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## **Allied Amphibious Doctrine, the Landing Craft Shortage of 1943-1944, and Operation OVERLORD**

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### ABSTRACT

The Allied invasion of Normandy on 6 June 1944 is rightly considered a touchstone event of the Second World War. The Allies' success marked the beginning of the war's final phase in Western Europe. Without the Normandy operation, it is difficult to see how the Allies could have achieved final victory in the West. Most accounts of the Normandy invasion deal with the assault troops, sea-borne and airborne, but rarely do the means of transporting those troops to the objective receive more than passing mention. The story of those landing craft, and their critical contribution to the Allies' capability to launch such an operation, is as important as the training and deployment of the troops they carried onto those hostile shores. The design, manufacture, and deployment of suitable amphibious landing craft and their availability ultimately proved to be a deciding factor in the final operational plan as well as the overall Allied strategic picture in Europe in 1944.

*Keywords:* Allied amphibious doctrine, landing craft shortage 1943-1944, Operation OVERLORD, D-Day, Normandy invasion, Andrew Higgins, landing craft, LCA, LCI, LCM, LCP, LCT, LCVP

## **Doctrina anfibia aliada, escasez de embarcaciones de desembarco de 1943-1944 y operación OVERLORD**

### RESUMEN

La invasión aliada de Normandía el 6 de junio de 1944 se considera, con razón, una piedra de toque de la Segunda Guerra Mundial. El éxito de los aliados marcó el comienzo de la fase final de la gue-

rra en Europa occidental. Sin la operación de Normandía, es difícil ver cómo los aliados podrían haber logrado la victoria final en Occidente. La mayoría de los relatos de la invasión de Normandía se refieren a las tropas de asalto, por mar y por aire, pero rara vez los medios de transporte de esas tropas al objetivo reciben más que una mención de pasada. La historia de esas naves de desembarco y su contribución fundamental a la capacidad de los aliados para lanzar una operación de este tipo es tan importante como el entrenamiento y el despliegue de las tropas que llevaron a esas costas hostiles. El diseño, la fabricación y el despliegue de embarcaciones de desembarco anfibia adecuadas y su disponibilidad finalmente demostraron ser un factor decisivo en el plan operativo final, así como en el panorama estratégico general de los Aliados en Europa en 1944.

**Palabras clave:** Doctrina anfibia aliada, escasez de lanchas de desembarco 1943-1944, Operación OVERLORD, Día D, invasión de Normandía, Andrew Higgins, lanchas de desembarco, LCA, LCI, LCM, LCP, LCT, LCVP

## 同盟军登陆原则、1943-1944年登陆艇短缺以及霸王行动

### 摘要

1944年6月6日同盟军入侵诺曼底一事被合理视为二战的一次重大事件。同盟国的胜利标志着二战西欧地区最终阶段的开始。没有诺曼底行动，则很难判断同盟国能如何在西方取得最终胜利。关于诺曼底入侵的大多数记录有关于海上和空中突击部队，但却几乎没有关于这些部队到达目的地的运输途径的详细记录。这些登陆艇的故事以及其对同盟军发动行动的能力所作的贡献，与他们在敌军海岸上进行的部队训练和部署一样重要。适宜的两栖登陆艇的设计、批量生产和部署，以及其可用性最终证明是1944年欧洲最终行动计划以及整个同盟战略计划中的决定因素。

关键词：同盟军登陆原则，1943-1944年登陆艇短缺，霸王行动，D日，诺曼底入侵，安德鲁·希金斯（Andrew Higgins），登陆艇，LCA, LCI, LCM, LCP, LCT, LCVP

## **Introduction**

**T**he Allied invasion of Normandy on 6 June 1944 is rightly considered a touchstone event of the Second World War. The Allies' success marked the beginning of the war's final phase in Western Europe as German forces were steadily pushed back from their conquered territory into Germany itself. Without the Normandy operation, it is difficult to see how the Allies could have achieved final victory in the West.

Most accounts of the Normandy invasion deal with the assault troops, seaborne and airborne, but rarely do the means of transporting those troops to the objective receive more than passing mention. Without the amphibious landing craft employed by the Allies on that June morning, there would have been no invasion at all. The story of those landing craft, and their critical contribution to the Allies' capability to launch such an operation, is as important as the training and deployment of the troops they carried onto those hostile shores.

The design, manufacture, and deployment of suitable amphibious landing craft capable of transporting men and equipment to the Normandy beaches were critical factors in the planning and execution of the operation. Landing craft availability influenced the size, makeup, organization, operational area, and landing schedule of the invasion force and ultimately proved to be a deciding factor in the final operational plan as well as the overall Allied strategic picture in Europe in 1944.

## **Doctrinal Development**

**T**he development of the specialized landing craft of the Second World War dates to the early 1920s and the Washington Naval Conference, which placed limits on the naval power of the United States, Japan, Great Britain, France, and Italy. The treaty prohibited the expansion and development of naval bases and facilities beyond certain well-defined areas, which led to the recognition of the need to take or establish forward bases during wartime. This problem applied in particular to the United States, which anticipated a war with Japan in the Pacific Ocean as the most likely scenario for future conflict.<sup>1</sup>

War Plan ORANGE articulated the US strategy for a war in the western Pacific and the Philippines. Given the Japanese mandates in the central Pacific following the First World War, the US Navy foresaw the need to seize bases to stage and project American power where it would be needed. It is important to note that, though War Plan ORANGE underwent several evolutions, the Philippines were understood to not be defensible given the restrictions of the Washington Naval Treaty.<sup>2</sup>

In order to ensure its ability to execute such a plan, as well as take back any lost territory, the Navy identified the need to develop an amphibious doctrine aimed at successfully landing troops on hostile shores in the face of determined opposition. Though the US, Japan, and Great Britain each had a long history of amphibious operations, the program undertaken by the US Ma-

rine Corps in the 1920s was the first to attempt to create a doctrine for landing under fire. The establishment of such a doctrine necessarily included the capability to execute unopposed landings. Thus the latter was generally ignored during training and development exercises.<sup>3</sup>

Under the leadership of Commandant John A. Lejeune, the Marine Corps took the lead on the program as it would be the task of the Marines to seize the naval bases in question. Throughout the 1920s and 1930s, amphibious exercises were conducted by the Marines, to include the Navy and the Army, which examined a wide variety of techniques and scenarios. The exercises emphasized a combined arms approach including naval gunfire, light armor and artillery, engineering, and air power.<sup>4</sup>

In 1938, the Navy published Fleet Training Publication 167 (*Landing Operations Doctrine*), a document that had been in development by the Marines since 1934 as the *Tentative Manual for Landing Operations*. FTP 167 was a sober assessment of the lessons learned over the previous 17 years of work. The Marines recognized that opposed amphibious operations were possible, but they would be difficult. The basic principles read like a broad summation of the Normandy operation itself: the target area would have to be isolated; a violent barrage of naval gunfire and close air support would precede and support the landing force; the landing itself would be carried out on a broad front by a combined arms team employing the utmost speed and

violence and immediately followed up by reinforcements including tanks and artillery. The greatest threat to the operation was a naval or air attack against the supporting fleet elements, but the most immediate concern was an enemy counterattack against the landing force.<sup>5</sup>

