# Strategic Logistics and Logistical Strategies:

# How the Allies Triumphed in Europe

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## Introduction

Victory in Europe (V-E) Day celebrates the victorious Allies of World War II and the unconditional surrender of Nazi Germany, which occurred on 8 May 1945. This year marks the 75th anniversary of V-E Day. Victory in Europe was the outcome of many years of sustained human conflict, supported by an unprecedented mobilization of military forces and the movement of massive amounts of materiel.

Strategic decisions drove theater logistical requirements. Strategy includes both grand strategy and operational strategy. From a grand strategic perspective, war aims were set by political leaders such as President Franklin D. Roosevelt and Prime Minister Winston Churchill. Operation strategy, which includes planning military campaigns, was determined by military leaders like General George Marshall, General Dwight D. Eisenhower, and theater staff. Successful execution of operations at the tactical level can be attributed to the valor and dedication of Soldiers, Sailors, Marines, Airmen, and Coast Guardsman in battle.

Logistical parameters constrained strategy. Leadership could set any strategy, and faithful service members could dedicate themselves to that objective, but no strategy can succeed without accounting for logistical considerations. Strategy drives theater logistics, but strategy is constrained by logistical parameters. Thus, the guiding question: How did logistics shape the outcome of the victory in Europe? This essay will answer this question and more, including how theaters logistics were organized, the scope of these organizations, and how American military logistics changed throughout the war to ultimately achieve victory.

This essay will demonstrate how logistics was the paramount factor contributing to Allied Victory in Europe during World War II. The interdependent and reciprocal relationship between strategy and logistics, in which strategic decisions are constrained by logistical possibilities and

logistical requirements are driven by strategy, underwrites the overarching argument that logistics is the preeminent factor in the United States' Victory in Europe.

Certain thematic elements dominated Allied military logistics in Europe. First, the interdependent and reciprocal relationship between strategy and logistics underwrote decision-making in every major Allied campaign. American and British strategic perspectives frequently diverged. American military leaders consistently sought to hasten the timeline for a cross-channel invasion of France, fearing unnecessary diversion of supply to other campaigns, while the British sought extended operations in the Mediterranean. The more resources that the United States contributed to Europe, the greater their leverage in strategic debates grew, culminating in the decision to pursue Operation OVERLORD.

Another theme of American military logistics was the steep learning curve faced by Army Services of Supply (renamed Army Service Forces in 1942). The first two years of Allied coalition warfare were characterized by an abysmal organization of supply. The immaturity and inadequacy of American military logistics became evident in Operation TORCH. In Italy, some lessons were learned, and some mistakes were repeated. The unprecedented buildup of manpower and materiel in Operation BOLERO yielded the largest amphibious invasion in history, OVERLORD, at which point the Allies were sufficiently seasoned in coalition warfare and amphibious logistics to achieve success, albeit with unique challenges.

Other regular features of American military logistics include bureaucratic issues and complex command relationships. Early operational planning omitted logisticians, but they were eventually incorporated once the importance of logistical considerations was fully understood. Contention existed between field commanders and logistical chiefs over who *should* have command authority over logistics and who *actually had* such authority. The debate over

centralized control of theater-wide logistics persisted through the entire war, aggravated by complex command structures and ambiguous responsibilities. Lastly, the availability of amphibious assault crafts proved to be a keystone issue in every major campaign, leading to competition within theater and between theaters for the allocation of this sparse resource.

The scope of this essay is limited in three significant ways. First, it focuses primarily on the United States Army, which commanded the entire theater logistical structure. The United States Navy contributed logistically to the European theater by (1) defeating the German maritime threat to secure Atlantic supply routes and (2) supporting amphibious operations. The U.S. Army Air Forces maintained its own supply system distant from Army Service Forces, but there was contention over responsibility for supporting theater air components.

The second limitation of this essay is the focus on launching amphibious invasions as opposed to sustaining military campaigns. All of the European theater's major campaigns in North Africa, Italy, and France (and on the Atlantic) are discussed herein, but with attention primarily given to supporting amphibious assaults and establishing logistics in (as opposed to sustaining them). For example, this essay will cover the logistical planning behind and execution of Operation TORCH, the invasion of North Africa, but will not discuss how operations were sustained until the Allies secured the continent by finally capturing Tunisia. Similarly, discussions of Operation OVERLORD will concentrate on the logistical plans preceding and logistical operations supporting the Battle of Normandy.

Lastly, this essay only covers the Western Front of the European Theater and the Mediterranean Theater. This notably excludes the Pacific Theater and the Eastern Front. Although not discussed herein, the contributions of the Soviet Union to defeating Nazi Germany cannot be understated. Military logistics in the European Theater is a dense topic, encompassing

thousands of pages of literature. For proper discussion of the topic, this essay is limited to Army-led logistics in the European and Mediterranean theaters driving the amphibious invasions in North Africa, Italy, and France.

The essay is separated into short sections. The first section provides a historical background and the conceptual framework necessary for discussing military logistics. The second section will provide the foundations for how the United States transformed from a latent superpower to an industrial powerhouse after the attack on Pearl Harbor. Then, the sections that follow will examine the logistical planning behind the Allied campaigns in North Africa, Italy, and Normandy, including the logistical successes and failures of each amphibious invasion.

**The Importance of Logistics in War**

This essay adopts George C. Thorpe's definition of logistics found in his culturally-influential work, *Pure Logistics: The Science of War Preparation*: logistics is the business of moving, supplying, and maintaining military forces.[1] Logistics is the algebraic sum of raw materials, industrial capacity, transportation, scientific knowledge, and manpower potentials, which must be translated into "fully equipped and trained forces at the strategic points."[2] In the early twentieth century, the term "supply" was used interchangeably with logistics, albeit too narrow a term. Logistics is less spectacular than strategic plays or battlefield stories and thus easier for history to overlook. Nathanael Greene, after being offered a position as George Washington's chief logistician, jived, "Whoever heard of a quartermaster in history as such?"[3] History, however, repeatedly proves that logistics are a major determining factor of war outcomes. The Second World War follows this trend.

