

Photo courtesy of US Maritime Commission

A Bird's-eye view of landing craft, barrage balloons and Allied troops landing in Normandy, France, on D-Day, June 6, 1944.

# Logistics of Operation Overlord

"...G-2 [intelligence] existed to tell me what should be done ... G-4 [logistics] was to tell me what could be done ... Thus, a timid G-4 could directly limit the scope of operations ... a resourceful G-4 could expand it."

~ General Omar Bradley Commander of US Forces at D-Day

General Dwight D Eisenhower, Supreme Commander of the Allied Expeditionary Force, was blessed with resourceful logisticians who gave the combat forces everything they needed and much of what they wanted to accomplish the incredibly daunting invasion of France, code named OVERLORD but better known as D-Day.

Victory was achieved by young Allied soldiers who faced and defeated the enemy, but their success was made possible by the transporters, quartermasters, medics, engineers and others, many of whom also experienced the risks and hardships of combat. Over 132,000 troops landed on June 6th with their equipment, vehicles, weapons, and essential supplies. They crossed a shore littered with debris, mines, and obstacles and were under fire from snipers, machine guns, and artillery.

So how many is 132,000? I commanded a logistics unit in the redeployment phase of DES-ERT STORM. Each morning I would be briefed on the number of supplies we were managing. After several days of hearing numbers which meant nothing to me except that they were large, I asked the briefer to tell me something I could do with these supplies to help me visualize the amounts. I don't remember the numbers but I do remember that we had sufficient sandbags to build a wall three-feet high across the United States. The logistical challenge of D-Day was enormous and this article is intended to help you visualize the challenge and fully appreciate the accomplishment.

Landing 132,000 fully equipped soldiers is equivalent to moving the current population of Columbia, South Carolina with all their vehicles, tools of trade and life support. It is also greater than the current population of 25 other state capitals. By June 30th (D+24), over 850,000 men,148,000 vehicles, and 570,000 tons of supplies had landed in Normandy. To visualize 850,000 soldiers, consider putting them in standard passenger buses bumper to bumper. The line would stretch 137 miles, approximately the distance from Los Angeles to San Diego, California. Arranged similarly, the 148,000 military vehicles would stretch 647 miles, or from New York City to Detroit, Michigan.

The Naval Operation, code named NEP-TUNE, consisted of over 1,200 combat ships, over 5,000 landing ships, ancillary craft, and merchant ships. Combat ships ranged from battleships to destroyer escorts. Each ship was a floating city, requiring large quantities of fuel and other supplies. The merchant fleet included 326 cargo ships. Anchoring just the cargo ships, bow to stern, would stretch 28 miles, longer than the width of the English Channel at its narrowest point.

Over 13,000 aircraft supported OVERLORD. 5,000 bombers and over 4,000 fighters prepped the battlefield and provided close air support. 2,300 aircraft and 800 gliders delivered 18,000 paratroopers, crucially needed supplies, and evacuated the wounded. These aircraft also consumed significant quantities of fuel and ammunition as well as repair parts and teams of mechanics to keep them in the air. 13,000 is the number of aircraft in all branches of the US military today.

As usual, the number of troops in the logistical tail significantly outnumbered those in the





combat teeth.

#### Predecessors of OVERLORD

After the 1940 evacuation at Dunkirk, the British focused on defending England against a cross-Channel invasion rather than launching one. Operation BOLERO was the buildup of American Forces in the United Kingdom, initially to support this defense. By December 1942, the situation had sufficiently improved for the Allies to consider an offensive.

The Allies were fighting on many fronts and each campaign competed for limited resources. Two proposed invasions, SLEDGEHAMMER in 1942 and ROUNDUP in 1943, were both cancelled due to logistical shortages, specifically landing craft.

British General Bernard Montgomery (later Field Marshall), commander of the Allied Ground Forces, argued that an invasion force of three ground and one airborne division was insufficient. General Eisenhower approved his recommendation; five ground divisions and two airborne divisions would land on D-Day. This increase required more shipping, landing craft and supplies as well as more logisticians. As a result, Operation ANVIL, the invasion of France from the Mediterranean, had to be postponed, another example of the logistical tail wagging the combat dog.

The Allies had learned much from the invasions in North Africa, Sicily, and the Pacific Theater. The delays permitted the Allies to garner the necessary supplies, shipping, and troops but it also gave the Germans time to strengthen "Fortress Europe."

