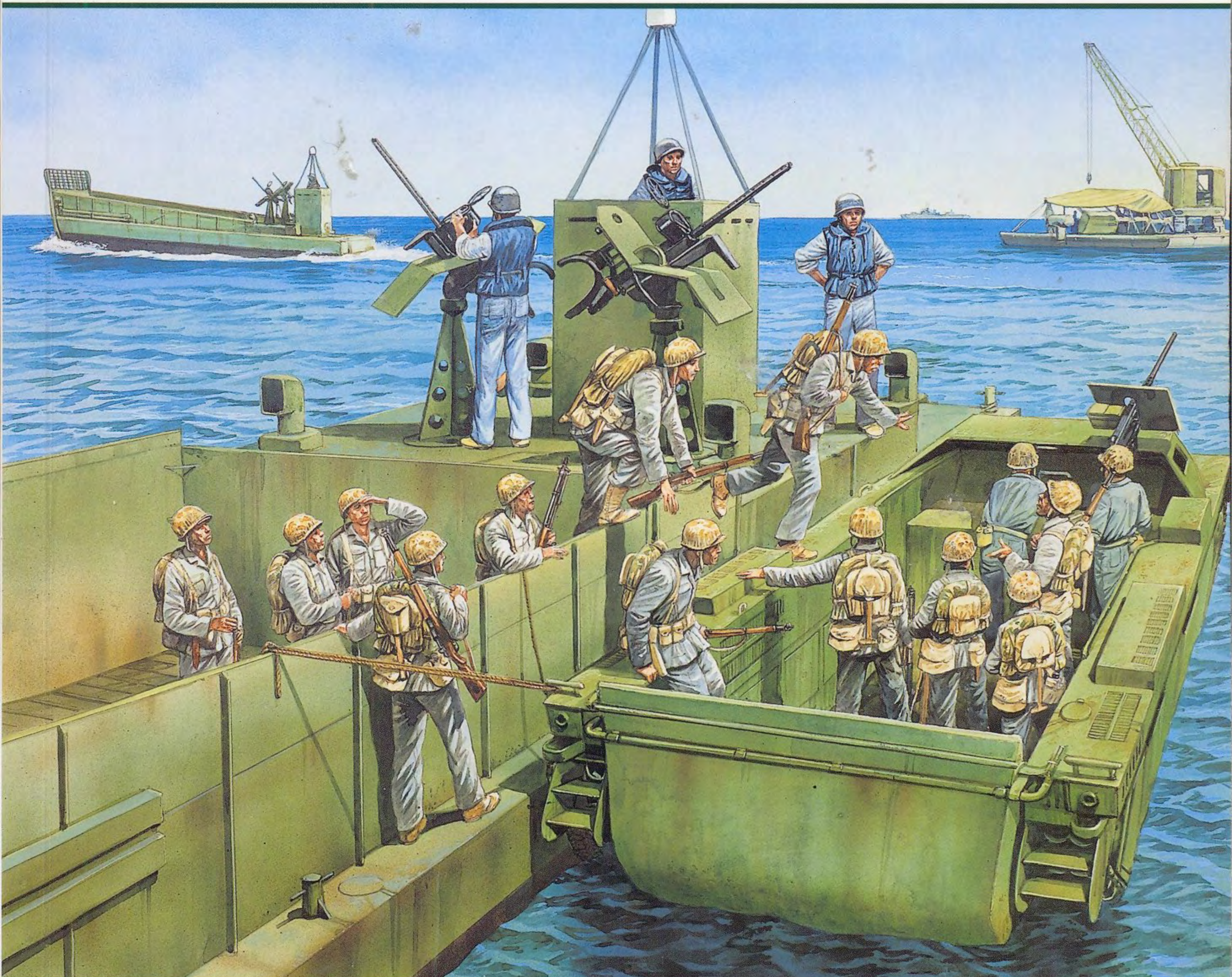


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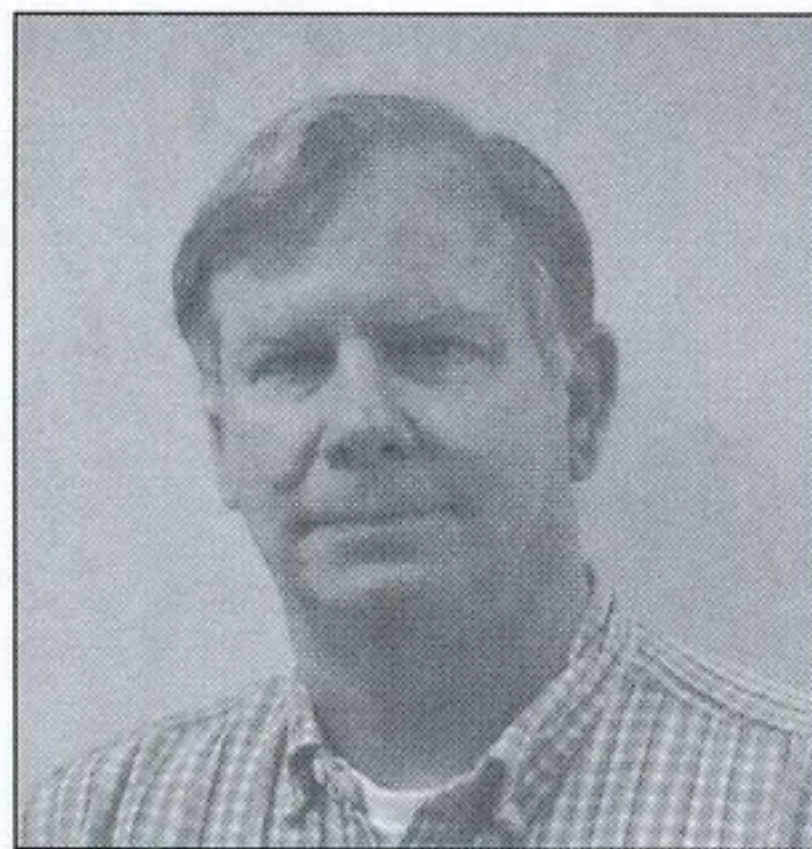
OSPREY
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US World War II Amphibious Tactics

Army & Marine Corps, Pacific Theater



Gordon L Rottman • Illustrated by Peter Dennis



GORDON L. ROTTMAN entered the US Army in 1967. He served in the 5th Special Forces Group in Vietnam in 1969–70 and subsequently in airborne infantry, long-range patrol and intelligence assignments until retiring after 26 years. He was a special operations forces scenario writer at the Joint Readiness Training Centre for 12 years and is now a freelance writer.



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Consultant editor Martin Windrow

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Abbreviations used in this text:

AT	antitank
BAR	Browning automatic rifle
BCT	Battalion Combat Team
BuShips	Bureau of Ships
CAS	close air support
CINCPAC/POA	Commander-in-Chief, Pacific Fleet/Pacific Ocean Area
CO	commanding officer
ESB	Engineer Special Brigade
FLEX	Fleet Landing Exercise
FMF	Fleet Marine Force
FMFPac	Fleet Marine Force, Pacific
Flot	Flotilla
GHQ	General Headquarters, Southwest Pacific Area
HQ	Headquarters
HQMC	Headquarters, Marine Corps
IIIAC	III Amphibious Corps
IMAC	I Marine Amphibious Corps
Inf Div	infantry division (US Army)
JASCO	joint assault signal company
LVT	Landing Vehicle, Tracked ("amtrac")
LVT(A)	Landing Vehicle, Tracked (Armored) (amphibian tank)
MarBde	Marine Brigade
MarDiv	Marine Division

NCB	Naval Construction Battalions ("Seabees")
NCO	non-commissioned officer
NG	New Guinea
PI	Philippine Islands
Prov	provisional
RCT	Regimental Combat Team
SWPA	Southwest Pacific Area
TF	Task Force
TG	Task Group
UDT	Underwater Demolition Team
USMC	United States Marine Corps
USN	United States Navy
VAC	V Amphibious Corps
(-)	less (elements detached from this unit)
(+)	reinforced (additional elements attached to this unit)

Amphibious ship & landing craft classification codes:

AGC	Amphibious Force Flagship
AKA	Attack Cargo Ship
APA	Attack Transport
APc	Coastal Transport
APD	Fast Transport (also "destroyer-transport")
LCC	Landing Craft, Control
LCI	Landing Craft, Infantry

LCM	Landing Craft, Mechanized
LCP(R)	Landing Craft, Personnel (Ramp)
LCR(L)/(S)	Landing Craft, Rubber (Large)/(Small)
LCT	Landing Craft, Tank
LCVP	Landing Craft, Vehicle or Personnel
LSD	Landing Ship, Dock
LSM	Landing Ship, Mechanized
LST	Landing Ship, Tank
PC	Patrol Boat/Submarine Chaser
PT	Patrol Torpedo Boat
SC	Submarine Chaser

Linear measurements:

Distances, ranges, and dimensions are given in the contemporary US system of inches, feet, yards, and statute miles. For metric equivalents convert these figures as follows:

feet to meters – multiply feet x 0.3058

yards to meters – multiply yards x 0.9114

miles to kilometers – multiply miles x 1.6093

Ordinal numbers:

These are given in the 1940s rather than the modern styles, e.g. 2nd rather than 2d.

US WORLD WAR II AMPHIBIOUS TACTICS

Army & Marine Corps, Pacific Theater

INTRODUCTION

A reminder that the success of amphibious operations depended as much upon logistics – the ability to get supplies and equipment ashore – as upon the first wave of assault infantry. This is a typical water dump, a vital and immediate factor for Marines fighting under the tropical sun. In the center is a hypo-chlorination unit for purifying water pumped from the 3,000gal collapsible canvas tank to the left.

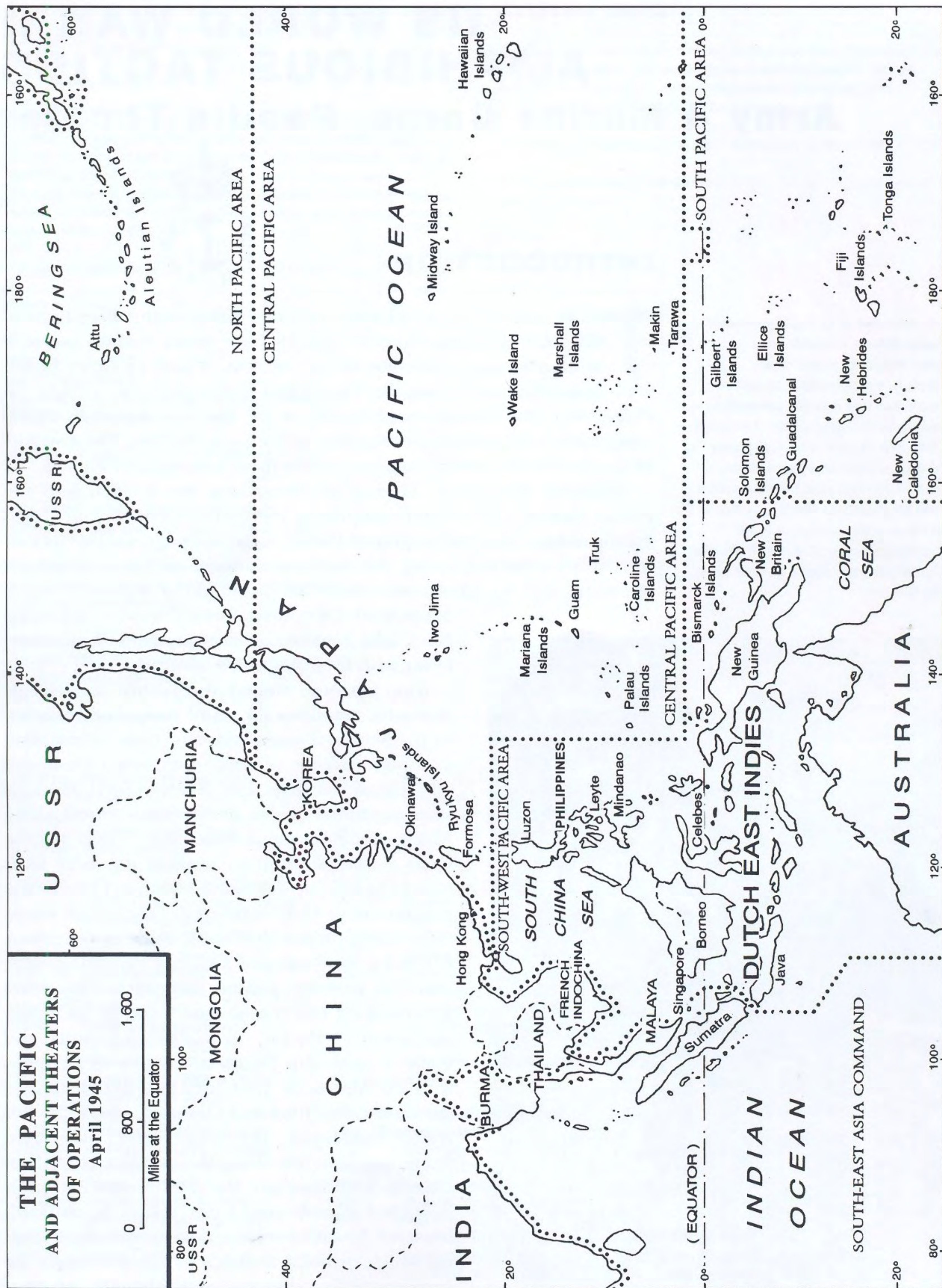
THE PACIFIC OCEAN stretches across 9,600 miles – some three-fifths of the world's circumference, and 13 time zones – and covers 70 million square miles. For all its vastness, if one excludes Japan, New Zealand, New Guinea, the Dutch East Indies (Indonesia), and the Philippines, the thousands of islands in the Pacific cover only 42,000 square miles of land – about the size of the state of Ohio. The conduct of the Pacific War would be governed by these enormous distances.

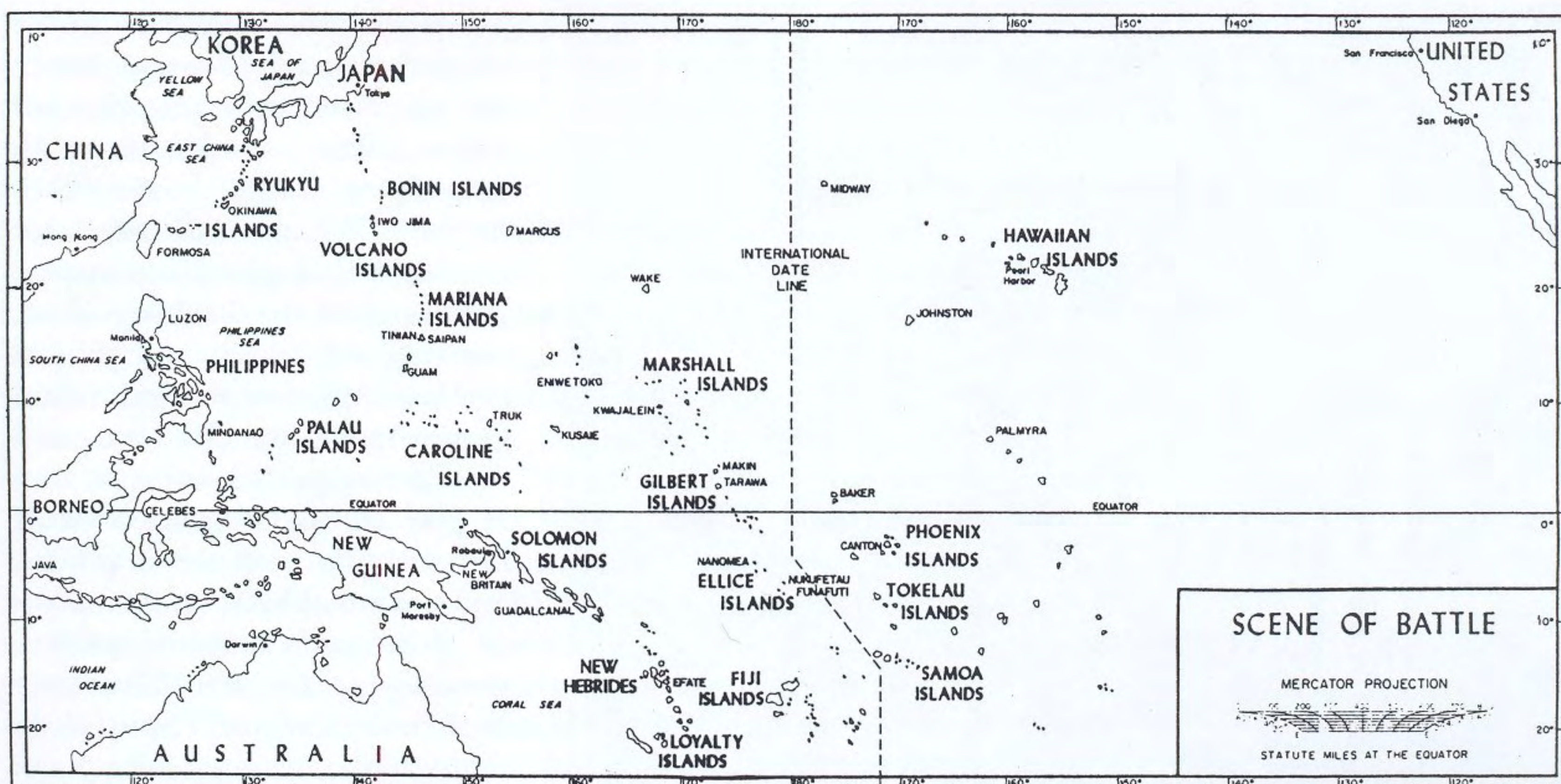
Militarily, the Pacific Theater of Operations was divided into the Pacific Ocean Area – itself comprising the South, Central, and North Pacific Areas – and the Southwest Pacific Area (see page 4). The former was Navy-controlled, under the overall command of Admiral Chester W. Nimitz, and the latter came under the command of General Douglas

MacArthur. Of course, forces from the US Army, Navy, and Marines would operate in both areas along with their respective air arms.

The Japanese viewed the islands as strategic defensive positions for naval bases and airfields, to further their conquests and then to maintain an outer defense of their conquered territories and Home Islands. The Allies viewed them as stepping-stones across the Pacific – a path along which airfields, naval bases and troop staging bases would be built to support the next steps toward Japan, the ultimate island objective. At the suggestion of Gen MacArthur, the Allies would “island-hop” across the Pacific, striking the enemy where he was weak and avoiding his strongholds; and this concept proved successful. The Allies advanced on two routes: one through the South and Central Pacific, from the Solomons and Gilberts, into the Japanese Mandated Territory with the Marshalls, Carolines and Marianas, and then on to Iwo Jima and Okinawa, where the two routes converged. The other route, supported from Australia, led along the north coast of New Guinea and through the Philippines. Strongly defended islands could not always be avoided, however. It was necessary to seize specific islands on which to build airfields to accommodate the comparatively short-ranged aircraft of that







Main island groups mentioned in this text.

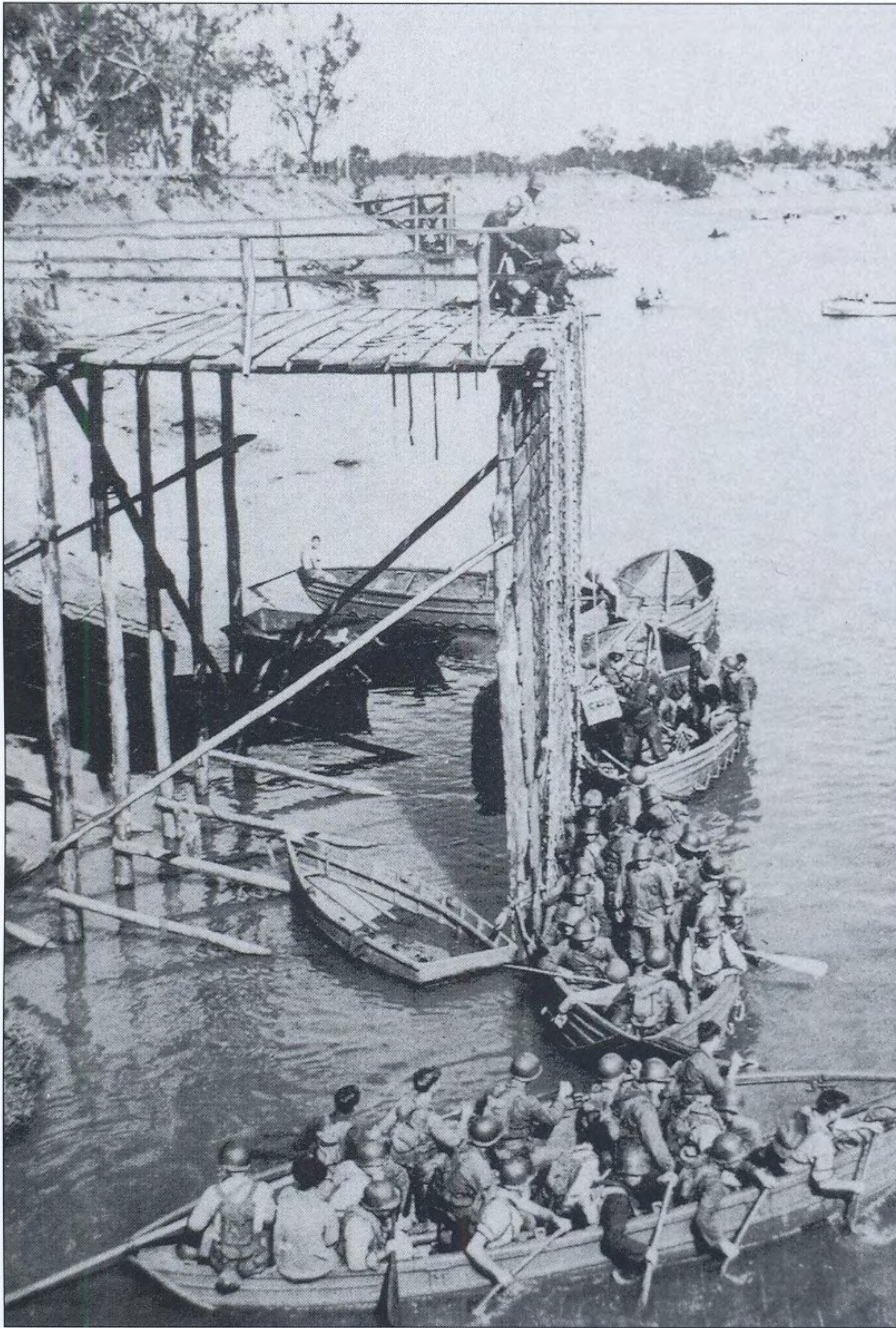
period, to provide naval anchorages and troop staging bases to support the next campaign, and to eliminate significant enemy forces that might be a threat if by-passed.

The island objectives varied greatly, ranging from tiny islets rimming atolls – little more than palm- and brush-covered sandbars – to larger, rugged volcanic islands with both forests and open ground, and very large mountainous islands shrouded in jungle. Intelligence was critical: very little was known regarding the terrain and conditions on most islands, the weather had its impact, and enemy capabilities and tactics changed over time.

No two amphibious operations were planned, organized, or executed in exactly the same way; the specifics were dictated by available units and resources, missions, terrain, enemy forces, and evolving doctrine. Almost every operation broke new ground, and was essentially an experiment with new types of units, ships and landing craft, organizational concepts, tactics, techniques of command and control, and logistic procedures. Amphibious warfare was an evolutionary process throughout the war.

AMPHIBIOUS DOCTRINE

US amphibious doctrine at the beginning of the war was still in its infancy. The Marine Corps had become the dominant service in its development, but pre-war exercises had been limited in size and scope. With the establishment of the Fleet Marine Force in 1933, Marine and Navy amphibious warfare development increased, but only slowly – funding was limited. The Marine Corps published a landing operations manual in 1934 and this provided the basis of all three services' amphibious doctrine; the Navy adopted this manual the same year, and the Army in 1943. The pre-war Marine Corps studies of amphibious operations identified six major components for the amphibious assault: command relationships,



Regardless of the complexities of mounting a major amphibious operation, the little details of training could not be neglected. Here US Army troops in Australia practice descending cargo nets into "landing craft" – actual landing craft were not yet available for more realistic training, so civilian boats were pressed into service.

Pacific – in greater numbers, in fact, than the Marines; but it would be the Marines who executed most of the assault landings on extremely heavily defended shores.

In some operations requiring prolonged combat ashore the Marines were withdrawn after the landing phase and replaced by Army units, so as not to waste the Marines' special capabilities in extended slugging matches when they could be employed more effectively elsewhere. Joint training often revealed doctrinal differences between the Army and Marines, but these were usually minor, involving questions of command and control and logistics, and were normally resolved during actual joint operations. One major difference was that the Army initially preferred night landings and the Marines daylight. In the event night landings proved to be impractical for all but small-scale raids; the difficulties of troop and fire control, beach location, avoidance of obstacles, locating enemy positions, and other factors made landings after dark prone to failure.

naval gunfire support, aerial support, ship-to-shore movement, securing the beachhead, and logistics. The organization of an amphibious task force, even back in the 1934 manual, called for task-organized groups: transport (to transport the landing force), covering (to screen and protect the landing), fire support (naval gunfire), and air (air cover and close air support) groups.

The Navy put limited effort into landing craft development, and few suitable troop transports or other amphibious warfare vessels were available. The Army took an increasing interest in amphibious operations from 1940; but while limited exercises were conducted, it was not until 1942, after the US entered the war, that the Army began serious efforts to develop amphibious operations and began large-scale training. As late as April 1942 the Army was still proposing that it should be responsible for amphibious operations in the Atlantic and the Marines in the Pacific. While the Marines were initially envisioned as operating in both oceans, they were to fight only in the Pacific while the Army served in both theaters. The Army would conduct its share of amphibious operations in the

While the necessity of amphibious operations had been fully realized, pre-war exercises did not begin to approach the scope of even the smaller wartime operations. In the spring of 1942 there were only six transports (AP), two cargo ships (AK), and three destroyer-transports (APD) in the Pacific Fleet. The Navy formed the 2nd Joint Training Force in November 1941, including both a Marine and an Army division. This evolved into the Amphibious Corps, Pacific Fleet (PacFlt), and eventually into V Amphibious Corps. In August 1943 the Marines activated Troop Training Unit, Amphibious Training Command, PacFlt at Camp Elliott, California. This trained both Marine and Army divisions as a component of the Navy's Amphibious Training Command, established at Coronado, near San Diego, in June 1943. The 4th and 5th Marine Divisions (MarDiv) and the Army's 81st, 86th, 96th, and 97th Infantry Divisions (InfDiv) were trained there. Coronado was one of several naval amphibious bases where Amphibious Force personnel received instruction in landing craft operation, maintenance and control, communications, air support and gunfire control, intelligence, and other skills. The others were Solomons Island, Md (not to be confused with the Solomon Islands in the South Pacific); Little Creek, Va; and Fort Pierce, Fla. The Army activated its Amphibious Training Center at Camp Edwards, Mass, in June 1942, but that October the Center relocated to Camp Gordon Johnson at Carrabelle, Fla. The division trained by the Center that saw service in the Pacific was the 77th, but the 1st-4th Engineer Amphibious Brigades also received instruction at the Center before it was disbanded in June 1943. Most Army divisions deployed to the Pacific received their amphibious training at Camps Cooke or San Luis Obispo, Calif, or in Hawaii.

Doctrine evolved throughout the war by the analysis and implementation of lessons learned in actual operations. While every operation saw the introduction of new tactics and techniques, the bloody 2nd MarDiv assault in November 1943 on Betio Island, Tarawa Atoll in the Gilbert Islands marked a turning point that had a major impact on all subsequent operations. A study of the costly lessons



In the early Solomon Islands campaign large beaching craft, such as the LST and LCI, were not yet available. This Landing Craft, Medium Mk II, seen disembarking a Marine 1-ton truck on Guadalcanal in November 1942, was one of the largest beaching craft available for this early operation.

learned there essentially addressed the critical aspects of any amphibious assault:

Command and control The need for dedicated amphibious command ships, improved radio circuits, additional radio nets, better waterproofed and more rugged radios, back-up radios, and closer coordination between all elements.

Naval gunfire and air support The need for further studies in fusing and angle of fire against shore targets; the need for ships to fire at specific targets rather than simply shelling the island; improved target designation systems; better coordination between ships and aviation (air support to be flown while shelling was underway); longer pre-invasion bombardments; and the necessity of denying the area to enemy aircraft.

Amphibious assault The greater effectiveness of landings on the lagoon side of islands; the critical need to land assault troops by amphibious tractor ("amtrac") rather than by landing boats, in at least the first four waves; the unsuitability of rubber boats; the need for amtracs with improved mechanical reliability, protection and armament, and rear exit ramps; the need for more detailed reconnaissance and attention to tides; the importance of clearing underwater and beach obstacles and marking routes; the need for better beach control; the ineffectiveness of light tanks (37mm gun) and need to replace them with medium tanks (75mm gun); the need to seize adjacent islets to emplace artillery; the need for improved infantry-tank-engineer team training, for increased distribution of bazookas, flamethrowers and demolition charges, and for all marines – not just engineers – to be trained in demolitions; the need for increased medical support and more realistic casualty training; and for ammunition and supplies to be delivered on pallets.

The short-lived Landing Craft, Vehicle of mid-1942 began being replaced by the LCVP before the year was out. Note that it had a pilot station for the cox's'n on the fantail, which prevented it from being stacked or "nested" aboard transport ships. The LCVP's steering position would be moved down and forward beside the engine compartment, and gun tubs would be provided on the fantail. Here a .30cal MG is mounted on the port bulwark abaft the engine compartment; most LCVs were unarmed.



US Pacific Theater Amphibious Operations

Regimental- and divisional-sized opposed landings (only initial assault units are listed, not follow-on units). Until June 1944 and the Saipan operation, all Marine landings were conducted by a single division at most, and a few battalion- and regimental-sized landings were executed.