The military leaders of World War II were conscious of the role logistics played in their operations. General Omar Bradley believed that "amateurs study strategy, professionals study logistics." British Field Marshal Bernard Montgomery reflected that "During the Second World War, 80 per cent of our problems were of a logistical nature." General George S. Patton imparted, "The officer who doesn't know his communications and supply as well as his tactics is totally useless."[4] The Germans called the war in Europe *materialschlact*, meaning material battle, which competed the industrial capacities of Germany and the United States.[5] In brief, the Allied triumph in Europe is the story of supply.

Conceptually, military logistics has been approached through theory and history by soldiers and scholars alike. In *On War*, Carl von Clausewitz posits that "there is nothing so common as to find consideration of supply affecting the strategic lines of a campaign and a war."[6] In 1962, economist Kenneth E. Boulding theorized that logistics was the basis of military power because armies experience a "loss-of-force gradient" whereby they progressively weaken in combat the farther they fight from home.[7] Economist Albert Wohlstetter rejected this theory in *Illusions of Distance* (1968), arguing that the logic may flip when comparing land and sea logistics. For example, moving supply through mountains can be more challenging than across an ocean.[8] While economists apply theoretical lenses to logistics, historians analyze past operations to derive lessons learned. Roland G. Ruppenthal's *Logistical Support of the Armies* and Allan Gropman's *The Big 'L': American Logistics in World War Two* are majors sources of this essay that examine the story of supply. Through works like these, scholars and soldiers alike examine the relationship between logistics and military victory.

The chronological sections that follow will demonstrate how every major Allied campaign in Europe was planned and executed within logistical parameters. Before the United

States could establish a foothold on the British Isles, the nation had to look inward. Although withdrawn from foreign affairs, America was a sleeping superpower. After an attack on the homeland, the nation began transforming latent capacity into global power projection.

**How American Logistics Changed After the Attack on Pearl Harbor**

Despite an unprecedented mobilization of American forces during the First World War, the interwar period saw the United States pursue limited global engagement and, by extension, shrink its military. Domestic pressures favoring nonintervention led the United States to withdraw from Europe and avoid permanent security commitments. The United States was not isolationist but rather engaged in foreign affairs on a limited basis. The public felt that homeland defense was the only benefit worth the cost of another world war. This translated into a foreign policy of (1) military posturing aimed at hemispheric defense, (2) collective security with partners on the American continent, and (3) material support for the Allies (the United Kingdom and France).[9] That calculation changed with the Japanese bombing of Pearl Harbor on 7 December 1941, which shattered the American hemispheric defense and brought the nation into World War II. The United States was already recovering from the Great Depression, thanks in part to an expanding industrial base fueling the Allies. However, serious logistical deficiencies remained before American forces could deploy abroad. The attack on Pearl Harbor forced President Franklin D. Roosevelt, Congress, and the War Department to confront these problems.

Even before Pearl Harbor, the escalating situation in Europe demanded adjustments to military readiness. After the outbreak of war in 1939, the Regular Army was expanded from 174,000 to 227,000 soldiers, plus a National Guard of 235,000 men. Following the occupation of France in 1940, Congress passed the Selective Service Act, enacting the first peacetime military

conscription in American history and expanding the Army to 1.4 million soldiers. Additionally, President Roosevelt and Congress increased appropriations for growing the armed forces and defense industrial base.[10] These efforts were substantial but existed mostly on paper. Moreover, the expanded Army still required training and supply to match the formidable Axis war machine.

Congress revisited naval expansion after the Pearl Harbor attack. The "Two-Ocean Navy Bill," signed into law on 19 July 1940, increased the Navy's authorized combatant tonnage by 1,325,000 tons (70%), calling for the construction of battleships, aircraft carriers, cruisers, destroyers, and submarines. This bill also set strategy: The Navy would pursue offensive action in the Pacific and defensive operations in the Atlantic.[11] In reality, Germans and American forces avoided engagement on the seas, excluding a few close calls. To support Britain on the high seas, President Roosevelt arranged "loans" of old American destroyers to Britain in exchange for bases in the western hemisphere in 1940. Furthermore, the Lend-Lease Act of March 1941 enabled Britain to receive supplies and pay for them later.[12] The United States Navy and Coast Guard were instrumental in protecting the movement of troops and materiel across the Atlantic; however, American naval power was unable to defeat German submarine warfare until years after the Two-Ocean Bill. The means by which the United States Navy finally overcame the German maritime threat will be covered further in the section on Operation BOLERO.

President Roosevelt boosted research and development (R&D) funding to strengthen America's competitive edge. Before the war, American R&D was not as strong as Europe, and private spending was quite limited. Federal R&D was stimulated by Roosevelt's New Deal, particularly on matters relating to public health, but constituted a fraction of the budget by 1941. This changed in World War II, during which private and academic researchers mobilized for wartime projects in their own institutions' laboratories.[13] Budget constraints limited weapon

development before 1940, but appropriations jumped from $3.5 million to $20 million between 1940 and 1941, boosting the production of improved individual weapon systems. The National Defense Research Committee, National Investors' Council, and the Office of Scientific Research and Development were all stood up in 1940 and 1941 to capitalize on America's scientific innovation base.[14] The most notable R&D project of World War II is the Manhattan Project, which developed the first nuclear weapons. Scientific knowledge is a significant component of national logistics. Technological innovations in weaponry, electronics, medicine, and more contributed to Allied Victory in Europe.

