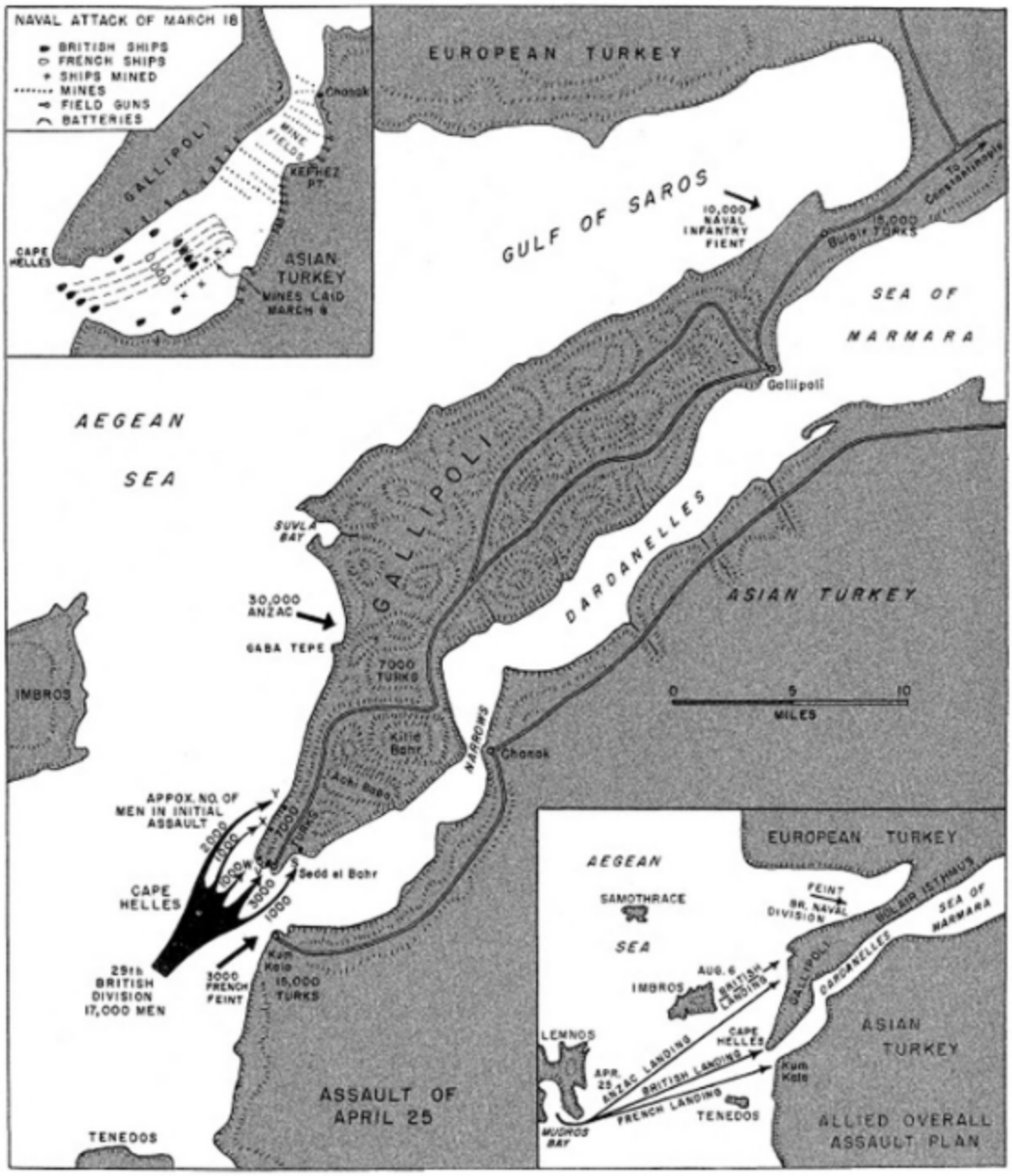

Figure 1. The Dardanelles Campaign, 1915. T. A. Gibson, "Gallipoli, 1915," in *Assault from the Sea: Essays on the History of Amphibious Warfare*, ed. Merrill L. Bartlett (Annapolis, MD: Naval Institute Press, 1993), 144.

Selection of the assault sites would prove tricky. Lord Kitchener forbade any Allied troops to land in Asia, which left the Gallipoli peninsula as the only option. Because the peninsula is "45 miles long and about 12 miles wide at its thickest waist, only four real possibilities to land a sizeable force existed: (1) the Bulair area which was served by the Bay of Bakla Liman in the

Gulf of Saros; (2) Suvla Bay; (3) the Gabe Tepe area; (4) Cape Helles."[23] Bulair and Suvla Bay were ruled out quickly due to the Turkish defensive preparations at Bulair and the limited topographical data on Suvla Bay. Gabe Tepe and Cape Helles offered more favorable terrain, but these sites were only inspected from ships and primitive sea planes. Restricted terrain would be one of the points of risk for this campaign; mountainous terrain, restricted beaches, and operational segmentation of the ground would cause considerable problems.

By 10 April 1915, Gen. Hamilton had devised a plan for the attack. He was deeply concerned with the loss of surprise given the necessary transport reconfiguring occurring in Egypt, so he determined to use trickery and mass to defeat the enemy.

> His plan was to make his main effort from the beaches of Cape Helles and Sedd-el-Bahr with the Regular 29th Division, with the ANZAC Corps landing simultaneously just north of Gabe Tepe to seize 'the high backbone of the Peninsula and cut the line of retreat of the enemy on the Kilid Bahr plateu;' the French were to land temporarily with a brigade on Kum Kale on the Asain side of the mouth of the straits to neutralize the guns that could range on the Morto Bay and also to prevent enemy reinforcements moving across from the side, and the naval division would make a demonstration in their transports off Bulair to transfix the enemy there.[24]

The beaches at Cape Helles would be divided into S, V, W, X, and Y beaches from east to west with V and W beaches being the main effort. The ANZAC plan had no such delineations. Naval bombardment would destroy the visible enemy positions, while the men would be rowed, tugged, or beached in their landing craft to begin the assault. "The challenge for the British war planners was to land enough troops to overcome the stiff opposition they expected to encounter. Tows of four rowboats would only deliver 120 to 130 men at a time, and the British could only manage six tows for V Beach – a maximum of 800 men."[25] The solution was to repurpose a collier, *River Clyde,* to carry approximately 2,100 troops to shore in a Trojan Horse fashion. Noticeably absent

[23] Rogan, *The Fall of the Ottomans*, 145.

[24] Ibid., 147.

[25] Ibid.

from the plan was analysis on the disposition of the enemy and the prepared enemy emplacements.

The lack of rehearsals and doctrinal procedures for amphibious landings would quickly make themselves apparent. The landings began on 25 April 1915 at Cape Helles on V beach. The *River Clyde* beached itself and immediately came under concentrated fire. The paddle boat that was to serve as a bridge between the shore and the *River Clyde* was unable to fight the strong current of the straits and beached sideways. The soldiers erected a pontoon bridge from the *River Clyde,* but it was suicidal to attempt a run across the narrow bridge in the daylight. The British would wait until darkness to unload the remaining men. W beach received a similar welcome from well-entrenched Turkish machine gunners who caused heavy causalities. It did not help that Gen. Hamilton ordered troops destined for V beach to W beach once he realized that he could not take V beach until hours of darkness. Y, X, and S beaches faced far less retaliation, but the British commanders were not able to maintain adjacent unit communications, and under pressure from Turkish units of unknown size many choose to dig in their troops instead of assault.