<i>Location</i>	<i>Date</i>	<i>Assault Force</i>	<i>Codename</i>
Guadalcanal-Tulagi	Aug 7, 42	1st MarDiv	Watchtower
Attu, Alaska	May 11, 43	7th InfDiv	Landcrab
New Georgia	Jun 30, 43	43rd InfDiv	Toenails
Rice Anchorage	Jul 5, 43	1st Raider Regt	Toenails
Arundel Island	Aug 27, 43	172nd Inf Regt	Toenails
Vella Lavella	Aug 15, 43	35th Inf Regt	Toenails
Bougainville	Nov 1, 43	3rd MarDiv	Dipper
Makin	Nov 20, 43	165th Inf Regt	Longsuit
Tarawa	Nov 20, 43	2nd MarDiv	Longsuit
Arawa, New Britain	Dec 15, 43	112th Cav Regt	Dexterity
New Britain	Dec 26, 43	1st MarDiv	Backhand
Roi-Namur	Jan 31, 44	4th MarDiv	Flintlock
Kwajalein	Jan 31, 44	7th InfDiv	Flintlock
Eniwetok	Feb 18, 44	TacGrp 1	Catchpole
Admiralty Islands	Feb 29, 44	1st CavDiv	Brewer
Volupai-Talasea	Mar 5, 44	5th Marine Regt	Appease
Aitape, New Guinea	Apr 22, 44	163rd Inf Regt	Persecution
Hollandia, NG	Apr 22, 44	24th & 41st InfDiv	Reckless
Wakde-Sarmi, NG	May 17, 44	163rd Inf Regt	Straightline
Biak Island	May 27, 44	41st InfDiv	Horlicks
Saipan	Jun 15, 44	2nd & 4th MarDiv	Forager
Guam	Jul 21, 44	3rd MarDiv, 1st MarBde	Forager
Noemfoor Island	Jul 2, 44	158th Inf Regt	Cyclone
Sansapor, NG	Jul 30, 44	6th InfDiv	Globetrotter
Morotai Island	Sep 15, 44	31st InfDiv	Daredevil
Tinian	Jul 24, 44	4th MarDiv	Forager
Peleliu	Sep 15, 44	1st MarDiv	Stalemate
Angaur	Sep 17, 44	77th InfDiv	Stalemate
Leyte, Philippines (PI)	Oct 20, 44	7th, 24th & 96th InfDiv, 1st CavDiv	King II
Mindoro, PI	Dec 15, 44	24th InfDiv	Love III
Luzon, PI	Jan 9, 45	6th, 37th, 40th & 43rd InfDiv	Mike I
Zambales, PI	Jan 29, 45	38th InfDiv	Mike VI
Nasugary Bay, PI	Jan 31, 45	11th AbnDiv	
Corregidor	Feb 16, 45	503rd Prcht Regt, 34th Inf Regt	
Palawan, PI	Feb 28, 45	186th Inf Regt	Victor III
Iwo Jima	Feb 19, 45	4th & 5th MarDiv	Detachment
Kerama Retto	Mar 26, 45	77th InfDiv	Iceberg
Okinawa	Apr 1, 45	1st & 6th MarDiv, 7th & 27th InfDiv	Iceberg
Ie Shima	Apr 16, 45	77th InfDiv	Iceberg
Mindanao, PI	Mar 10, 45	41st InfDiv	Victor IV
Jolo, PI	Mar 16, 45	163rd Inf Regt	
Oroku Peninsula	Jun 4, 45	4th Marine Regt	Iceberg

AMPHIBIOUS FORCES

NAVY AMPHIBIOUS FORCES

The Navy's Amphibious Force incorporated a broad range of units and organizations, including amphibious squadrons, landing craft flotillas, naval construction battalions, underwater demolition teams, advance base units, and other supporting units to include radar, communication and medical.

The Amphibious Force (singular, for the overall organization) began life in February 1942 when Amphibious Force, Atlantic Fleet was established at Norfolk, Va. On April 10, 1942 Amphibious Force, PacFlt

was established to control all amphibious units within the Pacific Fleet – then (a mere four months before the Guadalcanal landing) amounting to only a handful of ships and landing craft.

Early in the war the various Pacific Fleet amphibious forces bore designations reflecting their areas of responsibility; on March 15, 1943 these forces were redesignated as numbered fleets. On August 15 the Fifth Amphibious Force was activated and assigned to the Fifth Fleet. The existing amphibious forces were redesignated and assigned to the new fleets bearing the same numbers:

Amphibious Force, South Pacific became Third Amphibious Force

AF, Pacific Fleet became Ninth Amphibious Force

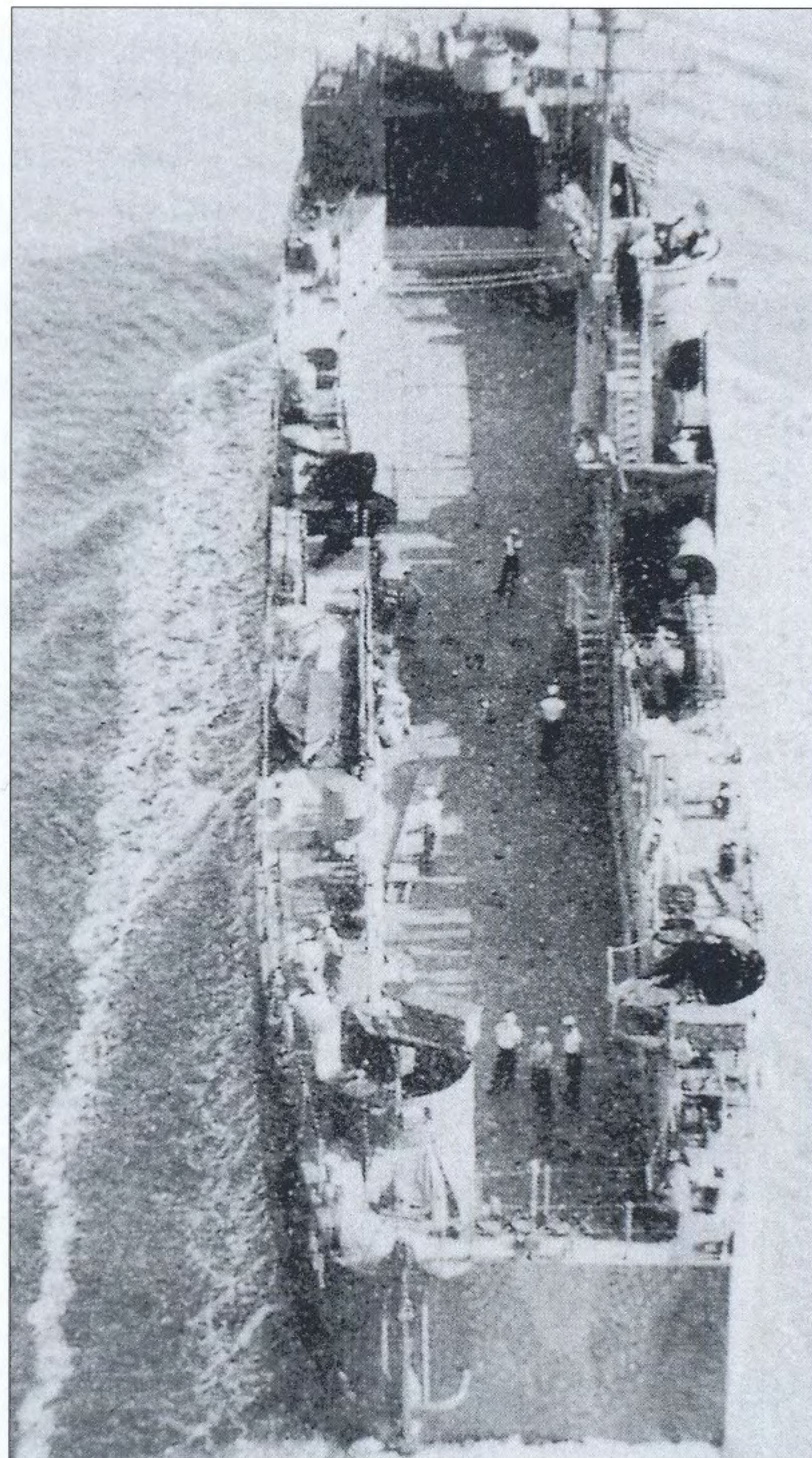
AF, Southwest Pacific became Seventh Amphibious Force

Rear Echelon, AF, PacFlt became Amphibious Command, PacFlt.

An “amphibious force” could be of any size and composition. The assigned ships and craft varied greatly as new and more numerous types of ships were commissioned. Ships were frequently reassigned between commands and forces that were task-organized differently for each operation.

Task organization

The Navy’s task force concept originated in April 1940 when LCdr Maurice E. Curtis proposed that Navy task organization designations be standardized using prearranged numerical designators rather than the unwieldy system of



A major Navy contribution to Amphibious Forces were the Naval Construction Battalions (NCB) or “Seabees,” here laying Marsden matting for an airstrip. Well equipped with construction gear, highly skilled and motivated, and famous for their ingenuity, their motto was *Construimus Batuimus* – “We build, we fight.”

OPPOSITE **The Landing Ship, Mechanized – LSM – introduced in spring 1944 was the vehicle equivalent of the Landing Craft, Infantry. Despite its size it only carried three medium tanks, like a Landing Craft, Tank; but it could carry more tractors and other lighter vehicles. Normal antiaircraft armament was six 20mm AA guns or one 40mm and four 20mm, but some LSMs were converted to take batteries of rocket launchers for close-in support. Note the stern anchor used to winch the ship off the beach after unloading; all beaching landing ships and larger craft possessed these. The stern plate shows the “spotted” camouflage employed on many larger landing vessels – see Plate C.**

functional nomenclatures then in use, e.g., Cruiser Scouting Force, Kyushu Bombardment Force, etc. It was impossible to predict what task organization nomenclatures would be required to support a given exercise or operation, and a new communications plan had to be developed for each, making reorganizations difficult. Prearranged numerical designators allowed for the easy activation and deactivation of task organizations, and permitted the establishment of standard fleet-wide communications plans. Task force designations included both a number and a functional designation; the function designation might change between operations, but the number remained unchanged.

The Navy designation system uses numbers beginning with that of the parent fleet, e.g., TF 50 (Fifth Fleet and Central Pacific Task Forces). Subordinate task components are designated by decimal point numbers, e.g., Task Group 51.1, a task group assigned to Task Force 51. Task forces are asymmetrical with variable hierarchy, composition and organization. The system allows a great deal of flexibility with no fixed size specified for task component subdivisions, from largest to smallest: task force (TF), task group (TG), task unit (TU), and task element (TE). Additionally, a specific task component could control other subordinate components of the same echelon, e.g., TF 50 controlled three other task forces (TF 51, 57, 58) during the Okinawa campaign. One of these, TF 51, controlled five other task forces and three task groups.

The task organization and hierarchy of Navy components could thus be quite intricate. Squadrons, flotillas, groups, and divisions were type commands for administrative purposes, consisting of specific types of ships. When task-organized, ships from different units were assigned to task groups, units, and elements as required, with mixes of many different ships. The task organization of amphibious forces evolved as lessons were learned, new types of ships came on-line, and capabilities and resources increased.

Landing flotillas

Landing ships and large landing craft were organized into flotillas each of three groups. The groups were numbered in sequence through the flotillas: e.g. LCI Flotilla 1 (LCIFlot 1) had LCI Groups 1, 2, and 3, while

The Army operated its own landing craft for shore-to-shore operations, several of which were carried out during Gen MacArthur’s leap-frogging advance along the coast of New Guinea. Here troops of the 2nd Engineer Special Bde, wearing camouflage uniforms and jungle boots, take a break during training.



LCI Flotilla 4 had LCI Groups 10, 11, and 12. Groups were each subdivided into two divisions, which were also numbered in sequence: e.g. Divisions 1–6 were assigned to LCIFlot 1. LST and LSM flotillas usually had 12 craft, as did LCI/LSM gunboat flotillas; LCI flotillas had 24 craft, and LCT flotillas 36. The number of craft assigned to a flotilla often varied, however, some having more, some fewer. Flotillas, groups and divisions were administrative organizations and would be broken up for assignment to task components, and craft could be reassigned between flotillas. These flotillas were under the administrative control of the Commander, Landing Craft Flotillas (LandCraftFlots) of each Amphibious Force. For instance, LandCraftFlots South Pacific Force in mid-1943 consisted of:

LSTFlot 5	18x LST
LCIFlot 5	26x LCI(L)
LCTFlot 5	30x LCT(5)
LCTFlot 6	12x LCT(5)
Coastal Transport Flot 5	10x APc

September 15, 1944: early production Landing Craft, Infantry (Large) – LCI(L)s – disembark Army troops at the edge of Morotai Island's coral reef via troop ramps flanking the bow. These troops are fortunate that the reef was narrow, giving them a comparatively short wade. Unlike the Army, the Marine Corps made only limited use of the LCI. This early "square bridge" class were numbered LCI(L)-1 to 48, 61 to 136, 161 to 196, and 209 to 350.

Not all landing craft were embarked aboard amphibious warfare ships. The Navy formed a number of Standard Landing Craft Units (SLCU), also known as "boat pools." Equipped with LCMs, LCVPs and other small craft, these provided local transport and courier services at island bases. While most craft were operated by the Navy, the Coast Guard manned 76 LSTs, 28 LCI(L)s, and numerous smaller landing craft (the Coast Guard was transferred from the Treasury Department to the Navy Department between November 1941 and January 1946).



Naval Construction Battalions

The Navy fielded several organizations that proved invaluable to amphibious warfare. Foremost among these were the Naval Construction Battalions, more popularly known as "Seabees," derived from the initials CB. Before the war the Navy contracted civilian construction firms to build overseas bases. With war on the horizon it was realized that civilian contractors could not be exposed to potential combat. Headquarters Construction Companies were formed in late 1941 in case war interrupted overseas contracted construction; and after the declaration of war the need for overseas construction expanded greatly. The formation of NCBs was approved on January 5, 1942; civilian construction crews were withdrawn from the outlying islands to Hawaii in the summer of 1942, and replaced by Seabees.

Navy regulations permitted only line officers to have command authority. The Naval Construction Corps was abolished in June 1940 and combined with the Engineering Corps to form the Civil Engineer Corps. In March 1942, when the 1st NCB was commissioned, the Secretary of the Navy authorized Civil Engineer Corps officers to command the new units. Seabee enlisted men were recruited from skilled construction tradesmen and given petty officer ratings, making the Seabees one of the highest paid organizations in the US armed forces. Seabee training was undertaken at the US Naval Construction Training Center, Navy Operating Base, Norfolk, Va, and at several smaller camps throughout the country. The Marine Corps provided Seabees with tactical training at NCB Training Centers at Camps Pendleton, Calif, and Lejeune, NC.

Each NCB consisted of a headquarters and four construction companies with 1,105 personnel. They were well-equipped, self-contained units capable of virtually any field construction task, to include building advance Navy operating bases, docks, airfields, seaplane bases, road networks, supply depots, troop camps, warehouses and other facilities. Seabee units accompanied expeditionary forces and landed immediately after the assault troops, to clear debris, build roads, construct or repair captured airfields, prepare off-loading sites, off-load cargo, reopen ports, reactivate railroads, and build any other facilities required. Famous for their ingenuity, they were capable of accomplishing virtually any task assigned them. Seabees were trained and equipped to fight and were frequently called upon to defend their work sites from Japanese attacks and infiltrators.

By the end of 1942, 60 NCBs had been organized. NC regiments were administrative headquarters capable of controlling three to five NCBs, and NC brigades were formed to coordinate the activities of two to four regiments. By the war's end 286 NCBs had been raised, along with numerous specialized units including five pontoon operating battalions; 40 NC special battalions could serve as stevedores for loading and unloading ships in overseas areas where native labor was not available, and to serve as shore parties during assault landings. There were also 136 construction battalion maintenance units to provide installation maintenance on completed overseas naval bases. For specialized functions 118 construction battalion detachments were raised, consisting of anything between six and 500 men; these included mobile field laboratory, pontoon causeway, tire retread and repair, harbor reclamation, spare parts control, and dredge operation detachments. Five naval pontoon assembly

detachments constructed floating docks, piers, and causeways. In all there were 8,000 officers and 238,000 enlisted men in the Seabees, serving around the world, and a total of over 325,000 Seabees served during the war.

Underwater Demolition Teams

The need was recognized for a capability to reconnoiter reefs, obstacles, and nearshore water conditions, as well as to destroy manmade and natural obstacles in the path of landing craft, and this was reinforced by the near failure of the November 1943 Tarawa assault. The Navy formed its first UDTs in December 1943 using Navy, Army, and Marine personnel. First employed at Roi-Namur and Kwajalein in February 1944, the "frogmen" (armed only with knives) conducted pre-invasion hydrographic reconnaissance from the 3½ fathom (21ft) curve to the high-water line. UDTs located and destroyed obstacles, blasted boat lanes through reefs, marked boat lanes, and reported nearshore and beach conditions. Later, 92-man UDTs were formed solely from Navy personnel; many were raised by assembling six-man Navy combat demolition units, Seabees, and others trained by the Joint Amphibious Scouts and Raiders School at Fort Pierce, Florida. All subsequent landings in the Pacific were preceded by UDT swimmers, who were instrumental in their success. All UDTs were subordinate to Underwater Demolition Flotilla, Amphibious Force, Pacific; and the Naval Combat Demolition Training and Experimental Base was established on Maui, Hawaii, in April 1944. By the war's end some 3,500 men were assigned to the UDTs, and it was planned to commit 30 teams to the invasion of Japan.

Advance Base Forces

Amphibious Force provided a number of prepackaged Advance Base Forces tasked with constructing, operating, and maintaining naval and air bases in theaters of operation. Many of their personnel were Seabees, augmented by Navy staff, technical and support personnel. The smallest force was an "Acorn" with 1,660 men (including an NCB), organized to construct, operate, and maintain an advanced landplane and seaplane base. An "Oak" was a large airbase unit with the same mission. A "Cub" was a 3,900-man unit (including two NCBs), capable of constructing and operating naval and air bases in a combat zone. A "Lion" was the largest of these advance base forces, made up of three-and-a-half to five NCBs, with 7,500–10,000 men, to build and run a major naval operating base.

ARMY ENGINEER AMPHIBIAN COMMAND

The Army possessed its own amphibious force in the form of the Engineer Amphibian Command (EAC), due to the Navy's inability to provide sufficient landing craft crews to support projected

2nd Engineer Special Brigade, 1944

HQ and HQ Company, 2nd ESB
 532nd, 542nd, & 592nd Engineer Boat and Shore Regts, each:
 HQ & HQ Company
 Boat Battalion
 HQ & HQ Co
 Boat Cos A–C
 Shore Battalion
 HQ & HQ Co
 Shore Cos D–F
 562nd Engineer Boat Maintenance Bn
 HQ & HQ Detachment
 1458th–1460th Engineer Maintenance Cos
 1570th Engineer Heavy Shop Co
 1762nd Engineer Parts Supply Ptn
 262nd Medical Battalion
 HQ & HQ Detachment
 Medical Cos A–C
 Quartermaster HQ & HQ Co, 2nd ESB
 162nd Ordnance Maintenance Co
 189th Quartermaster Gas Supply Co
 287th Signal Co
 695th Quartermaster Corps Truck Co
 3498th Ordnance Medium Maintenance Co
 5204th Transportation Corps Amphibious Truck Co
 Support Battery, Prov, 2nd ESB
 Medical Detachment, 2nd ESB
 4116th Army Service Forces Band

Army operations. A conflict arose between the Army and Navy over the responsibility for training boat crews and the control of landing craft units. It was eventually decided that the EAC would support shore-to-shore amphibious operations as opposed to ship-to-shore (the Navy's prerogative) in the European Theater, and would augment the Seventh Fleet to support MacArthur's Southwest Pacific Area – the Navy had limited capabilities in that area, as it was focused on the South and Central Pacific. The Command was established at Camp Edwards, Mass, in June 1942. The Army employed the 1st–4th Engineer Special Brigades in the Pacific (HQ only of the 1st ESB), each with three engineer boat and shore regiments. These were initially designated engineer *amphibian* brigades and regiments until May 1943, as the Navy was responsible for *amphibious* operations.

Engineer boat and shore regiments were viewed as “specialized” supply and transport units. Each 7,400-man brigade had 270x LCVPs, 270x LCM(3)s, 32x control boats, 51x patrol and fire and salvage boats, 21x utility boats, and 50x DUKWs. Some brigades formed a provisional support battery with amtracs mounting machine guns and 4.5in rockets. Regiments had an unnumbered boat battalion and a shore battalion, capable of providing an infantry division with all necessary landing craft and shore party support. The 2nd–4th ESBs operated in conjunction with the Seventh Amphibious Force in the northern Solomons, New Guinea, and the Philippines. The Army also possessed amphibian tank and tractor battalions, which frequently supported the Marines, along with DUKW-equipped Transportation Corps amphibious truck companies. Both the Army and Marines organized companies each with 50 of these “Duck” six-wheel-drive swimming trucks, which proved invaluable for delivering artillery and supplies, as well as evacuating casualties.

The business end of a Landing Vehicle, Tracked (Armored) Mk IV – LVT(A)4. This prototype amphibian tank is armed with a 75mm M3 howitzer mounted in the turret from an M8 self-propelled gun carriage. Production models would mount a .50cal machine gun atop the turret and a .30cal MG in the bow beside the driver's vision port. Although armored to some degree, “amtanks” were never an effective substitute for true tanks; they were a stop-gap to give the assault wave some heavy firepower until the Stuarts and Shermans could be landed.



LANDING FORCES

Amphibious warfare in the Pacific Theater is often assumed to have been dominated by the Marine Corps. While the Marines played an important role in the Pacific, the Army contribution was actually larger, since 21 Army divisions served there: 1st Cavalry (fighting as infantry), 6th, 7th, 11th Airborne, 24th, 25th, 27th, 31st, 32nd, 33rd, 37th, 38th, 81st, 93rd, 96th, 98th, and Americal Divisions, plus the Philippine Division (which capitulated after the 1942 invasion). Five separate infantry regiments also served in the Pacific: 102nd, 111th, 147th, 148th and 503rd Parachute, plus the 112th Cavalry serving as infantry. Three armies – Sixth, Eighth and Tenth – controlled these forces, along with I, IX, X, XI, XIV, and XXIV Corps. Eighteen Army divisions conducted 26 major amphibious operations.

The 1st–6th Marine Divisions (the last organized from the 1st Prov MarBde) fought in the Pacific under III and V Amphibious Corps (IIIAC and VAC). IIIAC was designated I Marine Amphibious Corps (IMAC) prior to April 1943.

IIIAC and VAC excluded "Marine" from their designations since they were intended as joint corps and might include Army elements. Their out-of-sequence designations reflected that they served with Third and Fifth Amphibious Forces. The six Marine divisions conducted 15 amphibious assaults, but in a higher proportion per division than Army divisions. Marine units were under the Fleet Marine Force controlling ground, air, and supporting operating forces. In June 1944 Fleet Marine Force, Pacific (FMFPac) was established to control both corps, Marine Aviation, and logistical activities.

While Army and Marine divisions were similarly organized and armed, there were some significant differences. Army infantry division structure remained constant through the war with only minor strength changes; however, Marine divisions underwent annual changes.

An **Army infantry division** had three infantry regiments, each with three infantry battalions with cannon, antitank and service companies plus a medical detachment. Division artillery had one 155mm and three 105mm howitzer field artillery battalions. Combat engineer and medical battalions plus signal, ordnance light maintenance and quartermaster companies, plus a company-size reconnaissance troop, completed the division. Attachments for amphibious operations varied, but by late in the war typically consisted of two or three additional combat engineer battalions, tank and antiaircraft artillery battalions, plus an ordnance ammunition company, a field hospital, and one or two portable surgical hospitals.

A **Marine division** began the war with three infantry regiments each with three battalions and a weapons company; an artillery regiment with one 105mm and three 75mm howitzer battalions; plus amphibian tractor, engineer, light tank, medical, pioneer, service, and special weapons (AT and AA) battalions. An engineer regiment was added in 1942, comprising the existing engineer and pioneer battalions plus a Seabee battalion; this regiment was dissolved in 1944, the engineer and pioneer battalions being retained and the NCB reverting to Navy control. From late 1942 to early 1944 the artillery regiment had three 75mm and two 105mm battalions; this was reduced to two battalions of each caliber in 1944, and by 1945 all four battalions were 105mm. The

amtrac battalion was reassigned to FMF Troops in May 1944, and the special weapons battalion was deactivated. A motor transport battalion was assigned in late 1943. A defense battalion with coast defense and AA weapons usually accompanied a Marine division; in early 1944 these were split to form AAA and 155mm gun battalions, which were assigned to corps troops. A Seabee battalion was also attached

40th InfDiv troops land unopposed from 2nd Engineer Special Bde Landing Craft, Vehicle or Personnel - LCVPs - and Landing Craft, Medium Mk III - LCM(3)s - on Panay Island in the Philippines, March 1945. In preparation for the landings Filipino guerrillas had secured many beaches in advance.





The number of shore party troops necessary to conduct round-the-clock unloading of beaching craft was initially underestimated. Besides dedicated pioneer and engineer troops, reserve infantry battalions were employed as stevedores during the first days of a landing, until released to the forward combat units.

when not organic to the engineer regiment, as well as medical and small service units.

Marine divisions typically organized their service and special troops units into "groups" for the conduct of an assault. These varied, but might include armored amphibian tractor, amphibian tractor, artillery, antiaircraft, engineer, shore party, supply, service, medical, and reserve groups. Such groups were built around the basic divisional unit, minus detachments to the regimental combat teams (see below), plus augmentation units, and were commanded by the principal unit commander.

The Army and Marine infantry regiments were task-organized into **regimental combat teams** (RCT, or simply CT). Exact organization varied greatly depending on the mission, situation, and available supporting units. Army RCTs usually had a light or medium tank company, engineer combat company and medical collecting company, plus detachments from divisional signal, supply, maintenance, and joint assault signal companies, plus a shore party comprising a non-divisional engineer company or even a battalion. A 105mm field artillery battalion was usually attached. A Marine RCT generally had engineer, pioneer, Seabee, light or medium tank, medical, and motor transport companies, plus a 37mm AT battery and 40mm AA gun platoon from the special weapons battalion, and MP, ordnance, and supply & service platoons, a joint assault signal company detachment, and a band section as litter- (stretcher-) bearers. Early in the war the Marines too would

The DUKW-353 ("Duck") amphibian truck proved invaluable for landing artillery, ammunition, and other supplies as well as evacuating casualties. This one is fitted with an A-frame boom for unloading cargo from other vehicles.



attach an artillery battalion, but from early 1944 artillery battalions were landed separately and kept under division control.

Infantry battalions were similarly task-organized as **battalion landing teams** (BLT or simply LT). The various units attached to RCTs were not always broken down to BLTs; most were kept under RCT control, and elements could be attached to battalions as needed. A BLT might include an AT gun platoon from regiment, and maybe an engineer platoon (often organized into assault teams with flamethrowers and demolitions); self-propelled AT guns were sometimes attached, together with shore and beach communication teams, shore fire control and air liaison parties. One or two tank platoons were often attached, but they came ashore in later waves and did not land with the assault waves – the initial assault relied upon amphibian tanks.

The Marine and Army corps often task-organized very differently depending on the situation and available supporting units. In some instances very few corps assets were committed, as the objective islands were small and fighting was expected to be brief; but complete and

augmented corps units were deployed for larger and longer-duration operations. Corps troops included significant logistical and service support units, engineer, signal, and medical units, and several battalions of corps artillery. The number of antiaircraft battalions attached to a division or corps depended on the degree of the air threat and proximity to Japanese airbases.

Examples, Regimental Combat & Battalion Landing Teams:

Guam, July 1944

21st Combat Team, 3rd MarDiv

21st Marines (Reinforced)
1st & 2nd Ptns, Co B, 3rd Tank Bn
Co B, 1st Bn (Engineer), 19th Marines
2nd Bn (Pioneer) (– Cos D & F), 19th Marines
Co H (+ detachment, HQ Co), 25th Naval Construction Bn
2nd Ptn, 3rd Reconnaissance Co
Co B, 3rd Motor Transport Bn
Co B, 3rd Medical Bn
2nd Messenger Dog Section (– one squad),
2nd Marine War Dog Ptn
2nd Scout Dog Section (– one squad), 3rd Marine War Dog Ptn
Detachment, 3rd Joint Assault Signal Co
2nd Band Section

306th Regimental Combat Team, 77th InfDiv

306th Infantry Regiment (Reinforced)
304th Field Artillery Bn (105mm howitzer)
132nd Engineer Combat Bn (shore party)
Co B, 302nd Engineer Combat Bn
Co B, 706th Tank Bn
Co B (Collecting), 302nd Medical Bn
Bty B, 7th AAA Weapons Bn (Semimobile)
1st Ptn, 36th Medical Field Hospital
Detachment, 77th Signal Co
Detachment, 777th Ordnance Light Maintenance Co
Detachment, 292nd Joint Assault Signal Co

New Britain, 1943 (BLT detached for independent mission)

Battalion Landing Team 21, 1st MarDiv

2nd Battalion, 1st Marines
Bty H, 3rd Bn, 11th Marines (75mm howitzer)
4th Ptn (37mm AT), Bty A, 1st Special Weapons Bn
2nd Ptn, Co B, 1st Amphibian Tractor Bn
1st Ptn (Surgical), Co B, 1st Medical Bn
37mm AT Gun Ptn, Weapons Co, 1st Marines
Detachment, Co C, 583rd Signal Radar Bn (Army)
Detachment, Prov Boat Bn, 592nd Engineer Boat & Shore Regt (Army)
Detachment, Australia-New Guinea Administrative Unit (porters)

Amphibian tractors and tanks

“Amtracs” and “amphibian tanks” proved to be essential for amphibious assaults. Early in the war amtracs were viewed only as carriers to deliver supplies over coral reefs and haul them inland to the front line. The Marines used them to land assault troops for the first time at Tarawa, and the Army at Makin in November 1943. From that point most amphibious assault waves were landed by amtrac. They proved so crucial to an operation’s success that MajGen Holland Smith recommended that Marine and Army divisions be supported with 312x LVT(2)s – three amtrac battalions – and a battalion of 75x LVT(A)1 amphibian tanks. Most Army landings on New Guinea and the Philippines were still conducted by landing craft, however, as there was little or no resistance at the water’s edge.