The United States maintained a relatively strong military industrial base during peacetime, but one critical issue was a lack of standardization. For example, the Douglas Aircraft Company was manufacturing seven versions of the same aircraft for different customers before 1942. Frequently modifying the production and inventory generated high costs, slow production, and delayed deliveries. Recognizing the need for standardized systems, American and British representatives agreed to standardize components and production schedules.[15] Standardized defense manufacturing supplied Allied forces across the European theater, and standardization is a keystone principle of modern defense logistical planning.

The War Department, facing great power conflict in multiple theaters, restructured after the attack on Pearl Harbor. The United States Army reorganized by Executive Order No. 9082 (dated 28 February 1942) and War Department Circular No. 59 (dated 2 March 1942). These directives provided for the creation of three autonomous components under Chief of Staff of the United States Army General George C. Marshall: (1) Army Ground Forces, (2) Army Air Forces, and (3) Army Service Forces.[16] The latter, originally called Services of Supply (SOS), was renamed on 12 March 1942 because the term supply did not encompass the whole mission

breadth of Army services.[17] The initial theater headquarters on the British Isles was officially established as European Theater of Operations, United States Army (ETOUSA) on 8 June 1942.[18]

By establishing an autonomous logistics branch, the War Department sought centralized control of logistics. General Brehon B. Somervell, Commanding General of the Army Services Forces, believed in a unified logistical command. He sought control over all logistical matters under the broad mandate for Army Service Forces "to provide services and supplies to meet military requirements."[19] Somervell's logistics chief for ETOUSA, Major General C. H. Lee, also sought to bring virtually all European theater supply and service forces under his command.

Traditional officers opposed the broad command authority asserted by Somervell and Lee. ETO commanders felt Lee was inverting the command structure by exercising theater-wide jurisdiction through a subordinate command. The fight for control endured through the war, but the principle of centralized control and decentralized execution prevailed in contemporary military doctrine.[20] Gropman writes, "Efforts to implement centralized control over theater logistics were met with countervailing efforts by commanders not to surrender completely planning and execution responsibilities for logistical support of their forces."[21] In other words, while ETO-Army Service Forces pushed for greater control over all logistical matters, some ground and air commanders resisted this perceived encroachment on their command authority. General Dwight D. Eisenhower assumed theater command on 24 June 1942 and restated command relationships, clarifying that Commanding General, SOS was responsible for supplying all of ETO.[22] Debates over command authority continued throughout the European campaigns.

The United States military logistics changed after the attack on Pearl Harbor. The Roosevelt administration began adjusting the nation's military posture as the situation in Europe escalated, but only took serious action after the events at Pearl Harbor. When the Japanese attacked, the United States was not ready to fight; however, it was more prepared than usual. In providing material support for the Allies, the nation's military industrial base was scalable. The War Department quickly identified the unprecedented logistical challenge presented by the prospect of simultaneous war in Europe and the Pacific and reorganized the Army, giving broad authority to Army Service Forces. These early steps built the foundation for successful allied campaigns in Europe. The logistics of the first major campaign of the war, the invasion of North Africa, is explored in the next section.

**Invading North Africa: Lessons from Planning Operation TORCH**

The invasion of French North Africa, codenamed Operation TORCH, was the first major operation of the Second World War. TORCH demonstrated the interdependent relationship between logistics and strategy. TORCH initially seemed unrealistic because it would require shifting strategic and logistical focus away from amassing forces in the United Kingdom (Operation BOLERO) to an amphibious invasion of North Africa. When TORCH planning began in the summer of 1942, the immaturity of SOS was quickly revealed. TORCH logisticians sought resources already in the United Kingdom, but the mismanagement of BOLERO's early stages by an inexperienced and overwhelmed supply personnel forced the logisticians to look elsewhere. Furthermore, the strategic decision to conduct an amphibious invasion meant that the availability of amphibious assault crafts was a keystone issue. Despite serious flaws in Allied logistics and organization, the Allies invaded North Africa on 8 November 1942 and achieved

their initial military and political objectives. Moreover, TORCH yielded many fundamental logistical lessons for future operations.

From the beginning, Allied decision-making was dictated by logistics. The decision to invade Africa was controversial among Allied commanders. While focused on recapturing Europe, the Allies found that their original plan to invade northern France by spring 1943 (Operation ROUNDUP) was logistically unfeasible. Consequently, the British War Cabinet revisited plans to invade North Africa. General Marshall and other Americans objected to the proposal, fearing an unnecessary diversion of materiel and manpower away from the Axis' strategic centers of gravity. President Roosevelt overruled the Chief of Staff, giving a direct order to support the British proposal for an amphibious invasion of North Africa. In negotiating with the British, the American commanders consented to the invasion but conditioned that ROUNDUP remained an option. President Roosevelt interpreted the agreement as the total pursuit of TORCH, putting the invasion preparations into full swing.[23]

The earliest logistics planning suffered from bureaucratic issues. Logisticians waited on supply requirements while the American and British staff debated the location, size, composition, and timing of the invasion. ETOUSA headquarters staff failed to integrate SOS into their operational planning, despite the importance of logistics in amphibious invasions.[24] In his monograph titled *No Tail for the Strategic Dog: Marginalization of Logistics During Operation TORCH,* Major Richard J Matson argues:

> By marginalizing logisticians, leaders failed to achieve unity of effort in conducting operations. The negative bias towards logisticians influenced planners and senior leaders who controlled the troop basis to reduce allocations and minimize the inclusion of service units in operations. Finally, because planners and senior leaders did not value logisticians' interpretation of data, which constricted tactics and strategy, they excluded them from planning efforts. As a result, during both the amphibious assault and subsequent attack on Tunis, United States forces lacked necessary equipment and services to sustain operations.[25]

TORCH would transplant the word “amphibious” from military textbooks into history, thereby presenting an unprecedented challenge.[26] The sudden challenge for logisticians was finding the resources for amphibious invasion.[27] In 1942, most assault crafts were located in the Pacific theater, and repurposing conventional ships for amphibious landings was time-consuming.[28] The impending invasion required transporting hundreds of ships carrying tens of thousands of troops and millions of pounds of supplies. For the Allied commanders and the newly established SOS, preparing for that November morning involved a steep learning curve.