The new doctrine was the result of realistic training and an honest assessment of the needs in an ever more likely Pacific war with Japan. The nature of such a war would severely curtail, if not eliminate, the opportunities to land forces unopposed and move to assault a suitable port from the landward side, a problem that would face Allied planners in Europe as well. As a result of the efforts of the Marines, with Navy and Army participation, the US military possessed the most modern amphibious doctrine in the world by the outbreak of war, if not the forces or resources to implement it.<sup>6</sup>

The British also studied amphibious doctrine during the interwar period, though they lacked an organization to take the lead on the issue, as the Marines had in the United States, until 1938. The Admiralty grew concerned over the development of amphibious capability in the United States and Japan and finally established the Inter-Services Training and Development Centre, under the command of Royal Navy Captain L.E.H. Maund, to conduct research and development on amphibious operations. With such a late start, the most significant achievement of the program was to educate British defense officials, including the Chiefs of Staff and the Committee of Imperial

Defence, about the necessity of combined operations, especially those of an amphibious nature.

Thanks to indifference on the part of the British Army and Royal Air Force, who saw themselves fighting sweeping battles on the European Continent, only the Royal Navy had any enthusiasm for amphibious operations. Without the support of the other two services, the development of amphibious capability beyond what already existed received low priority. Maund began the study and design of dedicated specialized landing craft based on his observations of Japanese operations in China as well as examining the principles of beach defense and overcoming such defenses. Only with the rise of Winston Churchill in 1940 would the supporters of combined amphibious operations finally receive the attention they merited.<sup>7</sup>

## **Developing the Tools**

**A**fter the ignominious evacuation from Dunkirk in May 1940, the British Army realized that, in order to defeat the Germans, they would have to develop the capability to land a sizeable force on the Continent against determined opposition. To this end, Maund's program to develop specialized craft such as the Landing Craft Assault (LCA) and the Landing Craft Mechanized (LCM) received more funding and resources. The LCA and LCM were small craft designed respectively to carry infantry and vehicles onto a hostile beach.

Upon becoming Prime Minister in May 1940, Churchill, long an advocate of amphibious capability, ordered the development of larger craft capable of landing troops and equipment directly onto a beachhead without the need to capture a port. The result was the Landing Craft Tank (LCT) and the ocean-going Landing Ship Tank (LST), a ubiquitous design that saw service into the Twenty-First Century.<sup>8</sup>

In the United States, the Marine Corps had developed the doctrine, but still lacked suitable craft with which to implement it. The US Navy Bureau of Ships had submitted several designs, but none had proven satisfactory. To make matters worse, the Bureau of Ships jealously guarded its prerogative regarding ship and boat design, hampering the contributions of private enterprises.<sup>9</sup>

The performance criteria for such craft were specific and demanding. First, they had to be seaworthy. Operating against hostile beaches did not guarantee the protection of a breakwater during the approach, so the craft must be capable of reliable handling in rough seas. Second, they had to combine shallow draft with heavy lift capacity. Third, they should be able to efficiently disembark troops, equipment, or cargo directly onto the beach. This last meant that the craft must be able to drive themselves onto the beach itself while still maintaining the capability to retract after unloading. Finally, the craft had to be rugged enough to handle heavy surf, debris-strewn water, and possible enemy fire and remain operational.<sup>10</sup>

Feb. 15, 1944.

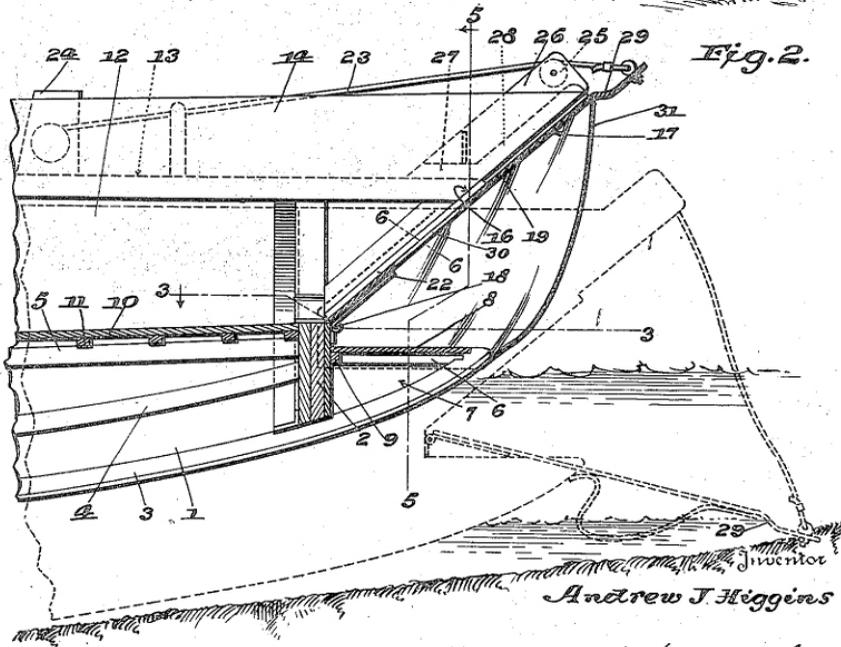
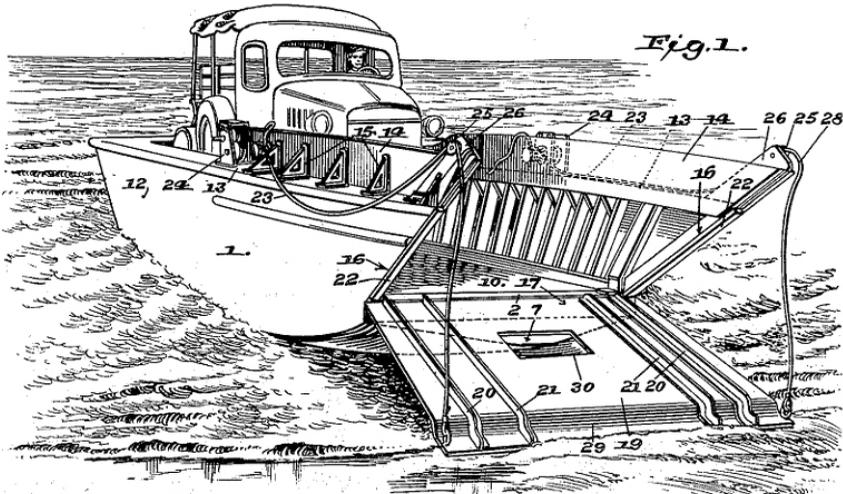
A. J. HIGGINS