It was a different matter on the smaller Pacific islands, where amtracs were crucial: landing craft often could not cross the fringing coral reefs, in which case the troops would be forced to wade long distances across reefs exposed to heavy fire. Normally an amtrac battalion landed an RCT, and one or more amphibian tank companies led the assault, “shooting” the assault waves ashore. An



Two LCT(5)s offload cargo; besides three medium tanks, an LCT could carry a huge amount of general supplies. The beach space dilemma is vividly demonstrated here – the beachmaster is probably trying to decide where to dump the arriving cargo.

amtrac battalion had three companies (though sometimes one or two additional companies), each with 30x vehicles. A company could land an infantry battalion. Army and Marine amtrac battalions were organized the same; so were Marine “armored amphibian tractor” and Army “amphibian tank” battalions – only the names differed. These battalions usually had three companies of 18x amphibian tanks, or LVT(A)s.

Usually the amtrac units reverted to division or even corps control once the initial landing was accomplished. They were then used to land supplies and haul them forward, evacuate wounded, establish beach defenses against a Japanese counter-landing, relocate reserves, etc. Amphibian tank units would also establish beach defenses and provide indirect fire support, but they were far from being as effective as true tanks once beyond the beach. Amtracs could cross reefs and soft sand, negotiate most swamps, and bust through brush and light trees, but they had limitations. Their low ground clearance and narrow tracks hindered them on rough ground, and deep craters, antitank ditches, extensive rubble and debris, deep mud, large rocks or tree stumps could halt them. They had a high profile, were unarmored (even rifle

Basic data, Amphibian Tractors & Tanks

Mark	Quantity built	Armament	Troops/cargo	Crew	First employed
Amphibian Tractors:					
LVT(1) Alligator	540	1x.50cal, 1x.30cal	20/ 4,500lbs	3	Guadalcanal 1942
LVT(2) Water Buffalo	1,355	1x.50cal, 3x.30cal	24/ 6,500lbs	3–4	Tarawa 1943
LVT(3) Bushmaster	2,962	1x.50cal, 1x.30cal	24/ 12,000lbs	3	Okinawa 1945
LVT(4)	1,765	1x.50cal, 1x.30cal	24/ 8,000lbs	3	Saipan 1944
Amphibian Tanks:					
LVT(A)1	182	1x37mm, 1x.50cal, 3 or 4x.30cal	–	6	Roi-Namur 1944
LVT(A)4	533	1x75mm howitzer, 1x.50cal, 1x.30cal	–	5	Saipan 1944



Moving supplies and equipment off Iwo Jima's narrow beaches, fringed with steep terraces of coarse volcanic sand, posed special problems. The terraces were between 8ft and 15ft high, angled at from 40 to 45 degrees – and then the ground rose even higher. It was impossible for wheeled vehicles to climb the terraces, and few tracked vehicles could manage it either; most would bog down, their treads finding no purchase in the sand. Those that did make it to the top usually sank up to their bottom frames; as they spun their treads in an effort to move forward they dug themselves in deeper, piling up banks of sand behind them and thus creating another obstacle for following vehicles.

fire penetrated the sheet steel hulls) and vulnerable to mines, their gasoline engines made them highly flammable, and their machine gunners were exposed. If they ran out of fuel at sea (fuel capacity was limited), their engine-driven bilge pumps quit, and they sank rapidly. Amphibian tanks were found to be no substitute for conventional tanks and suffered most of the same limitations as amtracs; they had less ability to cross obstacles, were slower and had lighter armor than conventional tanks, and their high profile made them easy targets

Shore parties

Once a landing had been accomplished, shore party support was essential and manpower requirements immense. The arrival of supplies and equipment on landing beaches quickly led to congestion and confusion, as supplies piled high and units competed for scarce space in the developing beachhead; moreover, timely distribution of critical supplies was essential for the troops in combat inland. Across-the-beach logistics is one of the unique and, often, most difficult components of amphibious warfare. It was also the least developed early in the war, and its evolution was continuous. The concept of the fully integrated shore party, with Navy, Marine and Army elements, was central to success.

Previously, two separate organizations had been responsible for the logistic effort. The “beach party” was a Navy organization, under a Beachmaster; it was responsible for beach reconnaissance, marking beaches and navigation hazards, removing obstacles, selecting dump and bivouac sites, supervising the unloading of troops and supplies, constructing landing facilities (beach ramps, causeways, etc), sorting and storing supplies in dumps, controlling landing boats and beach traffic, and casualty and prisoner evacuation. The “shore party” was a Marine or Army organization, under the control of the Landing Force Commander,

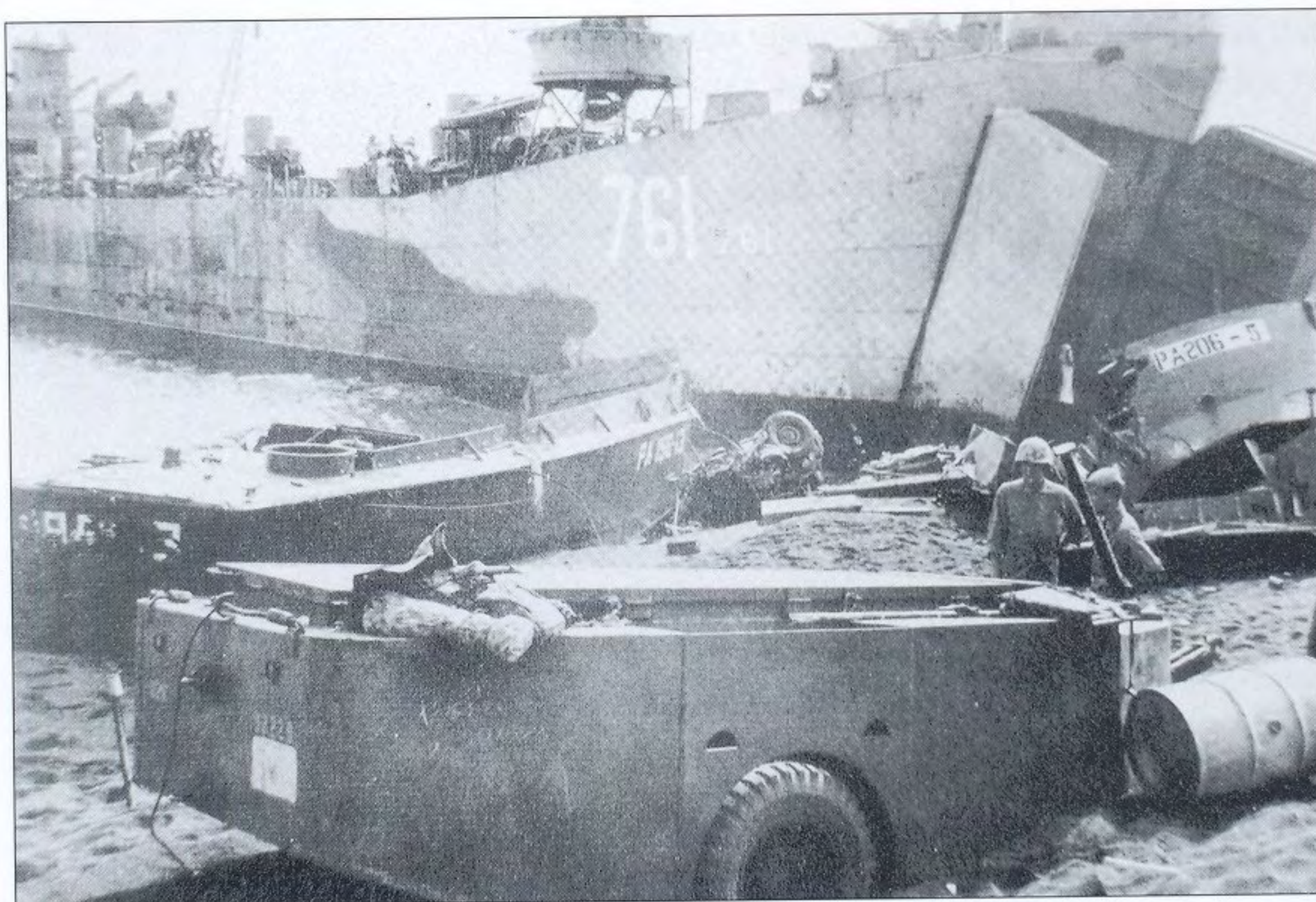
responsible for selection and marking of routes inland, assignment of bivouac areas and dumps, movement of units and supplies from the beach to the fighting front, and control of stragglers and prisoners.

The structure of each organization was not specified; it was task-organized from available assets as the mission required. In theory the beach party controlled activities on the beach while the shore party was responsible for the rest of the beachhead beyond the dune line. A major flaw revealed by pre-war landing exercises was the independent operation of each party, leading to predictable problems of communications, coordination, and demarcation of responsibilities. In August 1941, MajGen Holland Smith recommended that the two organizations be consolidated into the Shore Party, responsible to the Landing Force Commander – since its mission was to support troops ashore. Dedicated work details were to be established in order to prevent drawing from the landing force's fighting strength. The Navy Beachmaster was designated as an assistant to the Marine/Army Shore Party Commander. The concept was approved on August 1, 1942, just in time for implementation in the Guadalcanal landing.

The Marines and Army solved the need for manpower to unload landing craft differently. The Marines organized divisional pioneer battalions in early 1942. Other elements included detachments from engineer, supply and service, motor transport, medical, signal, joint assault signal, and military police units. The Marines also made heavy use of Seabee battalions in the shore party, and formed depot and ammunition companies to serve as stevedores. The Army had shore battalions as a component of the EAC boat and shore regiments, and when these were unavailable (as in the Central Pacific and Okinawa) employed combat engineer battalions in this role. The Army also employed detachments drawn from similar units as the Marines, plus Transportation Corps port companies, who were essentially stevedores.

The pre-war rule of thumb specified 100 men to unload each cargo ship discharging on the beach. Experience led to higher strengths: 150 men to unload cargo ships, transports and LSTs, 50 per LCT, and 25 per LCI. Infantry units held in reserve were employed for this purpose until required at the front. From early 1945 replacement drafts accompanied Marine divisions and were initially assigned to the Shore Party; once the major part of the unloading was accomplished, they were released to combat units after about five days.

All Marine and Army shore elements and the Navy beach party were consolidated under provisional corps and divisional shore party groups, usually commanded by senior logistics or engineer officers and tailored for each operation. The Shore Party for a division was broken down into RCT and BLT shore parties. A BLT shore party was built around a pioneer platoon in the Marines, and in the Army either a shore company (when boat and shore regiments were available) or a combat engineer company. Both had joint assault signal company detachments (see below). Functionally the Shore Party was organized into " platoons" and "sections", though these were larger in size than those terms suggest. The headquarters platoon – provided by the pioneer, shore or combat engineer company, augmented by elements from service units – included command, reconnaissance, map, and liaison parties and supply, mess, and medical sections. The service platoon was provided by



Landing Ship, Tank, No 761 provides the background for two wrecked Landing Craft, Vehicle or Personnel, marked as boat 13 from APA-196 and boat 5 from APA-206. In the foreground is a Clever-Brooks 3½-ton amphibian cargo trailer; this was provided with watertight hatches on top and internal floatation chambers. They proved to be difficult to tow with amtracs, and usually made only a one-way trip to shore.

fulfill engineer tasks such as making beach-to-dump roads, clearing dump sites, removing mines and obstacles, and demolitions. Attack transports and attack cargo ships provided 100-plus-man ship platoons for unloading. The Navy Beach Party had three officers and 43 enlisted men provided by attack transports, in command, hydrographic, boat repair, communication, and medical sections.

One of the most effective organizations developed to support amphibious assaults ashore was the **joint assault signal company**. JASCOs consisted of Marine or Army and Navy personnel (including aviation liaison officers). Battalion-size joint assault signal "companies" began to be formed in late 1943 to replace *ad hoc* shore fire control and air control parties. JASCOs were capable of coordinating and controlling naval gunfire and close air support. The companies had an 87-man company headquarters, a 30-man shore and beach communication team, and a four-man air liaison party attached to the division headquarters. There were three RCT sections each with three 20-man shore and beach communication teams; three seven-man shore fire control parties; and four four-man air liaison parties – with one of each attached to the three battalions, plus an air liaison party attached to the regimental headquarters.

COMMAND, CONTROL & ORGANIZATION

While the organization of no two operations was the same, there were basic similarities. Overall command was the responsibility of Commander-in-Chief, Pacific Fleet & Pacific Ocean Area (CINCPAC/POA). The assigned numbered fleet commander had immediate on-the-scene control of the operation. He controlled the Joint Expeditionary Force conducting the amphibious assault, as well as the Fast Carrier Force supporting the operation, Land-based Air Forces, Submarine Forces, and certain reserves and follow-on garrison forces.

the bulk of the pioneer, shore or combat engineer company, and was broken into a beach labor "section" with stevedore platoons, and a dump labor and records section. The communication platoon operated radio and telephone nets, a message center, and visual signals. The shore platoon had weapons, engineer, military police, and motor transport and repair sections, to direct traffic, control stragglers and prisoners, make emergency vehicle repairs, provide local defense, and

The commander of that fleet's Amphibious Force usually doubled as the Expeditionary Force Commander (a term used from early 1944). He would control one or two Attack Forces, a Reserve Force (Expeditionary Force Floating Reserve), and certain service forces. In many operations two attack forces were employed, as two separate islands (e.g. in the Marshalls or the Marianas) were to be seized, or two corps were to be landed on a large island (e.g. in the Philippines or Okinawa.) An attack force would deliver and support anything from a reinforced regiment or a division to a corps.

A "typical" Attack Force delivering an infantry or Marine division was built around the Landing Force, with a transport group of two or three transport divisions, each with three or four attack transports, an attack cargo ship, an LSD, and possibly a troop transport in lieu of the fourth attack transport. The Tractor Group might include eight to ten LSTs carrying amtracs. The Control Group would consist of a few submarine chasers and small control boats to coordinate and guide the assault waves; and destroyer-transports (APDs) carrying UDTs were usually assigned to the Control Group. A half-dozen or so destroyers comprised the Transport Screen. The Fire Support Group might consist of two or four old 14in-gun battleships, two or three heavy and light cruisers, eight to ten more destroyers, and one or two LCI divisions, each with six rocket-firing LCI gunboats. Fire Support Groups were usually subdivided into mixed "units" of several types of ships assigned specific target areas. The Carrier Support Group had three escort carriers, each with nearly 30 fighters and torpedo-bombers to provide close air support, and escorted by three or four destroyers. A Mine Sweeping & Hydrographic Group of varied size was necessary to sweep the approaches and entry channels. There would also be a mixed bag of defense and garrison groups transporting follow-on forces to hold and develop bases on the islands; these would be transported aboard LSTs, troop transports, and cargo ships. A Floating Reserve would be carried in similar ships or in attack transports. Service, salvage, and fueling groups might also be involved.

Corps and division commanding generals were normally "double-billeted" as Commander, Troops & Landing Forces. They were responsible for the control of assault troops and supporting units during the landing and subsequent operations ashore. The Troops & Landing Forces designation, or variations thereof, was applied to assault units when two or more major units were to land on the same island, but separated by distance or a major terrain feature, or if they were to land on different islands within the same group. These designations were usually named after cardinal directions in relation with the associated forces, e.g. Northern Troops & Landing Force, Western Landing Force, etc. The

Example, Attack Force: Saipan, June 1944

Task Force 51 Joint Expeditionary Force

Task Force 52 Northern Attack Force

Task Group 52.3 Transport Group ABLE

(2nd MarDiv embarked) 9x APA, 2x AP, 3x AKA, 2x AK, 2x LSD

Task Group 52.4 Transport Group BAKER

(4th MarDiv embarked) 9x APA, 4x AP, 3x AKA, 2x AK, 3x LSD

Task Group 52.8 Eastern Landing Group

(1st Bn, 2nd Marines embarked) 6x APD

Task Group 51.1 Joint Expeditionary Force Reserve

(27th InfDiv embarked) 7x APA, 7x AP, 1x AKA, 1x AK, 6x DD, 6x DE, 1x ATF, 1x AN, 1x AKN

Task Group 52.12 Transport Screen

15x DD, 1x APD, 4x PCE

Task Group 52.5 Tractor Flotilla

Tractor Group ABLE 21x LST

Tractor Group BAKER 27x LST

Task Group 52.6 Control Group

(UDTs 5 & 7 embarked) 3x APD, 14x SC, 7x LCC, 25x LCI

Task Group 52.17 Fire Support Group One

4x BB, 2x CA, 2x CL, 16x DD

Task Group 52.10 Fire Support Group Two

3x BB, 4x CA, 2x CL, 9x DD, 2x APD, 1x AV, 2x AM

Task Group 52.14 Carrier Support Group One

4x CVE, 5x DD

Task Group 52.11 Carrier Support Group Two

3x CVE, 6x DD

Task Group 52.13 Minesweeping & Hydrographic Survey Group

14x AM, 5x YMS, 12x LCC, 6x LCV

Task Group 52.7 Service & Salvage Group

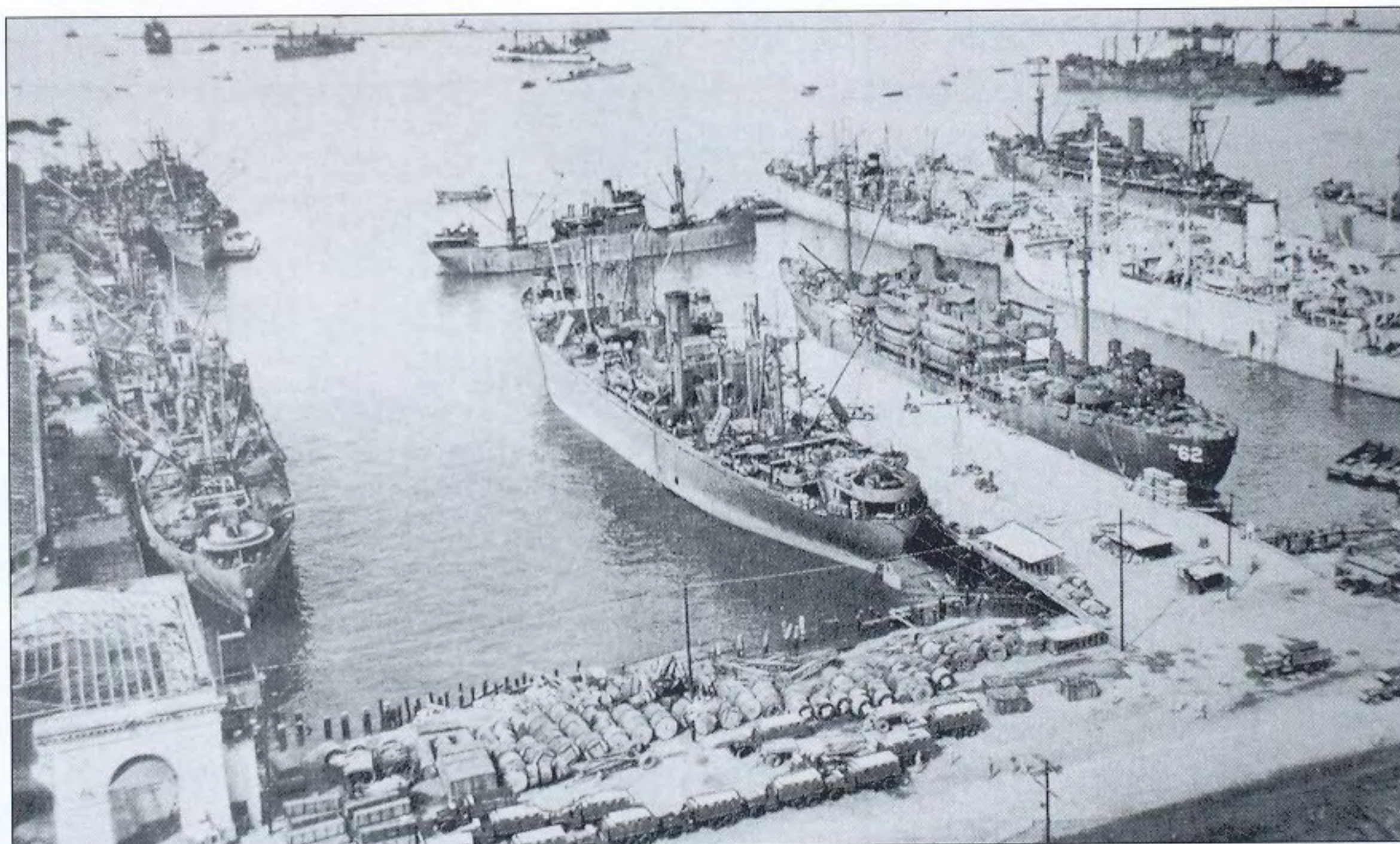
3x ATF, 1x AR, 2x ARS, 1x AV, 1x ARK

Task Group 50.17 Fueling Group

4x CVE, 7x DD, 19x DE, 21x AO, 4x AH

Task Unit 99.3.5 (8th, 9th & 11th Naval Construction Bdes)

The mounting of an amphibious operation was a major undertaking requiring weeks to assemble the ships; to develop embarkation orders and combat-loading plans; to physically load the masses of vehicles, equipment, munitions, supplies and troops; and finally to depart in stages, with the slower ships, such as the LST flotillas, leaving earlier.



assault was under the direct command of the commander of the Attack Force, the naval force delivering the landing force. Once the beachhead was established, command of combat operations ashore was formally passed to the Landing Force commander, usually within hours of the landing. The Attack Force commander continued to provide naval gunfire and CAS, send troops and supplies ashore, evacuate casualties, etc.

Deploying the Landing Force

Rifle companies were usually organized into "boat teams," essentially split rifle platoons, each team assigned to a single amtrac or LCVP; they would fight as individual teams until a lull in the action allowed them to reorganize into platoons. Companies retained no reserve, though they usually fought with two platoons forward and one in support. Battalions usually landed with two, sometimes three companies abreast, but even in the latter case one company would normally go into reserve once the immediate landing area was cleared. Regiments almost always held a battalion in reserve and commonly landed two battalions abreast.

Divisions normally landed with two regiments abreast and one held as the Division Reserve; on occasions when all three regiments landed abreast, one or two battalions detached from regiments would form the Division Reserve. Regiments contributing battalions to the Division Reserve might retain a single company in reserve. Early in the war the Division Reserve was retained afloat and landed when necessary, but it became apparent that it was beneficial to land it late on D-Day if space was available on the beachhead; this allowed it to be employed immediately when needed. The Corps Reserve was usually held as a floating reserve until needed. In the first days after a landing there was a reluctance to commit all of the reserve, as the situation might change rapidly. Once the situation had stabilized and the main Japanese resistance in the landing area was broken, there was more willingness to employ the reserve in the line. This might occur only after several days in some instances, but after mere hours in others.

Because of increasing casualties, with few if any replacements immediately available, units were able to take and hold narrower and

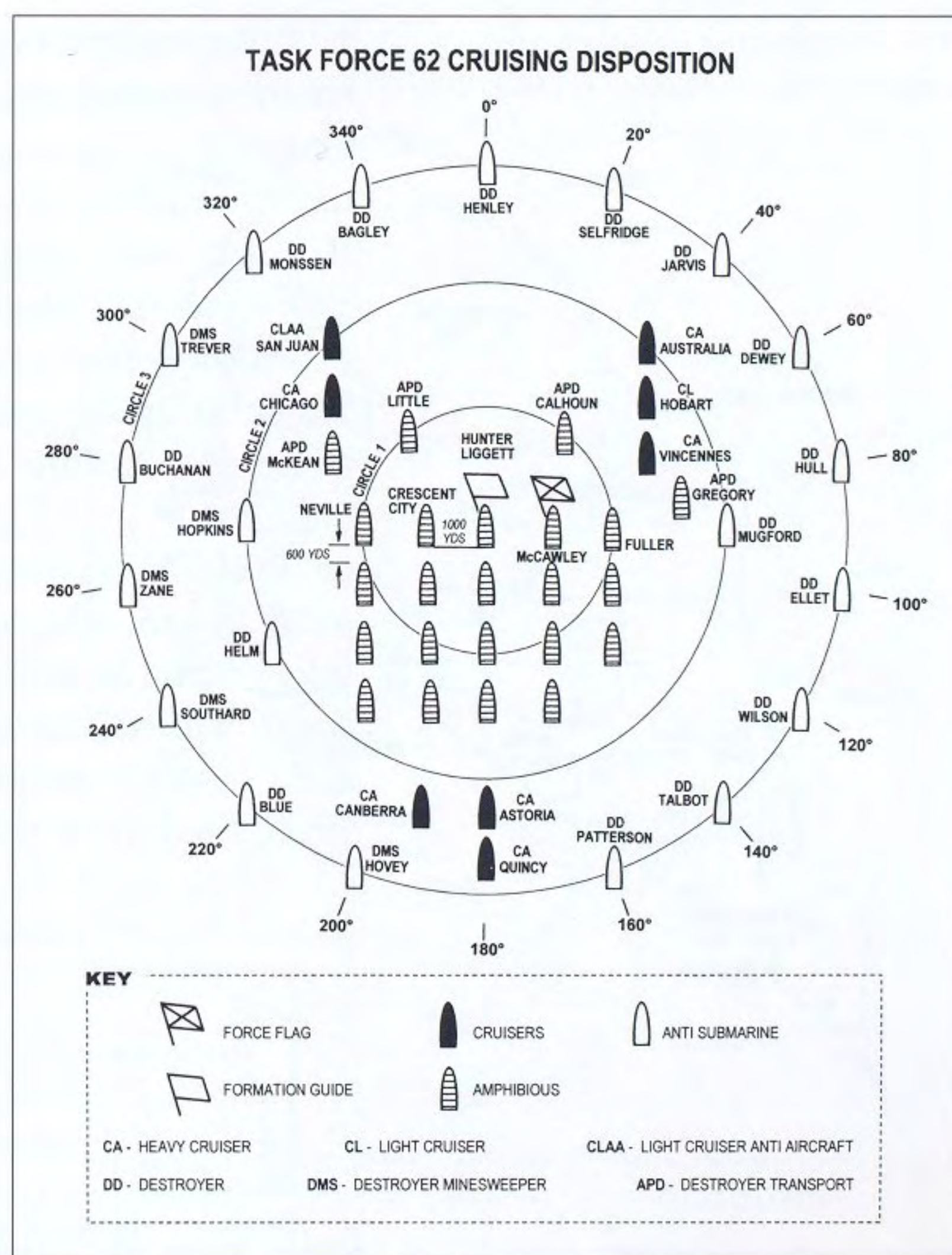
narrower frontages as the seizure of the island wore on. This often necessitated placing the reserves into the line at any or all levels, depending on unit strength, enemy resistance, terrain, etc. Committing reserves into the line had serious consequences beyond simply the immediate advantage of the ability to meet Japanese counter-attacks. (In most instances such enemy threats were limited, as by the later stages of an operation they too had suffered heavy losses including the destruction of most of their heavy weapons.) Retaining a reserve at any level allowed units to rotate for rest and refit behind the fighting line. With all units committed, all the troops became exhausted more or less simultaneously, and there was no comparatively rested unit available to exploit a favorable situation – e.g. seizing a key hill that the assault troops were too worn out or depleted to capture. Reserves were also necessary to mop up by-passed pockets of resistance, stragglers and infiltrators – all serious problems.

While divisions strove to retain a regiment in reserve, they were often able to keep back only one or two battalions. This was especially the case in the latter stages of the campaign, as Japanese resistance and capabilities rapidly decreased. It was common for a battalion from the reserve regiment to be attached to a forward regiment, and for battalions to be “cross-attached” between regiments and even divisions in the face of changing situations and terrain. On Saipan, for instance, at one point the single Army and two Marine divisions, each of which began with nine battalions (plus a spare separate Marine battalion), were untidily cross-attached (though this is an extreme example – divisions usually retained their organic battalions):

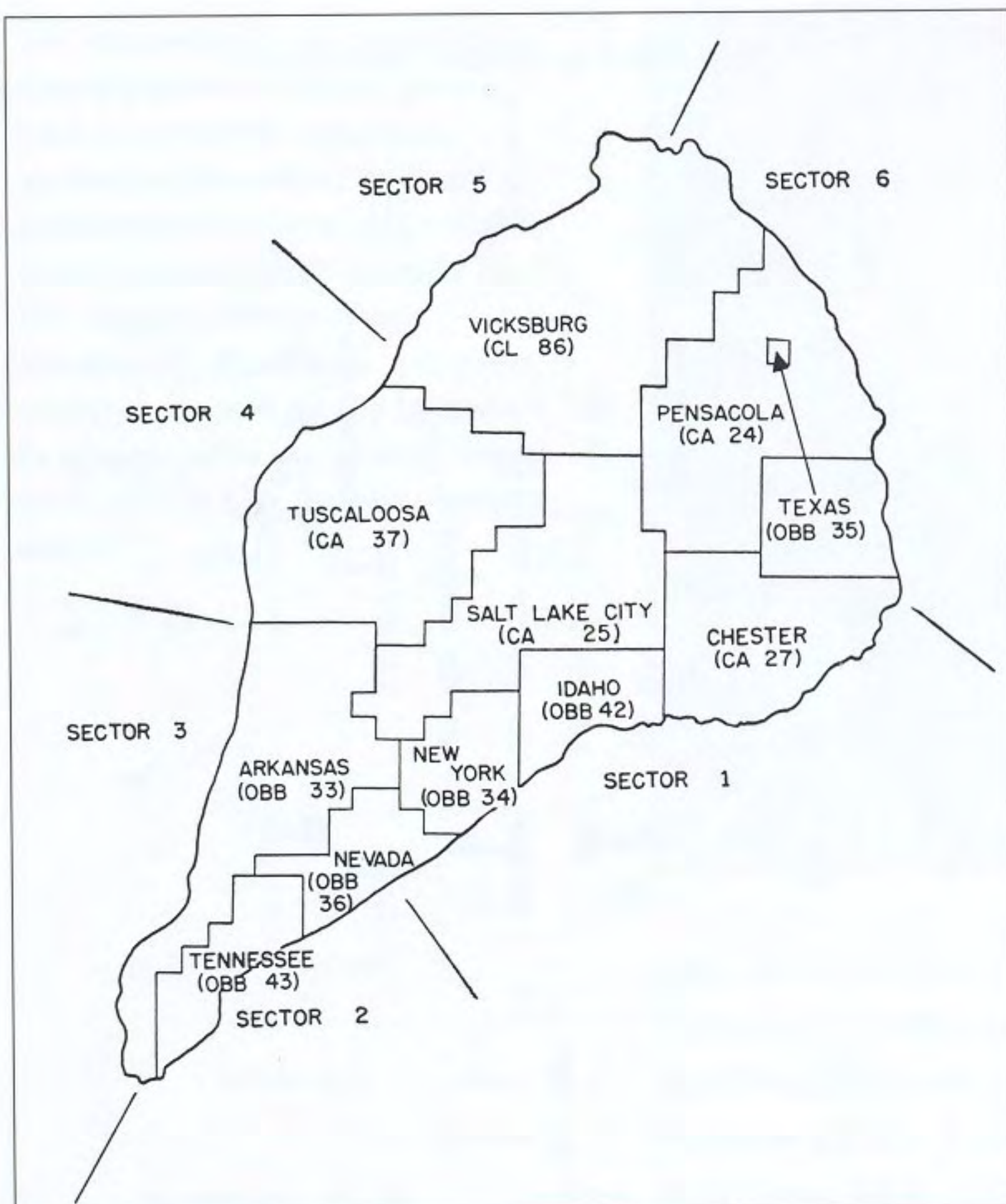
2nd MarDiv	10 Marine battalions
4th MarDiv	6 Marine bns, 3 Army bns (from 2 regts)
27th InfDiv	5 Army bns (from 3 regts)
Corps Reserve	3 Marine bns
Garrison Force	1 Army bn (rear mop-up)

The Corps Reserve might initially be a division retained afloat, but it was soon committed, and often only a regiment was held as the Corps Reserve. Other reserves included an Expeditionary Troops or Fleet Reserve, usually a division. This force may or may not have accompanied the task force, but was often held in readiness at a distant island base, requiring several days to embark and arrive at the objective island. This division, since it was combat-ready and seldom committed to the operation it supported, was tasked for the next island in the campaign. Additionally the theater commander often designated an Area Reserve, requiring perhaps two weeks or more to commit; in the event this never proved necessary.