The War Department’s logistical organizations had no experience planning anything near the magnitude of TORCH. Army Service Forces was established only four months before the decision favoring TORCH, and ETOUSA was established just one month prior. During the initial troop buildup of BOLERO, overwhelmed and inexperienced service troops failed to keep a record of their inventory, which impacted TORCH.[29] While the logistical requirements for TORCH could be mostly fulfilled with equipment already in Britain, such supplies were “randomly scattered among makeshift depots by British workers without records or box or create markings.”[30] The lack of receipts handicapped TORCH planners who had (1) no valid records of stockpiled inventory and (2) insufficient time to account for the misplaced equipment.

To establish a comprehensive inventory, TORCH staff turned to supply coming directly from the United States. Staff planners requested 260,000 tons of additional supplies to be shipped to the United Kingdom in a telegram known as Message 1949. This confession of failure stunned and frustrated General Somervell. The flood of material in the summer of 1942 was in disarray, so Somervell advised Lee to have his staff “swarm on the British ports and depots and find out where these people have put our supplies and equipment.”[31] These efforts were futile because Lee simply lacked the time. Stateside, Somervell ordered that supply services work

around the clock to ready and dispatch material, but only 131,000 of the 260,000 tons of requested material was organized and transported in time for the amphibious assault.[32] Meanwhile, commanders appealed to the British War Office, scrambled to comb stockpiles, and improved their marking systems.[33] The newly founded organizations responsible for supplying TORCH had just 100 days from approval to execution to meet the requirements of a full-scale offense, and their early missteps from BOLERO quickly caught up to them.

Gropman described the logistics in TORCH as "haste, waste, turmoil, and confusion."[34] Despite these missteps and the inadequate supply, the minimum logistical requirements were sufficiently met, and the Allied task forces landed as scheduled. On 8 November 1942, 49,000 of the nearly 250,000 American forces in the United Kingdom and 35,000 directly from the United States landed in Africa. Seven hundred ships of the combined naval fleet participated in the invasion. Two weeks before the landings, several fleets sailed out of British ports while another convoy left Norfolk, Virginia. In total, the ships carried 22 million pounds of food, 38 million pounds of clothing, 10 million gallons of gasoline, and more than 1 million copies of 10,100 different maps.[35] These massive quantities, plus tons of ammunitions for thousands of guns and tanks, made TORCH the greatest amphibious logistical operation in history until the Normandy landings. The operation was successful; the Allies achieved their initial objectives within three days. However, the conquest of North Africa took longer than expected, and sustaining the ground campaign was challenging.[36] Airpower played a limited role in the invasion of Africa but was important in sustaining the Mediterranean campaign. TORCH was the first major operation of the European Theater, and its success is surprising given the logistical pitfalls. Logisticians adapted to strategic decisions made without their input, and leaders at the operational level faced inadequate supply because strategic decision makers did not properly account for logistical

constraints. Nevertheless, the valuable lessons learned from planning TORCH were critical in producing successful invasions of Italy and France.

In January 1943, President Roosevelt, Prime Minister Churchill, and the Combined Chiefs of Staff met in Casablanca, Morocco, to plan their coalition strategy. German submarine warfare against Allied shipping and the unprecedented demand for landing craft were major topics of discussion.[37] Both issues represented logistical problems constraining strategic options. The Casablanca conference resulted in two key decisions for the Allies: (1) restarting BOLERO and (2) leapfrogging off Africa to invade Italy. In a worldwide radio broadcast, Churchill justified the British preference for Mediterranean operations over a direct assault Europe by explaining that North Africa was "not a seat but a springboard" facing "the underside of subjugated Europe."[38] In other words, the Allied position in North Africa permitted, and naturally inclined the Allies to pursue, the invasion of Italy.

**The Invasion of Italy: Amphibious Assault, Again**

The Kingdom of Italy, surrounded on three sides by water and a heavily fortified land border on the fourth, was most like an island of all the greater continental powers. It was most vulnerable to seaborne attack, and the Allied position in Africa established Italy as a viable theater of war. The Allies had cleared the Axis out of Africa in May 1943 following the defeat of German and Italian forces in Tunisia. Strategically, the campaigns in Africa (and later Sicily) were concerned with securing the sea lanes between Gibraltar and Suez. Logistically, it rendered long-haul voyages around Africa unnecessary and established bases around continental Europe. Like TORCH, initial questions surrounding an invasion of Italy were mostly logistical and divided between American and British perspectives. The Americans, more conscious of the

Pacific theater, wanted an early cross-channel invasion. Alternatively, the British sought to continue Mediterranean operations in order to further weaken Germany. Churchill felt that an attack on Italy would divert German resources away from France and the eastern front, describing Italy as the exposed "underbelly of the Axis." The strategic decision made at Casablanca was possible because of the Allied position in North Africa. As the amphibious invasions of Sicily and Salerno demonstrate, logistical operations in Africa suffered from many of the same problems as TORCH. The invasions were successful and witnessed American forces fighting on the continent of Europe for the first time since 1918.

The Italian Campaign started with the Allied invasion of Sicily in 1943, codenamed Operation HUSKY, which began on 10 July and ended on 17 August. Strategically, establishing bases in Sicily provided for the invasion of mainland Italy. Logistically, Sicily faced many similar difficulties to TORCH. Emergency requisitions were again sent to the United States due to ineffective stock procedures. The theater was unable to re-equip troops for a new campaign because, despite having adequate supply and equipment in theater, congested internal communication handicapped preparation. Army Services Forces initiated automatic shipments from the United States, which supported the entirety of HUSKY.[39] The Sicilian campaign achieved its political objectives (forcing the deposal of Italian Prime Minister Benito Mussolini and the surrender of Italy) and logistical objectives (launching an amphibious invasion, establishing a forward base, and securing deep-water ports).[40] Victory in Sicily eliminated Italy from the war and set the stage for breaching the European continent.