The ANZAC landings faced similar problems. "The assault planners miscalculated the strength of the current off the Gallipoli coastline, and the steam launches with their tows of four landing craft drifted well off course, landing a mile or more north of the landing site."[26] The new landing site would challenge the ANZAC with heavy brush and high ridges. Much like their commonwealth partners to the south, ANZAC experienced command and control issues as landing craft assaulted in the wrong place and in the wrong order. Units became intermixed, "soldiers were separated from their commanding officers, under fire and fired up the Australian soldiers fell in on the nearest officer, fixed bayonets, and began to charge up the first ridge of hills to drive back the Turkish defenders."[27]

[26] Rogan, *The Fall of the Ottomans*, 153.

[27] Ibid., 154.

The beachheads were captured at a terrible price, but some of the worst days were yet to come. Following the initial invasion, the beaches needed to be cleared of the wounded for follow on troops and supplies. The planners had made no effort, beyond the initial invasion beach designations, to subdivide the beaches for incoming and outgoing beach traffic. They also did not establish an overall beach commander to sort these issues out while the tactical commanders pressed the attack on the Turks. As individual commanders chaffed against each other with divided commands and fear of the unknown, the Turks were able to rush additional defensive troops to the area, ultimately resulting in the British withdrawal by 9 January 1916.

USMC Interwar Doctrinal Development

As the guns fell silent in Europe and the Treaty of Versailles codified what the international community hoped would be a lasting peace, nations sought to learn from the conflict. The USMC had been through a radical change. In 1914 they stormed Vera Cruz, testing their rapid deployment and advanced base force concept with incredible results. They soon expanded: "during World War I, Marine personnel strength went from 13,725 to a peak of 75,101 at the time of the armistice, of which 30,000 served with the US Army in France."[28] During the war the advanced base force did not participate in advanced basing or landing assault operations, but served in a garrison capacity in the Caribbean, Philippines, China, and Guam. While this force did not participate in the European conflict, the marines were busy perfecting a new style of doctrine in the Banana Wars. In 1921, Maj. Samuel Harrington drafted *The Strategy and Tactics of Small Wars* recording the best practices for dealing with guerrilla campaigns and consolidation of gains in limited scope military intervention operations. Also, in 1921, Lt. Col. Earl H. Ellis submitted his amphibious assault operation plan, *Advanced Base Operations in Micronesia*, to Commandant of the USMC (CMC) Maj. Gen. John A. Lejeune. Maj. Gen. Lejeune, fresh from

[28] Kenneth J. Clifford, *Amphibious Warfare Development in Britain and America from 1920-1940* (Laurens, NY: Edgewood, Inc., 1983), 25.

his experience in World War I, desperately tried to preserve the size of the USMC. As a veteran of the Vera Cruz Campaign in 1914, Maj. Gen. Lejeune saw a future for the USMC in advanced basing. In correspondence with the General Board, he stated that "the advantage of having immediately available mobile USMC force adequate to conduct offensive landing operations against hostile naval bases was apparent."[29] With the emergence of Japan as a world naval power, the USMC would get to keep more men and develop its amphibious concepts.

The strategic focus of US war planners changed following World War I with the assumption of great power status. The Great War drastically weakened the continental powers while launching the United States into a new position both strategically and economically. The Secretary of War and the Secretary of the Navy redesigned the Joint Army-Navy Board to deal primarily with advising on matters of national defense. Mostly the board re-evaluated the numerous color plans, including introduction of Special Plan Blue for the defense of the continental United States. "The plan did not specify an enemy nor did it specify a strategy for use against the phantom foe. In reality, Plan Blue was a mobilization plan."[30] Mobilization would be the main problem for both services during the interwar years. While the board recommended maintaining large forces, the US Congress was determined to cut back troop numbers and pay down war debts. "Throughout the 1920's and most of the 1930's the regular US Army never attained a strength of 150,000, the National Guard and organized reserves combined barely broke 200,000, and the US Navy, limited by the Five Power Treaty of 1922, had to scrap fifteen capital ships and stop work on eleven more leaving it with eighteen battleships, one carrier, thirty cruisers, 205 destroyers and 126 submarines manned by 113,500 personnel."[31] The USMC fared no better with its post war end strength settling around 21,000 personnel. In this environment, innovation would have to be frugal and pass the scrutiny of multiple boards.

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[29] Clifford, *Amphibious Warfare Development in Britain and America from 1920-1940*, 27.

[30] Ross, *American War Plans*, 99.

[31] Ibid., 102.

Military innovation and doctrinal development would be a labor of love for many officers. Lt. Col. Ellis wrote a groundbreaking work on amphibious assault. Through observation of USMC exercises, research papers at the US Naval War College, and reconnaissance of Pacific islands, Lt. Col. Ellis drafted Operation Plan 712 H, better known as *Advanced Base Operations in Micronesia*. The plan reads similar to a field manual with prescriptive language as to force structure, size, and placement. It discusses aspects of the Pacific Theater of Operations and how to prepare a beachhead with combined arms forces from land, air, and sea. It accounts for offensive and defensive operations, while discussing iterative objectives.[32] Maj. Harrington would deliver the next critical piece to the doctrinal puzzle. Maj. Harrington wrote *The Strategy and Tactics of Small Wars*, which would eventually develop into the *Small Wars Manual*. The small wars doctrine provided the USMC with a manual to conduct operations beyond the beach. This is essential to transitioning from offensive amphibious operations to expanding lodgment off the beach head. The manual discusses logistics, training, reconnaissance, security, civil-military operations, and strategy.[33] Both manuals were critical to helping the USMC develop its future amphibious role.

The Marine Corps Schools (MCS) proved far too dependent on the US Army for its post-war curriculum. "It was natural that the curriculum of all of the schools at Quantico during the 1920's would be US Army oriented, because of the recent experiences in World War I. In addition, all texts, with the exception of Advanced Base writings, used by MCS were written be the US Army."[34] MCS commanding officer Col. Ben H. Fuller, "requested Harrington to send him copies of his work on small wars in order to build up a course strictly patterned for USMC

[32] US Marine Corps, *Fleet Marine Force Reference Publication 12-46, Advanced Base Operations in Micronesia* (Washington, DC: Government Printing Office, 1992), 3-10.

[33] US Marine Corps, *Small Wars Manual* (Washington, DC: Government Printing Office, 1987), 1-9.

[34] Clifford, *Amphibious Warfare Development in Britain and America from 1920-1940*, 92.

work."[35] The USMC had to differentiate itself from the US Army lest the latter absorb the former through congressional lobbying.

Through the 1920's the USMC began to codify its doctrine and formations. Advanced base force was changed to Marine Corps Expeditionary Force (MCEF) in 1923. "The MCEF organization and mission remained the same from its pre-war counterparts, and looked like solid structures on paper, but the fact was that the post-war USMC had no experience in training with fleet and, conversely, the fleet had no experience with the MCEF."[36] From 1922-1926 the US Army, US Navy, and USMC conducted a series of landing exercises on the US coasts. "The results of the exercises were disastrous…landings on the wrong beaches, boats being lost for a time, insufficient naval bombardment, and transports poorly loaded were a few of the adverse criticisms of the exercises."[37] The MCS with its new expanding curriculum on MCEF operations gradually expanded over the decade. This practice and development served the USMC well, because in 1927 the Joint Board of the Army and Navy officially designated the Corps to "provide and maintain forces for land operations in support of the fleet for the initial seizure of advanced bases and for such limited auxiliary land operations as are essential to the prosecution of the naval campaign."[38]

The Great Depression from 1929-1939 re-launched the perpetual cycle of budget and force cuts throughout all military services. The USMC was able to stabilize their numbers through with the assistance of the Chief of Naval Operations (CNO), Adm. William V. Pratt, "to 27,400 while the appropriated strength remained at 21,000 during the decade."[39] The instruction

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[35] Clifford, *Amphibious Warfare Development in Britain and America from 1920-1940*, 94.