# The Plan

The Principle of War "Mass" dictates, "combat power should be concentrated at the decisive place and time." Success at Normandy depended on the Allies massing a sufficiently





large and logistically supported force faster than the Germans could mass sufficient forces to destroy it – and the Germans didn't have to cross the Channel and a beach. Logistics is essential to combat power.

"A tank without fuel or ammunition is just a 60-ton radio." ~ MG James Wright 45th US Army Quartermaster General

The initial goal was to defend the beachhead; the follow-on mission was to attack Germany. Each division would require approximately 700 tons of supplies each day. As the supply lines extended across France, more trucks, fuel, rations, repair parts and other supplies as well as more logisticians were required to operate them. General Bradley observed that turn-around time for resupply was five days, meaning five trucks with drivers and fuel were now needed to deliver one truck load.

Humanitarian assistance was also needed for liberated areas. General Bradley estimated that the liberation of Paris, alone, would require 4,000 tons of supplies daily, enough to support six divisions.

To meet the unprecedented logistical challenges of WWII, logistic organizations at all levels were created or modified as experience was gained. At OVERLORD, Engineer Special Brigades were created to operate the beachheads. These brigades consisted of engineer, transportation, quartermaster, military police, ordnance, medical, signal and chemical warfare units.

Build Up Control (BUCO) would manage the movement of men, equipment, and supplies onto Normandy. The BUCO had three subordinate



commands: Movement Control (MOVCO) would direct unit movements from England onto the Continent; Turnaround Control (TURCO) would liaise with the Special Engineer Brigades to return shipping to England for subsequent loads; and Embarkation Control (EMBARCO) would allocate space to units arriving in the crowded marshalling areas in Normandy.

## The Equipment

Necessity is the mother of invention and war is a great motivator. Mechanical vehicles replaced horses, although the German Army used horses throughout the war. The submarine snorkel allowed submarines to recharge batteries without resurfacing. Penicillin, blood plasma, and vaccines saved lives. Synthetic rubber replaced natural rubber that was no longer available to the Allies. Radar, rockets, jet airplanes, computers and even the jeep were introduced during the war and of course the atom bomb.

There were also logistical inventions. The British invented the Mulberry Harbour, enabling ships to offload far from shore. Vehicles would then move to the beach over miles of flexible steel roadways.

[The Mulberry is] "one of the most inventive logistical undertakings of the war."

# ~ General Omar Bradley

Two Mulberry Harbours were constructed in England and towed in segments with final assembly on Omaha Beach to support the American sector and Gold Beach to support the British sector. 200 tugs were



planned to support the invasion. Only 125 tugs were available. The construction of the Harbours was, therefore, delayed, but both were operational on June 18th (D+12).

Sunken caissons (Phoenixes), a line of scuttled ships (Gooseberries) and a line of floating breakwaters (Bombardons) sheltered each Mulberry. Construction of the Mulberry Harbours required enormous amounts of concrete and steel, both of which were in short supply and high demand. Ironically, some of the material was salvaged from the rubble from the German bombings of London. It is unlikely that this investment of materials, money, and manpower would have been made if it were not for the personal support of British Prime Minister Winston Churchill.

At full capacity, 7,000 tons of vehicles and supplies could move across a Mulberry each day. By July 2nd (D+26) there were 25 divisions ashore. 7,000 tons was sufficient to provide one day's support for just ten of them. Over-the-shore supply by landing craft made up the difference until French ports could be captured and refurbished.

OVERLORD relied on numerous types of landing craft, each with a specific purpose. One of the most versatile was the DUKW, a 2.5-ton amphibious truck which could not only swim from ship to shore but travel on its six wheels to deliver cargo inland.

Winston Churchill best described the value of landing craft in his diary. "The destinies of two great empires [are] seemingly tied up in some #\$#@# things called LSTs [Landing Ship Tank]."

In addition to the landing craft there were landing ships, which were sea-going and longer than 200 feet. As with the landing craft, there was a wide variety of landing ships to fit specific purposes. For example, the Landing Ship Dock (LSD) could be flooded at its stern to allow loaded landing craft to enter the water.

When there was no room to dock at the Mulberry, some LSTs would "dry out" by beaching at high tide to be unloaded at low tide. While hazardous, it was considered a necessary risk and proved successful.

To meet the increased demand for fuel as the Allies advanced across France, an under the channel pipeline was created, appropriately named Operation PLUTO (Pipe Line Under the Ocean). As with construction of the Mulberrys, PLUTO's facilities in England were camouflaged to reduce the risk of enemy air and rocket attacks. It became operational on August 12th. Overland pipelines were then constructed to move the fuel forward.