Operation AVALANCHE, the amphibious invasion of Salerno on 9 September 1943, was the centerpiece of the Allied invasion of Italy. Two concurrent and smaller operations took place in Calabria and Taranto. For Italy, logistics again dictated strategy: The Gulf of Salerno was

chosen because it was favorable for landing troops and supply. First, the surf and shore gradient permitted transports to reach the shore. Second, narrow beaches facilitated the easy construction of exit routes. Third, the terrain behind the beaches was suitable for supply dumps.[41] Salerno was in range of friendly fighter aircraft staged in Sicily, and the port of Naples could sufficiently support a large army.[42] Amphibious landing crafts were required to transport the initial invasion force and offload cargo directly onto beaches. The availability of these assault crafts was a limiting factor, but some were readily available from TORCH and HUSKY. The Combined Chiefs of Staff centrally managed assault crafts, so the AVALANCHE planners had to determine an effective ratio of combat troops to support forces for the assault convoy.[43] Moreover, operational capabilities were limited by the withdrawal of troops from the Mediterranean to support the invasion of France.[44] The operation ultimately employed 642 ships and 925 ship-borne landing craft.[45]

Logistical preparations for AVALANCHE had many of the same deficiencies as TORCH, despite this being the Allies' third amphibious assault. The crowded ports of North Africa and Sicily were disorganized. For example, the Army and Navy had not coordinated loading plans, and some ships were loaded, unloaded, and reloaded. Boxes on assault craft were sometimes incorrectly labeled. Boxes labeled "medical supplies" were found to contain coffee, and others marked "special equipment" contained shoes. In one incident, a mislabeled box of incendiary bombs was accidentally stowed in an officer's stateroom.[46]

AVALANCHE had some unique challenges, too. In the northern landing area, offloading times for vessels were short because the narrow beaches allowed quick disembarkation. However, some vessels were slow to unload due to disorganized loading in North Africa, congestion on the beaches, suppressing enemy fire, and an absence of amphibious vehicles that

had been reallocated to ground forces for inland transport. Unlike TORCH, the Allies faced heavy resistance in Italy from a strong and capable opponent. Nevertheless, the Fifth Army landed 202,066 men, 35,262 vehicles, and153,930 tons of supplies in the first month of the invasion.[47]

The invasion of Italy yielded several vital lessons. Italy taught the Allies how to rebuild a nation's infrastructure, including ports, transportation, and utilities. Both Sicily and Salerno proved that access to a major port was *not* required for landing an army. While true, the goal of securing the ports of Naples still shows the clear advantages of deep-water ports. All of these concepts would be mirrored in the invasion of France, which the Italian campaign eased by diverting German resources southward.

The Italian campaign continued until the German surrender in 1945. American forces only captured Rome two days before the Normandy landings, and Northern Italy was not fully captured by the German surrender in late April 1945. Nevertheless, the Allied strategic focus changed after the landings in Salerno. There was a renewed focus on expanding the troop buildup in the United Kingdom. On this shift, General Sir Harold R. L. G. Alexander wrote, "The Mediterranean theatre would no longer receive the first priority of resources and its operations would become preparatory and subsidiary to the great invasion based on the United Kingdom."[48]

**The Buildup to France: Operation BOLERO**

Operation BOLERO was an American plan accepted by the British in April 1942 that outlined the massing of forces in the United Kingdom in preparation for a cross-channel invasion of the continent in early 1943 (Operation ROUNDUP).[49] American commanders favored a

strategy focused on France, but TORCH sidelined BOLERO by draining its logistical resources and attention. BOLERO was renewed after The Casablanca Conference, so this section is mostly concurrent with the previous section on the Italian campaign. ETOUSA was logistically christened in North Africa and Italy. The recommenced buildup was difficult; it required overcoming the disorganization which plagued TORCH and winning the Battle of the Atlantic.

As demonstrated in TORCH, the Army Service Forces managing the early phases of BOLERO were inexperienced and overwhelmed. This early disorganization can be attributed to multiple factors. First, preparations for ROUNDUP were complicated by Operation SLEDGEHAMMER, a contingency plan to launch an emergency cross-channel attack in late 1942.[50] While both SLEDGEHAMMER and ROUNDUP involved amphibious invasions, the logistics supporting each plan were separate and conflicting. Their dedicated forces had different timelines, tasks, and priorities. Second, troop movements around Britain were limited by the capacity of British ports and rail systems. Third, British labor shortages meant that service troops were needed to build airfields, depots, and cantonments, but the availability and training of service troops to receive and organize incoming supply was already a limiting factor.

German submarines persistently challenged Allied shipping through the spring of 1943, making the Atlantic Ocean a major front in World War II. Germany sought to exploit Britain's dependence on imports from the United States and interfere with its exports to the Soviet Union. American naval construction increased significantly after the passage of the Two-Ocean Navy plan, but Germany maintained sea superiority in the meantime. The United States Navy did not have enough destroyers to simultaneously protect the coastline and escort merchant vessels or troop ships across the Atlantic. For most of 1942, German U-Boats hunted merchant ships along the east coast and contested convoys sailing across the Atlantic. The tides turned around May

1943 for multiple reasons. First, the British and Canadian navies began effectively defending convoys. Second, the British also began intercepting German message traffic, revealing valuable intelligence about the location and activity of U-Boats. Lastly, the reinforced American Tenth Fleet assumed responsibility for antisubmarine warfare. The Tenth Fleet employed scout and bomber aircraft with sonar and radar to close "air gaps" where submarines would freely contest merchant vessels. On the high seas, newly constructed escort carriers and destroyers combined air and sea munitions to destroy German submarines.[51] By mid-1943, shipping losses to submarines fell dramatically due to antisubmarine warfare and increased merchant ship construction.[52] Maritime security allowed the Allies to overcome their greatest logistical obstacle and begin accurately planning troop and cargo movements on a larger scale.