Garrison Forces consisted of follow-on units – initially under the control of Commanding General, Expeditionary Troops – responsible for



This diagram shows the formation employed by Task Force 62 en route to Guadalcanal, August 1942; the amphibious force is led and followed by cruisers, and surrounded by outer rings of destroyers.



Naval gunfire areas of responsibility for the last day's bombardment of Iwo Jima (D-1), designating sectors and specific ship target areas. OBB is the code for a 14in-gun battleship, CA for an 8in-gun heavy cruiser, and CL for a 6in-gun light cruiser.

units from the landing force for rear area mop-up and security.

Demarcation in time and place

Numerous control measures were employed to manage amphibious operations in the form of designated areas, boundaries and lines. These, like all other aspects, were evolutionary and varied between operations.

D-Day was the day on which an amphibious assault or other operation commenced. H-Hour was the specific time on D-Day at which an assault commenced – when the first landing wave came ashore. Dates and times of scheduled events were usually specified in relation to D-Day and H-Hour, so that if D-Day or H-Hour were brought forward or postponed the

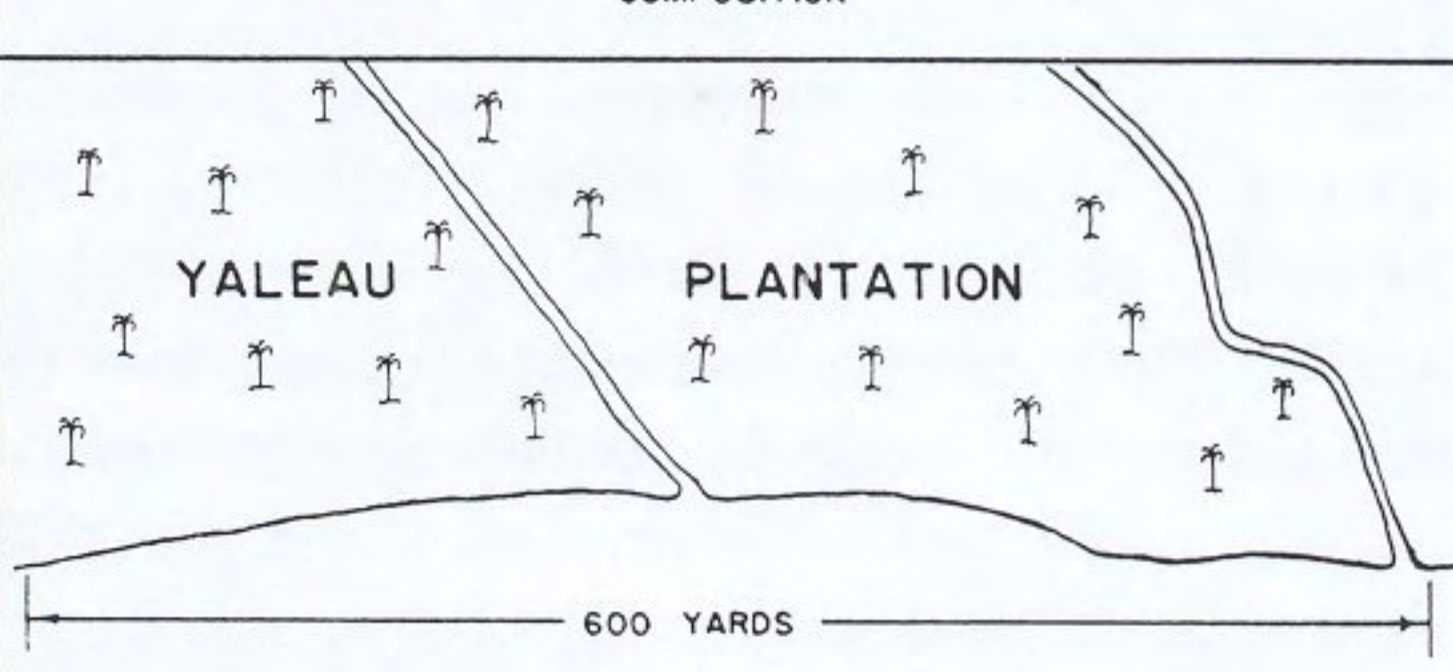
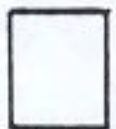
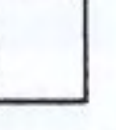
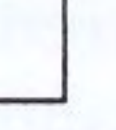
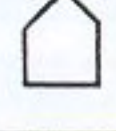
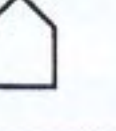
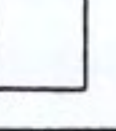
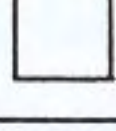
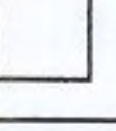
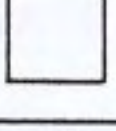
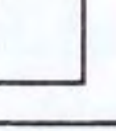
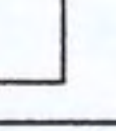
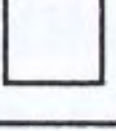
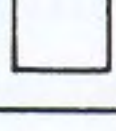
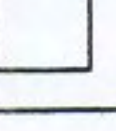
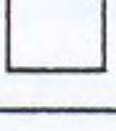
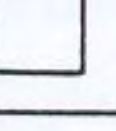
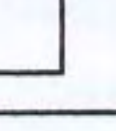
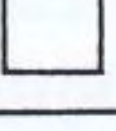
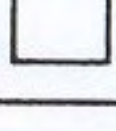
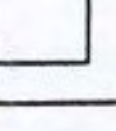
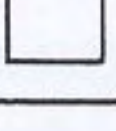
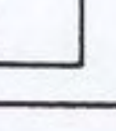
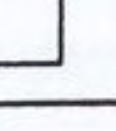
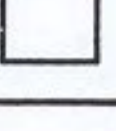
securing and developing a captured island as an advanced naval and/or air base. Once Commander, Troops & Landing Forces declared the island secure, the responsibility for it was turned over to Commander, Garrison Forces. The Garrison Forces consisted of a base headquarters, antiaircraft or defense units, infantry units for mopping up and security, military police, medical, civil affairs (military government), Navy advance base units, engineer and naval construction units, depots, hospitals, and various service troops. Garrison Forces were joint organizations composed of Marine, Army, and Navy elements. Commander, Garrison Troops might be designated the Island Commander or be subordinate to the Island Commander. Often the least battered regiment which had participated in the assault was retained under the Garrison Force for mopping up, which might continue for weeks or months. In some instances the Garrison Force was given responsibility for the rear area while the island was still contested, to permit early construction/repair of an airfield, and it might be detailed infantry

Reserve troops of the 4th Marines wade ashore on Guam, July 21, 1944. Early in the war a division's reserve Regimental Combat Team (often called the Reserve Group) had fewer augmenting units attached than the assault regiments. By early 1944 reserve RCTs usually had the same augmentation as assault regiments, thus allowing maximum flexibility in their employment.



planned timetable of related events would also change automatically. For example, if D-Day was May 10 and the preliminary shore bombardment was scheduled to begin on the 8th, it would be designated in plans to begin on D-2 (D-Day minus two days). If a certain objective ashore was to be secured by the 13th it was specified as D+3 (D-Day plus three days). If D-Day was moved to the 11th, the bombardment would still begin on "D-2," but now on the 9th. From early 1944, to prevent confusion, other letters were often used to designate days and hours when multiple operations were conducted on adjacent islands or on different dates in the same area.

Designated routes were prescribed for different groups of ships to approach islands and enter lagoons. Likewise, specific areas were designated in which ships anchored or operated. For example, the Transport Group anchored in the Transport Area; Naval Gunfire Areas were designated for each Fire Support Group to operate in; and LSTs were assigned their own LST or Tractor Area in which to debark their

YALEAU OPERATION		LANDING DIAGRAM RED BEACH		5 MARCH 1944	
WAVE	TIME	COMPOSITION	CRAFT	TROOPS	
					
1	H-HOUR (0735)	     	4 LCVP 2 LCM	300	
2	H+5 (0740)	     	6 LCVP	180	
3	H+10 (0745)	     	6 LCVP	180	
4	H+15 (0750)	     	6 LCM	348	
5	H+40 (0815)	     	6 LCVP	36	
6	H+60 (0835)	     	6 LCM	120	
7	H+75 (0850)	     	6 LCM	78	
8	H+100 (0915)	     	6 LCM	42	
9	H+125 (0940)	     	6 LCM	64	

This 542nd Engineer Boat & Shore Regt landing diagram for Yaleau Plantation, northwest of Saidor, New Guinea, in March 1944 provides the time each wave was to land, numbers and types of landing craft, and numbers of troops in each wave.

amtracs and for the amtracs to assemble. The assault waves formed up on line in assembly areas; and each regiment or battalion was assigned boat lanes, cleared by UDTs, along which to approach their assigned beach.

When amphibian tanks were employed they either preceded the assault waves as Wave 0, or comprised part of Wave 1, with three tank platoons swimming in groups on either flank and in the center of the troop amtrac wave. At least a regiment's two assault battalions were landed aboard amtracs, as was the reserve battalion if sufficient amtracs were available. The number of waves depended on the width of the beaches and how many units were landing abreast. Light or medium tanks were landed in LCMs immediately after the assault battalions, usually in Wave 4, 5, or 6; then headquarters elements, engineers, medical units, shore parties, other support elements, and finally artillery. When landing craft were employed LCVPs were substituted for amtracs.

The chief control officer/beachmaster was in the primary roving control boat for an RCT. Liaison officers accompanied him from the RCT, amtrac battalion, supply staff, and medical unit, authorized to make on-the-spot decisions and coordinate amtrac movement, supply flow, and casualty evacuation. The regimental commander was in a second control boat on one flank and an assistant Navy control officer on the other flank. These boats might be sub-chasers (SC), LCCs or patrol craft (PC). LCP(L) and LCVP guide boats aided in the assembly and station-keeping of assault waves, with one on each flank of each wave. Force, group, and transport division control officers were also aboard control boats. Once the assault waves landed the control boats coordinated and guided subsequent waves, controlled returning craft, directed rescue and salvage, expedited casualty evacuation, and carried out myriad other control tasks. Communication was accomplished by radio, loudspeaker, signal and semaphore flags, and blinker lights.

The assault waves usually formed up 1,000–6,000 yards from shore, just short of the "line of departure." Control boats flew a flag identifying the beach color and number (e.g., a white flag with three vertical blue bars for Beach BLUE 3). The primary control boat signaled the release by rapidly lowering a red "Baker" flag. When the command was given to release the assault waves it usually took from 10 to 30 minutes to reach the beaches, depending on sea conditions and distance. In instances when assault troops were boated from their transport ships aboard LCVPs and transferred to amtracs launched from LSTs, a "tractor transfer line" was established where this was accomplished.

These lines were coded by the color designating the beach; at the beginning of the war these were RED, BLUE, GREEN, YELLOW, ORANGE, and WHITE. Two separately identified beaches of each color could be assigned and designated, initially e.g. RED and RED TWO; but it was soon realized that to prevent confusion both beaches required numbers, e.g. RED ONE and RED TWO. By late 1943 beaches were being subdivided up to four, RED 1 through 4, with one beach designated for each assault battalion and a single color assigned to each regiment. Additional colors came into use, including PURPLE, SCARLET, and BLACK. Besides the main landing beaches, alternate or proposed beaches were designated; sometimes these were used after the initial landing to bring ashore reserves or supplies.



A unit's follow-on echelon embarked aboard an LST *en route* to Cape Gloucester, New Britain. These trucks loaded with combat supplies and equipment would descend to the tank deck and disembark out the bow doors. The visible gear includes Stokes litters, concertina wire, fuel drums, rations, and 250gal water trailers.

Beaches might be from 400 to 1,400 yards wide; at least 1,000 yards was preferred, but landings were sometimes conducted on much narrower beaches. Beaches were selected according to surf conditions, gradients (bottom slope), obstacles, exit routes from beaches, proximity to the objective, enemy defenses, and availability and types of landing craft. A key factor was their proximity to Japanese airfields; it was desired for these to be seized early, repaired, and quickly employed for CAS aircraft. If an airfield did not exist then the landing often occurred near a site suitable for constructing one.

Troop amtracs attempted to reach the first available cover before disembarking their troops at what was designated the "tractor control line." In some instances they attempted to carry them 100 or so yards

On the black sand terraces of Iwo Jima scores of supply dumps were established in a constant beehive of activity involving amtracs, bulldozers and cranes. Everything that might possibly be needed by the landing force was carried by invasion fleets, even – as here – pre-sawn lumber. The Japanese seldom directed the little artillery they had at rear installations, so little effort was made to protect dumps with berms during the later operations when there was no serious air threat. A 6ft square beach marker panel can be seen at the center of the photo.

inland – terrain, obstacles, mines and fire permitting; occasionally the line was set considerably further inland – over 1,000 yards on Saipan – but this was seldom successful, since amtracs could not handle rough terrain and obstacles.

Units were assigned objectives along the “O-1 Line” – Objective 1 Line – to be secured before nightfall on D-Day. This was usually the first defensible line of terrain features close enough to the beaches to be achievable on the first day, but sufficiently deep inland to allow space in the beachhead for reserves, artillery positions, headquarters, supply dumps, aid stations, etc. In the event the complete O-1 Line was seldom achieved on D-Day, owing to the density of Japanese defenses around beaches. Subsequent O-lines were specified on which units focused on the following days, but these were more realistically phase lines for tactical and logistical planning purposes; some might not be completely secured on a given day, but on other occasions two or more O-lines might easily be overrun in one day.

Early operations in the Solomons saw the establishment of a large beachhead lodgment in which defense forces were established and airfields built. Initially at least, no effort was made to clear the large islands entirely. The lodgment provided a base of operations, airfields for defense and to attack Japanese installations on other islands – and also a magnet to lure Japanese forces into expending their resources in futile attacks. The Force Beachhead Line (FBHL) was designated in later operations. Following defensible terrain features beyond the O-1 Line, this provided sufficient space for all beachhead activities, and a degree of protection from all but long-range artillery.



LANDING CRAFT & SHIPS

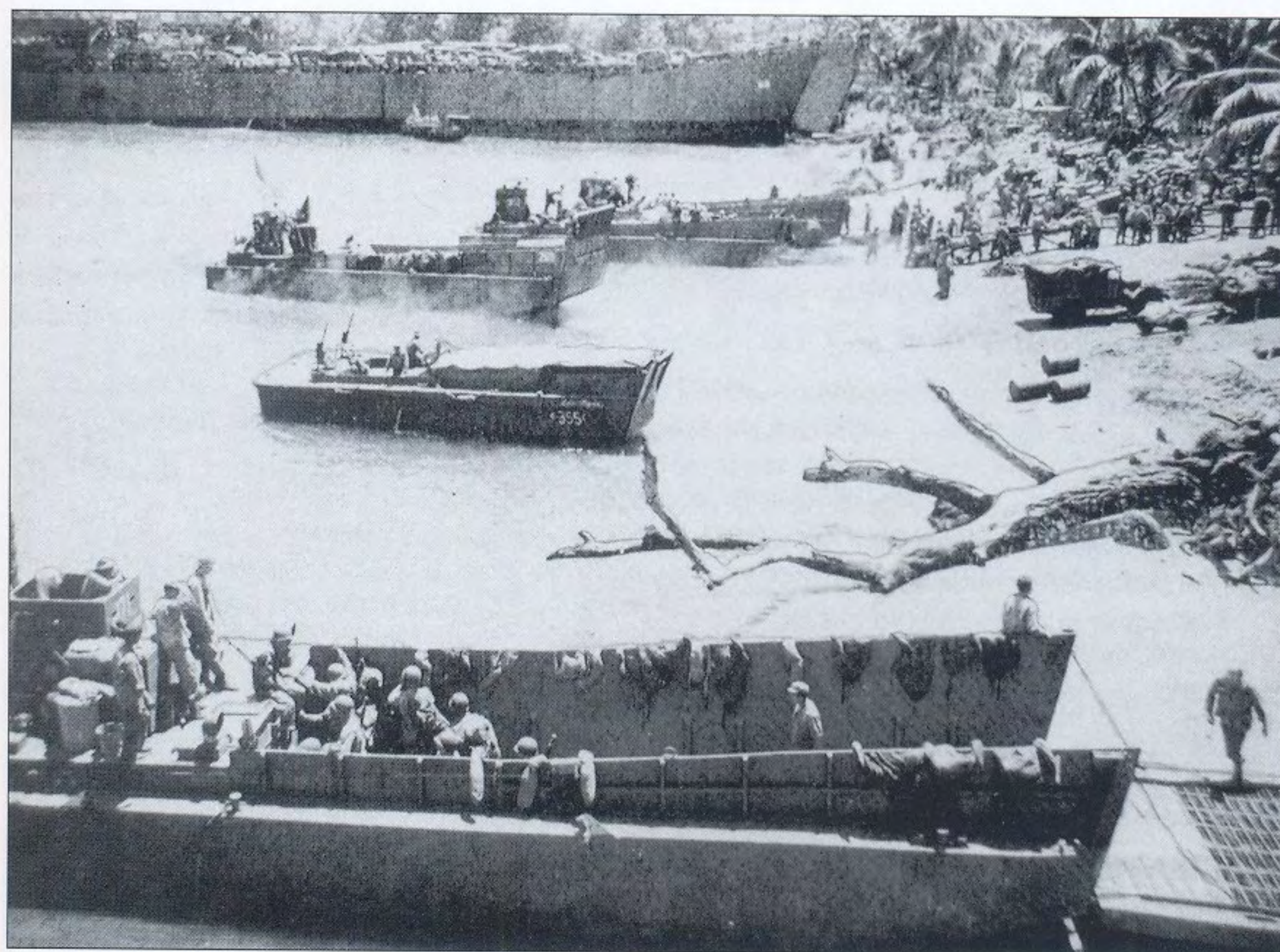
Specialized vessels were obviously crucial for amphibious operations, to land assault troops, vehicles, supplies, and materiel; to provide inshore fire support, evacuate casualties, and maintain logistic channels; and for all manner of administrative and support tasks.

Landing ships (LS) were comparatively long-range, ocean-going vessels capable of transporting and delivering large numbers of vehicles, supplies, and troops directly on to beaches. Their shallow draft and slow speed limited their sea-going capabilities, however. Landing craft (LC) had to be transported and launched from amphibious warfare ships – transports; they were characterized by very shallow draft, open cargo bays, and bow ramps. Both landing ships and craft were heavily armed for air defense and to provide fire support, but were lightly armored or lacked armor altogether, in order to reduce their weight and therefore their draft. In July 1942 a standardization agreement between the US and the UK on landing craft/ship designations resulted in existing US craft being redesignated; the gaps in mark numbers of US craft were due to the other numbers being applied to British designs. Landing ship and craft construction was a massive undertaking, and only prototypes were available in late 1942; it was not until mid-1943 that the new craft began to appear in the Pacific in any numbers. Over 66,000 landing ships and craft of all types were eventually constructed.

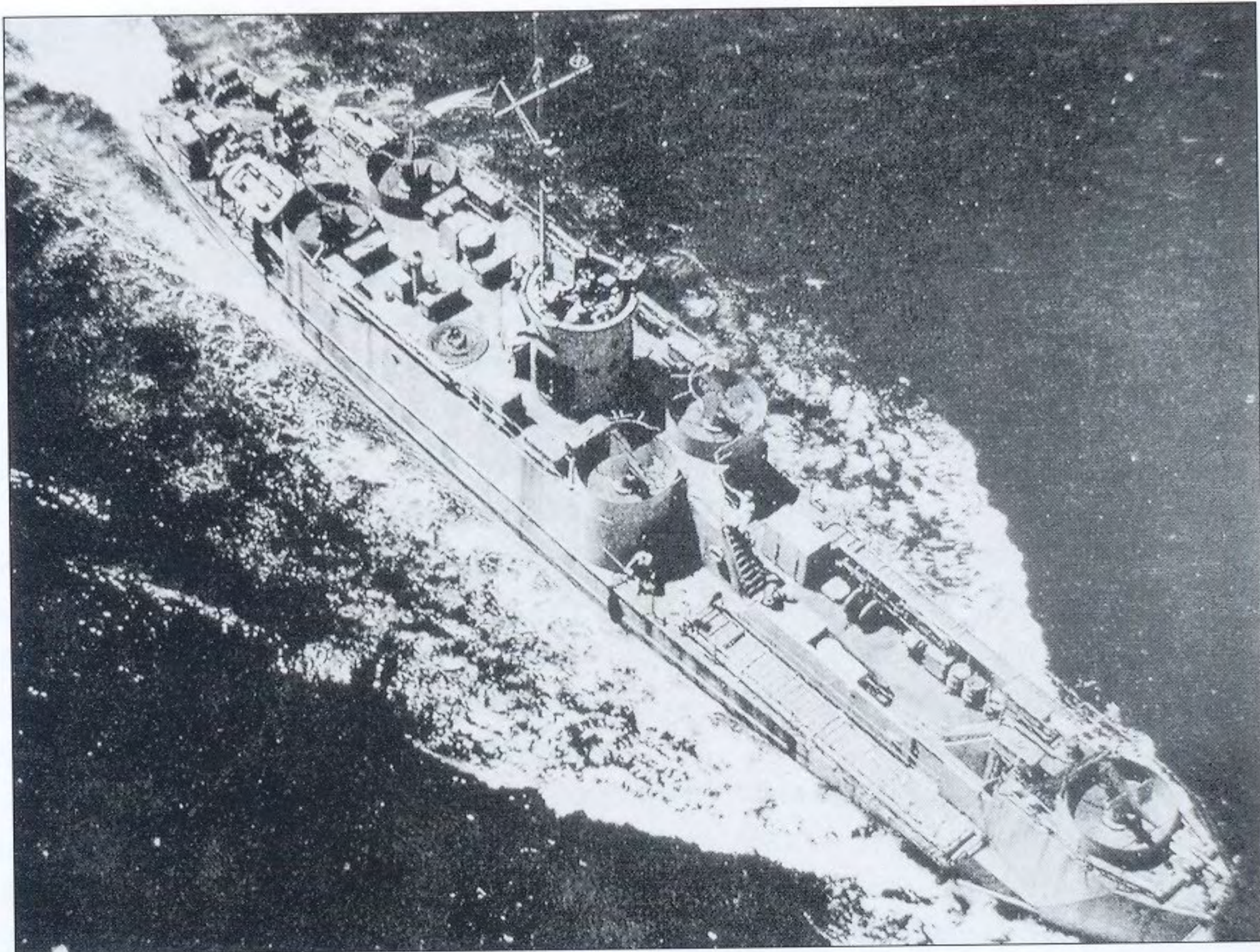
Until 1940 the US Navy possessed no effective landing craft or other amphibious warfare ships other than a few troop transports. Previously ship's launches and lifeboats were employed; these proved entirely unsatisfactory for assault troops, and there were no craft available for landing tanks, artillery and other vehicles. In the 1930s the Navy and Marine Corps experimented with various craft, all of which proved inadequate and even hazardous. It was not until 1939 that Andrew Higgins of Higgins Industries Inc in New Orleans offered a shallow draft

boat designed for beaching, the "Eureka" boat. The Navy was irritated that Higgins' designs were preferred by the Marines over its own poorly designed offerings, but finally conceded, and adopted the Eureka in 1941 as the **Landing Craft, Personnel – LCP**. This was a 31ft boat with a rampless, blunt bow capable of carrying 18 troops. Previously ship's davits were limited to 30ft craft and 5 tons weight, but the new transports that the Navy was building could accept heavier 36ft craft. In September 1941 the LCP was replaced by the similar

During the Philippines landings an LCVP runs ashore among Army-operated LCM(3)s, with an LST in the background. The LCVP was the most widely built and used troop carrier in the Higgins boat series. The Landing Craft, Mechanized, proved to be an extremely valuable utility craft, employed for all sorts of hauling jobs as the "cargo truck" of the landing craft fleet.



The later LCI(L) "round bridge" or "castle bridge" type appeared in 1943, armed with five 20mm AA guns and two .50cal MGs; note the troop ramps flanking the bow. The class included LCI(L)-351 to 716, 731 to 780, 784 to 821, 866 to 884, 943 to 1033, and 1052 to 1098. LCIs were nicknamed "Elsies" or "Elsie Items" after their type code.



A good comparison between LCI(L)-402 and -354. From July 1944 newly built LCIs lost their gangway ramps, and were provided with small bow doors and a sliding ramp. This allowed them to carry jeeps and small cargo, making them much more versatile and reducing the exposure of troops debarking.

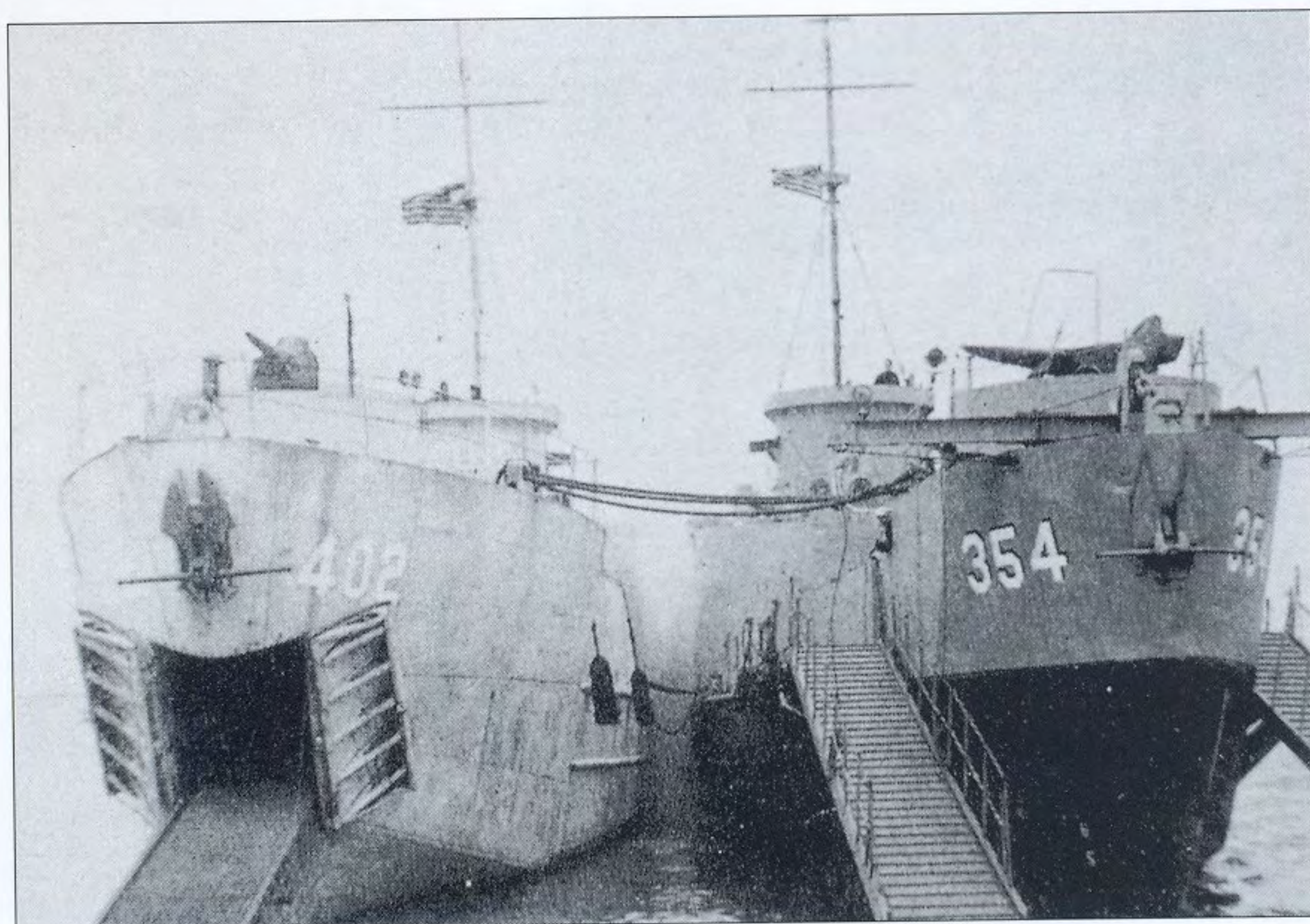
LCP(L) – L for "large" – called a Y-boat until July 1942; this was a 36ft craft carrying 36 troops.