[36] Ibid., 85.

[37] BG Eli K. Cole to CMC, 15 Feb 1924, USMC, RG 127, National Archives, Washington, DC.

[38] [US] Joint Board, *Joint Action of the Army and Navy, 1927* (Washington, DC, 1927) p. 12, para. VI, 8(b).

[39] Clifford, *Amphibious Warfare Development in Britain and America from 1920-1940*, 96.

formalization and shift away from US Army focused training programs helped the USMC to develop its own unique identity. On the order of the commander of MCS, two officers, Maj. Charles D. Barrett and Maj. Lyle H. Miller, drafted the first formalized text on landing operations. The team was soon expanded to include Maj. P.S. del Valle and Navy Lt. Walter C. Ansel. These men formed the nucleus of the Landing Operations Text Board. While the board was comprised of USMC and US Navy members, "the Boards appointed with MCS to develop a text needed only the concurrence of the CMC. The text was only to be for internal use within the school, therefore approval from the Secretary of the Navy, CNO, Navy General Board, or anyone else was not necessary."[40] MCS's steady addition of landing operations to the curriculum added pressure on the Landing Operations Text Board to complete the work, however, given the usual cycle of military movements and change of commands, the first board never published a text.

It would take three drastic actions to complete the work of the first board. First, in 1932, MCS discarded all courses developed by the US Army. By discarding all institutional knowledge of the US Army, "Instructors at MCS had to rewrite all their material and gear it to USMC tables of organization and equipment."[41] Second, in 1933, the MCEF would be replaced by the Fleet Marine Force (FMF). The Secretary of the Navy, signed "general order No. 241, designating the Fleet Marine Force, where the marines would be the old expeditionary forces and would be maintained in a state of readiness by the CMC for operations with the Fleet."[42] This new force would require their own doctrine for training and provide guidance to the fleet elements supporting their efforts. Third, in 1933, marines were called to service in Cuba, and the commander of MCS recommended to the CMC that all MCS classes be discontinued to focus the entire school effort towards the development of the new doctrine. The CMC agreed to the

[40] Clifford, *Amphibious Warfare Development in Britain and America from 1920-1940*, 97,

[41] Ibid., 99.

[42] Ibid.

proposal and on 13 June 1934 "the *Tentative Manual for Landing Operations*, the first of five such named, was issued to MCS during the 1934-1935 school year."[43]

The manual quickly caught on throughout the Department of the Navy. The organization of the manual focused on six basic elements of landing operations: "(*a*) command relationships; (*b*) naval gunfire support; (*c*) aerial support; (*d*) Ship-to-shore movements; (*e*) securing the beachhead; (*f*) logistics."[44] "Several weeks later, in July 1934, the title was changed to *Manual for Naval Operations* and published by the Navy Department."[45] Neither of the manuals were distributed outside of the Navy Department. In 1935 a revision board was established to incorporate the comments of US Navy and USMC Officers. Updates to the *Tentative Manual for Landing Operations* and *Manual for Naval Operations* were written in 1935 (*Tentative Landing Operations Manual, 1935*) and 1937 (*Landing Operations Doctrine, US Navy, 1937*), but the work that US forces would carry into World War II was published in 1938 as *Fleeting Training Publication (FTP) Number 167,* better known as *Landing Operations Doctrine, US Navy, 1938.*

Landing Operations Doctrine, US Navy, 1938 dealt with many coordination problems between combined arms forces. It stated that "the [amphibious] force was to be commanded by a US Navy flag officer. The task force would have two main components: the landing force, made up of FMF units and the naval support groups consisting of the fire support group, the air group, covering group, and the transport group."[46] Much of the doctrine was pulled from *Advanced Base Operations in Micronesia*, *The Strategy and Tactics of Small Wars,* and intensive study of the Gallipoli Campaign from World War I. While the US Navy held overall the command in the

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[43] Clifford, *Amphibious Warfare Development in Britain and America from 1920-1940*, 103.

[44] US Marine Corps, *Tentative Manual for Landing Operations* (Washington, DC: Government Printing Office, 1934), x.

[45] Clifford, *Amphibious Warfare Development in Britain and America from 1920-1940*, 103.

[46] US Navy*, Landing Operations Doctrine, US Navy, 1938* (Washington, DC: Government Printing Office, 1938), 29-31.

doctrine, the doctrine was written to be responsive to the needs of the landing force. The 1938 manual highlighted problems with naval fire support as naval guns would have to serve in capacity as field artillery pieces during an assault. While suitable measures were developed for the manual, "delivery of naval gunfire in close support of assault troops still represented a problem and the writers of the manual explored the possibility of employing aircraft for this purpose."[47] These efforts recognize the early importance of close air support that would become a staple of US firepower doctrine.

The 1938 manual spent significant time describing the correct techniques for ship-to-shore movement. "The text provided a technique for the water-borne deployment of the landing force for battle in accordance with the principles of fire and movement."[48] Equally important was the construction of beachheads and prioritizing the flow of logistics and personnel to and from the beach in an orderly manner. Yet one of the greatest achievements of the manual was its use of numerous illustrations, "over sixty, ranging from schemes of maneuver to sample debarkation data sheets."[49] Ample photographs of loadout plans, amphibious equipment, and artillery also served to increase understanding throughout the force.

When published in 1938, *Landing Operations Doctrine, US Navy, 1938* [FTP 167], would be the culmination of decades of work by the USMC and Navy on amphibious operations towards hostile shores. While previous manuals were withheld in the Department of the Navy, the 1938 manual was widely published throughout the War and Navy Departments. "Gen. George C. Marshall in 1941, then Chief of Army Staff (CSA), authorized the publication of FTP 167 under Army covers, as *Army Field Manual 31-5, Landing Operations on Hostile Shores*."[50] The

[47] Clifford, *Amphibious Warfare Development in Britain and America from 1920-1940*, 106.

[48] Ibid., 106.

[49] Ibid., 107.

[50] Ibid.

learning that took place from early 1900 through 1938 effectively built the fighting amphibious doctrine for World War II.

USMC Interwar Equipment Development

The USMC had to develop the equipment for its advanced base force mission. After World War I, marines were operating landing lighters that were nearly identical to those used by the British at Gallipoli. A towed, v-hulled, open air craft, that measured fifty feet capable of transferring 100 men or "one 155-mm and two 75-mm guns [with one 10-ton and three 5-ton tractors] onto beaches."[51] These boats were awkward and cumbersome to pilot, required calm seas to launch, and were hard to recover for additional troop deployment. There was considerable room for improvement.

The USMC sought to test their existing vehicles in an environment that would represent realistic combat conditions. USMC planners would direct interwar exercises to be held in the tropical climates of the Caribbean and Pacific as these locations best represented future battlefields. For the 1924 Panama exercises, the USMC acquired multiple pieces equipment for testing purposes. The first vessel was a derivation of the British "beetle" boats used during the Gallipoli Campaign. The boats were to be fitted with additional shielding to protect the crews/marines from small arms fire as they approached the shore. Yet the beetle boats were not a great leap forward. It was a modification of an existing technology and in a fiscally constrained environment was necessary to keep ship builders working at the Philadelphia Naval Yard. The second vehicle was the Christie Amphibious Tank. J. Walter Christie built the amphibious tank in an attempt to court the War and Navy Departments with new age technology. While the tank demonstrated its capability in a riverine environment prior to the exercises, they performed

[51] Clifford, *Amphibious Warfare Development in Britain and America from 1920-1940*, 86.

marginally in blue water conditions ensuring that they would never be used again during exercises.