For BOLERO, the uncontested movement of ships across the Atlantic meant a rapid surge of troops and materiel. Instead of worrying about insufficient logistics, Allied commanders were concerned with accommodating the massive influx of personnel and supplies. Between August 1943 and May 1944, an approximate average of 129,000 troops arrived in the United Kingdom every month. The end-of-month manpower in May 1944 was 1,525,965 troops, including 620,504 ground forces, 426,819 airmen, 459,511 supply troops, and 20,131 staffers. One to two million tons of cargo were arriving monthly in the United Kingdom in early 1944. As part of BOLERO, a cumulative total of 1,671,010 American troops and 14,050,290 tons of cargo was received from January 1942 to May 1944. An additional 3.7 million tons of cargo arrived in Britain in the two following months.[53] BOLERO was a massive logistical operation aimed at building forces for an amphibious invasion across the English Channel. By late 1942, ROUNDUP was considered infeasible and the timeline for invasion was delayed. The purpose of BOLERO was renewed following a series of military conferences in mid to late 1943.

President Roosevelt and Prime Minister Churchill convened three military conferences after Casablanca. All in 1943, the first took place in May at Washington (codenamed TRIDENT), in August at Quebec (QUADRANT), and in November-December at Cairo and Tehran (SEXTANT-EUREKA). These conferences "settled the order and scale of British and American operations in every part of the World"[54] and yielded many important strategic decisions. From a strategic purview, the Americans sought direct confrontation with Germany, while the British sought a war of attrition through diversionary attacks, strategic bombing, and a continuation of the Mediterranean campaign.[55] Logistics dictated strategy, and logisticians were increasingly incorporated into these meetings. Any strategy would involve the employment of finite resources. In these conferences, leaders considered the balance of resources between theaters (Europe and the Pacific) and within theater (Mediterranean and Northwest Europe), the availability of shipping to sustain operations, and the Allied assault lift capability to conduct a cross-channel invasion.[56] As American contributions of manpower and materiel grew, so did their influence in strategic debates. Their vision as realized; born from TRIDENT, QUADRANT, and SEXTANT was the foundational plans for Operation OVERLORD.

**The Invasion of France: Operation OVERLORD**

The stakes for OVERLORD could not have been higher. The Battle of Normandy began with the D-Day Landings (Operation NEPTUNE) on 6 June 1944. This single most crucial event would determine the war's outcome. Success was not guaranteed, and failure would have cost a tremendous amount of Allied lives, material, and morale. BOLERO's unprecedented buildup gave life to OVERLORD, but sheer numbers alone could not guarantee victory against the heavily fortified German defenses guarding the European coastline. The scale of OVERLORD

had no precedent, and amphibious assaults are inherently the most hazardous and complex type of military operation. Even the overwhelming Allied forces relied on military deception to surprise the German Army. By May 1944, the invasion had been meticulously planned, and forces were readied. Three and a half million forces of 11 nationalities stood ready in England. Thousands of ships, aircraft, and ground vehicles were prepared to move them.

The plan for Operation OVERLORD included landings of five divisions on five beaches, each three or four miles of gentle slopes of hard sand or gravel, along sixty miles of Normandy shore. In the early morning hours of D-Day, the British 6th Airborne Division and the American 82d and 101st Airborne Divisions would land via parachute and glider to support the beach landings. At dawn, the British Second Army was to take the Sword, Juno, and Gold beaches, while the American First Army was to take Omaha and Utah to the west. The Allies were then to move inland as fast as possible, and reinforcements from all 39 divisions were to arrive on the continent within seven weeks.[57] OVERLORD's objectives were two-fold. The long-term objective was to destroy the German armed forces and recapture Europe. The immediate objective, however, was entirely logistical: The Allies needed to breach the shores of France in order to create a funnel through which troops and supplies could enter the continent. Planning the actual invasion, which required landing troops en masse across the English Channel, was dictated by logistical considerations.

The availability of amphibious assault vehicles was the keystone issue of the assault phase of OVERLORD. The dilemma deepened when General Eisenhower ordered the assault force to increase from three to five divisions. Churchill, in a letter to General Marshall on 16 April 1944, grumbled, "The whole of this difficult question only arises out of the absurd shortage of LSTs [Landing Ship, Tank]. How is it that the plans of two great empires like Britain and the

United States should be so much hamstrung and limited by a hundred or two of these particular vessels will never be understood by history."[58] The assault lift phase of D-Day (NEPTUNE) was addressed by solving the landing-craft issue. To meet the mission requirements, the Allies reallocated amphibious assault crafts initially dedicated to Operation ANVIL, the invasion of southern France, to OVERLORD. D-Day was delayed until June to benefit from another month's worth of production, and Southern France was delayed until August. The landing-craft issue was critical, but supplying combat operations on the shore was a comparable challenge.

Once the initial assault phase was complete, the Allies had to sustain combat operations through a continuous supply of the beaches in high-wind and heavy-surf conditions. The Mulberry Harbors were artificial piers designed to facilitate the direct offload of deep-draft transports until French port at Cherbourg could be captured. Each harbor (Mulberry A at Omaha and Mulberry B in the British Sector) was to consist of 6 miles of steel roadways on pontoons that floated with the tides. Staff planners devised a minutely detailed choreography of timetables and procedures for the debarkation of supplies at these piers. The plans afforded no margin of error, instead calculating a near-constant resupply of materials and manpower. In other words, each new shipment required the prior shipment to maintain its schedule of arrival and departure.[59] In the unpredictability of battle, such an inflexible plan was dead on arrival.