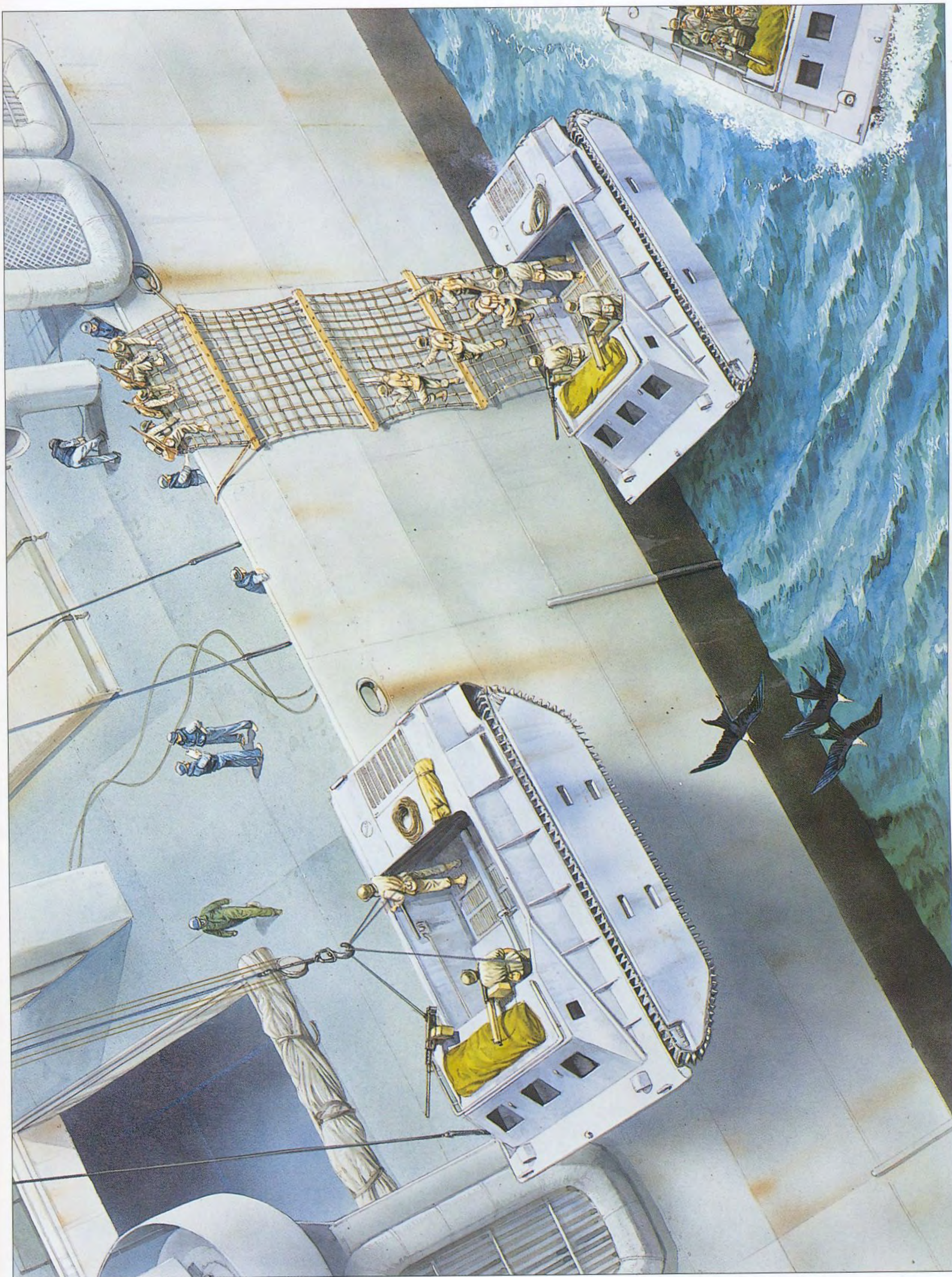
In early 1941 the Marines showed Higgins a photo of a Japanese landing barge with a bow ramp. This *Daisatsu* (49ft, 100–120 troops), developed in the late 1920s, was more advanced than other period designs; the Japanese conducted no further development and used this craft throughout the war. The Navy initially opposed the idea of a new design copying its features, since production had begun on the LCP(L) and they could not foresee that additional craft would be necessary. The Bureau of Ships (BuShips) modified the LCP(L) by adding a narrow gangway through the bow and a small ramp to create the **Landing Craft, Personnel (Ramp)** –

LCP(R), called a TP until July 1942; but the narrow ramp could not accommodate even light vehicles or wheeled weapons.

At the same time Higgins designed a new ramped craft capable of carrying a jeep or 1-ton truck, antitank gun, or similar sized equipment. This was the **Landing Craft, Vehicle** – **LCV**, called a TR until July 1942. Just over 2,000 LCVs were built before it was replaced by a new model: the **Landing Craft, Vehicle or Personnel**

(continued on page 41)





DEBARKING LVTs, 1942 See commentary for details



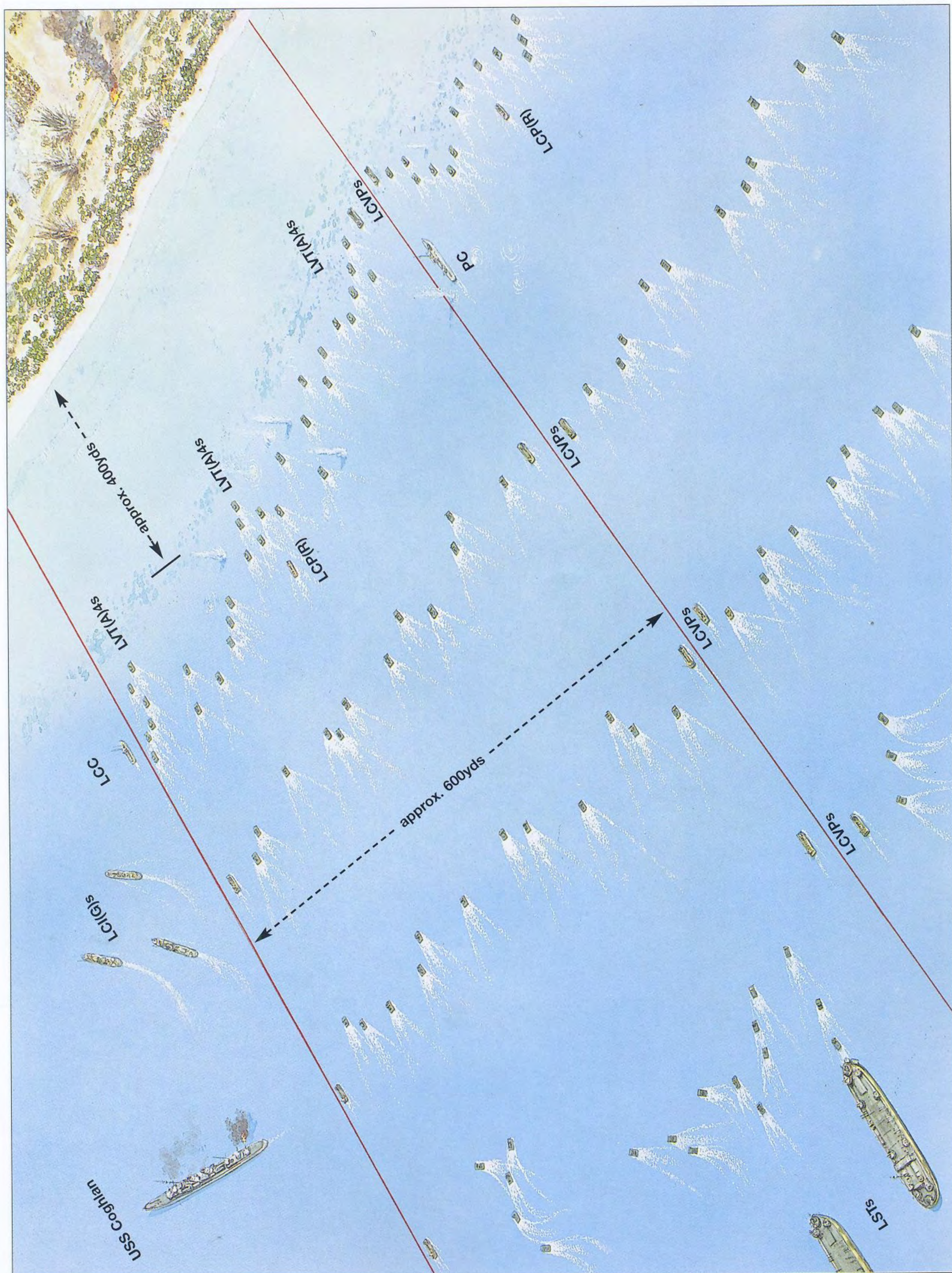
SHERMAN TANKS ABOARD AN LCT, 1944 See commentary for details



D DEBARKING LVTs FROM AN LST, 1944-45 See commentary for details



TRACTOR TRANSFER LINE, 1945 See commentary for details



F BATTALION ASSAULT PLAN, 1944 See commentary for details



BEACHHEAD See commentary for details



H TANK-INFANTRY TEAM See commentary for details

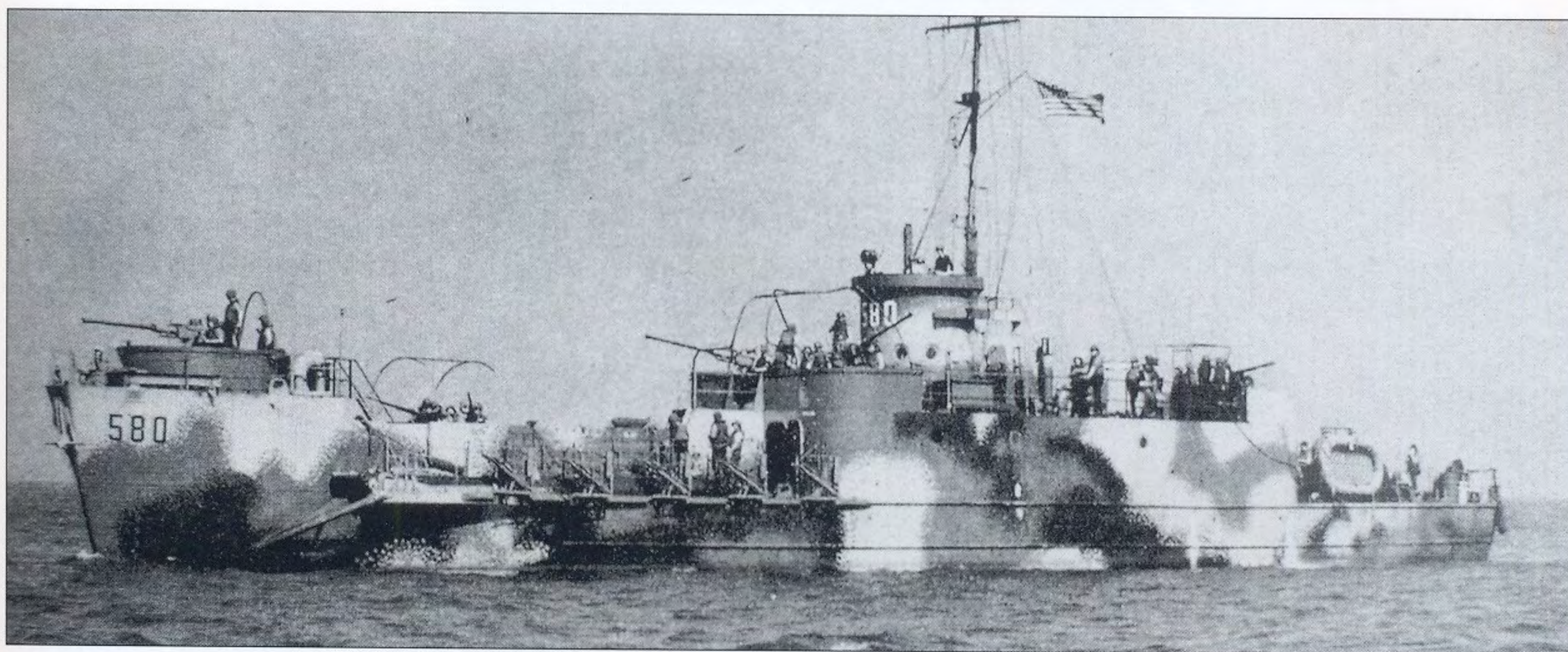
– **LCVP**. The LCVP also replaced the LCP(L), although the latter was retained for special purposes, as a control boat, UDT transport, etc. With more than 23,000 built the LCVP became the most widely used landing craft of the war. It was heavier than the LCV and had less cargo capacity, but it offered numerous design improvements, including the capability for it to be nested (stacked) aboard transports.

Larger landing craft were necessary to deliver artillery, tanks, other vehicles and bulk supplies and materiel. Early efforts met with little success because of weight limitations, the need for shallow draft, top-heaviness caused by such heavy loads, and difficulties getting the vehicle off the craft. Numerous designs were tested before two were finally selected in 1942: the BuShips' WL for light tanks and Higgins' larger WM for medium tanks. In July 1942 these were redesignated **Landing Craft, Mechanized Mk II & Mk III – LCM(2) & LCM(3)** respectively – and would be extensively used as utility craft. The LCM(3) was the largest landing craft that could be carried in davits, and aboard transports an LCVP could be nested inside an LCM. The Mk II was soon replaced by the Mk III, and this was supplemented in 1943 by the Mk VI, which was essentially a Mk III with a 6ft center section added to the hull. It was normally carried aboard a Landing Ship, Dock or an LST with smaller craft nested inside. Most attack transports could carry six or eight LCM(3)s; by early 1945 transports were carrying six LCM(6)s or two each LCM(3)s and (6)s.

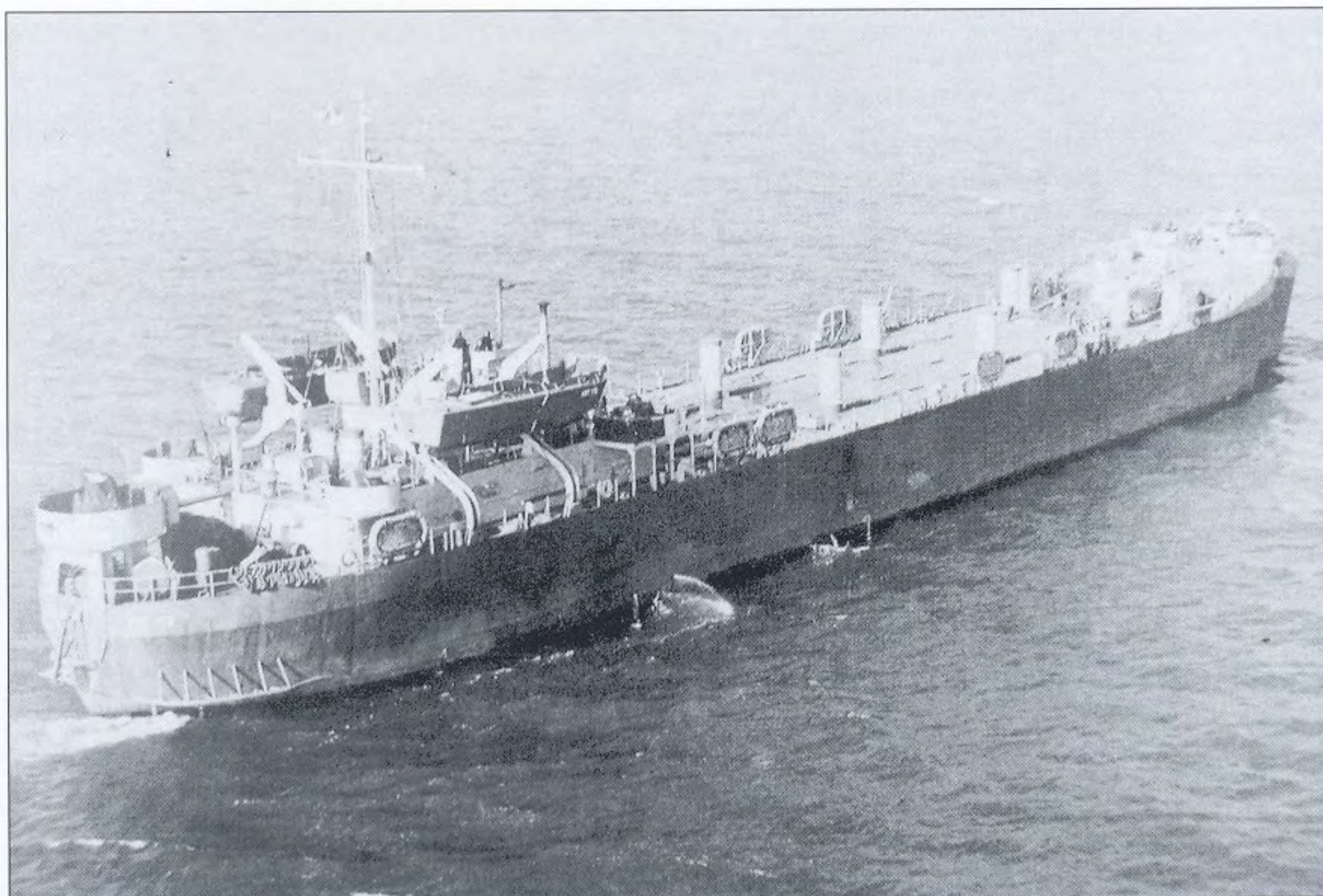
Still larger landing craft were needed to land multiple tanks in follow-on waves to allow a rapid build-up of armor in the beachhead. The BuShips-designed **Landing Craft, Tank Mk V – LCT(5)** – was adopted in late 1942 (called the TLC during development). The 1943 LCT(6) was the largest US landing craft built during the war. It and the LCT(5) could be carried aboard an LST and launched broadside over the larger ship's side by flooding ballast tanks on one side to list the ship. An LCM could be carried inside the LCT, and an LCVP inside the LCM. The LCT(5) & (6) could also be transported on a larger ship in three sections and assembled in the water; an LST could carry five such sections.

An even larger vessel, intended to deliver up to 30 tanks to support invasion forces, was the **Landing Ship, Tank Mk II – LST(2)** – designated

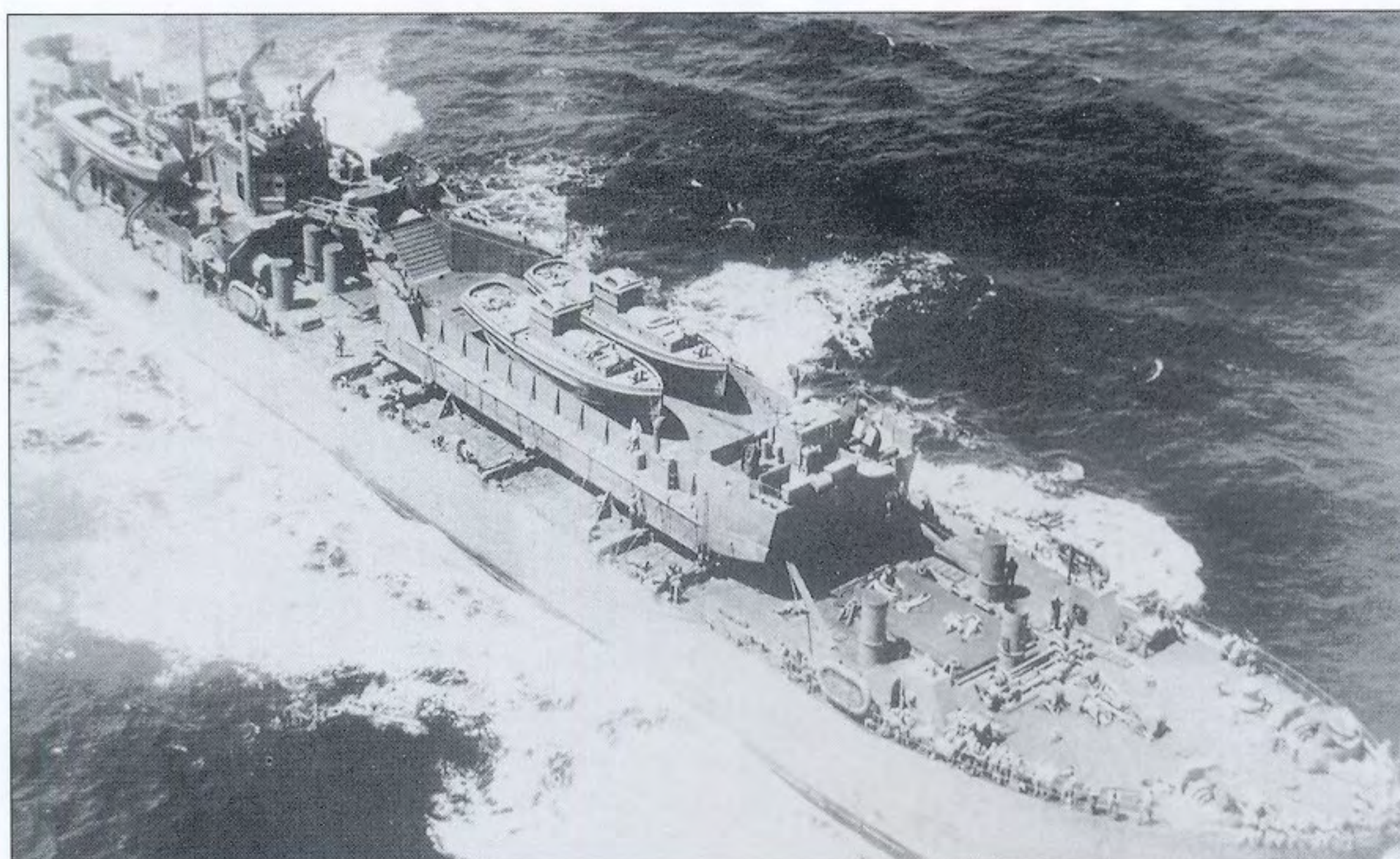
LCI(G)-580 was one of 86 standard LCIs converted to gunboats, in eight different battery configurations; this craft mounts 10x 4.5in rocket launchers, 4x 40mm guns and 2x 20mm. There were also 42 **LCI(M)**s mounting 3x 4.2in mortars, and 36 **LCI(R)**s with 6x 5in rocket launchers. Note the "spotted edge" camouflage pattern.



An early Landing Ship, Tank – No 173. These were initially lightly armed with only one 40mm and six 20mm cannon, and two LCVPs were typically carried aboard. The prominent tank deck ventilators were relocated forward and aft on later ships, to allow more deck storage space.



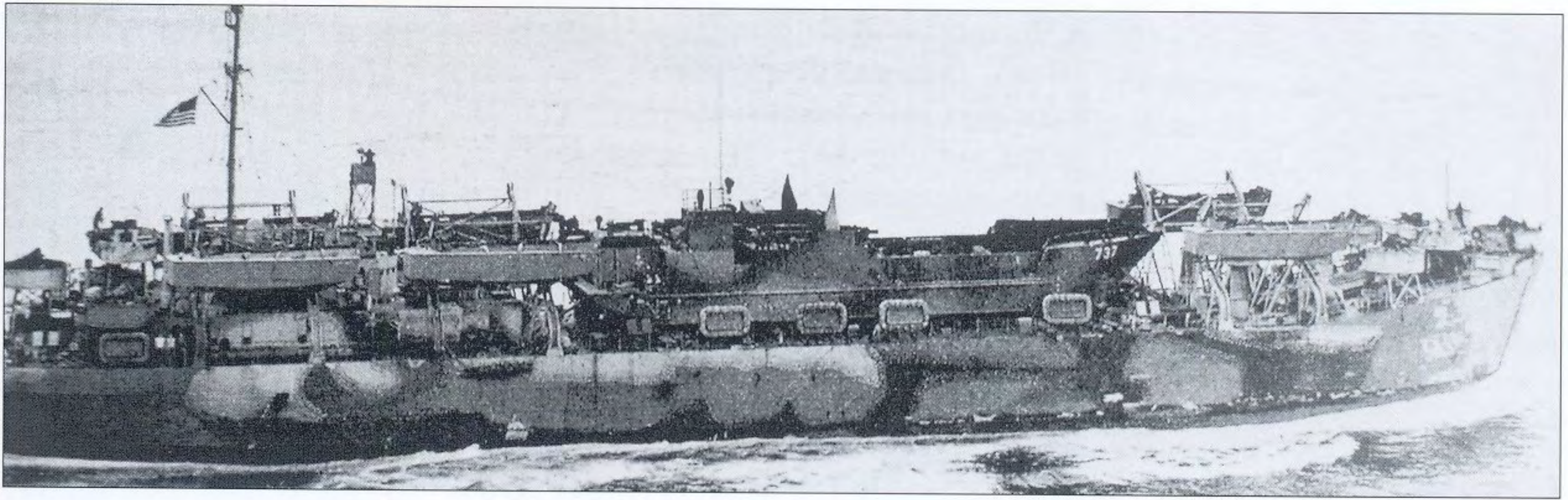
LST-214 with relocated ventilator stacks. An LCT(5) can now be carried as deck cargo, carrying in its turn two Army Motor Tow Boats, Large – MTLs. The LCT was launched over the side after listing the LST by means of its ballast pumps.



the ATL during development. The LST(1) design was built by the British, but was unsatisfactory, and at British request the US undertook the redesign and production of LSTs in late 1941. The first LST(2) was commissioned in December 1942. In order to make the flat-bottomed LST a sea-going vessel accommodation was made to pump water into the ballast tanks, so the ship would ride deeper at sea and the ballast could be pumped out as it approached shore. Tanks were carried inside and on the weather (topside) deck. LST-1 through 512 were fitted with a weather-deck-to-tank-deck elevator; LST-513 onward (except LST-531) were fitted with an internal ramp instead. The first LSTs were operational in the Pacific in March 1943. From the beginning of 1944 they transported amtracs, which debarked at sea. Some were modified to transport pontoon sections to provide a causeway ramp extension to the beach, over twice the LST's length. Improvements were made throughout LST production, including increased armament, deck obstructions rearranged to allow an

LCT or vehicles to be carried, and bridges raised to provide vision over deck-carried LCTs. The original two pairs of LCVP davits were increased to six on many LSTs.

Originally conceived by the British as a transport for commando raiders across the English Channel, the **Landing Craft, Infantry (Large) – LCI(L)** – was developed quickly in 1942. It was more accurately a landing ship, but was assigned an LC



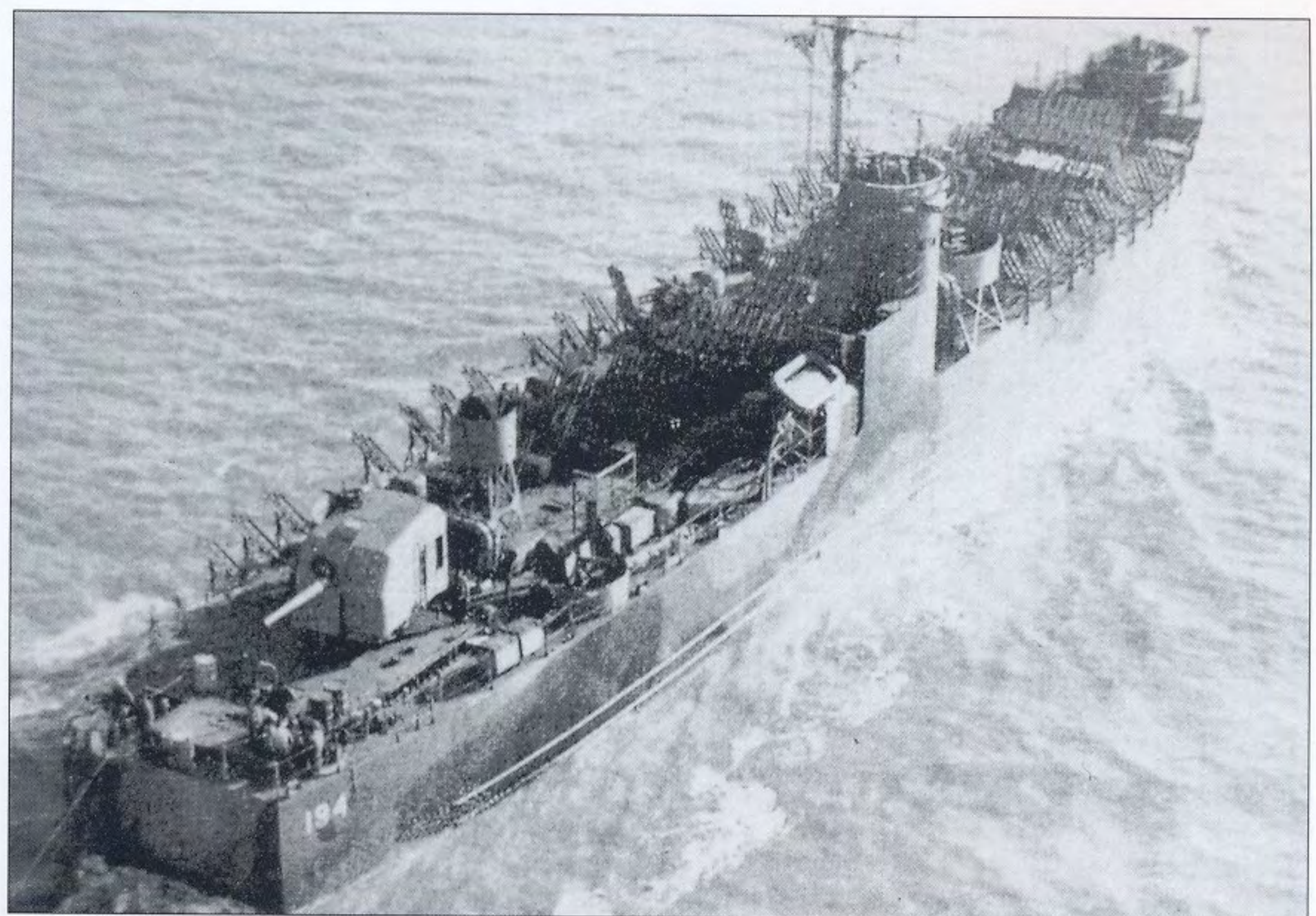
designation. Rather than a conventional bow ramp, two narrow troop gangway ramps were fitted to the hull sides. The LCI was designed to carry troops only, not cargo or vehicles. The early class LCIs had a square bridge; the improved later vessels, beginning with LCI-351 in May 1943, had a round "castle" bridge and enlarged deckhouse, and could carry a few more troops. That same month they became operational in the Pacific. The LCI was extensively used by the Army, but little by the Marines. Most (though not all) completed after May 1944, beginning with LCI-641, had bow doors and a ramp, with the side gangway ramps deleted. LCIs were designed for short-range shore-to-shore operations; their shallow draft with flat bottoms limited their seaworthiness, and their simple troop accommodations and food and water restrictions limited their troop transit time to 48 hours (although they could and did cover long distances when necessary). Both LSTs and LCIs participated in their first amphibious assaults at New Georgia at the end of 1943.