Figure 2. Christie Amphibious Tank during Culebra Maneuvers, 1924. Merrill A. Bartlett, "The Genesis of the US Marine Corps Amphibious Assault Mission, 1890-1934," in *Amphibious Assault: Manoeuvre from the Sea*, ed. Tristan Lovering (Woodbridge, Suffolk: Seafarer Books, 2007), 69.

Following the 1924 Panama Exercise and the 1925 Hawaiian Joint Army/Navy Exercise, the USMC desire for more suitable landing craft became a rally cry. The US Navy also supported the development of specialized craft noting, "the use of regular ships' boats for the purpose of transporting landing parties ashore, when opposition is to be encountered, is a hazardous undertaking and little likely to succeed…It is of utmost importance that experiments continue to determine what type of boat is best for this purpose."[52] The US Navy had two fifty-foot lighters built for this purpose, one was designed as a troop transport and the other an artillery hauler. Unique to these boats was the inclusion of armament (either a machines guns or 37-mm guns) allowing them to suppress enemy ashore and in the event they became stuck they could be used as aide stations (protected dressing stations) or as machine gun nests. The infantry lighter was

[52] Robert Coontz, "Command-in-Chief US Fleet to General Board," 1924, USN, RG 432, NHD.

powered by two onboard motors, but the artillery lighter had to be towed to shore. The artillery lighter had many drawbacks: "it had to be beached stern-to and the gun or vehicle unloaded over a stern ramp. Retracting was easy but the single disadvantage was that the lighter could not be worked in and beached until the beach had been secured."[53] The USMC decided not to pursue the artillery lighter, but sought to retain the infantry lighter and develop it further.

The man who would solve many of the land craft problems for the War and Navy Departments began his boat building career after World War I. During the 1920's a small-time lumberman from Alabama named Andrew Jackson Higgins shifted his company from pure lumber production to focus on the small boat design and construction. "By 1926, Higgins began working closely with the US Army Corps of Engineers (USACE) to try to design a boat to fulfill its needs for operating on the Mississippi River."[54] Higgins' research into shallow-draft boats with heavy-duty transmissions, reverse gears, and clutches were tested during the great flood of 1927 and provided him with experience on transporting agricultural equipment while introducing him to USACE and the US Coast Guard (USCG). USACE eventually contracted with Higgins to build twenty boats for operations on the Mississippi River, but during delivery Higgins' son Edmond "reported to his father that a new type of bow needed to be developed, one that would ride over logs and other partially submerged obstacles."[55] Experimentation began, but the Great Depression quickly reduced customer demand. Higgins kept his business solvent through the creation of the Boat Services Company (BSC) that built, purchased, and leased boats to clients that could not afford to purchase the boats outright. The BSC structure allowed for continuous development and talent acquisition during the Great Depression.

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[53] Capt. K. E. Rockery, "Report on Artillery Lighter to CMC," 3 July 1926, USMC, RG 127.

[54] Jerry E. Strahan, *Andrew Jackson Higgins and the Boats that Won World War II* (Baton Rouge, LA: Louisiana State University Press, 1994), 15.

[55] Ibid., 16.

The Navy Bureau struggled during the Depression to make use of its little money and almost always placed the Marine Corps needs at the bottom of the priority list. In 1933, "the CMC established a USMC Equipment Board, composed of eleven members…whose primary purpose was to recommend the types of equipment best suited to the needs of the Marine Corps to the US Navy Bureau of Construction and Repair (BCR)."[56] In 1935 the US Navy BCR advertised bids for the construction of landing craft, receiving little enthusiasm from the private sector considering the rigid specifications. Out of nine boats submitted, five were selected for testing in 1936 with mixed results. By 1937, the Secretary of the Navy took notice and established "a Department Continuing Board for the Development of Landing Boats for Training Operations…the board membership included representatives of the CNO, CMC, Bureau of Construction and Repair, and Bureau of Ordnance."[57] "Simultaneously, the C-in-C of the US Fleet was directed to organize a board that would report on the actual testing of these craft by the fleet and make recommendations to the BCR, this board was named the Fleet Development Board (FDB)"[58] Of all the members on the Landing Boat Development Board (LBB) the representative with the most to lose was the BCR. Following the testing in 1936, the BCR's own shipbuilders took the best features of all tested boats and attempted to amalgamate them into one craft, they were nicknamed "bureau boats," and would be the chief competition for anyone who dared to challenge.

[56] Clifford, *Amphibious Warfare Development in Britain and America from 1920-1940*, 109.

[57] Ibid., 109.

[58] Strahan, *Andrew Jackson Higgins and the Boats that Won World War II*, 30.

Figure 3. Higgins Eureka Boat. Jerry E. Strahan, *Andrew Jackson Higgins and the Boats that Won World War II* (Baton Rouge, LA: Louisiana State University Press, 1994), 121.

Andrew Higgins and his boat company became the principal challengers to the BCR. In the mid-1930's he successfully developed the Wonderboat and its successor the Eureka. The hallmark of Higgins' boats would be their shallow draft, tunnel encased propellers, high speed, innovative dual-channel water flow hull that kept debris out of the propellers while allowing for quick turns, and the spoonbill-reinforced bow that allowed it to charge over floating/submerged obstacles. The boats were originally developed for oil companies and fur trappers in the Louisiana bayous, but with the economy recovering in the late-1930's, Higgins was looking for opportunity. In 1937 he won a contract with the USCG gaining a powerful ally in New Orleans District Commander, Capt. William Wheeler. Further, he secured additional contracts with USACE and the Biological Survey Agency. The US Navy and its boards would be a different story. The BCR, clearly with self-protective intentions, favored its own developmental craft over all challengers and in spite of numerous poor performance reviews from the FDB, continued to press towards ultimate contract issuance. Higgins lobbied the US Navy relentlessly for four years

until money was available to purchase a test craft. On May 5, 1938, Higgins received his first naval contract to provide one 30-foot craft for testing.

In 1939 the fleet maneuvers tested multiple landing craft along with new amphibious doctrine. Once again, the BCR favored its own products, even when the FDB stated that Higgins' boats performed in a superior manner. However, with all competition eliminated the US Navy still requested that Higgins build one additional boat with changes based on the exercise. Early in 1940, similar fleet exercises were held in the Caribbean with similar results to the maneuvers of 1939. The BCR continued to issues contracts to itself, but on 20 August capitulated, ordering a contract of sixty-two 30-foot Eureka landing craft. Higgins finally triumphed over the lengthy acquisitions process, but he hated the 30-foot design mainly because the length was too short for the beam. "At his own expense he built a 36-foot boat, had it shipped to Norfolk and demanded that it be tested."[59] On September 11, the CNO authorized as test between Chris Craft Cooperation, Higgins, and the BCR. Once again, the Higgins' boat proved its superiority, but the BCR staunchly refused to admit defeat awarding contracts for its own design. This was in bad taste, "as competitive trials had been held, the Secretary of the Navy and the CNO were both well aware of the superiority of the Higgins' boat."[60] The BCR boats were never built. One last trial was held in October to determine the best model of Higgins' boat for manufacture, and "on November 18, 1940, Higgins was officially awarded the contract for 335 36-foot Eurekas of the flatter hull design."[61] These boats would be designated landing craft vehicle personnel (LCVP) and would be the principal personnel landing craft of World War II.

Artillery lighters progressed through a similar bureaucratic process of trial and error before contracts were awarded in 1942. The attempts by the BCR to develop its own craft proved

[59] Strahan, *Andrew Jackson Higgins and the Boats that Won World War II*, 46.

[60] Ibid., 47.