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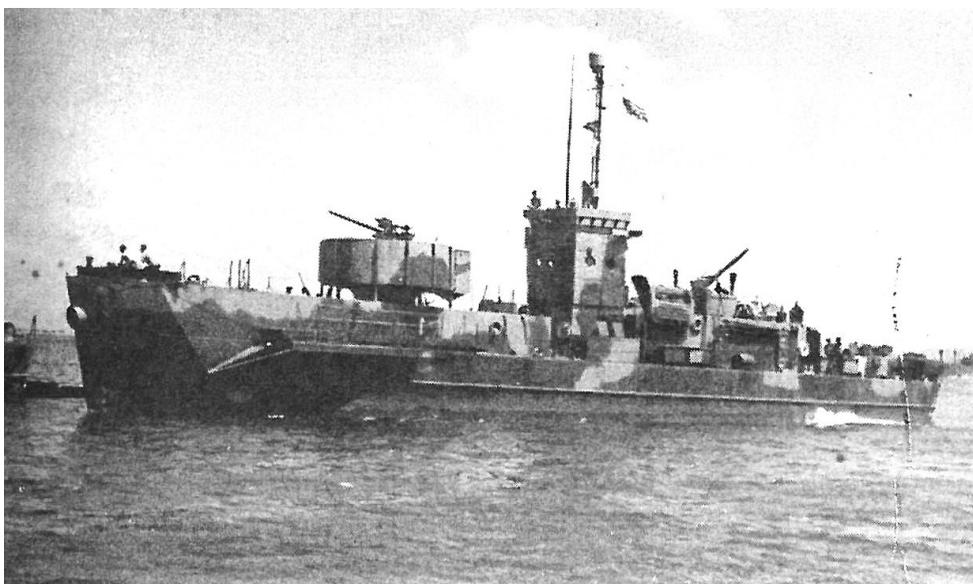
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Attorneys

Andrew Higgins, a New Orleans boatbuilder, built his wooden infantry landing craft for the US Marines based on a design intended for civilian use. With considerable power for their size they easily retracted from the beach. Subsequent variants were constructed of steel and featured a bow-mounted ramp for the debarkation of personnel and vehicles. Pictured an early-model Higgins Landing Craft, Mechanized (LCM). US Navy Division of Naval Intelligence.

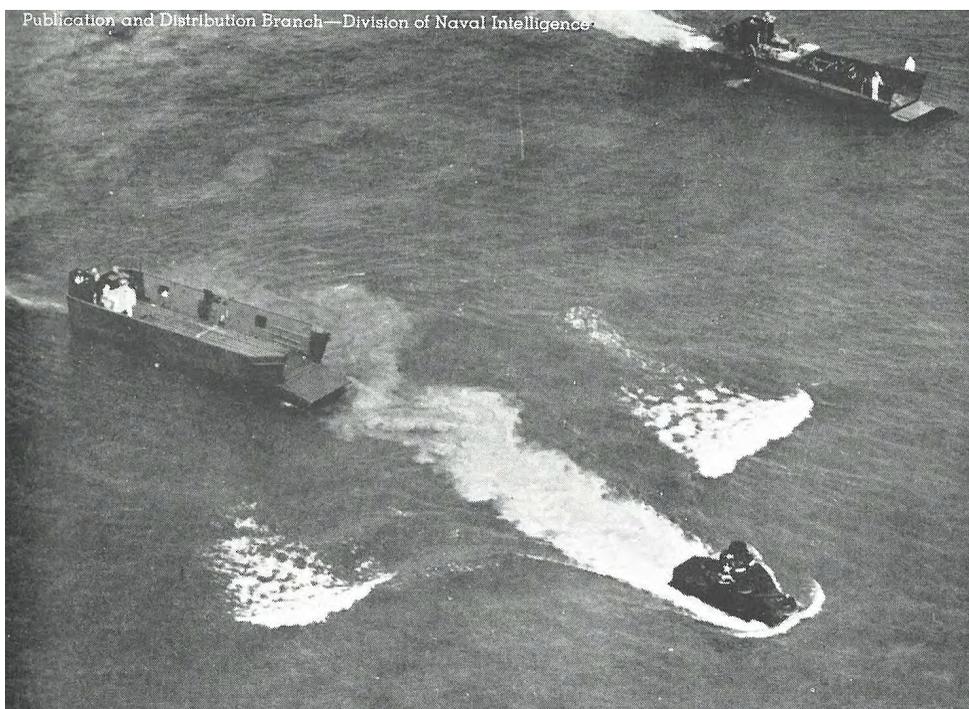
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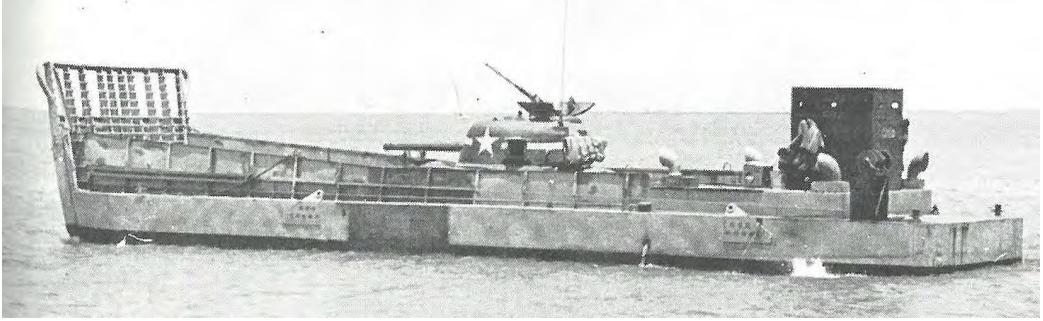
Pictured are two later-model ocean-going Landing Craft, Infantry (LCI). The LCI on the left features a centerline debarkation ramp, which was standard on all models built after 1 June 1944. The LCI embarked six officers, 182 enlisted men, or 72-tons of cargo. US Navy Division of Naval Intelligence.