The **Landing Ship, Mechanized – LSM** – was derived from the LCI, the first being launched in April 1944. It was originally designated the LCT(7), but was of a much different and larger design. The LSM appeared like a small LST, but had an open-well cargo deck running its length with the bridge offset amidships on the starboard side. It was fitted with bow doors and a ramp. The quickly designed LSM possessed a number of flaws, and was retired soon after the war.

Large numbers of LSMs and LCIs were converted while building to the landing fire support role by the addition of various combinations of machine guns, 20mm and 40mm automatic cannon, 3in and 5in guns, 4.2in mortars, and

The camouflage-painted LST-563 was of the six-davit type, enabling it to carry six LCVPs, or five and one LCS(S)(1). Armament of this type was six single and one twin 40mm and 14x 20mm cannon. LCT(6) No 737 is carried as deck cargo.

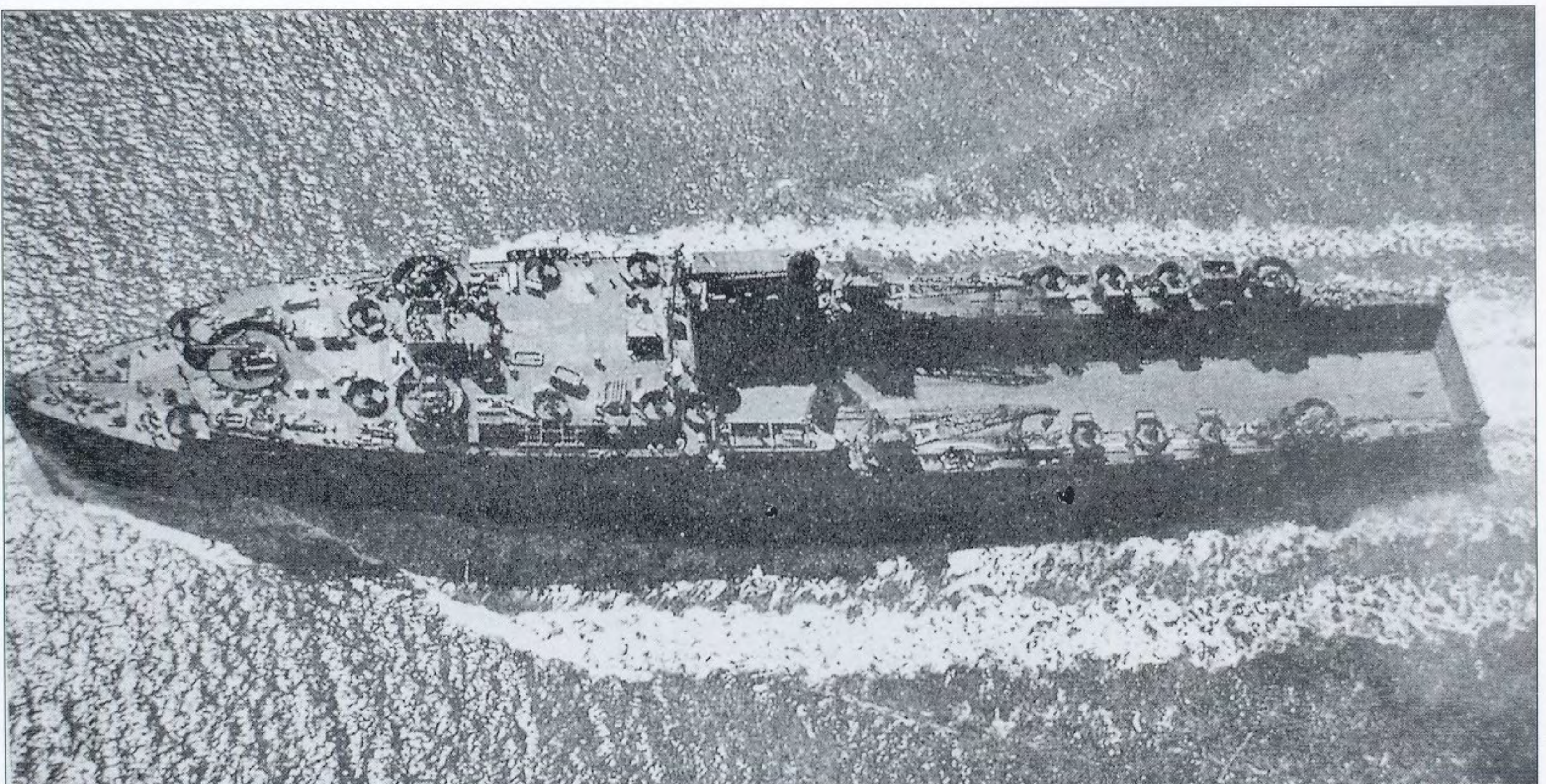
LSM(R)-194 was one of 12 standard LSMs converted and armed with 74x four-rail and 30x six-rail 4.5in rocket launchers (476 rockets in all) – plus a stern-mounted 5in gun, two 40mm and four 20mm cannon.



4.5in and 5in rocket launchers. These included the **LSM (Rocket) and LCI (Gun), (Mortar) & (Rocket) – LSM(R) and LCI(G), (M) & (R)**. The **Landing Craft, Support (Large) – LCS(L)** – was a purpose-built gunboat based on the LCI. The armament combinations varied greatly; for example, the LCI(G) was found with eight different battery configurations, and some gun-armed LCI(G)s also had rockets. Such craft were first tested during the Treasury Islands landing in October 1943, and their first large-scale use came in February 1944 in the Marshalls. The **Landing Craft Support (Small) – LCS(S)** – was a converted LCP(L) that mounted machine guns and sometimes rockets, intended for inshore fire support. The LCI gunboats also supported UDT frogmen, screened transport anchorages against Japanese suicide boats, interdicted barge traffic, and engaged targets of opportunity along the coasts in support of advancing troops.

The British proposed an unusual concept in the form of the **Landing Ship, Dock – LSD**. The US Navy at first saw little use for this, but after the first was commissioned in June 1943 it proved to be extremely valuable, and 25 were built. The LSD was not intended as a beaching vessel, but as a transport for loaded landing craft. It possessed a well deck running the length of the hull and a stern ramp. It was originally intended to carry two LCTs (which were not capable of transoceanic sailing) in the well deck, and had deck space for vehicles. No fewer than 14 tank-loaded LCMs could be carried, as could amtracs and DUKWs. To launch its cargo of amphibious craft, the ballast tanks were flooded to settle the ship lower in the water; the stern ramp was lowered, and the craft sailed out of the ship. An LCI, PT boats, and even small minesweepers were transported across the Pacific aboard LSDs. The well deck could be used as a dry dock to repair landing craft. Late in the war two temporary “Pearl Harbor” decks (named after the place where they were designed) could be installed inside the well deck, to provide three decks for even larger numbers of amtracs or DUKWs.

The Landing Ship, Dock, may be described as a self-propelled seagoing dry dock. The dry well deck could accommodate landing craft, amtracs and DUKWs; when it was flooded they could float out through the stern gate. Note the many gun tubs: armament was a 5in gun, two twin and two quad 40mm cannon, and 16x 20mm.



Basic data, US Landing Craft & Ships

(Note: slash / means 'or')

<i>Craft & capacity troops/cargo</i>	<i>Introduced</i>	<i>Nos built</i>	<i>Length x beam</i>	<i>Armament</i>	<i>Crew</i>
LCI(L) LCI-1 to -350 188 tps/75 tons	1942	1,031	158ft 6in x 23ft 8in	4x 20mm	24
LCI(L) LCI-351 + 209 tps/75 tons	1943	605	158ft 6in x 23ft 8in	5x 20mm	29
LCT(5) 4x light tanks/ 3x med tks/ 150 tons	1942	500	114ft 2in x 32ft 8in	2x 20mm	11
LCT(6) 4x lt tks/ 3x med tks/ 150 tons	1943	965	119ft 1in x 32ft 8in	2x 20mm	13
LCM(2) 1x lt tk/ 1x med gun/ 55 tps/ 27.5 tons	1942	147	45ft x 14ft 1in	2x. 50cal	4
LCM(3) 1x med tk/ 1x med gun/ 60 tps/ 30 tons	1942	8,631	50ft x 14ft 1in	2x. 50cal	4
LCM(6) 1x med tk/ 1x med gun/ 75 tps/ 35 tons	1943	2,718	56ft x 14ft 1in	2x. 50cal	4
LCP(L) 36 tps/ 4 tons	1941	2,193	36ft 8in x 10ft 10in	2x. 30cal	3
LCP(R) 36 tps/ 4 tons	1942	2,631	36ft 3in x 10ft 10in	2x. 30cal	3
LCV 1x lt gun/ 1x 1 ton truck + 12 tps/ 36 tps/ 5 tons	1942	2,366	36ft 3in x 10ft 10in	1x. 30cal	3
LCVP 1x lt gun/ 1x 1-ton truck + 12 tps/ 36 tps/ 4 tons	Nov 42	23,358	35ft 10in x 10ft 6in	2x. 30cal	3
<i>Ship</i>	<i>Introduced</i>	<i>Nos built</i>	<i>Length x beam</i>	<i>Armament</i>	<i>Crew</i>
LSD Capacity 3x LCT(5/6)/ 2x LCT(3/4)/ 14x LCM/ 41x LVT/ 47x DUKW/ 1,500 tons; plus 240 troops. With removable decks installed in floodable bay, 92x LVT/ 108x DUKW	1944	18	457ft 9in x 72ft 2in	1x 5in, 16x 20mm, 12x 40mm	254
LST Capacity 17x LVT/ 20x med tks or equivalent vehicles; plus 2x/ 6x LCVP on davits.	1942	1,152	328ft x 50ft	12x 20mm, 7/8x 40mm	211/299 (2/6 davit)
LSM Capacity 5x lt tks/ 3x med tks/ 6x LVT/ 9x DUKW; plus 48 troops/ 165 tons	1944	525	203ft 6in x 34ft 6in	6x 20mm/ 1x 40mm, 4x 20mm	60

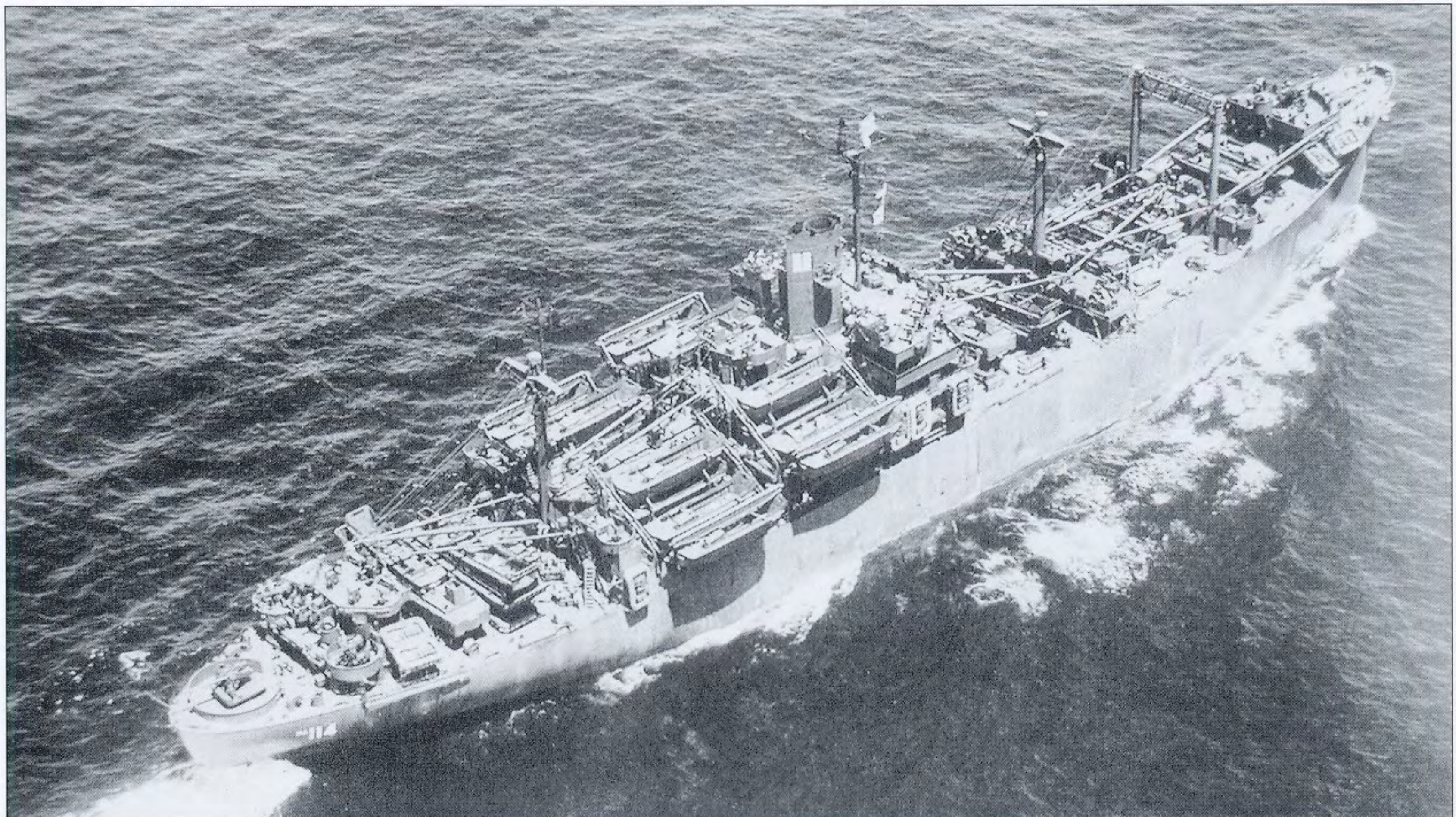
Most **attack transports and cargo ships** were based on the mass-produced Victory and C3 cargo ships, though some early types were converted from merchant ships. The designs and capacity of these ships varied greatly as so many different classes were employed. Ships designated "attack" carried a complement of landing craft and could unload their cargo over the sides into them at sea; they also mounted significant antiaircraft armament. Conventional troop transports (AP), some of which were modified ocean liners, and cargo ships (AK), which were essentially merchant ships, lacked landing craft, and were employed to move personnel, vehicles, equipment and supplies on the lines of communication. In February 1943 the APA and AKA classifications were established for new attack transports and cargo ships; some existing APs and AKs which had been upgraded received these designations retrospectively.

Attack transports (APA) generally carried over 1,000 troops, and cargo capacity varied from less than 1,000 tons to as much as 5,500 tons. As an example, one of the most widely used was the Haskell Class built on a Victory-ship hull. These 455ft ships could carry 1,561 troops plus the crew of 536, along with 2,900 tons of cargo; their landing craft included 22x LCVPs, one LCP(L), one LCP(R), and two LCM(3)s. They were armed with a 5in gun, 12x 40mm in one quad and four twin mounts, and 10x 20mm guns.

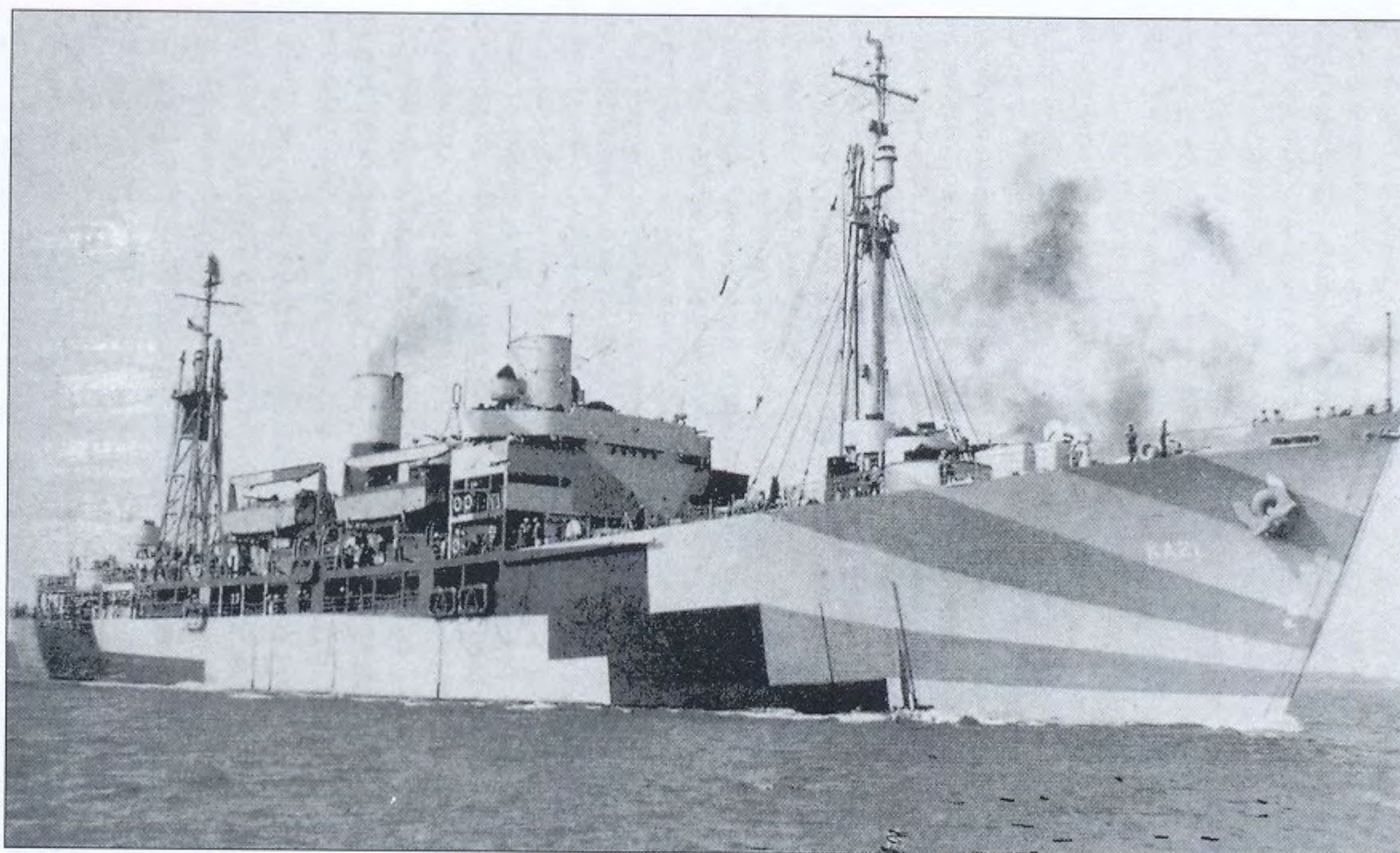
Attack cargo ships (AKA) had a large cargo capacity, but could carry some troops – mostly vehicle or artillery crews, so they could land with their equipment. The 459ft Andromeda Class cargo ship carried 4,500 tons along with 16x LCVPs and eight LCM(3)s.

An invaluable ship was the destroyer-transport, officially known as the fast transport (APD), with a speed of 24 knots. They were employed to transport scouts, Raiders, Rangers and UDTs. The concept of converting

An attack transport, such as the USS *Hamble* (APA-114), could carry a reinforced battalion landing team and its equipment. These Bayfield Class APAs were literally crammed with 24 to 26 LCVPs and two LCM(2)s. They were armed with two 5in guns, four twin 40mm, and 12x twin 20mm cannon.



World War I flush-deck, four-stacker destroyers (DD) was suggested in 1937 to ease the shortage of amphibious transports and move small landing parties to Caribbean trouble spots. They also had the advantage of providing fire support to the landing force. The first of six old destroyers were converted in 1938, and 20 more in 1942. Two boilers, two stacks, and the torpedo tubes were removed; troop compartments for 140 men were installed in the empty boiler spaces and elsewhere, and four LCP(R)s were provided (later LCVPs). Armament was three 3in, two 40mm, and five 20mm guns. In 1943, 54 new destroyer escorts (DE) began conversion to fast transports; these could carry 162 troops and a small quantity of ammunition, vehicle fuel and general cargo. Up to two 1-ton trucks and six jeeps could be carried as stern deck cargo; they had four LCVPs, and were armed with a 5in, three twin 40mm and six 20mm guns. Both types retained their depth charge racks. The early "flush-deckers" had a crew of 101, and the converted DEs a crew of 203.

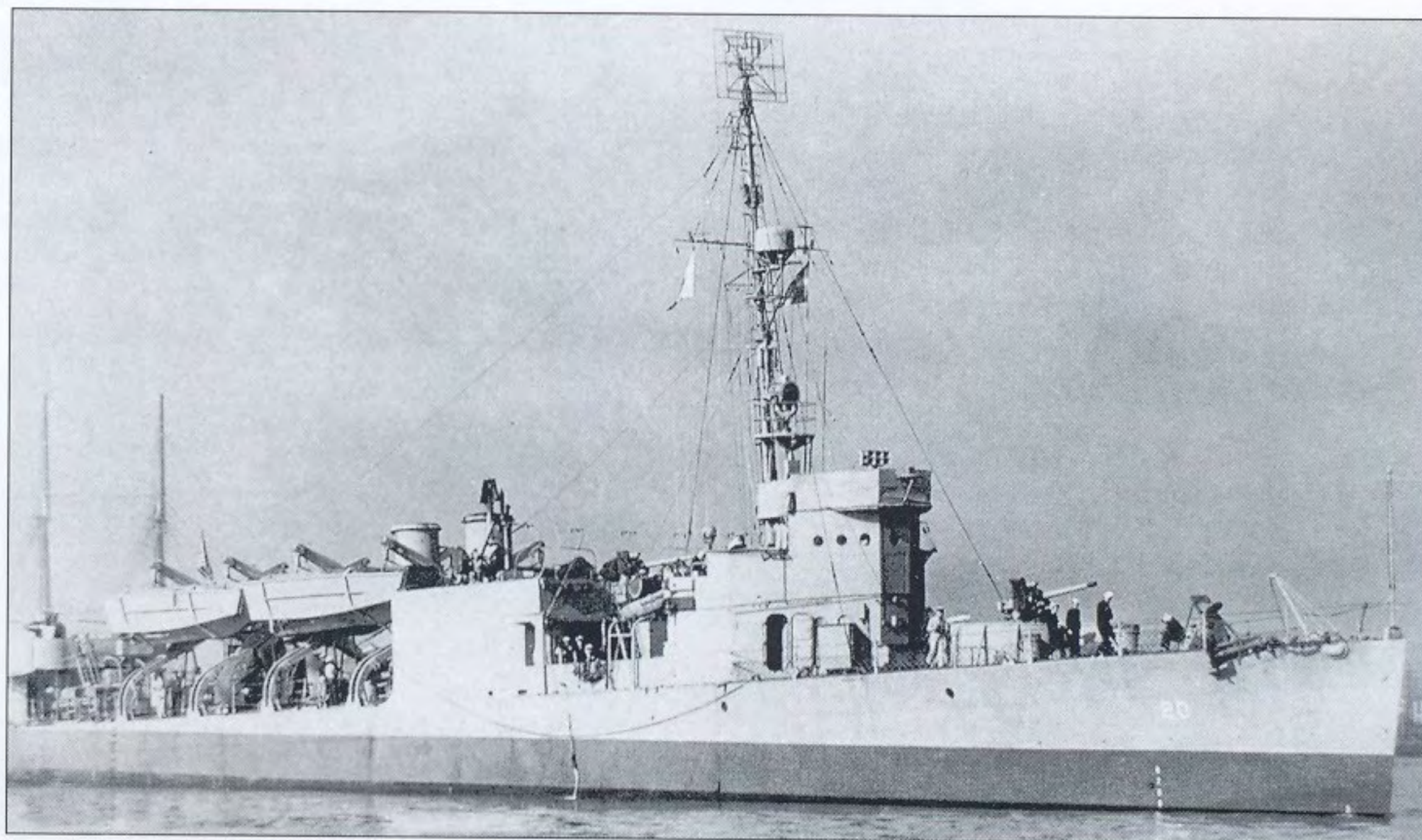


The USS *Artemis* (AKA-21), lead ship of its class, was a typical attack cargo ship. This class carried an LCP(L), 11 to 13 LCVPs, and two LCM(3)s. It was armed with a 5in, four 40mm, and 12x 20mm guns. This dazzle camouflage was found to be not particularly effective in confusing submarines attempting to estimate range, but often remained in use throughout the war.

In 1943 the need for specially designed **amphibious command ships** (AGC) was realized and a number of different types of vessel were converted for this role, though most used C2 cargo ship hulls. These ships provided additional spaces for a joint operations room, war command room, flag plot, combat information center, fighter control room, voice (radio) filter room, intelligence office, photo interpretation room, map reproduction room and print shop. Additional radios and radar were installed. The USS *Mount McKinley* (AGC-7) had a crew of 622 and space for 441 headquarters personnel. These ships carried anything from five to 14 small landing craft of different types.

Control craft were necessary to marshal, provide navigation, and control landing craft and amtracs as they assembled and made their approach to the beach, and to coordinate and control post-landing supply and troop delivery, casualty evacuation, and the many other boat activities. Submarine chasers (SC), patrol boats (PC), and smaller landing craft were

The USS *Roper* (APD-20) was a World War I-vintage flush-deck, four-stack destroyer converted into a fast transport, typically for small raiding units, and carried four LCP(R)s.



employed in this role, but dedicated craft were also built, to include the Landing Craft, Control Mk I – LCC(1). This was a 56ft boat was fitted with communications, navigation, and hydrographic gear, crewed by 14 men, and armed with three twin .50cal machine guns. The later LCC(2) had a narrower beam, was crewed by nine men and armed with two .50cal guns.

Naming/numbering of amphibious warfare vessels

US Navy ships followed standard naming practices particular to each type of ship:

Amphibious command ships (AGC) – mountains

Cargo ships (AK) – stars, or US counties

Attack cargo ships (AKA)– US counties

Transports (AP) – presidents, signatories of the Declaration of Independence, generals, admirals, famous women, historic places

Attack transports (APA) – US counties

High-speed transports (APD) – distinguished USN or USMC officers or men, Secretaries of the Navy, civilians who aided the Navy

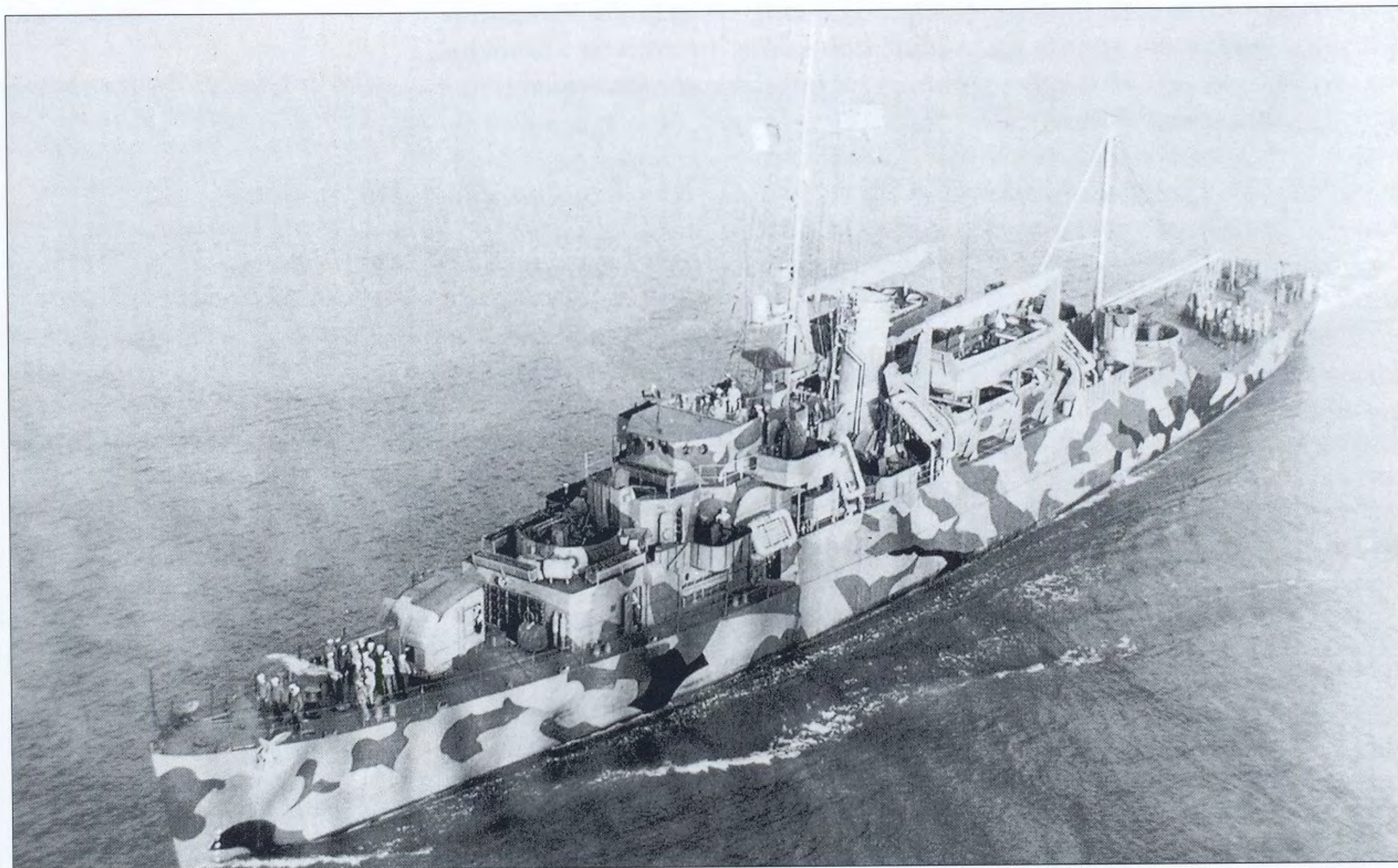
Landing craft repair ships (ARL) – mythological creatures

Dock landing ships (LSD) – homes of famous Americans or famous sites

Vehicle landing ships (LSV) – trees, or old Navy monitors

The LSTs, LSMs and LCIs were identified only by BuShips hull numbers (LSTs were named after US counties in July 1955). Sometimes the second or third letter of the ship/craft's type code might be included on the hull, e.g. "ST" or "M." Smaller landing craft (LCMs and smaller) were usually identified by the hull number of their parent AKA, APA, APD or other ship followed by a specific boat number. Sometimes

The USS *Kinzer* (APD-91) was one of 54 new Charles Lawrence Class destroyer escorts (DE) converted to destroyer-transport in 1943–44. She carries four LCVPs.