[61] Ibid.

disastrous, with many of the craft being so top heavy that they would capsize in moderate swells. Development continued through the 1930's but the main limiting factor proved to be the increasing size of interwar equipment. "Tanks were the US Army and USMC main interest. In three separate years -1935, 1939, and 1941 – the modification of existing lighters had to be considered with the adoption of three different tank sizes."[62] Testing of BCR lighters proved promising "until one sank off Culebra when a US Army tank shifted to one side in moderate seas."[63] In May 1941 the Navy approached Higgins for a solution. He provided it in the form of a 45-foot lighter initially built for the Columbian government, and constructed a ramp for the front in one week to satisfy the roll-on-roll-off requirement requested by the US Navy. The US Army's new 30-ton M-4 Sherman tank required that five additional feet be added to the lighters to carry the new load. Prior to the delivery of a BCR and the Higgins' 50-ft prototypes, "the President [Franklin Roosevelt], at a White House Conference on 4 April 1942, simply ordered the procurement of six hundred fifty-foot tank lighters by 1 September 1942, for the North African operation."[64] The crafts were tested in May with 30-ton concrete blocks representing tanks, and Higgins earned his second contract to produce the newly designated landing craft medium (LCM).

The final piece of amphibious equipment desired by the USMC was born of the failed experiments with the Christie Tank in 1924. There remained a desire to develop a hardened vehicle that could transport troops to the shore. The British were successful is creating light amphibian tanks in the interwar period, but none were ever procured by the War or Navy Departments for testing. The vehicle the USMC and the War Department would eventually adopt was built by Donald Roebling to save lives in Florida swamps after hurricanes, known as the "Alligator." It was tracked with special treads that gripped sandy soil and paddled the vehicle

[62] Clifford, *Amphibious Warfare Development in Britain and America from 1920-1940*, 115.

[63] Ibid., 116.

[64] Ibid.

while in water. It appeared in *Life* Magazine on 4 October 1937, which caught the interest of military communities. The USMC Equipment Board sent representatives to test the vehicle and reacted favorably to the prototype. The US Navy and USMC tested the vehicle in 1940 at Quantico and 1941 at Culebra. Following the exercises, "Roebling contacted the Food Machinery Corporation (FMC) for help in redesigning the Alligator which now was designated landing vehicle tracked model number 1 (LVT-1)."[65] FMC redesigned the model with welded steel construction and a more powerful engine and was quickly awarded a contract for 200 further vehicles.

Interwar development produced the iconic landing craft used by American forces during World War II. However, it was not without considerable bureaucratic process, considerable investment, and repeated testing. Each vehicle would prove its worth during the numerous campaigns of World War II. Nevertheless, the War Department would have to force generate formations to utilize this doctrine and equipment as it found itself in World War II.

The Army and the Engineers

The US Army and the Engineer Regiment took a different path to develop their World War II amphibious capability. The US Army always drew its strength from the people in the form of citizen soldiers in times of great crisis. Following the Spanish-American and Philippine-American War, the War Department conducted an extensive examination of its mobilization techniques and army organization. The resulting *Field Service Regulations, United States Army 1905* set forth an organization focusing on the divisional level effectively departing from the national and international practice of focusing on corps that had been the norm for the army since the Civil War.[66] This restructuring also included the newly formed National Guard. Individual

[65] Clifford, *Amphibious Warfare Development in Britain and America from 1920-1940*, 122.

[66] John B. Wilson, *Maneuver and Firepower: The Evolution of Divisions and Separate Brigades* (Washington, DC: Center of Military History, 1997), 23-24.

states maintained militias since the 1600's, however, the emergence of the National Guard with the passage of the Dick Act in 1903, and the US Army Reserve in 1908 with the Militia Act in 1908 provided structure beyond traditional militia systems. These acts served as a mechanism to control the mustering and federalizing of volunteer troops for armed conflict utilized through World War I.

The US Army and the Engineer Regiment drastically changed structure as a result of World War I. Rapid force generation produced a surplus of engineer troops that required basing and headquarters. The war in Europe caused the United States to debate national defense resulting in the National Defense Act of 1916. "The new act provided that the 'Army of the United States' would consist of the Regular Army, the Volunteer Army, the Officers' Reserve Corps, the Enlisted Reserve Corps, the National Guard in the service of the United States, and such other land forces as were or might be authorized by Congress."[67] The act also added special provisions for the use of National Guard troops off of US soil as the original act prevented such action. The rapid expansion of troops soon proved to be a problem as the war abruptly ended 11 November 1918. All individual muster plans were immediately halted, releasing approximately 250,000 males between ages of eighteen and forty-five from military service.[68] As quickly as the Army had force generated sixty-two combat divisions for World War I they rapidly deactivated fifty-five within one year of the armistice with no framework to replace it.[69] A student of demobilization, Frederic L. Paxson, characterized this situation as worse than a "madhouse in which the crazy might be incarcerated. They were at large."[70]

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[67] Wilson, *Maneuver and Firepower*, 37.

[68] *Second Report of the Provost Marshal General to the Secretary of War on the Operations of Selective Service System to December 20, 1918* (Washington, DC: Government Printing Office, 1919), 239.

[69] Wilson, *Maneuver and Firepower*, 81.

[70] Frederic L. Paxson, *The Great Demobilization and Other Essays* (Madison, WI: University of Wisconsin Press, 1941), 7.

The sweeping change in force structure came with the National Defense Act of 1920 (Kahn Act). Congress and the War Department sought a more controlled mobilization structure that prevented gaps in knowledge. Suggestions ranged from universal military training for eighteen/nineteen-year-old males to maintaining round number divisions geographically throughout the continental United States.[71] The Kahn Act, authorized a Regular Army of 296,000 officers and enlisted men, a National Guard of 435,000 men, and an Organized Reserve (Officers Reserve Corps and Enlisted Reserve Corps) of unrestricted size. The new law replaced the old territorial departments with corps areas, which assumed the tasks of administering and training the Army.[72] This act would serve as the basis of structure for Army organization throughout World War II until the passage of the National Security act of 1947.[73]

The post-World War I US Army maintained forces in the Philippine Islands, China, the Panama Canal Zone, Puerto Rico, Germany, and Hawaii.[74] It was these units that would perform many of the joint exercises with the US Navy and Marine Corps during the interwar period. The *Joint Army and Navy Action in Coast Defense, 1920*, was one of the first efforts to codify a relationship between services on duties and responsibilities for landing operations. The manual describes some of the first combined arms doctrine as US Army, US Navy, Air Service, and USMC are all directed with a specific task and purpose for the defense of the United States and her overseas possessions. The US Army section provides a framework of defensive placement (permanent, semi-permanent, and mobile structures), while going into detail on how an enemy force would assault beaches. This is remarkable considering that this manual represented

[71] John Dickinson, *The Building of an Army* (New York: Century Co., 1922), pp. 330-34.

[72] US War Department, *The National Defense Act* (Washington, DC: Government Printing Office, 1921), 5-8.

[73] Frank N. Trager, "The National Security Act of 1947: Its Thirtieth Anniversary," *Air University Review*, November–December 1977, 1.

[74] Wilson, *Maneuver and Firepower*, 99.

independent thought across the services and was not a copy of any Marine Corps studies such as *Advanced Base Operations in Micronesia* which would be published one year later.

To test the newly defined relationships between services, the US Army participated in multiple joint exercises in the 1920's. In 1925 the US Army and US Navy conducted a joint landing exercise on Oahu, Hawaii. The US Army, serving as defensive forces, secured the Hawaiian Islands, while the US Navy and USMC were tasked with "the occupation of the Hawaiian Islands to secure Pearl Harbor and Honolulu as naval operating base."[75] The exercise's task organization was in excess of 60,000 soldiers, sailors, and marines. While the engineers had the critical task of constructing beach obstacles, much of the exercise was designed to test the existing coastal artillery batteries, scouting techniques, rapid troop maneuver, and communications apparatus for the islands under assault. The soldiers under command of Maj. Gen. John L. Hines failed to prevent the marines from pushing thirty-five miles beyond the beachhead, demonstrating how little effort the US Army made on Oahu toward making it impenetrable to an invading force.[76] The poor performance of its units and publication of the *Joint Action of the Army and Navy, 1927* ensured that the US Army would take an extended hiatus from amphibious capabilities development.