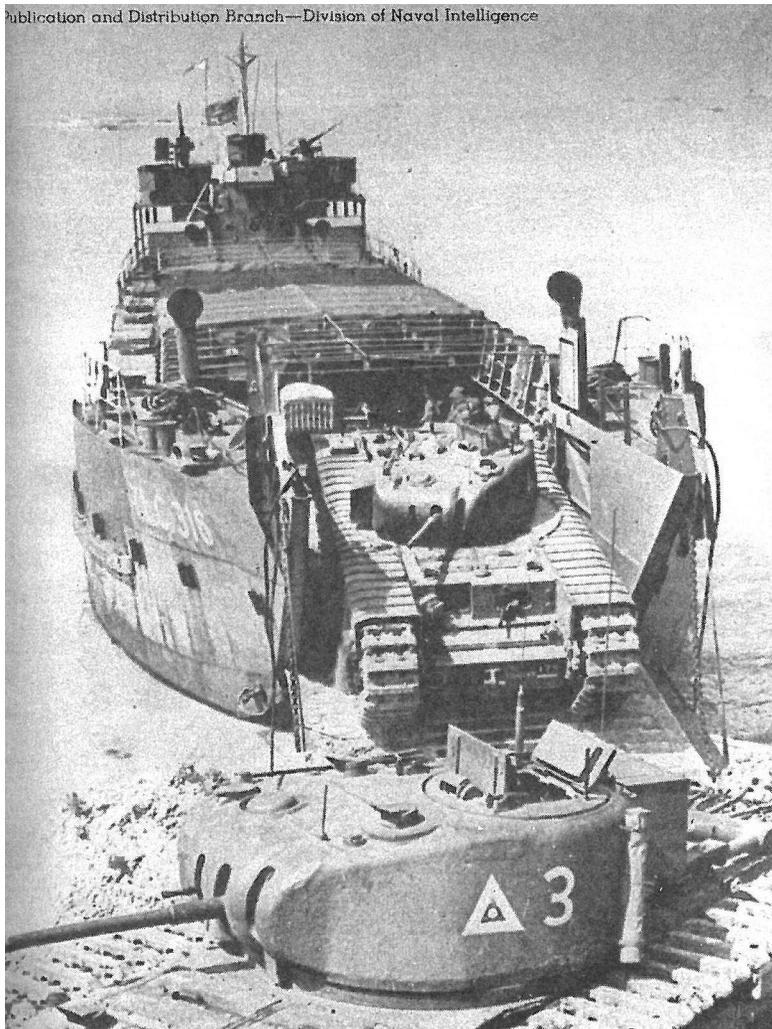
Landing Craft, Infantry, Gunboats (LCI-G) supplied close fire support of amphibious landings. LCI-G armaments varied depending upon which weapons systems were available when the vessels arrived in theater. Configurations were a mix of 3-in/.50cal. DP, twin-40mm MG, 20mm MG, and 2 ½-in rockets. US Navy Division of Naval Intelligence.



The Higgins Landing Craft, Mechanized (LCM 1) (top) in trials against a Navy Bureau of Ships tank lighter (bottom). The LCM could land one light tank or motor vehicle. US Navy Division of Naval Intelligence.



Higgins Landing Craft, Mechanized (3) (LCM 3) could land one 30-ton vehicle, e.g. M4 Sherman medium tank, 60 troops, or 60,000lbs. (27,000 kg) of cargo. US Navy Division of Naval Intelligence.



The Landing Craft, Tank (3) (LCT 3) was capable of landing five 40-ton tanks, ten 3-ton trucks, or 300 tons of cargo. US Navy Division of Naval Intelligence.

Enter Louisiana boat-builder Andrew Jackson Higgins. Higgins had entered his Eureka shallow draft workboat in a contest sponsored by the Navy in 1936. The Eureka was designed for use in the swamps and bayous of Louisiana and already featured many of the requirements for an amphibious landing craft. It was stable, powerful, operated well in shallow water, and could even traverse sandbars and small spits of land when underway. It could also retract itself efficiently from being grounded and was of extraordinarily robust construction.<sup>11</sup>

In 1939 the Marines and the operational Navy tested the Higgins design, which won universal praise. In 1941 Higgins adapted his design, now known as the Landing Craft, Personnel (LCP), to include a bow ramp for easier discharge onto a beach. At the same time, Higgins won a contest between his design for a tank lighter and one offered by the Bureau of Ships. This craft became known as the Landing Craft, Mechanized (2-6) (LCM 2-6).<sup>12</sup> This craft should not be confused with the British boat of the same designation which it eventually supplanted.<sup>13</sup>

Higgins endured long battles with the Navy bureaucracy, particularly the Bureau of Ships, which was determined to see its own boats adopted over the clearly superior Higgins designs. This struggle continued until March 1943 when a Bureau-designed landing craft failed in an exercise, costing the lives of nineteen men. Higgins had criticized the design as unsound, and his Landing Craft, Vehicle, Person-

nel (LCVP) had beaten it soundly in a head-to-head competition. Under pressure from the Navy and Marine Corps, the Bureau of Ships finally relinquished its less-than-effective hold on the design of small boats. Higgins eventually produced over twelve thousand landing craft for the US Navy and the British with thousands more being produced under license by other builders.<sup>14</sup>

By the time the British accepted the need for modern amphibious capability in 1940, the doctrine existed, as did the recognition of the necessity of specialized landing craft. The problem was that the development of such craft was in its infancy. The late start toward the design and development of suitable landing craft meant that there were chronic shortages throughout the war. The Allies struggled to establish production priorities, and the needs of amphibious forces in the Pacific and Mediterranean competed directly with the buildup and deployment of craft for the invasion of France.

The first Higgins-built LCPs were not ordered until September 1940, and the first major contracts were not let until the spring of 1942. The British took delivery of the first LCT in November 1940 and, though development was rapid, the workhorse fourth-generation LCT (4) was not ordered in large numbers until December 1941. The spring of 1942 saw the beginning of mass production of landing craft in the United States, including the entire production of the LST (2), the model which had been accepted by the Admiralty and the US Navy.<sup>15</sup>

Though production began in earnest, it was not without its problems. The US Navy Bureau of Ships continued its obfuscation for another year while small boat manufacturers and major shipyards tooled up to produce the new designs. There was fierce competition for resources, especially steel, wood, and marine engines. With the Battle of the Atlantic still raging and the Navy trying to expand its fleet of escorts as well as carriers and capital ships for the Pacific, the President's list of "must-have" programs for 1943 did not include landing craft.<sup>16</sup>

There was also a severe shortage of trained operators for the new craft. The Navy and Coast Guard established special training programs but there was a lack of experience even among the cadre. Andrew Higgins stepped in again. At the request of the Navy and Marine Corps, he had established the Higgins Boat Operators and Marine Engine Maintenance School in New Orleans in July 1941. Higgins Enterprises fully funded the school.<sup>17</sup>

By mid-1942, Higgins had trained over two thousand Navy, Marine, and Coast Guard personnel, but the demand was insatiable. In June, the Amphibian Command of the United States Engineers assumed control of the school to accommodate Army students as well. Even this was not enough, so Higgins helped the Navy establish its own schools throughout the country which were more accessible to the naval bases themselves. Most of the instructors were graduates of the original Higgins school in New Orleans.<sup>18</sup>

## **The Problem of Lift**

**T**he first British examination of a cross-Channel operation conceived a comparatively small undertaking launched in the Pas-de-Calais area in the event of a collapse of German power in the West. Code-named ROUNDUP, the plan was envisioned as the beginning of the final act in a protracted war aimed at disrupting the orderly withdrawal of German forces as opposed to defeating them in battle. As the British were fighting alone at the time, its scale was commensurate with projected British capabilities.<sup>19</sup>

With the entrance of the United States into the war in December 1941, the form and aim of ROUNDUP began to evolve toward a true offensive operation.<sup>20</sup> When strategic decisions regarding North Africa and the Mediterranean pushed the cross-Channel operation back to 1943 and then 1944, Allied planners faced a vacuum of official direction. In 1943 the continued planning for ROUNDUP was undertaken by the office of the Chief of Staff, Supreme Allied Command (COSSAC). There was some wrangling over the makeup of the planning staff and the command structure, but by March, British Lt. General Sir Frederick Morgan was named Chief of Staff and charged with continuing plans for the operation.<sup>21</sup>

Even before Morgan's appointment and the handover of the planning responsibilities to COSSAC, Allied planners under the auspices of the Combined Chiefs of Staff had begun to review the previous two years' worth

of data generated by the ROUNDUP effort. Most telling among this information were the lessons learned from the Dieppe raid of August 1942. Dieppe demonstrated that, in light of modern weapons and fortifications, a seaborne attack on an enemy-held port was not feasible. Also, the ongoing fortification of the Northwestern European coast would deny the Allies any opportunity to land unopposed and move on an enemy port. It became quite clear that any invasion of Northwest Europe would have to be an amphibious attack against a defended coastline. Such an attack could only be carried out by the use of specialized landing craft.