"Second in daring only to the Mulberry Harbors, was PLUTO." ~ General Dwight Eisenhower

### **Preparation**

Computers were still in their infancy so calculations were done with slide rules. The planning was accomplished on yellow pads and with stubby pencils. General Montgomery's Battle Plan for D-Day was handwritten on one piece of paper.

Britain became a huge depot of equipment and supplies. The common joke was that if it were not for the air blimps used to defend against enemy aircraft, the Island would have sunk beneath the sea.

Ships are normally loaded to fully utilize capacity in terms of weight and volume as well as stability. Cargo and landing ships in OVERLORD were "combat loaded" so that units were discharged with their equipment and priority supplies could be unloaded first. Combat loading is a less efficient use of cargo space so more lifts were required to move the units and supply. Forecasting demand is equivalent to "best guessing." A resupply ship would wait in the Channel and break the queue if its load became critically needed.

Containers had not yet been invented. Boxes, barrels, bags, and crates of cargo would be manhandled onto a net. The net would then be lifted by a ship's crane and manually unloaded into a landing craft or ideally into a truck if the ship could be docked against the Mulberry. Loading or unloading a ship took several days.

Riflemen would arrive on the beach carrying at least 68 lbs. of equipment – a heavy load when wading in the surf and under fire. Each soldier carried three combat meals and three survival meals. The units carried an additional three-days of meals for each man.

Initially fuel was packaged in 5-gallon jerricans, each weighing about 40 lbs. when full. Vehicles would carry additional jerricans in reserve. Jerricans were replaced with drums and fuel trucks as the beach was secured. Over 11.5 million jerricans were used in OVERLORD. If you placed the jerricans upright and side-by-side, they would cover 163 football fields.

## Execution

"No Plan Ever Survives Contact with the Enemy." ~ Helmuth von Moltke the Elder Prussian Field Marshall

General Eisenhower delayed the invasion for 24 hours due to weather.



Subsequent waves of units were already enroute to the ports, adding to the congestion and confusion as the first wave still occupied the marshalling areas.

Severe weather was again experienced June 19-23. 8.5 ft waves and 30 knot winds were sufficient to destroy Mulberry A, which supported the American sector at Omaha Beach. Mulberry A was abandoned and salvaged parts were used to repair Mulberry B.

## "In four days this Channel storm had threatened OVERLORD with greater danger than all the enemy's guns in 14 days ashore." ~ General Omar Bradley

Effective transportation requires delivery of cargo and information. There were no cell phones or satellites to aid communications. Manifests, huge documents which list the cargo on incoming ships, were supposed to have been delivered by air or watercraft but these methods proved ineffective. Without manifests, officers would have to go onboard each ship to find urgently needed supplies and equipment. Only partially unloading these ships further delayed resupply, as these ships could not return to England for reload as scheduled. The problem extended to troop movements as well. MG Gerow, the V Corps commander, personally flew back to England in search of a unit that had been reported to have deployed. It was still in its assembly area.

For the first two days, German artillery forced ships to stay out of range, some 12 miles offshore. This increased the turn-around time for

landing craft and, in some cases, critically needed DUKWs ran out of fuel and sank because they could not operate their bilge pumps.

Cherbourg on the Normandy Peninsula would significantly improve the Allies offload capabilities but it was not captured until June 29 (D+23). The Allies had gained great experience in clearing debris, booby traps, and mines in captured ports in Sicily and North Africa, but the first supplies could not be unloaded until July and the port was not fully operational until August. Until then the Allies relied on the remaining Mulberry, small, captured ports, and over-the-shore discharge.

Logistical shortages, especially ammunition, limited the Allies' ability to take advantage of a "target rich environment." As long as supplies had to cross the beach, artillery pieces were limited to just 25 rounds per day. Depending on the type of artillery, 25 rounds could be fired in less than ten minutes. Airlift provided emergency resupply.

#### **End Result – Success**

On June 6th, 1944, despite over 10,000 casualties, the Allies won the race to mass forces and had established a defensible foothold on Normandy. They had also amassed the necessary forces and supplies to breakout of the lodgment and begin a year-long campaign to Germany. Logistical challenges remained but the resourceful American and British logisticians in the tail made sure that teeth had what they needed.

Less than a year after D-Day, Germany unconditionally surrendered on May 7th, 1945.