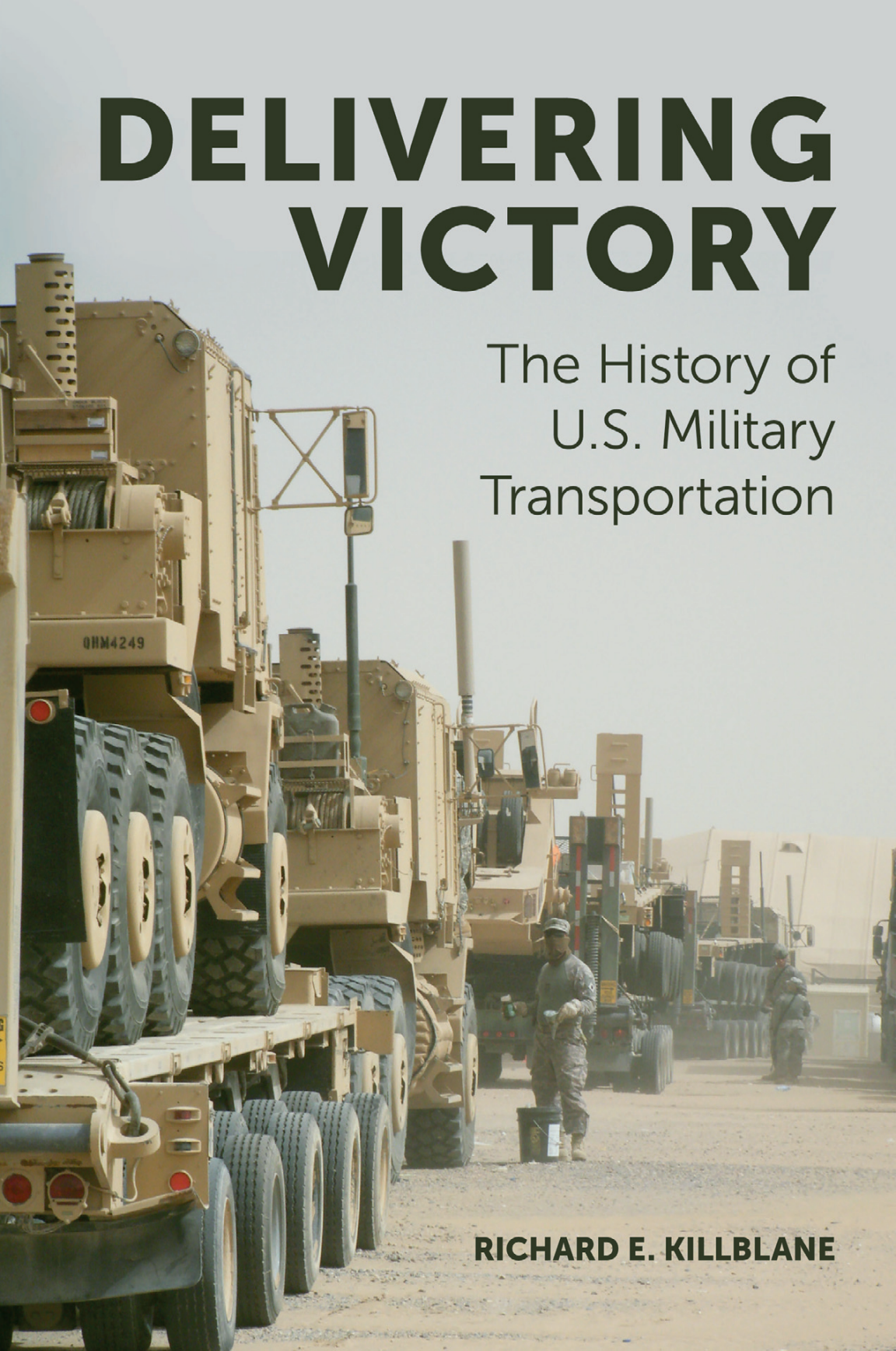
DELIVERING VICTORY

The History of U.S. Military Transportation



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Delivering Victory: The History of US Military Transportation

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United Kingdom – North America – Japan – India – Malaysia – China

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Howard House, Wagon Lane, Bingley BD16 1WA, UK

First edition 2020

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British Library Cataloguing in Publication Data
A catalogue record for this book is available from the British Library

ISBN: 978-1-78754-604-2 (Print)
ISBN: 978-1-78754-603-5 (Online)
ISBN: 978-1-78754-611-0 (Epub)

ISOQAR certified Management System, awarded to Emerald for adherence to Environmental standard ISO 14001:2004.