The primary lesson gleaned from Dieppe, however, was that the German defenses were more formidable than previously thought. Earlier iterations of ROUNDUP had called for widely dispersed landing sites to prevent the enemy from concentrating and to create confusion as to the location of the main effort. Upon examination of Dieppe, Allied planners determined that any landing force would have to be concentrated and mutually supporting in order to crack the German defenses and withstand the inevitable counterattack. A concentrated front also eased logistical concerns and allowed the invaders to reinforce the landing quickly and with greater depth.<sup>22</sup>

The new approach called for numerous conditions necessary for success, such as suitable beach gradients, exits, tides, shelter from the prevailing winds, and access to nearby port facilities to be taken after the landings. By early 1943 the planners had determined

that the Caen sector of the Normandy coast was the best, indeed the only, choice for such an operation. Secondary landings were planned for the east coast of the Cotentin Peninsula to provide access to the port of Cherbourg. On 1 March the new analysis was approved and code-named SKYSCRAPER.

SKYSCRAPER was deliberately ambitious, calling for no less than ten assault divisions afloat, four in the first wave and six in the immediate follow-up, supported by four airborne divisions dropped to block enemy reinforcements. All ten amphibious divisions were to land on the first four tides, that is, before the end of D plus 1. The stated reason for such a bold enunciation was to bring to light the problems inherent in such an operation so they could be planned for and dealt with. It did not disappoint in this regard.<sup>23</sup>

Although the Combined Chiefs of Staff approved SKYSCRAPER as a basis for planning, immediate questions arose as to its methodology. The British Chiefs challenged the planners' assertion that SKYSCRAPER'S force allocation was the bare minimum required for the operation given the justification that they expected "determined opposition" from the Germans. The Chiefs pointed out the impossibility of basing an operation on projected enemy strength over a year in the future.

The SKYSCRAPER planners countered that a firm decision must be made to ensure that the resources needed to accomplish the mission would be made available. Refusing to do so, they believed, opened the door to

using a lack of resources to justify delaying or even canceling the operation. The Chiefs did not agree and revoked their approval for SKYSCRAPER for its flawed approach which based resource allocation and force structure on unknowable enemy strength.<sup>24</sup>

When Morgan took charge in March, he made use of the work done on SKYSCRAPER, quickly agreeing with its conclusion that the assault would have to be in France, preferably in the Caen sector.<sup>25</sup> He also recognized that the logistical requirements for SKYSCRAPER had been enormous and, frankly, unrealistic. Concerning landing craft, subsequent studies based on projected availability indicated a likely shortfall of fifty percent for the assault divisions. Morgan's approach to the size and structure of the force, however, was not based on guessed-at enemy strength, but upon the resources that could reasonably be expected to be available at the time the operation was to take place.<sup>26</sup>

In March 1943, influenced by the SKYSCRAPER estimates and Morgan, the British requested an increase in landing craft production. US planners immediately rejected the proposal citing the urgent need for escort vessels in the Atlantic and the continuing buildup in the Pacific. Chief of Naval Operations Admiral Ernest J. King and his staff believed that the proposed increase would siphon off resources and once again delay desperately needed construction in other areas.

King's staff justified their stance by citing the 1942 crash program to produce craft for Operation TORCH

in North Africa. Thanks to the use of emergency directives and the creation of special expediting machinery, the 1942 production run of landing craft ended with a record of 106,146 light displacement tons for February 1943.<sup>27</sup> The Navy maintained that the dislocations caused by the building program of 1942 had reverberated across every other building effort in every shipyard in the nation, claiming that the shortfalls would not be made good until the fall of 1943. Another such delay could not be justified in light of current threats, especially the record shipping losses of March 1943 to the German U-boat offensive.<sup>28</sup>

Thus the Navy blocked the proposed increase and influenced the tentative plans for the invasion. The planners would have to make do with the current landing craft production schedules which held steady at about 60,000 tons per month for deliveries into the first half of 1944.<sup>29</sup> The landing craft situation was poised to impact strategic priorities on a theater-wide and even global scale. March 1943 saw the prediction by Morgan that, although the exact number of landing craft required for the operation could not yet be forecast, the figure would be "large enough...to present a very serious problem, which has no precedent." Even Churchill had gotten wind of the problem. He wrote in an April memorandum that "the destinies of two great empires ... seemed to be tied up in some god-damned things called LSTs whose engines themselves had to be tickled on by ... LST engine experts of which there was a great shortage."<sup>30</sup>

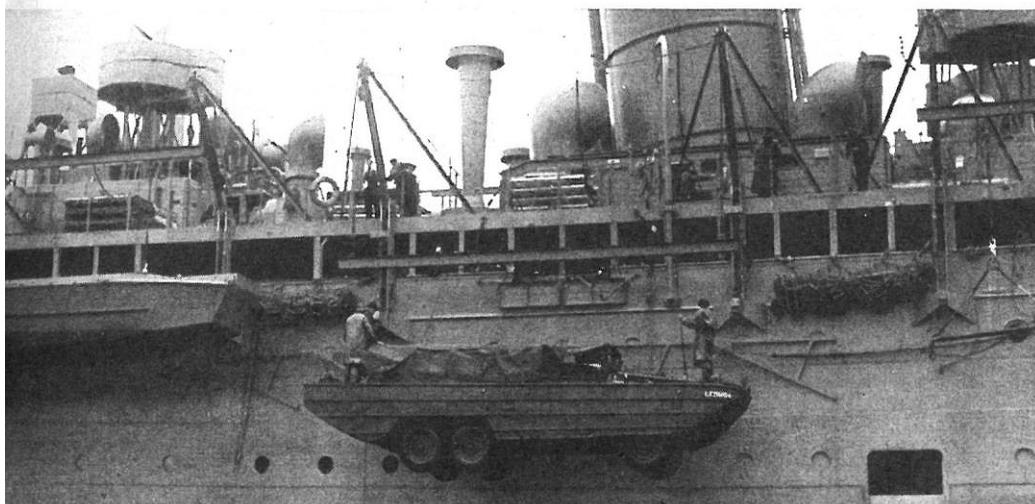
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The Higgins Landing Craft, Vehicle, Personnel, the ubiquitous LCVP, could land 36 troops, one 6,000lb vehicle, or 8,100lbs of cargo. US Navy Division of Naval Intelligence.



▼ British LSI(L) unloading by davits.