The Joint Army and Navy board published the *Joint Action of the Army and Navy, 1927*, which codified the fleet marine concept for the USMC, but it instructed the Army, "to defend permanent naval bases required to the US Navy freedom of strategic action and to conduct land operations in support of the US Navy for the establishment and defense of naval bases."[77] This manual continued to place the US Army in a subordinate, land-locked role to the US Navy

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[75] US Marine Corps, *Basic Plan Joint Army and Navy Exercises, 1925*, *Problem #3* (Washington, DC: HQMC, Division of Operations & Training, 1925), 1.

[76] Leo J. Daugherty III, *Pioneers of Amphibious Warfare, 1898-1945* (Jefferson, NC: McFarland & Company, Inc., 2009), 327.

[77] [US] Joint Board, *Joint Action of the Army and Navy, 1927* (Washington, DC: Government Printing Office, 1927) p. 2, para. V, 7(e), 8(c).

involving all things amphibious. However, through subsequent exercises conducted at Sandy Hook, NJ in 1929 and Culebra, PR in 1936 US Army observers gained insight into USMC practices and procedures. US Army Maj. A. Franklin Kibler provided key insight when discussing the Culebra exercise: "In the planning and execution of a landing operation by US Army units, the principles and methods to be employed should conform in general, with those laid down in the Tentative Landing Operations Manual published by the Navy Department in 1935."[78] While observers to USMC exercises helped to build the understanding of a select few officers it was not until the San Clemente Landings of 1939 and the Carolina Maneuvers[79] of 1941 that the US Army reinvested itself into amphibious warfare.

In early August and later October-November of 1941, a joint force of the US Army, US Navy, and USMC conducted a series of landing problems at Onslow Beach, New River Marine Barracks, North Carolina. Maj. Arthur G. Trudeau was selected as the Command and Staff College, Ft. Leavenworth observer. The Carolina Maneuvers of August 1941 were the blueprint for how the US Army viewed amphibious operations and would execute them in the Mediterranean, European, and Pacific Theaters of Operation.[80] During this exercise in particular the independent views of the respective services began to emerge. The USMC focused on the landings, while the US Army focused on breakout and exploitation. While these maneuvers have an incredibly important role in history in the development of amphibious warfare, during the exercise they had a disturbingly similar feel to many of the interwar exercises. Shortages of men, material, and the artificial nature of the actual exercise hindered the maneuvers from the start.[81]

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[78] A. Franklin Kibler, *Report on Fleet Landing Exercise N. 2* (Fort Leavenworth, KS: Command and General Staff School, 1936) p. 7. Sec. II, 9(a).

[79] The Carolina Maneuvers were designed to test existing doctrine and experiment with new landing techniques and procedures, as well as link with a major cross-country exercise similar to the Louisiana Maneuvers held August-September, 1941. Daugherty, *Pioneers of Amphibious Warfare*, 330.

[80] Ibid., 331.

[81] Ibid.

The USMC proved wholly incapable of sustaining itself and the US Army built pontoon bridges across intercoastal canals to inject much needed supplies to the exercise site. After action reports discuss the lack of command and control, lack of artillery integration, lack of supplies, and improper preparation by shore parties to develop the beaches to receive and exfiltrate troops. The post exercise analysis concluded: "the absence of any labor or special service troops required that combat troops be used as labor troops on board ship to assist in debarking cargo and handling supplies ashore. It is evident that special service troops (labor) must be provided for these duties in order to prevent reduction of fighting strength of battalion combat teams."[82] Most importantly the future of the Engineer Amphibious Command lay in a few sentences, "additional general service engineer troops, especially trained in road maintenance, water supply, and other special work, must be provided as Force Troops."[83]

The Engineer Regiment was well aware of this lack of engineer support to amphibious landings. In 1939 the War Department directed the Engineer School to initiate a series of studies on possible engineer functions during an opposed landing, in particular "landing ahead of the initial assault waves in order to destroy fortifications."[84] The US Army desired to develop its own amphibious doctrine to support US Army not US Navy/USMC operations. With the Pearl Harbor attacks on 7 December 1941, the United States found itself in a similar position to what it faced in 1917. But more unique to the problem in 1941-1942 was the lack of friendly ports, which would force the US Army to conduct landing operations on mainland Europe. The Engineer Regiment put forth a request that consideration be given to them to become the Army's primary

[82] The Commanding General to the Commander-in-Chief, Atlantic Fleet, USS *Augusta*, dtd. 27 August 1941, Subject: "Preliminary Report on 1st Joint Training Force Landing Exercises at New River, North Carolina, 4-12 August 1941," found in Historical Amphibious File (HAF) No. 142 Marine Corps University Archives, Gray Research Center, MCCDC, Quantico, VA., 3.

[83] Ibid., 5.

[84]Hugh J. Casey, *Engineers of the Southwest Pacific, 1942-1945, Vol. IV: Amphibian Engineer Operations, Reports of Operations, United States Army Forces in the Far East, Southwest Pacific Area* (Washington, DC: Government Printing Office, 1959), 16.

organization dedicated to carrying out "large-scale and sustained program of training for landing operations." On 18 May 1942, the War Department issued the Chief of Engineers a directive to "institute a training program for amphibious units."[85]

Engineer Amphibious Command

Brig. Gen. Daniel Noce and Col. Arthur Trudeau were the men who would stitch 40 years of amphibious development into a coherent force. Brig. Gen. Noce was selected as the commanding officer with Col. Trudeau as his chief of staff for the Engineer Amphibious Command (EAC). On 13 June 1942 the EAC was officially activated by the War Department at Camp Edwards, MA. The War Department dictated that the EAC's mission was to "transport combat elements and their supplies over extended water distances and logistically supporting the landing of these troops on hostile shores."[86] EAC further refined their mission into four points: water transport, organization of far shore beaches, evacuation, and re-supply.[87] The structure of these new units were designed to enable them to fight alongside infantry and armor formations. Having been an observer during the Carolina Maneuvers in 1941, Col. Trudeau, working with the War Department, settled on the brigade structure with "a regiment of boat engineers, a regiment of shore engineers, a boat maintenance battalion, and miscellaneous supporting elements."[88] The organization grew to six brigade formations during the course of the war.

Col. Trudeau reaped the benefit of the USMC developmental work on landing craft and doctrine during the interwar period. While the US Navy remained the proponent for landing craft, by summer 1942 the different models of the Higgins boats were already fighting their way

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[85] Arthur G. Trudeau, *Engineer Memoirs: The Oral History Transcripts of Lieutenant General Arthur G. Trudeau, US Army,* from an interview conducted by Colonel Calvin J. Landau, at the US Army War College, Carlisle Barracks, PA in 1971 (Washington, DC: US Army Corps of Engineers, EP 870-1-26, 1986.) p. 78.

[86] Casey, *Amphibious Engineer Operations*, 17.

[87] Engineer Amphibian Command, *Engineer Amphibian Troops: General, Tentative Training Guide No. 1* (Camp Edwards, MA: Engineer Amphibian Command, 1943), 3.

[88] Casey, *Amphibious Engineer Operations,* 19.

through the acquisitions process and would soon be ordered in mass for the North Africa operation. The manuals of the 1920's and 1930's provided a framework for the new series of *Engineer Amphibian Command, Tentative Training Guides* they would number one to seven and be updated throughout the war. The US Army also immediately published *Field Manual 31-5, Landing Operations on Hostile Shores* in 1941. While this first edition was almost a carbon copy of *Landing Operations Doctrine, US Navy, 1938*, three revisions would occur during the war to support the US Army's interpretation of landings.