Certificate Number 1985
ISO 14001

INVESTOR IN PEOPLE

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About the Author

Richard E. Killblane served 14 years in the US Army as an enlisted man and officer in the Infantry and Special Forces. He is a 1979 graduate of the US Military Academy and veteran of the Central American counter-insurgency and invasion of Panama (Just Cause). Earning his Master of Arts in History from the University of San Diego, he served briefly as an Air Force historian before becoming the US Army Transportation Corps Historian for over 18 years. In this job, he deployed to Kuwait, Iraq, Afghanistan, and Haiti to record firsthand logistics operations during military contingencies. He has published numerous articles, chapters, and books on military history.

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Chapter 1

Introduction to Transportation Concepts

In 1984, the US Army added operational art to its vernacular to describe campaigns. Military campaigns are a series of movements and battles, and in order to fully comprehend operational art, students of the art of war must understand logistics. Military logistics provides an army everything it needs to fight, which involves procurement and issuing of supplies, movement, billeting, maintenance, feeding, pay, evacuation, and hospitalization. Without this an army cannot sustain itself in the field. More often, the outcome of war is determined by the side that can sustain itself in the fight longer than is decided by destruction of the enemy force in battle. In respect to logistics, transportation is just one of several functions; but as the moving piece, transportation connects the other logistics functions with each other and with the maneuver force. Similarly, the supply lines or lines of communication dictate where the battles are fought.

As important as military transportation has been to the tactical, operational, and strategic levels of war, it has been generally misunderstood by historians and even many logisticians. The management of military transportation in the United States provides a unique study. From the Spanish–American War onward, all its wars have been fought overseas, which has required a tremendous transportation capability to deploy and sustain its military forces. The United States has also fought wars, both big and small, with greater frequency than most other similar nations providing ample case studies. Its military transportation initially started out small as a service provided to the maneuver units, but as the US Army expanded into one of the largest armies in the world, the movement of troops and supplies became more complex and evolved into a separate logistical function of its own.

While the clash of forces may dominate the focus of most studies of war, combatants only occupy a small part of the battlefield, whereas logisticians own responsibility for everything behind it, reaching all the way back to the fort and factory. This study examines chronologically the influence of transportation on logistics operations from the strategic to tactical level. The ability to deploy and sustain forces limits the amount of force the United States has been able to mass in each military contingency or war, which has resultingly shaped the conduct of the subsequent military operations. During the relatively short interludes of peace, the US Armed Forces have adapted the lessons from previous operations to the advancing technology. This study examines, in particular, how the US

Delivering Victory, 1–10
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doi:10.1108/978-1-78754-603-520191001

Army has evolved the organization and management of transportation as a function of logistics and in the context of military operations. To first understand how military transportation differs from the other logistical functions, one must understand certain logistical concepts.

Lines of Communication

The three main logistics functions are service, supply, and transportation. Services keep soldiers and their equipment in the fight. It maintains equipment and supports morale. This is critical in a democratic society that relies on volunteers to fight its wars. Days of supply determine the length of a campaign or rate of advance. When units run out of supplies, their advances go into operational pauses until the days of supply are rebuilt. Transportation translates into lines of communication, which determine where the battles take place.

By the end of the nineteenth century, the American military was engaged in conflicts and humanitarian actions around the globe. No longer confined to military enterprises within and along its borders, the United States projected its military and naval forces into nearly every region of the world requiring exceedingly lengthy supply lines. Vessels, vehicles, and aircraft transport passengers and cargo from point to point along paths of least resistance. These travel routes by which armies move and sustain themselves are referred to as lines of communication.