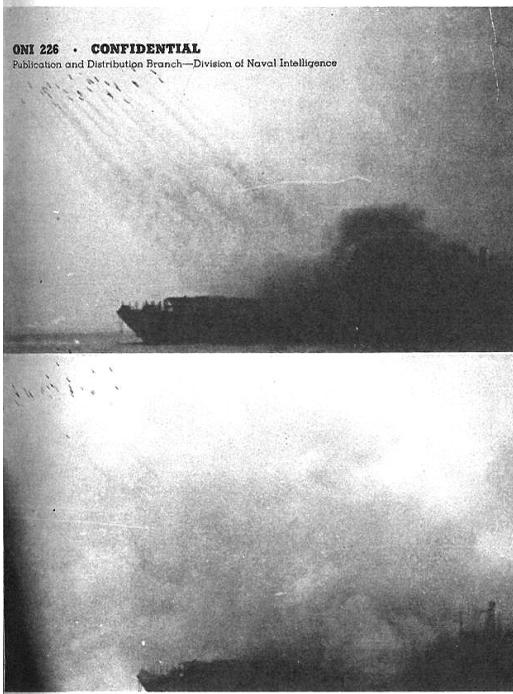


The DUWK, or “Duck” was the logistical workhorse of Allied amphibious landings the world over from mid-1943 on. Built on a 2 ½-ton, 6x6 truck chassis, the Duck could carry 25 combat loaded troops, 12 litters, small-caliber artillery pieces, or 25-tons of cargo.

May also saw the arrival of British planners in Washington to discuss, among other things, the allocation of resources for 1944. Despite the rejection of SKYSCRAPER, the British statement of requirements for what was again being called ROUNDUP included lift capacity for ten assault divisions simultaneously loaded. The statement called for 8,500 landing ships and craft to provide the needed lift. American planners,

comparing this figure with current and projected production capacity, came to the rapid conclusion that such demands would be impossible to meet.

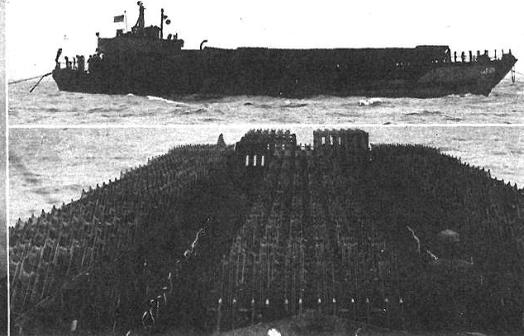
The stated requirements were so unrealistic that US planners suspected the British of deliberately making an impossible demand in order to justify delaying or scrapping the plan altogether. Such unfounded suspicions ignored the fact that a combined plan-



**LANDING CRAFT, TANK (ROCKET) LCT(R)**

Operational use	To deliver a large volume of preparatory rocket fire on landing beaches.
Description	British conversions from LCT Marks (2) and (3). False deck and rocket stands are readily removable so that the craft may continue as a tank-landing unit, once the initial landing is accomplished. Electrically fired in 24 salvos, the rockets cover an area of 750 x 160 yards, with a density of one rocket per 100 sq. yards.
Armament	792 (LCT (2)) or 1,064 (LCT (3)), 5" rockets in stands of six @ 45° fixed elevation, 3,500-yard range. Rockets are fitted with (a) 29-lb. HE head with 7-lb. burster; (b) CSA smoke head; (c) incendiary head (for ranging at night). Two 20 mm.
Endurance	2,700 miles @ 9 kts. Speed, 11½ kts. (max.) 1,400 miles @ 11½ kts. Draft, 4'3" for'd, 7'6" aft.
Protection	Blast screen and wooden shelter on bridge.
Propulsion	As in LCT (2), (3).

UK



Armed with between 792 and 1,064, 5-in rockets, each with a 29lb HE warhead, the Landing Craft, Tank (Rocket) or LCT-R was used for close in fire support. US Navy Division of Naval Intelligence.

ning staff developed the SKYSCRAPER estimates, but given the British preference for a Mediterranean strategy, the idea seemed logical. Admiral King was the most outspoken in this regard, openly declaring that he believed the British had no intention of supporting a cross-Channel operation in 1944. The more temperate General George C. Marshall merely stated that it must be concluded that a ten division assault was a logistical impossibility for 1944.

The US Chiefs concluded that, in order to argue successfully against the British preference for operations in the Mediterranean, the plan for the invasion of France must be scaled back within the realm of the logistically possible.

They determined that such a course would eliminate any possible justifications on the part of the British to postpone the operation on the grounds of resource availability. Increasing landing craft production was no longer entertained or discussed, and efforts turned to maximizing the craft that were and would be available.<sup>31</sup>

As mentioned earlier, Morgan had already reached a similar conclusion, though for different reasons. The new attitude of the Americans dovetailed nicely with his doubts about the feasibility of the SKYSCRAPER force structure. Absent an executive authority in the form of a commanding officer, he continued to operate in the realm of the theoretical, but he correctly viewed



At 2,160-tons landing-load displacement, the Landing Ship, Tank (LST), is the largest sea-going amphibious support ship, second only to the Landing Ship, Dock (LSD). A ramp, behind the clamshell bow doors, allowed the LST to deposit its 500-ton load of motor vehicles directly on the beach. Where coastal geography did not allow the LST to beach, a pontoon causeway was streamed to span the gap and tanks, truck, half-tracks or jeeps rolled-off onto the beach.

the rejection of the ten division plan as the break that was needed to begin anew.

Morgan's assessments quickly reduced the figure of 8,500 landing craft to around 4,000, a much more manageable number. He estimated that, by the spring of 1944, the Allies could provide lift for five divisions afloat, three in the initial assault and two in the immediate follow-up. He further determined that two additional divisions could be landed using craft returning from the assault and immediate follow-up.

Morgan arrived at these figures by allowing for two major Mediterranean operations for 1943 after the invasion of Sicily and the projected production figures for delivery by late spring, 1944. The completion of those operations should allow for the transfer of sufficient craft, added to the new inventory, for the cross-Channel operation. Twenty-six to thirty Allied divisions were projected to be present in Britain by the time of the operation and available for use in the reinforcement, buildup, and expansion phases. Mor-

gan's estimates were accepted, and he was instructed to confine his plans to the availability of 4,504 landing ships and craft by the target date.<sup>32</sup>

With the number of available landing craft settled, for the time being, a new problem emerged: what was the load capacity of each ship or craft and how would the loads be structured? The definitive answer would only be apparent once the final target was selected, a detailed estimate of enemy forces compiled, a tactical plan developed, and the force structure decided upon. While the number of craft would determine the options for how the landing force would be structured and employed, the plan and structure, once settled upon, would dictate the loading and mission for each ship or craft.

The preliminary figures for loading were necessarily vague. The British and Americans each had different opinions regarding lift capacity, needs for individual units, and loading philosophy. By May, COSSAC had adopted a "Standard Method for Forecasting Landing Craft Requirements." This method, however, was not used at the Washington Conference that month when Morgan was directed to move ahead. In an example of the differences of calculation, COSSAC, using its "standard method," allotted 3,000 vehicles to each assault division. The planners in Washington, at the same time, arrived at the figure of 4,380.