Manning the new engineer units required in-depth research to find the right soldiers with technical specialties. The Adjutant General, War Department screened 200,000 officers and 3,000,000 enlisted men to search for engineer-related skills associated with the work done by EAC.[89] Also, incredibly fortuitous to the young command was the placement of a well-connected G-4, Col. Oliver W. Van den Berg, who happened to be the son-in-law of Adm. Ernest J. King. EAC recruited locally from Cape Cod (in vicinity of Camp Edwards, MA) to source boat drivers and boat mechanics. EAC also received additional engineer battalions, a pontoon battalion, engine maintenance companies, ordnance troops, and a two-hundred-man detachment from the US Coast Guard."[90] With 9,000 to 12,000 men joining the EAC during summer 1942, the unit would be well manned for their future training and operational use.

Training for the EAC required ingenuity during the summer of 1942. The American economy was in the process of re-tooling for the war effort and much of the promised equipment would not be available until late 1942. Most pressing was the lack of landing craft, as the boats that were supplied were the prototypes from the numerous navy exercises in the 1920-1930's. This was solved by locally sourced civilian boats that were turned over to the government for a dollar a year. Unfortunately, the boats all had different engines causing a considerable headache

[89] Casey, *Amphibious Engineer Operations*, 18-20.

[90] Daugherty, *Pioneers of Amphibious Warfare*, 341.

for the boat maintenance battalion.[91] Soldiers were sent to twenty-eight different schools throughout the United States to receive specialized training such as nautical navigation, radio procedures, and boat operation/maintenance.[92] Basic soldiers went through a 14-week basic training focusing on physical fitness, rifle marksmanship, light and heavy weapons, grenades, bayonet fighting, antitank and anti-personnel, chemical warfare, organization of the Army and branch, military courtesy, interior guard, and a battle course.[93] Following basic training, Higgins boats began to arrive so by July there were enough boats to move a regimental combat team. Landing exercises were conducted at Camp Edwards, Camp Havedoneit, Camp Washburn, Camp Candoit, and Martha's Vineyard (all located near Cape Cod, Massachusetts).

During summer 1942, the 36th and 45th Divisions were sent to Camp Edwards to train for the North Africa operation. This ensured that the engineers would receive considerable training with their infantry division counterparts prior to theater operations. As a testament to the training, structure, doctrine, and resourcefulness of the War Department and EAC, 1st Engineer Special Brigade (ESB) was ready in August. Col. Henry Wolfe, EAC's G-3, was promoted to brigadier general and assumed command of the 1st ESB, shipping his unit of 7,000 men to England, fully equipped as far as their individual and basic unit equipment on 10 August 1942.[94] From the birth of the EAC concept on 18 May 1942 to the shipping of 1st ESB on 10 August 1942 eighty-five days passed. This remarkable achievement would not have been possible without the forty years of development in amphibious warfare starting in 1898.

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[91] Trudeau, *Engineer Memoirs*, 85.

[92] Daugherty, *Pioneers of Amphibious Warfare*, 343.

[93] Arthur G. Trudeau, "The Engineer Amphibian Command," *Military Review*, 1943, 13.

[94] Trudeau, *Engineer Memoirs*, 86.

Summary and Conclusions

The EAC is not a unique story during World War II. There where many specialized units that were rapidly created to fill an operational need such as the 10th Mountain Division and 1st Special Service Force. The EAC achieved a military objective that supported the Allied strategic objectives in two operational theaters. It required remarkably little time to force generate the EAC due to the decades of military research, development, and doctrinal experimentation. Its creation fostered integration across all services, regardless of deep-seated rivalries, resulting in the swiftest possible employment of tactics, techniques, and procedures. The EAC's story is one of American spirit that is brought forth during times of great crisis.

From the beginning of the 20th century the US military sought to protect its colonial possessions and control European and Asian influence on the coasts of the Americas. The USMC, recognizing opportunities, worked with the Navy Department to create its advance base force. After fighting with the legislative and executive branches of government to maintain their positions on ships, the USMC manned the force to support the Joint Army and Navy Board's colored war plans. Initial maneuvers were deemed rudimentary at best, but display some of the earliest indications of combined arms maneuver to support a military objective. The early exercises allowed the USMC to capitalize and rapidly consolidate gains at Vera Cruz in 1914. The advance base force concept proved its worth during the crucible of combat.

While US forces participated in World War I, they did not participate in the only major opposed amphibious landings performed by the British at Gallipoli. The arrogance of the British in the decision to force the Dardanelles Straits cost them in men and material. Overly aggressive timelines pushed by Winston Churchill and Lord Kitchener prevented the Royal Navy and British Army from making adequate preparations for the assault. Poor transition by the beachhead force to the breakout force immediately halted their operational tempo, wasting their superior mass against a force that could have been defeated during the initial assault. The lack of prescriptive doctrine and sequential military objectives hindered this first major assault, resulting in trench

style warfare and eventual retreat. Gallipoli's lessons along with input from experiences in Vera Cruz would help form the initial amphibious doctrine of the USMC.

The interwar period represented a renaissance of research and development for the USMC. CMC Maj. Gen. Lejeune fought tirelessly to maintain the size of the USMC and influenced the Joint Army and Navy Board to assign the Corps with a permanent amphibious forces mission in 1927. Intensive studies of World War I and independent research of the colored war plans resulted in the first coherent amphibious doctrine in the early 1920's. Regular maneuvers in the Pacific and Caribbean refined amphibious doctrine and amphibious equipment through numerous iterations. This constant testing ensured that equipment designs were in the acquisitions process and executable doctrine was available following US entry into World War II.

The US Army and the Engineer Regiment were slow to adopt their role as amphibious soldiers. From the Spanish-American War through much of the interwar period the principle role in amphibious development was coastal protection and land defense forces during USMC landing maneuvers. The US Army concerned itself with mobilization problems and managing the newly formed National Guard and US Army Reserves. The Engineer Regiment's amphibious study in 1939 and joint force landing exercises in 1939 and 1941 helped to renew interest in the topic for US Army. The Engineer Regiment would be designated with the task to rapidly force generate capable troops to provide operational access to contested theaters. The Engineer Regiment performed this task by integrating years of amphibious research and development.

Army Force Generation and Large-Scale Combat Operations

Army Field Manual 3-0, Operations, *2017* set forth a new priority to the US Army. Following the break-up of the Soviet Union and the dissolution of the Warsaw Pact, the US Army began to deconstruct its Cold War apparatus. The US Army focused heavily on counter-insurgency and humanitarian relief during the 1990-2010s, reducing the force to a level that capitalized on the strengths of targeting and domain supremacy. *Field Manual 3-0* requires us to

look back at the conduct and requirements necessary for large-scale combat operations. While the manual states it "is concerned with operations using current army capabilities, formations, and technology in today's operational environment (OE),"[95] it alludes to capabilities that would require rapid force generation to effectively control deep, close, consolidation, and support areas.

In the event of large-scale combat operations, the US Department of Defense would have to rapidly grow forces to meet the threat and most like require investment in particular capabilities that have been long discarded by services to focus on other more pressing missions. The defense establishment has gone to great lengths to provide the US Army with a structure to aide them in force maintenance and forecasting. National Strategy, Defense Strategy, and Joint Strategy all feed into the Total Army Strategy that sets priorities for: (1) sizing and shaping the force, (2) planning for time frames in the near-term (associated with the future-years defense program), mid-term (10-15 years) and far-term (20 years), (3) defining the force size and structure, capabilities, modernization, posture, infrastructure, readiness, and other defense elements required to execute the missions outlined in the National Defense Strategy.[96] In short, the US Army of today is not the US Army of the early 1940s, which was supremely mailable and rested on the visions of the Army Secretary and the Chief of Staff.