The logistical story of OVERLORD dramatically differs from the original plans, but the operation's success can be attributed to the Engineer Special Brigades (ESBs). These soldiers and sailors composed engineer combat battalions, embedded with the first waves of beach landing groups. Units like the 5th ESB were charged with creating order among the chaos by removing obstacles, clearing minefields, and opening the beaches under enemy fire. As an aside to disprove General Nathanael Greene's sneer that quartermasters would not be remembered in

history, consider the stories of the 37th Engineer Combat Battalion, 5th Engineer Special Brigade. Sergeant Zolton Simon, a squad leader in Company C, was wounded multiple times while leading his five-man crew through barbed wire to sweep a minefield, creating a path for infantry to reach the hilltop. Private Vinton Dove and Private William Shoemaker, bulldozer operators of Company C, cleared roadblocks and filled antitank ditches under enemy fire. Both soldiers earned the Distinguished Service Cross for their valor. 1st Lieutenant Robert P. Ross earned the Distinguished Service Cross for assuming command of a leaderless infantry company and leading both that company and his engineer platoon to force the surrender of two machine-gun emplacements. The 37th Engineer Combat Battalion suffered the heaviest casualties of the entire brigade, losing 24 men, including the battalion commander.[60] These soldiers demonstrated valor, but they also translated rigid logistical plans into practical success on the battlefield.

Logistics troops closely followed the arrival of combat units at Normandy, and their objective was to establish adequate supply. In theory, Army Service Forces sought to offload cargo directly from ships because deep-water ports are superior to shore deliveries. This theory proved even truer in Normandy. Cargo reception on the French shores was burdened by insufficient ship-to-shore transports, port congestion and backlog, lackluster inventory control, and the abandonment of priority systems. The Allies hoped to capture the deep-water port at Cherbourg by 14 June, but the Germans defended Cherbourg until 27 June. Moreover, the port's extensive damage required another three weeks of reconstruction.[61] Logistical planners were overly optimistic about Cherbourg, especially since they anticipated that the Germans would sabotage the port. Mulberry A and B harbors were supposed to mitigate this issue in the meantime. They were constructed 12 days after landing, but the American harbor was destroyed by a storm three days later, necessitating shore deliveries for a month longer than expected. By

July, over 452,000 troops, 70,000 vehicles, and 289,000 tons of cargo had arrived at the five beaches. Respectively, these were only 71.8, 64.5, and 80.5 percent of planned movements.[62] Having been seasoned in amphibious warfare, supply troops on the ground were the decisive factor in Allied logistical success in Normandy in spite of adverse conditions and inflexible plans.

At the upper echelons, contention surrounding command authority was ripe. An earlier section discussed how Army Services Forces' theater-wide jurisdiction created friction between traditionalist commanders, fearing usurpation of their authority, and General Somervell's efforts to establish centralized control of logistics. This issue persisted throughout the war and was complicated by General Eisenhower's constant reorganization of the ETOUSA structure. Eisenhower commanded ETOUSA and Supreme Headquarters Allied Expeditionary Force (SHAEF) simultaneously despite devoting most of his time to the latter. He appointed General Lee to Deputy Theater Commander, but Lee was already SOS commander and ETOUSA G-4 (logistician). This meant that Lee coordinated with air and ground components in his role as logistics chief while simultaneously being their superior in his role as Deputy Theater Commander. More perversely, Eisenhower merged ETOUSA headquarters into SOS headquarters. Thus, the two organizations were nominally separate staff but essentially the same staff.[63]

The final command plan for OVERLORD created three transitions. The initial assault would be commanded by a single ground force commander, and continental operations would have separate American and British commanders. An intermediate transitional phase would have other commanders. This system of three phases was complicated and ambiguous on timing. Moreover, the logistics of each phase was the responsibility of a different organization, so no

single organization planned the invasions' overall logistics.[64] For the rest of the war, questions over who should be in charge and who was actually in charge lingered. Field Commanders like General Omar Bradley resisted the expanding authority exerted over supply and administration by Lee. During the continental operations, Bradley could only *request* supply be divided between his armies, but he could not *order* it. Field commanders generally felt that their army's support was degraded by the autonomous logistics structure.[65]

OVERLORD was supported by logistically enabled clandestine operations, including military deception and material support for the French resistance. Brute force at Normandy could not guarantee success, so OVERLORD employed military deception to maintain the element of surprise. ETOUSA undermined German intelligence assessments by building up a fictitious Army group at the Strait of Dover (the narrowest part of the English Channel), placing dummy landing craft and tanks on the coast, broadcasting misleading radio transmissions, and conducting counterintelligence operations through known German espionage channels.[66] The Germans were tricked into believing that the Normandy operation was a feint and that the real attack would occur at Calais. As a result, they incorrectly allocated forces away from Normandy.

Additionally, the British Special Operations Executive (SOE), United States Office of Strategic Services (OSS), and the Army Air Forces provided material support for French internal resistance, which played a crucial role in the months leading up to D-Day. By 1943, doubts about the ability to organize and support internal resistance in northwest Europe were overruled by examples of guerilla warfare in Eastern Europe and the persistent demand for weapons in France. Large-scale supply operations, including mass daylight drops by Army Air Forces, enabled the French resistance.[67] One hundred thousand men in France were armed in some sort of fashion by June 1944, and these resistance cells facilitated Allied success in Europe by sabotaging the

electrical power grid, transportation infrastructure, and communications network.[68] SOE encountered some difficulties in supplying the resistance. First, the bomber command resisted diverting aircraft to clandestine transport. Second, acquiring parachutes during the buildup of airborne divisions proved a limiting factor. Nevertheless, approximately 76,000 submachine guns, 28,000 pistols, 17,000 rifles, 3,400 light machine guns, 572 rocket launchers, 304 anti-tank weapons, and 160 mortars were dropped in France alone from February to May 1944.[69]