Why the difference? "Vehicle" was a relative term and could mean anything from a small trailer to a tank. Only with the finalization of the actu-

al force structure and the tactical plan, would such numbers come close to being accurate. In the meantime, they served to demonstrate the complexity of the task before the planners and provided data that could be used later to assemble the final loading plan.

COSSAC planners, unlike Washington, also took into account the question of combat losses among landing craft and the effect those losses would necessarily have on the buildup phase. It is true that there was no real way for the Washington planners to assess possible losses given the lack of a confirmed target area and the time distance from the operation itself, but the American calculations tended more toward the higher end of projected capacities than those of the British.

Finally, the Washington planners failed to account for specialized support craft mounting guns, rockets, and mortars that employed landing craft hulls. These craft were essential for the close support of the landing, especially in the time between the lifting of the naval barrage and the landing of the supporting armor. The support craft would have to be included in the production and availability figures for landing craft but could not count in the total lift capacity for such craft.<sup>33</sup>

The Washington Conference of May 1943 accomplished the American goal of committing resources to the cross-Channel operation in the spring of 1944 while also setting the material parameters within a range unlikely to be challenged by the British. At the same time, the setting of a definite time

frame for the invasion limited the operational and tactical flexibility of the planners and commanders by setting a definite ceiling on available resources, not least of which were landing craft.

## Priorities

The differences of opinion between the Americans and the British regarding European strategy are well-documented. It is well-known that the British favored an opportunistic strategy based in the Mediterranean while the Americans advocated a concentrated assault across the English Channel into France as soon as possible.<sup>34</sup> In truth, the differences in the two sides were more nuanced than is generally indicated. These nuances manifested themselves in the months leading up to what eventually became Operation OVERLORD, and the availability of landing craft was at the center of the debate.

The Quebec Conference of August 1943 saw several stormy sessions between the American and British Chiefs of Staff regarding strategy and resource allocation for 1944. The Americans submitted a report recommending that OVERLORD have "overriding priority" for resources to ensure readiness by the target date, which was still undetermined.

The British were uncomfortable with the term "overriding priority" because it implied the operations in the Mediterranean were of secondary importance, which is precisely what the Americans meant. The difference of

opinion flowed from the American view that OVERLORD was the prime goal and everything else should be either subordinated to it or done in support of it. The British agreed that OVERLORD should be the primary operation of 1944 but that efforts in Italy and elsewhere in the Mediterranean were an integral part of preparing for it and were thus equally important.<sup>35</sup>

After much discussion, the Chiefs issued a joint statement reaffirming the precedence of OVERLORD when there was a question of competing needs but that Mediterranean operations should continue with the resources already allocated for their use. The Americans also conceded that unforeseen events or opportunities in the Mediterranean could change the priorities set forth at the conference. General Marshall had stated that the commitment to OVERLORD should be taken "without conditions and without mental reservation."<sup>36</sup> He was unable to achieve either in Quebec, though he did lay the groundwork for such.

The Americans did manage to hedge against a possible British push for an increased commitment to Italy or a rumored Balkan expedition. By proposing a landing on the Mediterranean coast of France to coincide with the cross-Channel operation, the Americans were able to focus the British more to the west and show a direct correlation between Mediterranean operations and OVERLORD. The British Chiefs agreed to the proposal and General Eisenhower, then commander of Allied forces in North Africa, was ordered to draw up

a plan for such an operation using only the resources already available to him.<sup>37</sup>

The Quebec Conference also saw the beginnings of an increase in the size of the OVERLORD assault force. Churchill requested an increase of at least twenty-five percent. Marshall concurred, and Morgan was instructed to take such an expansion into account in his plans. Morgan, on his own, had already been examining just such an increase. Still, without a commander to make executive decisions, he could only operate with theoretical models, though OVERLORD'S higher priority started to give him firmer ground on which to stand.<sup>38</sup>

This priority quickly brought OVERLORD into competition with the just-ordered invasion of Southern France, Operation ANVIL. A study of Eisenhower's available capability revealed only enough lift for about one division. Also, the lift capacity was not properly balanced in terms of its capability to land even that one division in such a way for it to be effective. The Chiefs denied a request to augment the lift capacity because it would take resources away from OVERLORD.<sup>39</sup>

As planning went forward, it became clear that if ANVIL were to take place, there would have to be additional resources allocated. As ANVIL began to take on a life of its own, not least because of Eisenhower's advocacy, it became a primary drain on scarce resources needed for OVERLORD. Again, landing craft and lift capacity were the centers of contention. As the commitment grew and began to threat-

en operations in Italy, British support for ANVIL began to wane.

As General Morgan expanded his plan to accommodate the increased assault force, he immediately saw his landing craft start to slip away. In August, before the Quebec Conference concluded and priorities set, the Royal Navy appropriated 44 LCTs for net duty at its anchorage at Scapa Flow. It was unknown if they would return in time. Also, the allocation of close-support craft was wholly inadequate.

Morgan was invited to address the British Chiefs of Staff on 12 August regarding the rapidly-eroding landing craft situation. His estimates showed that of the 653 LCTs allocated by the Washington Conference, up to twenty-five percent were no longer available due to reassignment to other tasks or the need to convert them to close-support craft. His figures were actually low, as he had underestimated the number of support craft required by the American assault divisions. Even worse, Morgan based his estimates on a three-division assault front which would soon increase to four.<sup>40</sup>

Inquiries into increased production of landing craft met with no particular success. Admiral King grudgingly agreed to an unspecified increase, but it was not clear whether it would positively affect deliveries in time to impact OVERLORD. The British landing craft industry was operating at full capacity, and British authorities were unwilling to make the changes necessary to increase it. Only in the late fall, when the shortage became acute, did Churchill

directly intervene in order to create capacity for about sixty more craft.<sup>41</sup>

Shortly after his presentation to the British Chiefs of Staff regarding the shortages for a three-division assault, Morgan received orders to expand his plan for a four-division front. Given the difficulties he already faced, Morgan decided to start his plans anew based on the increased allotment of forces. He quickly concluded that the expansion to four assault divisions was unwise based on the lift capacity he had and expected to have. Upon examination of the ordered increase, he wrote:

Detailed analysis of the present plan shows that while the three assault divisions are only barely adequately mounted in craft of suitable types, the immediate follow-up formations are most inadequately mounted, and there is a dangerous gap on D-plus-1-day .... We already have far too high a proportion of our goods in the shop window. To consider any increase in this proportion without adequate stocking of the back premises would in my opinion be basically unsound.

In other words, the follow-up formations were in no real position to provide follow-up at all, at least not in the immediate sense. The follow-up units were already inadequately loaded on unsuitable vessels which meant they would not be able to operate until at least twelve hours after landing. Morgan strongly recommended addressing this problem and creating a viable floating reserve before introducing

another assault division into the mix. His new calculations for the creation of an adequately mounted follow-up force showed a deficit of 251 LCTs for a three-division assault and 389 for the four-division plan. He would also need an additional 150 LCTs or equivalent craft for the fourth assault division.