[95] US Department of the Army, *Field Manual (FM) 3-0, Operations* (Washington, DC: Government Printing Office, 2017), xi.

[96] US Army War College, *How the Army Runs: A Senior Leader Reference Handbook, 2017-2018* (Carlisle Barracks, PA: US Army War College, 2018), 2-4.

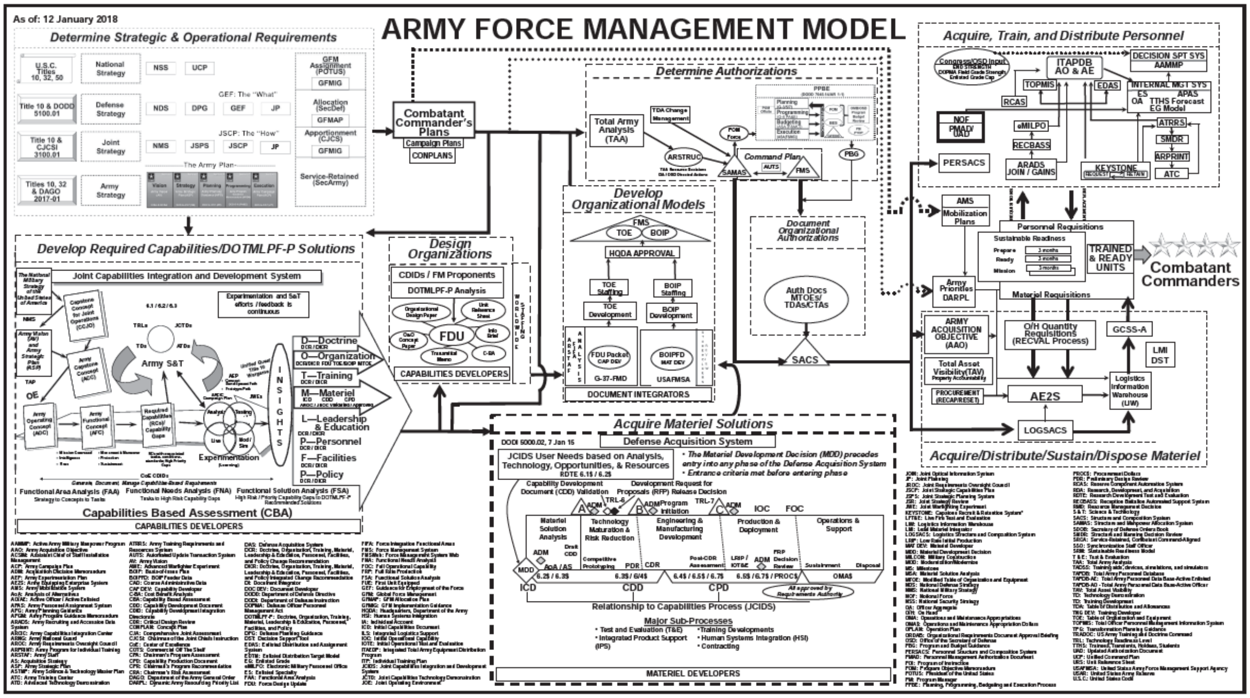

Figure 4. The Army Force Management Model. US Army War College, *How the Army Runs: A Senior Leader Reference Handbook, 2017-2018* (Carlisle Barracks, PA: US Army War College, 2018), G-54.

The US Army Force Management Model is a 'system of systems' approach to generating trained and ready units for combatant command (CCDR) employment.[97] It is a seven-step process[98] that is a means of controlling change within a large complex organization. This particular structure has been constantly refined since the 1940s and is the vision of Gen. George C. Marshall. The process is not perfect, but it recognizes that throughout the lifecycle of a concept there must to be multiple evaluations, prototypes, analysis, and testing to ensure that the US Army requires the capability. Very similar to the amphibious warfare development from the Spanish-American War to World War II, many of the concepts take a long to mature. The force

[97] US Army War College, *How the Army Runs*, 3-1.

[98] (1) Determine strategic and operational requirements (2) Develop required capabilities/doctrine, organization, training, material, leadership & education, personnel, facilities, and policy (DOTMLPF-P) solutions (3) Design organizations, develop organizational models and document organizational authorizations (4) Acquire material solutions through Defense Acquisition System (5) Determine authorizations utilizing total Army analysis and Planning, programming, budgeting, & execution (6) Acquire, train, and distribute personnel, (7) Acquire and distribute equipment, Ibid., 3-2.

management cycle provides the Army with an open laboratory and a record of concepts that can be used to aid in a rapid force generation model.

While the totality of the model provides for an endless archive of concepts, the main issue is the time associated with its full implementation. In the event of large-scale combat operations, the process would have to be shortened to build specialized units. The US Army has not released a new amphibious doctrine since *Field Manual 31-12, Army Forces in Amphibious Operations, 1963*. While the overall concept of the doctrine remains sound, the national, defense, joint, and army strategies have changed substantially since 1963. Also, almost all of the equipment described in the manual is no longer held in army inventory. While it is possible to utilize current USMC doctrine and equipment, there are no studies by the US Army on how they would fight these formations. This gap in knowledge and structure would require a full cycle of the force management model, which makes the miracle force generation of the engineer special brigades look impossible today.

Troop organization and building institutional knowledge is also at the mercy of the force management system. Creating new units at the size of a brigade, division, or corps requires tremendous faith in the capabilities of junior leaders tasked with the concept. The US Army is attempting to provide itself with a buffer in the form of security force assistance brigades (SFAB) and administrative division headquarters. These units are staffed by experienced army career professionals only at the headquarters level without any junior enlisted soldiers. In the event of national emergency, the ranks can be filled with new recruits and a new division can be force generated within the time it takes to get 20-25,000 soldiers through basic training and advanced individual training. However, there are currently only two active SFABs and one administrative divisional headquarters. A large-scale conflict would demand far more troops requiring capacity beyond the buffer currently built in by the SFABs and administrative divisional headquarters. The force management model would be employed to determine the organization, equipment, doctrine,

and training for a new specialty not to mention the new unit would be weighed against other priorities competing for limited space in initial entry training bases.

Global catalysts can force national action. In 1936, when Germany reoccupied the Rhineland in violation of the Versailles Treaty, it signaled to the US Army that they needed to re-evaluate their readiness. From 1936 to 1941 the US Army attempted to restructure itself to meet future challenges. When the Japanese bombed Pearl Harbor, their actions transformed a neutral nation into a unified force for action. For the amphibious force, the American people provided training land, training equipment, and soldiers to build the units. If a peer actor attacks the United States, there is a chance that there will be a similar effect on the American people. However, it is very hard to determine the will of the people. Currently many of the American people do not favor overt militarism in responding to a national crisis. There will always be an opposition party that will attempt to negotiate with peers to maintain a global status quo, to these people "war is *not* a continuation of policy by other means."[99] However, an overt attack on American soverignty might sway the public to action.

The case of the rapid force generation of the amphibious engineer brigades and EAC is not a unique story. From World War II through the present day there are numerous exmaples of specialized units that the US Army ordered into exisitance. Common to all of these units is an overarching strategic objective, political objective, and military problem that requires the creation of the new unit to solve. New units will come and go based on the strategic, defense, joint, and army strategies. Rapid force gerenation is not impossible, but the EAC example shows that there is always a tremendous base of knoweldge, prototyping, and expertimentaion which can help guide in the organization, manning, equiping, training, and doctrinal development of new units.

[99] Carl von Clausewitz, *On War*, ed. and trans. Michael Howard and Peter Paret (Princeton, NJ: Princeton University Press, 1976), 69.

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