OVERLORD demonstrated the audacity and capacity of American logistics. In total, the operation deployed 50,000 men drawn from five divisions for the initial assault, followed by over 2,000,000 forces from 39 divisions surging the continent. In terms of vessels, 138 major warships, 221 combat vessels, 1,000 minesweepers, 4,000 landing crafts, 805 merchant ships, 59 blockships, and 300 miscellaneous small craft were utilized. Fighters, bombers, transports, and gliders composed the 11,000 aircraft used in support of OVERLORD. Lastly, 100,000 lightly-armed members of the French resistance supported the invasion from behind enemy lines.[70]

## Conclusion

The European theater can be viewed as a struggle between the United States and Germany to capitalize on industrial production, mobilize troops, and dispatch materiel at will. Ultimately, the United States won this contest through its ability to deliver supplies to its troops whenever and wherever necessary. Logistics was essential to Allied Victory in Europe. Logistical parameters constrained all the levels of warfare—the strategic, operational, and tactical—while strategy drove theater logistical requirements. The amphibious invasions of North Africa, Italy, and Normandy can be viewed through the lens of the relationship between

strategy and logistics, in which decision-making is constrained by logistics and logistical requirements are driven by strategic decisions.

Several key logistical lessons can be derived from the themes explored in this essay. First, a military organization needs unambiguous relationships between its subordinate units and clear distinctions between their activities. Complex command relationships and confusion over responsibilities burdened all of the European campaigns but particularly affected Operation OVERLORD. However, interoperability and standardization are important, particularly between services. Briefly mentioned herein, miscommunication between the Army and the Navy created inefficiencies at the ports. The second logistical lesson is the importance of every stakeholder. The decision to marginalize logisticians in the operational planning of Operation TORCH excluded valuable stakeholders, which undermined the mission by not providing for adequate supply.

The third primary logistical lesson is that organization matters. The combat operations of Operations TORCH, HUSKY, and AVALANCHE suffered because of disorganization in receiving, sorting, and shipping materiel at the bases from which these invasions launched. Finding a particular file in a cluttered cabinet is hard, but finding an unlabeled supply box in a warehouse is harder. Moreover, finding an unlabeled supply box lost in the British Isles is a greater challenge, especially when the invasion of North Africa is just a few months away. Lessons as simple as inventory box labels seem trivial, but they demonstrated a perilous immaturity at the time.

The debate over centralized control of logistics between chief logisticians like General Somervell and ground commanders like General Bradley is not easily answered by history. The idea of centralized control and decentralized execution is a master tenet of contemporary Air

Force doctrine, but that does not mean the theory is infallible or applies cleanly to wartime logistics.

As a personal aside, I have seen some of these lessons apply to Air Force Reserve Officer Training Corps (AFROTC). I am a cadet at Boston University's Detachment 355. Logistics at Detachment 355 is primarily concerned with uniform distribution and maintaining our cadet headquarters. One of the key logistical lessons discussed in this essay is the importance of inventory records. In the early phase of Operation BOLERO, large quantities of materiel arrived on the British Isles but were not tracked. When that equipment was needed in TORCH, the materiel could not be found. Consequently, the troops were inadequately supplied. This lesson on inventory applies to uniform distribution, particularly our Logistics Officers (LOGOs) account for uniform inventory. Our Cadet Wing has two LOGOs who are responsible for equipping approximately 50-60 cadets with loaned uniforms. First, LOGOs regularly update a centralized inventory of uniforms. Second, LOGOs keep track of what clothing items (and what sizes) are distributed to cadets. Each cadet has an individual uniform tracker to ensure everyone is accountable. This system of inventory tracking ensures that (1) cadets have serviceable uniforms, (2) cadets have the uniform items required for professional development training, such as Field Training, and (3) uniforms are returned when graduating cadets commission.

The unprecedented logistical demands of World War II were caused, at least in part, by the modernization of warfare. There was an increasing need for ammunition, fuel, and maintenance for vehicles from amphibious landing crafts to armored tanks and heavy bombers. The movement of vast numbers of troops across oceans meant that basic necessities like food, medicine, and equipment needed to follow close behind. Support personnel and whatever amenities could be afforded also traveled across long distances. In World War II, new

technologies like mechanized warfare, strategic bombing, and aircraft carriers created new logistical challenges. As we approach the 75th anniversary of Victory in Europe Day, it is worth asking if warfare in the modern era—the information age—might look quite different because of emerging and rapidly changing military technologies.

The theory of a Revolution in Military Affairs (RMA) emerged in the 1990s after the United States' performance in the Gulf War. RMA posits that future battlefields will be characterized by advanced technologies that render large and expensive systems obsolete. For example, aircraft carriers are more vulnerable now than ever to long-range attacks, and modern aircraft are matched by sensors, radars, and air defenses. The theory compels changes to doctrine and strategy (and thus logistics, too). There are several arguments against RMA, such as the argument that doctrine and tactics affect war outcomes more than technology or that previous technological shifts have not significantly changed the character of war. The conversation around RMA has resurfaced as the national defense strategy reorients towards great power competition. How might 21st century warfare change logistics? What lessons from previous military revolutions will endure? What lessons have yet to be learned, and how can we preempt them?

The 75th anniversary of Victory in Europe Day will be celebrated on 8 May 2020, and this essay illustrates the European Theater of World War II as a story of logistics. The Allies struggled at first, but the Allied victory was determined on the shores of France. That success resulted from knowledge and experience accumulated throughout the war, yet the conflict continued for another year. Over 400,000 Americans died in World War II, but the decades since have been among the most peaceful in human history. War and peace are unpredictable. This essay presents lessons from the Second World War that were learned through experience, failure, and perhaps with blood. Logistics is the story of Allied Victory; therefore, the importance of

logistics cannot be understated. In thinking about today, we should consider how logistics may change in future conflicts and the foundations for success can be built sooner rather than later.

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