To project combat power overseas requires an ocean-going fleet of transports. Watercraft have historically carried more cargo more swiftly and securely along rivers than ground transportation. For this reason, civilization grew along the banks of major rivers. During the time of sail, winds and currents dictated the sea lanes. For smaller vessels, hugging the coastline or passing along island chains provided the safest route. During the age of steam, ships sailed from coaling station to coaling station. Modern vessels can span the entire ocean without needing to stop to refuel thus making a straight path, known as a rhumb line – the shortest distance between two points. These routes are known as sea lines of communication.

Vessels then require a place to discharge upon arrival. Until the development of adequate landing craft and amphibious vehicles, the only efficient means of discharging cargo from deep draft vessels was established ports with wharves and piers extending out into deep water. For that reason, ships sailed from port to port. Due to access denial or destruction of the port, men and supplies may have had to come ashore over an unimproved beach. Prior to World War II, landing barges discharged cargo over the side, and men carried it ashore. Once the cargo has been discharged from the ships, port and beach clearance require access to major road networks for further transportation to the intended customer.

Armies have marched across the land accompanied by equally large supply trains that required good roads. The contours of the land dictate the ease of movement for wheeled vehicles and intersect with other natural travel routes whether ground or river. The intersections of travel routes provide ideal locations

for logistical hubs or nodes for further distribution. For this reason, armies throughout history have been tied to the proximity of these groundlines of communication and fought battles over these transportation junctions.

Aircraft created a new dimension in transportation. Air lines of communication circumvent most ground obstacles but require adequate places to take off and land. The flight path could also be dictated by which countries authorized or restricted overflights of their territory.

Linked together, the continuous line of communication stretches from the point of origin whether the factory or fort to the battlefield or foxhole. Each line of communication, sea, land, or air, requires a different mode of transportation where cargo is transferred from one means to another at each logistical node. These logistical nodes distributed connect the army with the supplies and services needed to sustain the fight. Generally, the modes of transportation descend from larger to smaller as well as in the decreasing amounts of supplies accumulated at each node. Logisticians have experimented with the number of days of supply stockpiled at each node from the port area to the forward supply base. From the point of origin to the final destination, this line of communication is divided into three levels of war with organizations responsible for the management of transportation at each level.

Three Levels of War and Logistics Operations

Up until 1984, the US Army defined war in two levels, strategic and tactical. In 1984, the Army adopted operational art as part of its vernacular adding a third level of war. Strategy defines how to conduct and win the war. Operational art defines campaigns, which are a series of battles and movements. Tactics define how battles are fought. Each has a specific and measurable objective. Similarly transportation and logistics are defined by those same three levels.

Since operations or campaigns are a series of movements and battles, transportation represents the moving piece that connects the dots. Without the moving piece, logistics is just the service and supply; but when it moves, it becomes an operation. These operations differ in both conduct and description from combat operations. With a few exceptions, up until the War with Spain in 1898, the United States had confined its wars to within its borders and on its borders. With the invasion of Cuba and the Philippines, from then on all its wars would be overseas. The initial movement into the theater of operations is strategic deployment.

First of all, strategic transportation delivers the solders, their equipment, and supplies from the point of origin, their home base or factory, to the theater of operations. Delivering men and materiel from the fort or factory to the operational port of entry is known as force projection or strategic deployment and distribution. This involves inland transportation from the points of origin to the ports of embarkation. At each logistical node along the way, the men and materiel transfer from one mode of transportation to the next until they finally board strategic transportation, whether ship or aircraft, at the Port of Embarkation (POE) bound for the Port of Debarkation (POD) in the theater of operations.

Strategic transportation in the US Armed Forces is currently divided among the three services, Army, Navy, and Air Force. Both the Army and Navy have fleets, and the original dividing line between them was brown water–blue water, but deployments to Vera Cruz, Mexico, in 1847 and Cuba in 1898 revealed the real dividing line was ships with guns because the US Army had to purchase or lease the ocean transports in both cases. In fact, after the Spanish–American War, the US Army created the Army Transportation Service to manage its transport fleet. The US Navy focused on the security of those sea lines of communication until the Army turned over this deep water transport fleet to the Military Sea Transport Service in 1949, which became the Maritime Sealift Command in 1970. As airframes became large enough to deliver men and supplies, the Air Force coincidently also broke away from the Army in 1947 to form its own branch of the Armed Forces thus complicating strategic transportation even further. Until after World War II, the Army had responsibility for all strategic and operational transportation.