The British Chiefs of Staff rejected Morgan's opposition to the strengthened attack but allowed that increasing the number of landing craft had become a top priority. In September, the Chairman of the U.S. War Production Board, Donald Nelson, traveled to London and met with Morgan regarding landing craft shortages. He left the meeting convinced that LSTs and LCTs were the "most important single instrument of war from the point of view of the European Theater," and that the need for them had been "grossly understated."<sup>42</sup>

Despite Nelson's determination and King's agreement to increase production, no action was taken other than to study the problem. As the November production schedule was allowed to mirror that of October, it became clear that the only way to increase landing craft availability for OVERLORD would be to maximize the craft that already existed or would be delivered through the established production priorities.<sup>43</sup>

## Command Decisions

General Bernard Montgomery arrived in London on 2 January 1944 to assume command of the Allied ground forces, under Eisenhower, for OVERLORD. He immediately

demanding an expansion of the assault force from four to five divisions and the frontage for the landing from twenty-five to about forty miles. Eisenhower's Chief of Staff, Major General Walter Bedell Smith, concurred and apprised Eisenhower of the recommendations.

Despite his misgivings, Morgan was now able to operate with some express authority under a command staff that could make decisions. He was told to plan for the expansions under the assumption that the required landing craft would be made available. The additional landing craft needed for Montgomery's expansion included 72 Landing Craft Infantry, Large (LCI-L), 47 LSTs, and 144 LCTs.<sup>44</sup>

In addition to the five infantry divisions, lift had to be found for the equivalent of four armored brigades, five regiments of self-propelled artillery, shore control groups, air force and naval personnel, and an immediate follow-up force of two-thirds of an infantry division. All these units had to be combat-loaded on landing craft so as to be operational as soon as they arrived on the beach. The rest of the follow-up, one and one-third divisions, would be loaded on transports and not available until D plus 2.<sup>45</sup>

In order to accumulate the necessary craft for OVERLORD, training areas in the US and Britain were scoured, serviceability rates were improved, load capacity calculated and recalculated to improve efficiency, and, most significantly, the competition for resources between OVERLORD and ANVIL came to the forefront.

Montgomery and Smith informed Eisenhower in early January that the only way to procure the necessary craft would be to pull them from ANVIL. Eisenhower was a strong advocate of ANVIL from the start, believing that it would tie down German forces that might otherwise be brought to bear against OVERLORD. He resisted drawing resources from the complementary operation as long as he could.

ANVIL retained the capacity to lift three divisions. British planners, including Morgan, felt that a one division threat would be enough to hold the German units in place while diverting the rest of the landing craft to OVERLORD. The British believed that the ANVIL beaches, 500 miles away, were too distant to have a positive impact on OVERLORD. Churchill heartily agreed and pushed for the cancellation of ANVIL.

Eisenhower was still determined to salvage ANVIL if he could. At his direction, plans were changed for the loading of landing craft, especially concerning vehicles. The requirement per division for combat-loaded vehicles was cut from over 3,000 to 2,500, thus freeing up additional craft.

Serviceability requirements also increased across the board. The COSSAC outline for OVERLORD had placed the expected serviceability rate, the rate of craft that were operational at any given time, at eighty-five percent for landing craft and ninety percent for ships. In order to squeeze more lift out of the available assets, the acceptable rates increased in January to ninety percent for LCTs and ninety-five

percent for LSTs. These new rates only applied to US craft, as the British insisted on retaining the lower COSSAC figures because they were more realistic. As it turned out, the new rates were pessimistic. On D-day, the rates for all American landing craft were above ninety-nine percent, and the British were above ninety-six percent.<sup>46</sup>

In February, Eisenhower met with Admiral Charles Cooke of the CNO's War Plans Division and General John Hull, Chief of the US Army's Operational Planning Department to discuss the landing craft situation. Cooke and Hull were able to convince Eisenhower that he possessed more than enough lift for OVERLORD without having to pull extensively from ANVIL.

On 13 February, Eisenhower, Cooke, and Hull proposed reducing the numbers of landing ships and making up for the loss by overloading others. The plan was criticized by the command of 21<sup>st</sup> Army Group, the command headquarters for the ground forces, as taking a narrow logistical view toward loading as opposed to a tactical view. Admiral Sir Bertram Ramsay, the Allied Naval Commander, Expeditionary Force, echoed this criticism. Ramsay noted in his diary that Eisenhower, Cooke, and Hull were "forgetting that we have to look tactically to assault a strongly defended coast & any arithmetical calculation is bound to be impractical operationally."<sup>47</sup> The British Chiefs of Staff rejected the proposal.

The British Chiefs also took the opportunity to reiterate their opposition to ANVIL, which they saw as not

only draining resources from OVERLORD but also Italy. Italian operations retained a high priority with the British, a sentiment echoed by Eisenhower, which put the Supreme Commander in a tight spot.

The difference of opinion revolved around Eisenhower's belief that ANVIL was vital to the success of OVERLORD, a view, as noted previously, not shared by the British. Field Marshal Sir Alan Brooke, the British Chief of the Imperial General Staff, made a strong case that the needs of Italy and ANVIL would create either a shortage of badly needed divisions in the former or a lack of adequate buildup forces for the latter. Doing both was impossible.

The wrangling continued between Eisenhower and the Combined Chiefs, including some horse-trading of landing craft resources as Mediterranean needs spiked thanks to the difficulties at Anzio. By March, Eisenhower began to realize that the resources in men and materiel did not exist to execute ANVIL simultaneously with OVERLORD while also maintaining the needs of Italy. On 21 March, he recommended the cancellation of ANVIL. With the decision made, OVERLORD was assured of the landing craft needed to execute the operation.<sup>48</sup>

## Conclusion

**T**he landing craft employed in Operation OVERLORD performed admirably. It is impossible to think of the operation without conjuring images of the assault troops hitting

the beach in waves of Higgins LCVPs and other craft. It is difficult to surmise how the Allies might have gained a lodgment on the European Continent without the development and employment of these highly-specialized but essential craft.

4,126 landing craft were employed at Normandy on 6 June 1944. Over 4,000 were of a specialized variety developed for amphibious assaults.<sup>49</sup> 291 landing craft of all types were lost or damaged during the assault. Most of those damaged were repairable, a testament to their rugged construction.<sup>50</sup>

The success of the landing craft of World War II is also a testament to the designers, engineers, and craftsmen who created them as well as the

visionaries who determined the need for them in the first place. Though they never fired a shot during the war, the people responsible for the existence and eventual deployment of the landing craft were in their own way just as vital to eventual victory as those who did.

In a postwar interview, historian Stephen Ambrose was asked by Dwight D. Eisenhower whether he had ever met Andrew Higgins. When Ambrose said that he had not, Eisenhower replied, "That's too bad. He is the man who won the war for us. If Higgins had not designed and built those LCVPs, we never could have landed over an open beach. The whole strategy of the war would have been different."<sup>51</sup>

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