Pontoons

An unsung piece of equipment which was nevertheless essential to amphibious operations was the pontoon assembly. The Bureau of Yards & Docks developed the concept in 1939, with the idea of providing uniform-sized buoyant rectangular boxes which could be assembled into various floating structures. After testing to develop a rapid means of fastening individual pontoons together (the fittings were called "jewelry" by Seabees), to confirm their load-bearing capabilities and their ideal construction, further development began. The standard pontoon (P1) was 5x5x7ft and weighed 1 ton; unloaded, it drew only 16in of water, and it could support a 10-ton load. Other components were a sloped bow pontoon (P2) and two-section wedge-shaped ramp pontoons (P3 & 4). A large gasoline outboard motor was provided for propulsion, mounted on the stern of pontoon ferries. Long steel strips were bolted to pontoon strings to hold assemblies together. Pontoons were shipped overseas disassembled and were assembled at rear bases. By 1944 there were 31 standard pontoon assemblies, including: barges (3x7, 3x12, 4x7, 4x12, 5x12, 6x18, 10x30 pontoons); causeways, finger piers, seaplane ramps, service piers, floating small craft dry docks, fuel tank barges, 75-ton floating cranes, self-propelled "Rhino" ferries, warping tugs, net tenders, and PT boat service platforms. Pontoon barges could be used as cargo and vehicle lighters and landing craft refueling barges anchored outside the reef line; and cranes, pile drivers, drilling rigs and other heavy equipment could be mounted on them.

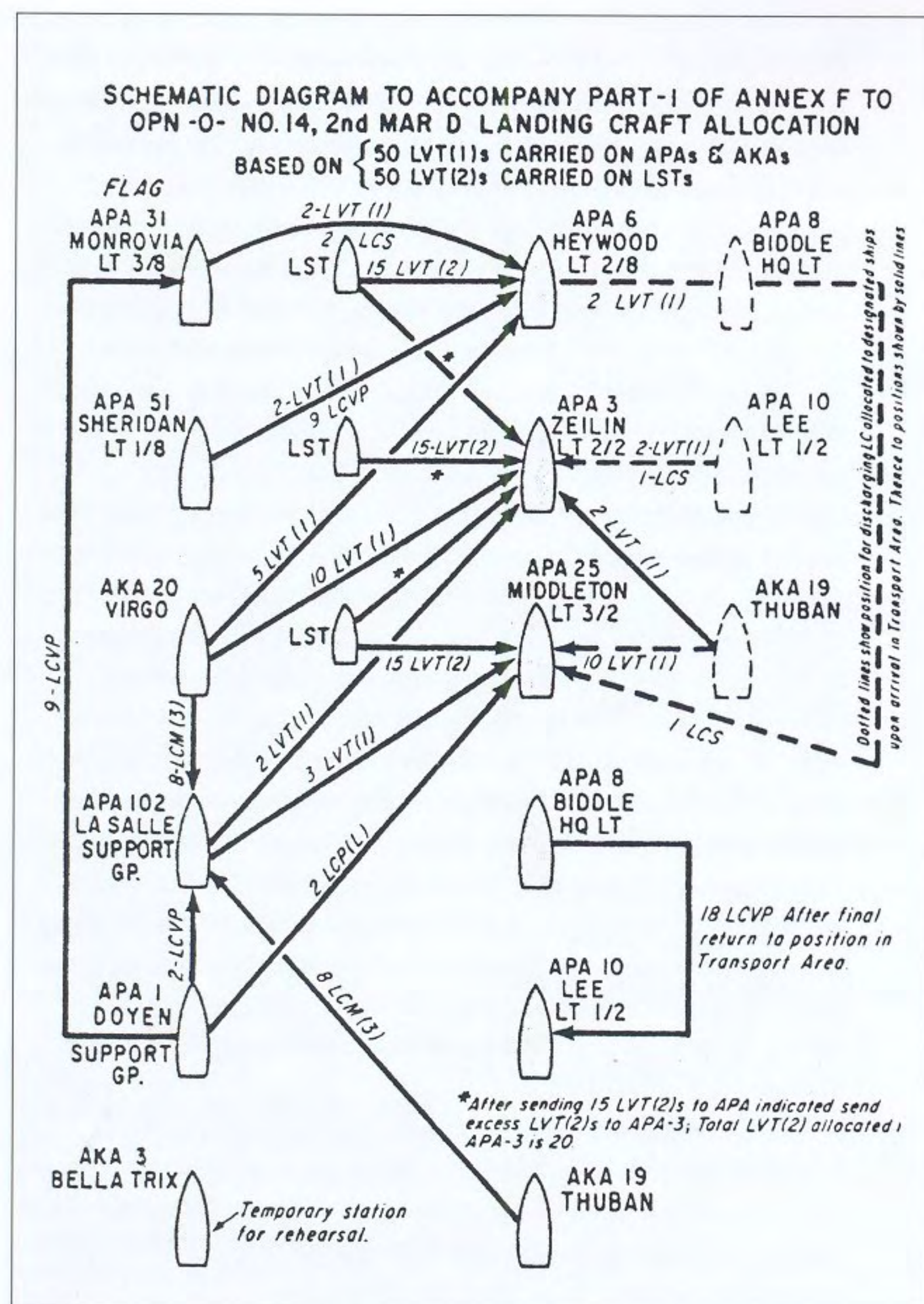
A means was developed to lash an assembled 3x15 pontoon causeway on both sides of an LST; these were cut loose as the LST approached shore, and momentum carried the sections to the beach. From release to when the first vehicle drove out of the LST across the causeway took less than 10 minutes.

letters, e.g. "KA," "PA" or "PD" or simply "K," "P" or "D" might be included to further identify the parent AKA, APA or APD. There was no standard numbering system, and many variations are encountered in photographs.

THE AMPHIBIOUS ASSAULT

An amphibious operation began at least two or three months in advance of the actual landing. This period was needed for planning: operations plans, operations orders, embarkation orders, logistics plans, and more; intelligence collection, assessment and dissemination; amassing supplies from countless organizations, distribution to units and combat loading¹; marshaling and training forces from all services; loading-out and rehearsals; movement to the objective, and pre-landing bombardment. Rehearsals, involving all elements including air support and naval gunfire, were critical, but were often incomplete due to some elements coming from far distant areas, time constraints, and inadequate rehearsal areas. The air and naval bombardment phase might begin weeks before the landing. Island bases elsewhere in the area were attacked and

¹ Combat loading involves the planned loading of supplies and equipment aboard ships in the reverse order it will be needed ashore, with the most immediate and essential items loaded last to be unloaded first. Equipment and supplies were also cross-loaded between ships, so that the loss of one would not mean the loss of a whole category of materiel – e.g. all of an artillery battalion's guns.



The different numbers and types of amtracs and landing craft carried aboard transports and cargo ships had to be re-allocated to land the landing force. The complexities of transferring craft between ships to pick up their troops is demonstrated by this diagram of the transport area at Tarawa, November 20, 1943.

followed. Landing craft waves assembled up to 5,000 yards out, and made for shore while naval gunfire pounded the beaches and flights of fighters strafed the defenses. Gunfire and air strikes would shift to inland targets as the lead assault wave came within a few hundred yards of the beach. Rocket-armed gunboats would fire their rockets from some 1,000 yards offshore, and suppress defenders with automatic gunfire. The gunboats would halt outside the reef line and the assault waves would pass them; in some instances the gunboats would turn to the flanks and shift their fire to adjacent areas.

Most landings were executed between 0700 and 0900 hours in the morning (H-Hour); they were invariably conducted up to one hour later than planned, owing to assembly and weather problems rather than enemy action. It was common for units to be landed some distance from their intended sites, even on the wrong beaches; this was the result of evasive action taken by landing craft under fire, current and wind, and the lack of landmarks on the smoke-shrouded shoreline when viewed from water level. Different tactics were sometimes employed. The Army and the Seventh Amphibious Force conducting landings on New Guinea would come ashore at dawn about two hours before high tide, unload within four hours, and withdraw until the next morning. The reason for this quick withdrawal after landing (hopefully) adequate ammunition and supplies was the absence of a strong Navy force to protect the transports from Japanese surface attacks, and insufficient air

neutralized; aircraft and shipping were destroyed or driven from the area. In 1942 insufficient Allied assets and the strength of Japanese forces in the Solomons limited the accomplishment of these goals, however.

Months before the assault submarines photographed the shorelines, aircraft photographed the entire island (or at least the main area of operations on larger islands), and reconnaissance teams sometimes went ashore. Photographic mosaics and terrain models were assembled, and all available information was collected from a variety of sources, including tourist books and reports by former residents. Long-range bombers would begin to pound the island; carrier raids would clear the objective and surrounding islands of enemy air assets; and air raids and submarines would sink or drive away Japanese ships and cut the objective off from reinforcement. Later, battleship raids would pound the island with heavy gunfire.

The assault landing

The amphibious task force would normally arrive in the early morning hours of darkness on D-Day. The order to man embarkation stations was given well before dawn, and the order to "land the landing force" soon

cover to defend against inevitable air attacks.

When assaulting atoll islands the assault force landed on the lagoon side, inside the area enclosed by the ring of islets and the connecting reef, even though the fringing reef stretching into the lagoon on this side of the island was much wider than on the ocean side. The lagoon provided the invasion fleet protection from submarines and offered a sheltered anchorage, and most were large enough to allow ships to maneuver to evade air attacks. The surface conditions were calmer (amtracs have low freeboard), surf was lighter, and amtracs could carry troops across the reef. Additionally, Japanese defenses and obstacles were usually less developed on the lagoon side. The enemy had assessed that landings would occur on the ocean side, even though the surf was rougher, because the narrower reef allowed transports to deliver landing craft closer in so that they would be exposed for less time when running ashore. They were slow to reorient their defenses, and never seemed to appreciate the capabilities of the large numbers of reef-crossing amtracs.

An RCT would normally land with two battalions abreast, and the regimental reserve battalion landing behind one of the assault battalions on the outer flank of the beachhead. This allowed it to move into a position to secure the exposed flank as the assault battalions pushed inland to their initial objectives. However, it was not uncommon for regiments to have to land in a column of battalions on narrow, restricted beaches; in such cases the lead battalion would swing to the right or left and the second battalion in the other direction, with the third coming ashore as the reserve. Light machine guns and 60mm mortars, flamethrowers, bazookas and demolition squads accompanied the first waves of assault troops. Heavy machine guns, 81mm mortars, and AT guns



In the early morning hours the order is given to disembark the landing troops. Men clamber down the swaying nets, with their packs fighting to pull them backward.



LCVPs from the USS Chinton (APA-38), a Bayfield Class attack transport, circle prior to forming up into assault waves. The dark panels along the hull sides mark the boat stations. Note that the groups of landing craft are circling clockwise and counter-clockwise: the theory was that if they collided they were going in the same direction and would glance off, causing less damage than if heading into one another.

came ashore in following waves with the reserve companies and engineers, headquarters, and shore party details. Aid stations generally landed with the unit headquarters they supported. Tanks often landed in the fourth wave, and artillery, AA guns, and more support and service troops followed. The shore party command group landed after the combat elements were ashore and was accompanied by the medical collecting stations, which were responsible for evacuating the wounded to transports. Besides establishing company, battalion, and regimental aid stations, the medical company supporting a regiment also possessed collecting parties, which evacuated casualties from company aid stations to battalion or regimental aid stations by ambulance jeeps and litter-bearers.

Any given unit divided into several echelons. The essential combat elements would land in the assault waves, followed by heavier weapons, support troops and equipment. Non-essential support personnel and equipment would follow later, sometimes the next day. Unit load and echelon plans were complicated, and assignment of elements to different waves and to individual landing craft was complex. Ammunition, medical supplies, fuel, water, rations and other materiel came ashore and were stockpiled in beachhead dumps.

The Navy preferred the assault force to land on the central coast of an elongated island, advance to cut the island in two, and then attack toward the opposite ends; it was believed that this ensured that the island was secured more quickly than landing at one end and attacking up the island's long axis. Their motivation was to limit the time the invasion fleet was exposed to air and submarine attack, though the Japanese in fact failed to take advantage of the latter capability. Available landing beaches often led the assault force to this scheme of maneuver – few suitable

beaches were found on the ends of islands; but it made the command and control, logistics, and fire support more complicated, with forces attacking in opposite directions. Another advantage of landing on one end of an island, if beaches were available, was that they usually had lighter infantry defenses and allowed the attackers to roll up the flanks of the beach defenses on the extended shores. Heavy coast defense guns were often positioned at an island's ends, but these were ill suited for engaging landing craft and were usually knocked out before the landing commenced. In the event, few suitable landing sites were available on the ends of islands, Kwajalein and Tinian being the only exceptions. Once the beachhead was established and the island was cut in two, the main assault force would drive toward the far end of the island while a minimal force mopped up and patrolled the end already occupied. Regardless, the urgency of securing the island as fast as possible was stressed at all echelons; it was found that this usually reduced casualties among assault troops.

Once the landing was accomplished and the enemy beach defenses were cleared, the assault units moved inland to seize initial objectives, secure the beachhead's flanks, and establish contact with adjacent units. A minimum 500–600 yard deep beachhead was necessary to allow space for everything that followed. Even then, space for command posts, aid stations, artillery, AA guns, reserves, assembly areas, dumps, and vehicle parking areas was at a premium. D-Day objectives were terrain features that provided good defensive positions to hold against the inevitable night counter-attacks and infiltration attempts. Besides enemy resistance, unexpected terrain difficulties – swamps hidden behind the beaches, broken ground, and dense jungle – might delay consolidation on objectives.

Japanese counter-attacks on the landing force were often too weak, too late, and conducted piecemeal. Later concerted counter-offensives also failed, because they were too weak and revealed poor coordination between the different elements. Allied air superiority also prevented the Japanese from assembling and moving reserves and counter-attack forces. The Japanese planned to conduct counter-landings on Allied beachheads, or to reinforce islands under attack by moving forces from nearby islands at night by barge. This was seldom accomplished in the face of US air patrols and aggressive patrolling and screening by LCI gunboats, PT boats and other small craft.

Subsidiary US landing operations were often conducted in conjunction with, and usually just prior to, the main landing. Battalion teams or the divisional scout/reconnaissance companies landed on and cleared adjacent islands of any Japanese defenders and lookouts. One or more artillery battalions were established on some of these islets to support the next day's main assault, and security outposts were established on others. On atolls another reason to secure adjacent islets was to prevent Japanese from escaping from the main island; submerged reefs, which could often be waded even at high tide, connected these islets. This was another lesson learned at Tarawa, where the Marines had to pursue over a hundred fleeing Japanese around the atoll's entire length before wiping them out on the last islet.

A single division conducted most assaults – some 20 of them – although additional divisions would often arrive later. Divisions

preferably landed two regiments abreast on adjacent beaches with the third regiment in reserve. When an entire corps was landed, two divisions were landed abreast. Of the four **two-division corps landings**, two – on Saipan and Iwo Jima – saw the divisions landing adjacent to one another. The other two – at Hollandia on New Guinea, and Guam – saw them landing 20 and seven miles apart, respectively; for all practical purposes Hollandia was two separate operations. (Actually the two-regiment 1st Prov MarBde was employed with the 3rd MarDiv on Guam, but it was at near divisional strength.) In these cases it took the two forces six and eight days respectively to link up.

The two-division assault required the centralization of some assets under corps control. Few support elements other than small, specialized units were attached directly to divisions. Amphibian tractor battalions would be attached to divisions to support the assault, but then reverted to corps control. Corps artillery retained control of non-divisional artillery battalions, although battalions were designated to support specific divisions. In the 1930s the Marine Corps described the similarities between ground and amphibious assaults, observing that amphibious assaults were “the assault of an organized defense position modified by substituting naval gunfire support for divisional, corps, and army artillery.” Close air support, to an extent unforeseen in the early 1930s, supplemented naval gunfire and helped fill the firepower lag until field artillery was landed, and played an important role in completing the occupation of an island. AAA battalions were also concentrated. Corps control of these assets allowed units to be attached to divisions as necessary to build combat power where needed.

As the assault waves form up the control boats move into position. This Landing Craft, Control Mk II – LCC(2) – mounts five radios, identification-friend-or-foe (IFF) gear, and navigation equipment.



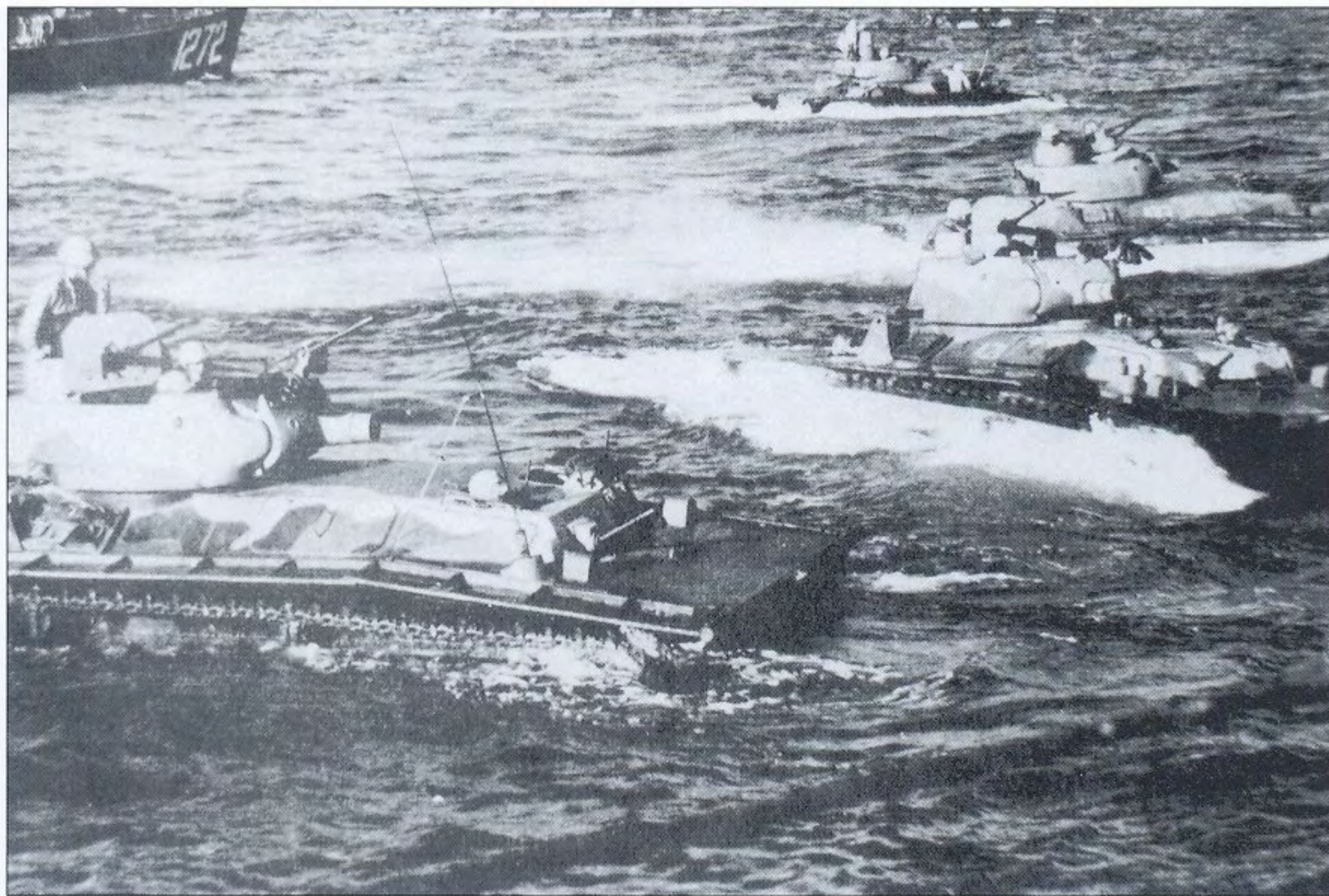
Only three two-corps, **four-division, army-level landings** were conducted on Leyte, Luzon and Okinawa. In each instance all four divisions landed on adjoining beaches or were separated by negligible distances.

In many of the early operations in the Solomon Islands the objective was to establish a lodgment on larger islands, to build airfields, and to let the Japanese batter themselves against the perimeter. Most landings on these mountainous, jungled islands

were lightly opposed, if resistance was encountered at all. In some cases the island was never cleared of Japanese, since the cost of doing so would have far outweighed the threat posed by the fugitive survivors of the garrison. Even when they might have been cleared, the mountainous interior was seldom penetrated. (For instance, after seizing initial lodgments on Bougainville and New Britain the Marines were relieved by the Army, which expanded the perimeter with two or three divisions, and harried the Japanese by conducting aggressive patrols further afield. The US Army units were themselves relieved by Australian forces, which kept up the pressure on the remaining Japanese until the end of the war.)

During the defense of the perimeter and offensive operations to clear the rest of the island, the troops relied heavily upon the Navy for air and gunfire support, delivery of munitions and supplies, ship-to-shore communications, and evacuation of the wounded. The USN also kept the Japanese Navy at a distance, interdicting barge and transport traffic attempting to reinforce the objective island, conducting local combat air patrols, and attacking airfields and bases on other islands within range.

Smaller islands in the Solomons were completely cleared, but these were usually under-defended. An entirely different type of island was encountered in the Central Pacific, where small atoll islets required every square yard to be cleared of dug-in defenders. Since the Japanese were forced to defend at the water's edge, the amtrac was essential to deliver the assault troops across the reef. Larger volcanic islands were also encountered in the Central and Western Pacific, though not as large as those in the South Pacific. Heavy resistance was usually experienced during the landing, but the real challenge was to clear the resolute defenders from the chaotic inland terrain, riddled with caves and fortifications. This resulted in battles sometimes lasting for months, requiring extensive support from the amphibious force before the final strongholds were overrun – if the garrison did not first waste itself in a futile *banzai* charge. The amphibious assaults of the larger islands of the Philippine archipelago were usually lightly resisted at the water's edge, but these operations turned into lengthy land campaigns.



"Wave 0": LVT(A)5 amphibian tanks pass SC-1272 as they begin their run to shore to "shoot" the following waves of troop amtracs on to the beach. These tanks are camouflaged with forest, medium and light green and sand colors.



Eniwetok Island, February 1944: amtracs and amphibian tanks pass the larger LCI(G)s, which are still smoking just after firing off their rockets.

Whatever the type of island, small, isolated enemy pockets and scattered groups of stragglers would hide out in the rear areas while reserve units and service troops mopped up, and discarded weapons had to be collected so as to deny them to stragglers. The island would be declared "secure" when organized resistance ceased, but this was not a claim of final victory. There was still significant mopping up to accomplish, even some pitched

battles to be fought as last strongholds were overrun and stragglers conducted raids in American rear areas. This could go on for weeks; but once declared secure by the assault force commander, the island was turned over to the island command.

* * *

American amphibious doctrine evolved constantly and drastically throughout World War II. The organization, command and control, assigned naval, assault, and air forces, and logistics capabilities seen on Okinawa in April 1945 bore little resemblance to those on Guadalcanal in August 1942. While amphibious warfare doctrine and capabilities have continued to evolve, a strong similarity to the operations of 1945 can still be traced in today's Marine and Navy amphibious doctrine.

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The assault waves have fought their way inland, and a massive logistical effort to supply the landing force and sustain prolonged operations ashore gets underway. Here LSTs and smaller landing craft crowd the water's edge to disgorge cargo over the beaches.

THE PLATES

A: DEBARKING LVTs, 1942

During early operations, before availability of LSTs and LSDs allowed amtracs to be driven directly into the sea, they were carried as deck cargo aboard transports and lowered over the side by booms. The engines had to be started immediately upon entering the water in order to operate the bilge pumps or the LVT would soon sink – there was no manual back-up bilge pump. Cargo had to be lowered into LVTs once they were in the water as they exceeded boom capacity if fully loaded. A few service troops would board to help load and secure cargo.

These are LVT(1) Alligators, as used for landing on Guadalcanal. In fact our plate elides two separate periods in order to show the troop embarkation technique: in 1942 the LVT – said to mean “large vulnerable target” – was not used to carry assault troops, but was strictly a supply transport. The LVT(1) was built by the Food Machinery Corp from 1941; it usually mounted a .50cal M2 machine gun and a .30cal M1917A1 water-cooled MG. The folded tarpaulin atop the cab is a cargo compartment cover. The Alligator had a 146hp engine, while most later marks had 250hp; it was first used on Guadalcanal, and for the last time at Cape Gloucester, New Britain. Early LVTs were painted blue, but this was worthless as camouflage at sea as they left conspicuous

wakes; moreover, blue did little to camouflage LVTs once ashore, where their need for subdued coloration was as essential as for tanks and other vehicles.

Descending down a landing net (actually cargo nets used to sling-load cargo on and off ships by booms) was a learned skill. The troops’ heavy loads of bulky equipment and weapons, the swaying net, and the bobbing LVT or landing craft all seemed to work against each other – and everything was wet. Troops were taught to grip only the vertical ropes to prevent the men above from stepping on their hands. Later in the war boat stations would be marked on painted squares on the side of the ship, identified both by number and color-code.

B: BOAT TEAM, 1944

Most amtracs could carry 24 troops and the LCVP up to 36; here we show only half that many in a lightly loaded LCVP. The troops stood in both boats and amtracs – there were no seats or benches. Army and Marine rifle platoons had just over 40 men; a platoon was split between two or three landing craft or amtracs and organized into what were called “boat teams,” regardless of the craft. Composition varied, but the idea was to make each boat team self-contained, with a designated leader and alternate leader, augmented with assault weapons, and specialist attached personnel such as engineers with flamethrowers and demolitions, a



medic, and crew-served weapons from the company weapons platoon. On Roi-Namur, for example, the 4th MarDiv organized platoons into an assault team (itself a boat team) plus two other boat teams of 18–20 men each. The assault team, under the platoon commander, was organized into light machine gun, demolition, bazooka, and support (two BARs) groups; this force would fight its way inland, knocking out pillboxes and blockhouses. The boat teams, with the bulk of the platoon's riflemen and BAR men, would follow, mopping up. All teams would push inland irrespective of the location of units on their flanks. Once they reached the "O-1 Line" they would consolidate, redistribute ammunition, and reorganize as rifle platoons.

By mid-1943 the LCV(P), commonly called the "Papa boat" or "Higgins boat," was in widespread use and would replace the LCP(R) and LCV. While built largely of wood, it was fitted with 2,000lbs of 1/4-in armor for the ramp, sides, front of the engine, rear fuel tank and gun tubs. On its weathered Navy green paint scheme this craft bears typical markings identifying it as boat 12 assigned to an assault transport, in this case the USS *Warren* (APA-53). The two .30cal M1919A4 machine guns were mainly intended for air defense and were not generally fired when approaching the beach, for fear of hitting passengers during the rough, bouncing ride in. The coxswain ("coxs'n") commanded and steered the boat, from the left side of the engine compartment; he could lower and raise the ramp from his position, but there was a manual back-up winch at the bow. The motor machinist's mate ("motor mac") and boat crewman manned the machine guns. Alternatively, a LCV(P) could carry a 75mm or 105mm howitzer, a 37mm AT gun, a jeep or 1-ton cargo truck with 12 troops, or 8,100lb of cargo. Today only one rebuilt LCV(P) survives, from more than 23,000 produced during the war; it is displayed at the National D-Day Museum in New Orleans, Louisiana.

OPPOSITE Not the typical image of an amphibious assault over the white beach of a coral atoll: here heavily armed Marines struggle ashore on New Britain. On the large islands of the Southwest Pacific, jungle and swamp often came down virtually to the water's edge.