Upon discharge at the ports of debarkation, the soldiers and their equipment are moved to staging areas where they prepare for future operations known as Reception, Staging, Onward Movement, and Integration (RSO&I). Reception involves unloading men, equipment, and supplies at the airports, seaports, or across bare beaches. The soldiers are usually staged at a camp where they marry up with their equipment, which is usually staged at the port. From the staging yards, the equipment and soldiers are transported to camps for preparation for combat operations, known as integration, or in cases of sustainment operations, they can be transported to their assigned camp. The Transportation Corps has responsibility for the Reception, Staging and Onward movement (RSO) piece.

Sustainment of forces begins almost immediately and runs concurrent to RSO&I. With the commencement of offensive operations, theater transportation follows along a relatively safe path carved out by the combat units in wake of their advance. These lines of communication usually dictate the routes by which armies advance. Sustainment during offensive operations differs from the later sustainment operations because the lines of communication follow the combat forces they support, are fluid, and can change depending upon the enemy threat. In theaters of operation where there is no broad front and safe rear, the rear area is another part of the battlefield requiring combat units to provide rear area security. The advent of fixed-wing and rotary-wing aircraft added the air line of communication to the battlefield eliminating the restrictions of terrain, but these air lines of communication are generally limited by the availability of airframes, airfields, landing zones, aerial delivery methods, and the amount they can carry.

Once the theater line of communication is extended to support the combat maneuver units, then logistics shifts to full-time sustainment operations. By World War I, the US Army defined the rear area behind the broad front as the Communication Zone (COMZ) and divided it into three sections: base, intermediate, and advance. Within a COMZ, lines of communication are usually modified for the ease of flow along the safest and shortest routes. While advancing forces may have had their separate lines of communication, often these are

reduced into single lines of communication from the base of supply at the port of debarkation to the intermediate and advance supply bases. The Mexican War was the US Army's first attempt at projecting an American invasion force across the sea to foreign soil, and from then on, it experimented with the number of days of supply necessary at each logistical node and the distances between nodes. From the depots in the advance section, supplies and equipment are pushed forward along separate lines to the rear of the supported units. In a broad front war, these lines of communication may spread out like a fan or resemble the hub and spokes of a wagon wheel. When combined with supply functions, transportation becomes distribution operations. Sustainment operations can become combat operations where the enemy threatens the groundline of communication with ambushes.

Theater transportation delivers to the tactical logistics nodes, and the difference between tactical and theater logistics is defined by the level of unit. During the Civil War, theater transportation pushed to the army, from 1984 until the Second Gulf War theater transportation delivered to the corps rear and then with transition to a modularized Army in 2007, the Army adopted the brigade combat team as the self-sustained maneuver structure, so theater logistics was redefined as echelon above brigade. From the tactical logistical nodes, the higher echelon pushed to the lower. The conclusion of the war does not end the need for transportation.

The last logistics operation is the retrograde of units, equipment, and supplies from the theater of operation, and it is probably the least studied of logistics operations. Often the main difference between strategic deployment and retrograde is the luxury of time and expense. Retrograde operations usually have the benefit of time and take longer because of the combination of a lengthy buildup and sustainment operations. As will be seen, each war will provide different challenges and have different solutions.

Similar to maneuver operations, logistics operations require detailed planning and coordination for successful execution. Each operation has a measurable objective, which is usually defined in terms of tonnage or pieces of equipment loaded, unloaded, or moved. These requirements are based upon the predictable consumption rates of the supported units and the capacity of available transportation assets. These operations have evolved throughout the history of the US Army. Overall the three levels of transportation make up a relay by modes of transportation that deliver to logistical nodes where the men and materiel are either stored, staged, or transferred to another mode of transportation. At each of these nodes, transportation assets handle the transfer from mode to node and node to mode. These logistics operations have improved with technology.