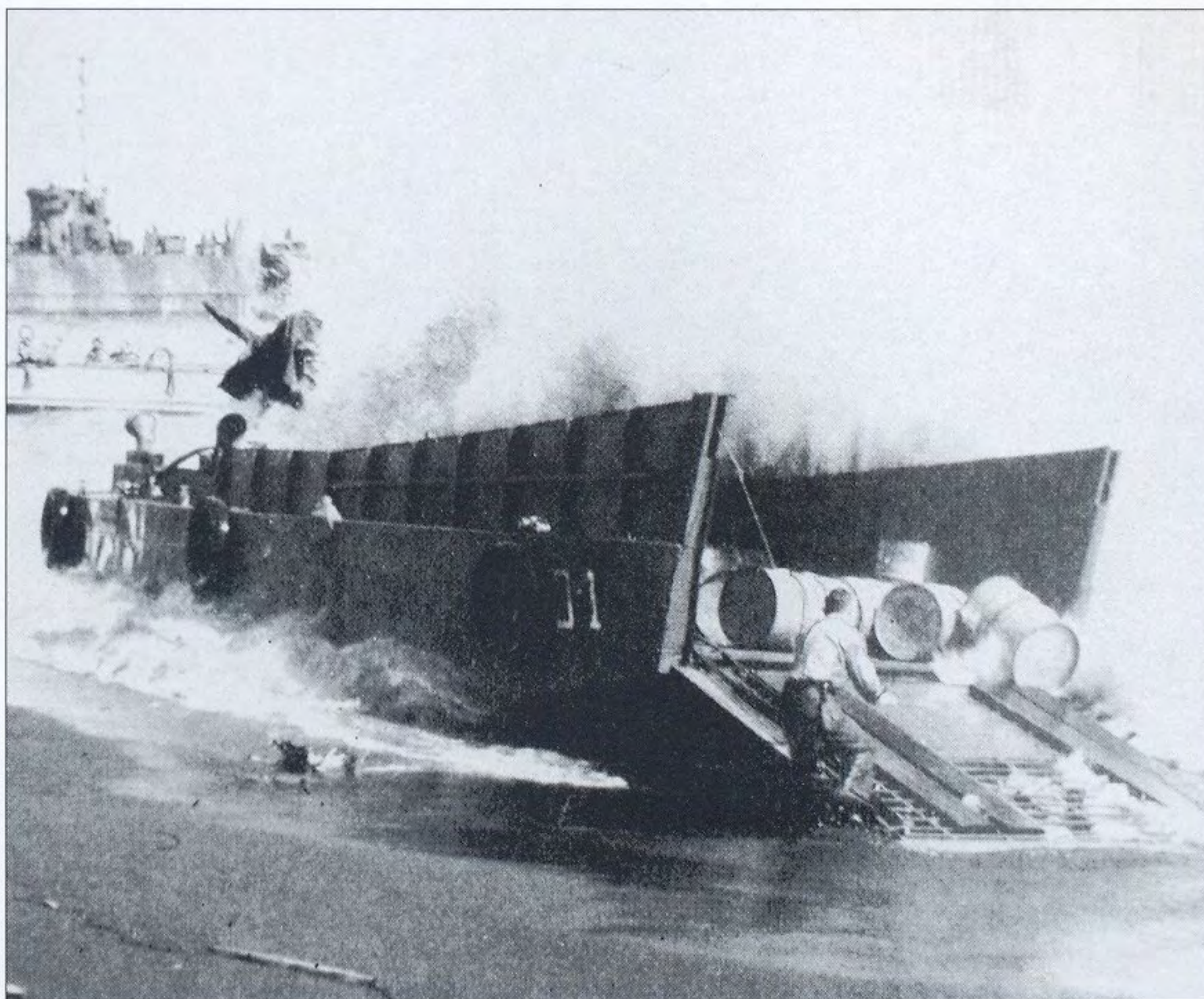
Broaching – turning broadside to waves and wind – was a common hazard for the flat-bottomed, high-riding landing craft, and avoiding it required a great deal of skill. Under rough conditions even experienced crews could fall victim, like this LCM(3). Broached craft had to be towed off by larger craft.

C: SHERMAN TANKS ABOARD AN LCT, 1944

In order to provide the capacity to build up tank strength in the beachhead more quickly than by LCMs landing only single tanks, a larger craft was needed. The LCT(6) appeared in 1943 to replace the less capable 1942 LCT(5); both could carry four M3 or M5 light tanks or three M4 medium tanks. They were also useful for landing heavy artillery and their prime movers, or 150-ton loads of cargo; on-board armament was two 20mm Mk IV anti-aircraft guns. While they were similar in capabilities, the Mk VI LCT boasted improved crew accommodations, and a removable stern plate allowing two or more to be moored end-to-end to serve as a drive-through causeway linking LSTs to shore. LCTs were the smallest landing craft to be assigned BuShips hull numbers: LCT(5), 1–500; LCT(6), 501–1465. They were used extensively for general cargo hauling and many support tasks in rear areas, resulting in them being redesignated Landing Craft, Utility (LCU) in 1949.

Camouflage schemes varied widely for amphibious craft, with little standardization in colors and patterns. One of the most effective was this mid-war pattern using "dots" to give a blended appearance; here the shades are dark "Navy green" over medium "ocean green" over light "haze green." The purpose of jungle-style camouflage was to allow the craft to hide from aircraft among shoreline vegetation, a common practice in the Solomons and New Guinea.

Since tanks often had to wade ashore from the edge of the reef, which was cut by undetected channels and potholes, they were fitted with fording kits. The T-O tank fording kit contained waterproofing paints, sealing compound, tape, brushes, and welding rods necessary to waterproof turret rings, ports, vents, and the many other openings found on a tank – a task requiring many hours' hard work. The MT-S fording stacks and an adapter kit for the specific model of M4 Sherman tank provided engine air



intake and exhaust. A quick-release cable system allowed the tank commander to jettison the stacks as the tank came ashore. The Sherman, armed with a 75mm gun, proved effective in the Pacific; it was much more capable than any Japanese tank, and could knock out most pillboxes. It was mostly impervious to the commonest Japanese 37mm AT gun, though vulnerable to the less often encountered 47mm gun. In the Pacific Theater more American tanks were lost to mines than to any other cause.

D: DEBARKING LVTs FROM AN LST, 1944-45

LST was said to mean "large slow target;" they were also known as "Green Dragons" and "Green Snappers" due to painted green camouflage patterns, or "Love-Sugar-Tare" after the phonetic alphabet. While the LST was designed to deliver large numbers of tanks and other vehicles to secured shores, one of its most valuable uses was to transport amtracs as part of the attack force's tractor group. The tractor group would anchor in the tractor area and debark its amtracs directly into the water. Troops usually transferred to the amtracs at the transfer line (see Plate E); but sometimes they were boated to LSTs aboard LCVPs, and boarded their amtracs in the LST's hold – a much easier and safer exercise. An LST could carry 29 6x6 cargo trucks or 20 Sherman tanks, but only 17 amtracs; forced air ventilators blew vehicle exhaust fumes out of the cavernous hold through deck vents. Amtracs were recovered by their parent LSTs for refueling and repairs; crews often worked on the temperamental amtracs all night to ready them for the next day's operations. Relaunching recovered amtracs was tricky: they had to back off the ramp into the water, as there was insufficient space to turn around in the hold – they could

not back up on to the ramp from the water. Some LSTs were fitted with a turntable behind the ramp to allow amtracs to be turned around when recovered. Hull numbers were required to be 3ft high until December 1944, when 6ft numbers were specified allowing identification at 4,000 yards.

The LST proved so versatile that 113 were converted to motor torpedo boat tenders (AGP), battle damage repair ships (ARB), landing craft repair ships (ARL), salvage craft tenders (ARST), aircraft engine repair ships (ARVE/ARVA), general store issue ships (AKS), barracks ships (APB/LST(M)), assault support surgical hospitals (LST(H)), and other specialized types. A few were fitted with light observation airplane flight decks and catapults (Brodie gear).

The LVT(2) Water Buffalo was built by the Food Machinery Corp from 1942. It had a .50cal M2 and up to three .30cal M1919A4 machine guns, with a crew of three or four. It could carry 24 troops or 6,500lb of cargo as compared to the LVT(1)'s 20 troops or 4,500lb. The cargo compartment could not accept a 105mm howitzer and was hampered by the drive shaft running the compartment's length, restricting some types of cargo. It was first used at Tarawa – also the first use of amtracs to land assault troops – and last used at Okinawa. The LVT(A)2 was an armored hull troop/cargo version, and not an amphibian tank; it was used only by the Army. Most amtracs were painted Marine forest green or Army olive drab by 1943.

E: TRACTOR TRANSFER LINE, 1945

In many instances the reef line – the ocean-side edge of the coral reef fringing islands – could not be crossed by landing craft at low tide. The initial assault waves would be loaded



5-ton crawler crane hoisting cargo from an LCM(3) on Okinawa.

OPPOSITE Equipment is landed from LCM(3)s, including a 1-ton cargo trailer.

aboard LCVPs or LCMs and boated to the "tractor transfer line" outside the reef. Fringing reefs might be anything from a few hundred to several thousands of yards wide, and the transfer line might be further offshore if the reef was narrow, in order to keep it outside machine gun range. Here a 12-man Marine rifle squad transfers from an LCM(3) to an LVT(3) amtrac; we show calm seas, but in rough water conditions this could be a daunting task for combat-loaded troops. Reserve battalions and support troops were usually landed by landing craft, but at low tide they might have to be brought ashore by amtracs. After delivering the assault waves the amtracs returned to the transfer line and picked up follow-on troops. This often turned into a piecemeal and somewhat disorganized operation because of amtrac shortages caused by enemy action and mechanical failure, factors that could not be planned for.

The Borg-Warner LVT(3) Bushmaster, or "Beach Buster," was actually fielded after the LVT(4) due to production problems. Its only wartime use was at Okinawa, though it would become the standard post-war amtrac, replacing the LVT(4). While both of these models carried 24 troops, the LVT(3) could haul 12,000lb of cargo compared to the LVT(4)'s 8,000lb. Both possessed a rear ramp to allow troops to debark more rapidly and safely, rather than climbing over the sides exposed to enemy fire, as had been the case with earlier amtracs. They could also carry up to a 105mm howitzer (though the barrel had to be at near full elevation for it to fit), and could deliver a jeep.

The LCM(3), the "Mike" or "M" boat, was intended to deliver a single medium tank directly after the assault waves. It was small enough to be almost as maneuverable as and drew little more water than the LCVP. It could also deliver 60 troops, making it ideal for landing follow-on units as well as trucks and supplies. It was armed with two .50cal M2 machine guns on Mk 21 mounts.

In the background is a 3x7 pontoon barge, propelled by an outboard motor, mounting a lashed-down 5 ton crawler crane to transfer cargo from landing craft to amtracs. Cargo was often stowed on wooden pallets, allowing it to be hoisted craft-to-craft, and then dragged by tractor across the beach. Other barges were anchored on the transfer line loaded with 55gal gasoline drums and powered fuel pumps, to refuel amtracs so they would not have to return to their parent LSTs far away in the tractor area.

F: BATTALION ASSAULT PLAN, 1944

The organization, composition, and formation of an amphibious assault varied depending on terrain ashore; the available types and number of amtracs, landing craft and control craft; fire support, and other factors. This is a depiction – not to true scale – of the 2nd MarDiv's 2nd Bn, 6th Marines, landing on Saipan on June 15, 1944.

This was the northernmost flanking battalion of the eight initial assault battalions on a 6,000-yard wide front. There was a good deal of drift northwards; the battalion was to have landed on Beach RED 2, but actually landed on RED 1



(originally not to be used), and the adjacent 3rd Bn landed on RED 2 instead of its assigned RED 3. The narrow beaches were 600 yards wide, and the reef line was about 400 yards offshore. A line of seven destroyers, two battleships, and two cruisers were positioned some 2,500 yards offshore to blast the beaches with direct fire. The USS *Coghlán* (DD-606) sat off RED 1, and the USS *Monssen* (DD-798) was to the right of the RED 3 lane. Three LCI(G)s advanced toward shore ahead of each battalion's assault waves to launch their 4.5in rockets at 1,000 yards, then turned to the flanks.

Rather than a "Wave 0" with an amphibian tank company, Wave 1 consisted of 12x LVT(2)s and (4)s. Three platoons each of six LVT(A)4 amphibian tanks accompanied Wave 1, with a platoon echeloned on each flank and another in a wedge in the center. An LCC was positioned on the left flank and an LCVP on the right for control. An LCP(R) followed the wave in the center as a rescue boat. Waves 2 and 3 had 12x LVTs and Wave 4 had 14; all waves had LCVP guide boats on both flanks. The 3rd of the 6th to the right was organized the same. A PC followed both battalions' Wave 1, carrying the LST division commander. Wave 2 would land at H+5 (minutes), Wave 3 at H+13, and Wave 4 (which is still forming up in the illustration) at H+21. All these amtracs, control craft, and guide boats for the 6th Marines' two battalions were launched from eight LSTs of Tractor Group

ABLE. Eight more LSTs launched the 8th Marines' two assault battalions further to the right to land on GREEN 1 and 2. PC(S)-1079 had overall control of both regiments' boat groups.

The Japanese opened fire on Wave 1 at the reef line. Wave 1 was to advance inland with the amphibian tanks, discharging their troops clear of the beach; the following waves would unload on the beach. No amtracs would advance beyond the Tractor Control Line, a railroad track just inland from the coast road. Almost half of the 2nd MarDiv's amphibian tanks were knocked out or suffered mechanical failures; and the 2nd Bn, 6th Marines had four different commanders during D-Day. Although the battalion experienced the most resistance of any on D-Day, it fought its way inland some 2,000 yards; but nightfall found it still

The treatment and evacuation of casualties was a major activity in the beachhead. Collecting companies gathered the wounded from unit aid stations and organized their progress towards the rear. Landing craft, DUKWs and amtracs carried stabilized casualties back out to the troop transports, where most were treated – these ships had complete surgical and other medical facilities. Hospital ships usually arrived later, to move casualties to rear bases and the United States.



1,000 yards short of the O-1 Line (which stretched the furthest inland in this battalion's sector).

G: BEACHHEAD

The beachhead, once secured by the assault troops, became a place of organized confusion. Space and suitable areas for the many competing units and facilities was often at a premium as more men, equipment and supplies flowed in, carried by progressively larger craft; here an LCM and an LCT unload in the background. Cargo handling equipment to unload and move this mass of materiel was essential – crawler cranes, bulldozers, A-frames mounted on DUKWs, scarce trucks, and conveyor rollers.

From 1943 the 2½-ton six-wheel-drive DUKW-353 ("Duck") amphibian truck (center) became an increasingly important asset. Completely unarmored, it was not suited as an assault vehicle, as was proved at Peleliu. Its primary role was to carry a 75mm or 105mm howitzer, with follow-on vehicles delivering ammunition. The cargo well was too narrow for a 105mm M2A1 howitzer, so this was remedied in two ways: the 105's standard wide wheel rims were replaced with narrower rims off cargo trucks, or the sides of the cargo well were beaten with sledgehammers until the howitzer fitted... DUKWs were launched from LSTs, crossing reefs and running ashore to unload their guns and ammunition directly at the firing site; some were fitted with A-frame hoists for unloading. They were also used to deliver other supplies, headquarters and specialized support troops, and to evacuate casualties. One in four mounted a .50cal M2 machine gun on an M36 ring mount.

There were never enough bulldozers to drag supply pallets from the beach, pull out vehicles stuck in the sand, push grounded landing craft free, tow heavy artillery pieces (a task also given amtracs), clear dump sites, build protective berms for artillery and dumps, plow roads or clear rubble.

Getting supplies and equipment to the right place proved to be a difficult and critical task. The first challenge was simply getting to the right beach: landmarks were often few and obscured by dust and smoke, and long stretches of the shore were lined with beached landing ships and craft blocking the view of markers erected by the beach party. It was difficult to avoid the masses of returning craft and amtracs and the marked obstacle areas, and the tricks of currents and winds aggravated the problem.

Beach flanks were marked with vertical 2½x12ft panels of the beach color, the number of panels identifying the beach number. Horizontal panels marked the left flank and vertical the right (an optional 6ft square panel marked the center); the panels shown here identify the adjacent right flank of RED 2 and left flank of BLUE 1. At night colored lights arranged horizontally and vertically in the appropriate numbers were used. Additionally, 6ft square panels identified unloading points from where materiel would be sent to dumps (see inset). At night these too were identified by colored lights (indicated in parentheses, the first color being at the top): 1 = medical supplies and casualties (white/green); 2 = ammunition (white/red); 3 = rations (white/blue); 4 = water (two white); 5 = fuel and oil (white/yellow); 6 = miscellaneous supplies (blue/yellow/red); 7 = tracked vehicles (two green); and 8 = wheeled vehicles (one white); 9 = cleared channels were marked with black pennants to port (left) and red to starboard (right) – at night a blinking white and steady red light, respectively, were used.

H: TANK-INFANTRY TEAM

The importance of tanks to successful operations ashore was emphasized by the priority given to their delivery, and the variety of beaching craft with different capabilities for landing medium tanks: LST (20 tanks), LSM (3 tanks), LCT (3 tanks), and LCM (1 tank). The first danger faced by tankers on debarking the landing craft was undetected potholes and hidden channels as the tanks waded across the reef toward the beach. On most islands there were few if any manmade underwater and beach tank obstacles, but landmines were often encountered once ashore. Antitank fire was often light during landings, but AT guns were frequently encountered further inland. Suicide squads armed with magnetic explosive charges and grenades proved to be a hazard where rugged and densely vegetated terrain offered concealment. Japanese tanks were often employed as dug-in pillboxes, employed in piecemeal counter-attacks, or committed too late to deter the landing. It was realized early in the Pacific campaign that the 37mm guns of US light tanks were ineffective against typical pillboxes; nevertheless, M3- and M5-series Stuart tanks remained in use to protect and support M4 Sherman mediums. Some light tanks mounted flamethrowers in lieu of the bow machine gun (as some Shermans did later). It was quickly appreciated that tanks could not operate independently of infantry, and much emphasis was placed on tank-infantry team training. The infantry protected the tanks from close-in attacks; reconnoitered routes clear of obstacles, mines, and debris; identified and marked targets; and cleared knocked-out enemy positions. This required infantrymen and tankers to have a clear understanding of each other's capabilities and limitations, standard tactics, and effective mutual communications – by radio, telephones mounted on the rear of tanks, arm and hand signals, and the use of tracers and smoke grenades.

This scene is set on Roi Island on February 1, 1944. Company C (Medium), 4th Light Tank Bn, 4th MarDiv landed in two waves an hour and a half after the lead amphibian tanks and the two assault waves. The LCM(3)s beached 200 yards offshore and the tanks, fitted with fording stacks, drove through 5ft of water, with a crewman wading in front to find potholes. Accompanying the 18 M4A2 Shermans was 1st Platoon, Co A with five M5A1 light tanks. They advanced in single file until they overtook the infantry short of the O-1 Line; they immediately pressed forward against light resistance, with the infantry having difficulty keeping pace. The Shermans advanced across the airfield runway with all guns blazing, the infantry following to protect them, with the M5A1 Stuarts held in reserve. Most of the two companies of LVT(A)1 amphibian tanks remained just above the beach, prevented by craters, trenches, and debris from moving inland; but a number of them advanced along the island's west shore with the tanks, despite their inherent weaknesses as land combat vehicles. Here, in the rear, a Stuart camouflaged with sand-colored streaks has failed to drop its fording trunks at the top of the beach; perhaps the cable release is faulty – a complication typical of the differences between plans and reality. The M4A2 Shermans have sturdy wooden planks bolted to each side of the hulls as extra armor. In the foreground lies a wrecked Mitsubishi G4M "Betty" of the IJN's 755th Kokutai, part of which had been based on Roi.

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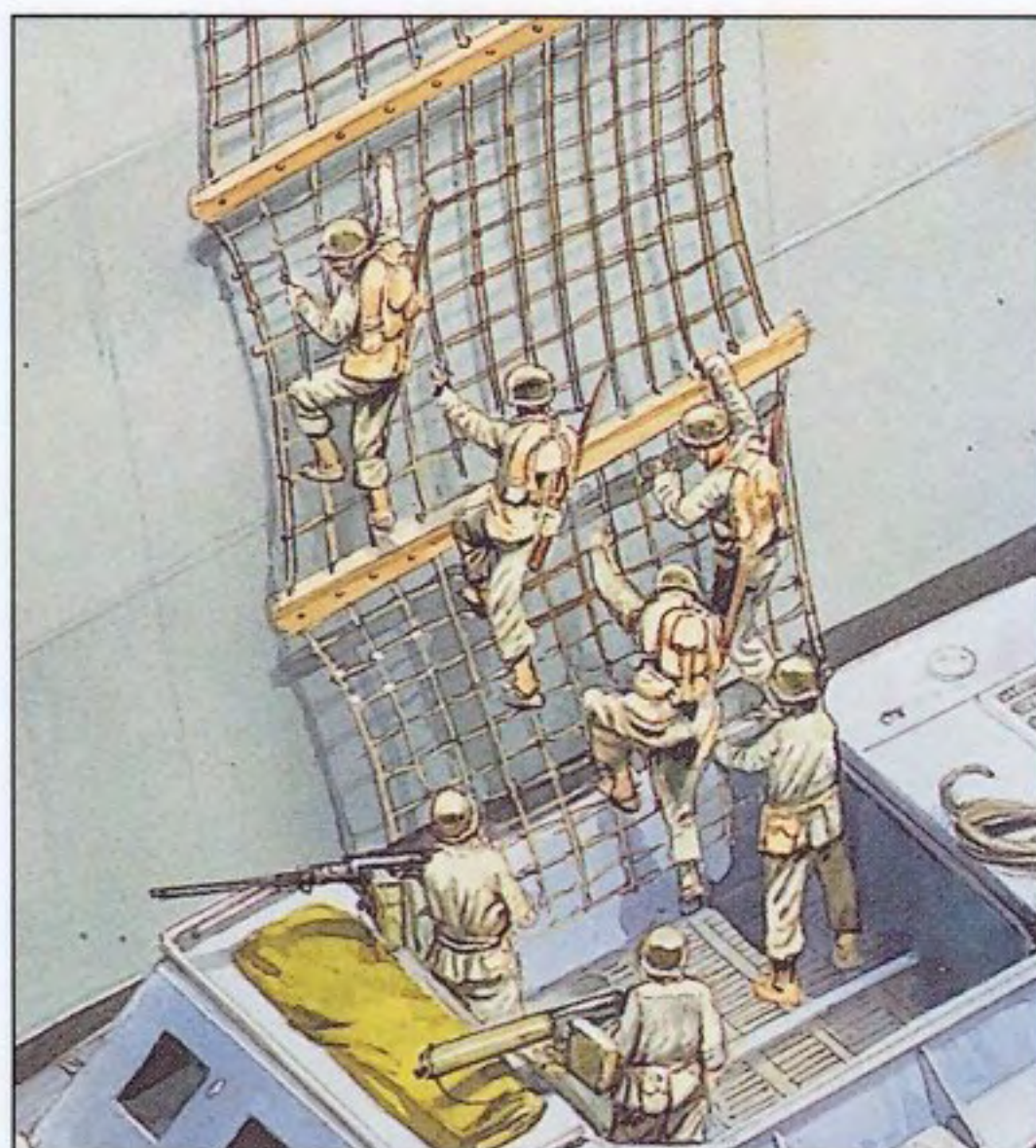
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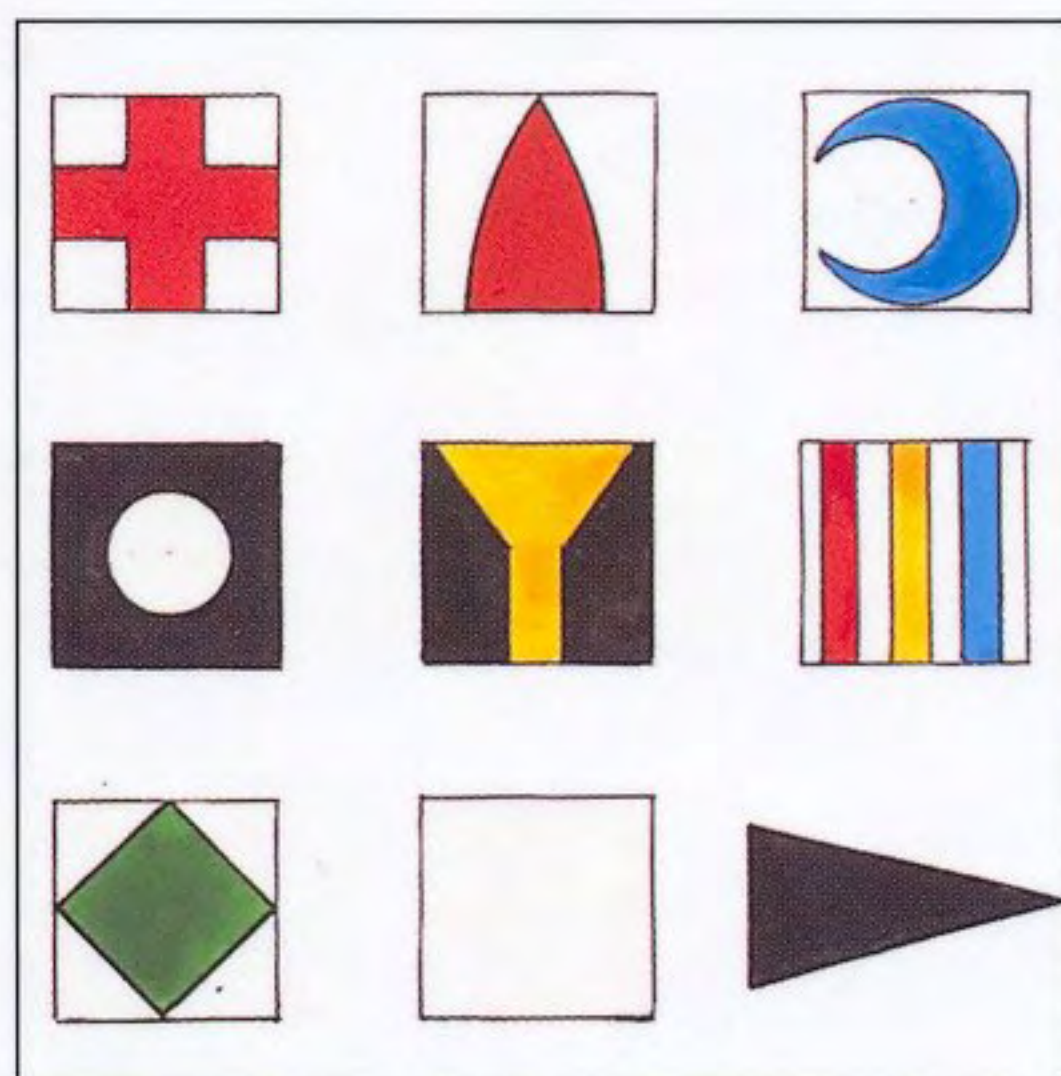
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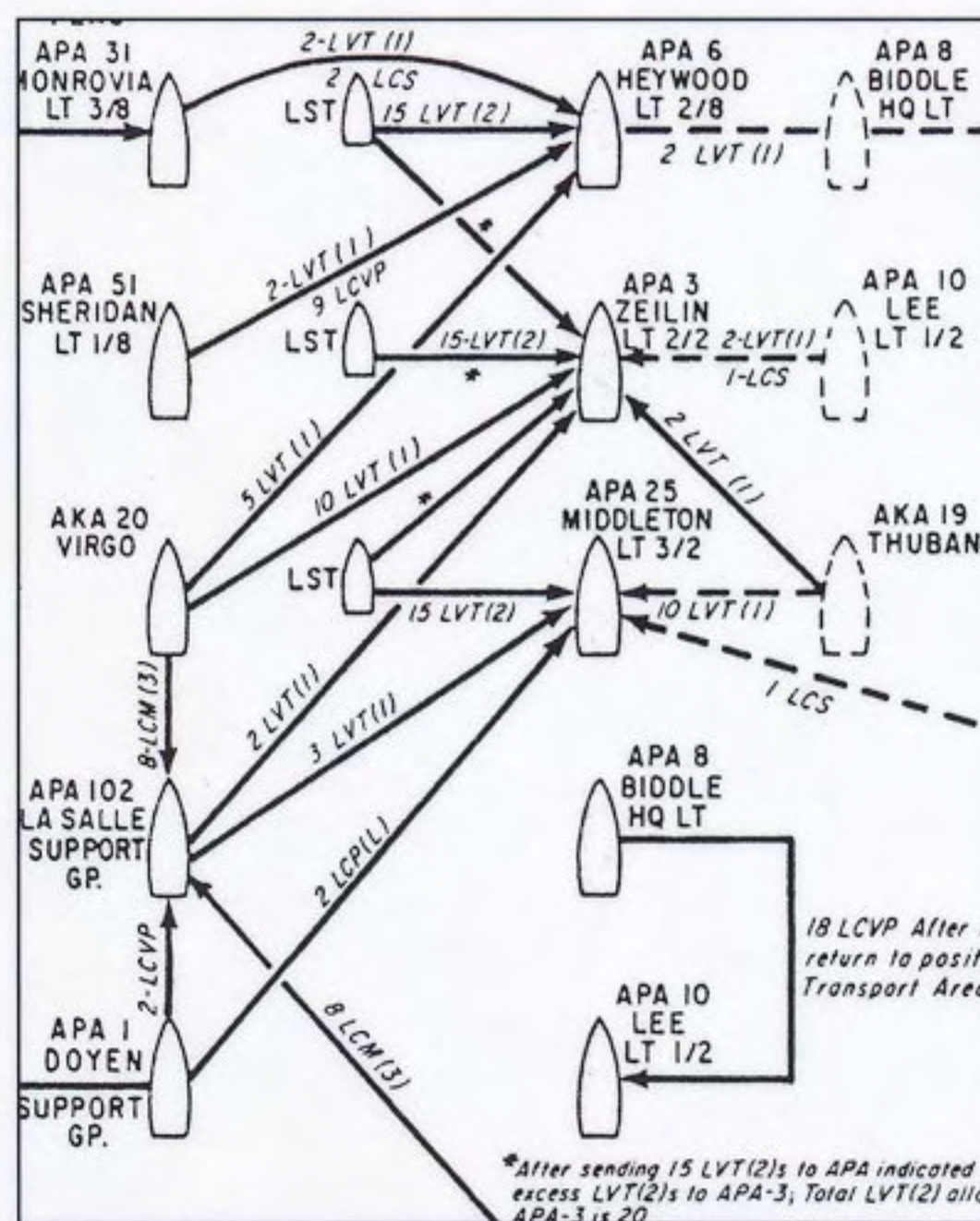
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