Technology

While technology has revolutionized the conduct of maneuver warfare, for the most part, it has only gradually improved transportation. The earliest technical innovations in transportation were the invention of the wheel, keel, and sail. For millenniums, these defined and confined transportation. Wagon and boat transportation were confined to roads and waterways. From then on

transportation was measured by speed and the volume it could haul. Watercraft saw the gradual improvements in ship design to increase size and speed, while wagon transportation ranged between 1- and 3-ton capability and rate of march was limited to pace of the draft animals. Speed and volume of transportation would dramatically change with innovations during the nineteenth and twentieth centuries.

The invention of the steam engine in the late eighteenth century was the next great technological innovation to revolutionize transportation. At first, its size limited this technology to watercraft, which freed vessels from dependency of wind, currents, animal, and manpower. Steam-powered river boats could plow their way upriver without the requirement of animals or men pulling them up river by rope or pushing them with poles. Once wheels were fastened to the steam engine, rail increased the speed of ground transportation from 3 to 10–15 miles an hour. For once, ground transportation outpaced the maneuver units it supported.

The invention of the internal combustion engine later in the nineteenth century provided power in a smaller package. The first Army truck in the early twentieth century not only increased the speed of ground transportation to 15 miles per hours but could travel anywhere wagons could, and the liquid fuel that powered the engine did not compete for cargo space but could be contained in a small container under the bed of the truck. During the nineteenth century, wagon transportation had a maximum efficient range of travel of 300 miles, whether one-way or round trip. From a logistical base, most armies could not sustain themselves beyond 150 miles for beyond that the animals consumed more cargo than could be delivered to the customer and consequently the increasing number of required wagons needed to sustain an army in the field became inefficient. The internal combustion engine removed this limit. Fuel could be transported in smaller packages, and refueling bases established at sites along the route. As dirt roads sufficient for slow moving wagons were paved and engines increased in size, ground transportation rivaled rail for volume and speed, but cost significantly more.

The internal combustion engine also allowed man to defy gravity and provided the means for powered flight. As aircraft grew in size, they became flying trucks freeing armies from the confines of groundlines of communication. Vertical or air lines of communication added a new dimension to military transportation breaking free of natural obstacles to ground transportation. Unfortunately, the size of aircraft seldom competed with watercraft or ground transportation for volume or weight. Aircraft's greatest contribution to transportation was speed and range. By the Vietnam War, aircraft would become the primary means of transporting troops into theater; but because of the limit in volume and weight and exceedingly high cost, ships remained the primary means of transporting cargo and equipment.

Innovations in ship design allowed vessels to increase in size, but armies denied the use of deep draft ports needed a more efficient means of delivering cargo over a bare beach. The discharge of men and equipment across an unimproved beach had been limited primarily to the inadequate design of the landing barges and launches. During the early history of the United States, the Army employed

launches, flat-bottomed landing barges, or flat-bottomed river bateaus. Both were rowed ashore. Lieutenant General George Washington's Continental Army came ashore on one of the four flat-bottomed river bateaus specially designed for artillery carriages at four separate landing sites on the James River in the vicinity of Williamsburg, Virginia, for the siege at Yorktown in September 1781. During Winfield Scott's landing at Vera Cruz on March 9, 1847, 10,000 soldiers came ashore in surf boats that held 50–80 soldiers each with sailors manning the oars, an operation that continued for several days. By March 18, Scott had sufficient supplies ashore to conduct military operations. During the landing at Daiquiri, Cuba, in June 1898, MG Shafter's V Corps disembarked launches at the bare beach and pier. This and the discharge of cargo at Siboney were time consuming due to the need to unload cargo over the side of the launches and carrying them ashore. A better design in landing craft was needed.

Aside from the American problems in Cuba, the British landings at Gallipoli, Turkey, during World War I inspired the Army to seek and find a solution. In 1915, the British delivered 200 lighters with spoon-shaped bows and drop-down frontal ramps referred by the soldiers as "Beetles." Building on this success during the interwar period, the British combined the design with an internal combustion engine to produce the motor landing craft in 1920 that could deliver a medium tank. Thus the design became known as the Landing Craft Medium (LCM). The hinged bow ramp designed by the British and later improved by the Japanese revolutionized the design of landing craft with the ability to more efficiently discharge cargo over a bare beach and even allow vehicles to drive directly off the boat onto the beach. Delivering cargo over an unimproved beach was nothing new in history, but the hinged landing ramp improved the efficiency.

The landing craft was, however, limited by the depth of the water and incline to the beach as well as underwater sandbars, which would strand the vessel and prevent it dropping ramp on dry beach. At best, the landing craft had to stop at the water's edge, so the US Army and Marine Corps wanted a vehicle that could swim and also drive on land. The US Marine Corps bought an amphibious tracked vehicle design developed by Donald Roebling in 1935 and converted it into their Landing Vehicle Tracked. In 1942, Sparkman & Stephens converted the 2½-ton truck into the most successful amphibious vehicle of the war for the Army. As a truck that could swim, it was unfortunately limited in its maneuverability in the water, essentially handling like a truck in the water, so the Army Transportation Corps began development on the second generation of amphibians – series of boats that could drive on land referred to as Lighter, Amphibious Resupply Cargo (LARC). For the third generation of amphibians, the Transportation Corps traded cargo capacity for speed with the air cushion vehicles. These amphibians gave the American Army the ability to deliver cargo from the ship across the bare beach right up to the cargo yard eliminating the need for transferring cargo from one mode to another at the water's edge.

An important factor in the efficiency of transportation had been loading and unloading cargo. The earliest forms of packaging employed by the American Army were boxes and barrels. The revolution in containerization of supplies went

directly hand-in-hand with the material handling equipment and vehicles or vessels that transported them. Boxes were handled easily by dollies and rudimentary cranes, while barrels could be rolled onto a wagon merely with two poles. The dimensions of military wagons were based upon the size of the barrels, so no space was lost thus maximizing volume. Loading individual barrels and boxes was time consuming so to expedite loading of cargo aboard a ship, they were lifted by cranes in cargo nets. During World War II, the US Army adopted a more efficient system of moving quantities of boxes and barrels with wooden pallets, which became practical because of the design of forklifts. The problem of pilferage inspired the idea for sealing the cargo in steel shipping containers. Malcom McLean and Keith Tantlinger designed the first metal intermodal container referred to as Container Express, better known as the CONEX. The CONEX was moved by a forklift, and the increasing size of the material handling equipment resulted in larger containers. The International Maritime Organization standardized the dimensions of containers between 1968 and 1970. For military purposes, the Kalmar Rough Terrain Cargo Handler (RTCH) easily handled 40-foot containers. This improved not only speed and volume but helped reduce pilferage. The challenge was then knowing what was in the container and tracking it from point of origin to its final destination making sure it arrived on time to the intended customer.

In early history of the US Army, the shipment of cargo was tracked by invoices and bills of lading. The electronic age communicated messages by telegraph and then telephone. Bulky vacuum tubes of the first wireless radios could transmit information through the airways. The transistors permitted smaller radios. The computer age processed data at a much faster rate, and microchips reduced computers to something one could hold in the hand. Satellites allowed radio waves to bounce around the world for global communication. The combination of this technology enhanced the capability to instantaneously track passengers and cargo from the point of origin to the final destination. Consequently, the US Army Transportation Corps and US Air Force developed computer programs that could plan deployments with greater predictability and track cargo in real time. This automation revolutionized planning and accurately predicted the arrival time of units, their equipment, and supplies. This efficiency allowed the Armed Forces to rapidly deploy to crises around the world in a manner it had never been able to do before.

The concept of transportation, transporting men and materiel from a point of origin to a final destination along established lines of communication has not changed. The technological advancements have significantly improved speed, volume, and the ability to synchronize transportation from end to end. This has revolutionized the United States Armed Forces' ability to rapidly deploy and sustain large number of forces around the world.

The United States Armed Forces' challenge throughout history was how to manage these complex operations into a refined science where the transportation managers could deliver the required numbers and tonnage to a determined destination at a predictable date and time. This challenge involved identifying career fields to manage transportation as a function of logistics.