

GEORGE C. THORPE'S

**PURE
LOGISTICS**

An NDU Press Edition

with an

INTRODUCTION

by

STANLEY L. FALK

PURE LOGISTICS

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*THE SCIENCE OF WAR
PREPARATION*

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1986

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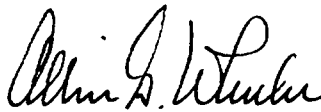
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FOREWORD

We place a premium on forward-looking military thought, but a reflective look at literature from the past can also be useful, especially when that literature marks the intellectual heritage of American planning for national defense.

At the Industrial College of the Armed Forces, one of the accepted classics of military literature is *Pure Logistics: The Science of War Preparation*, written by Lieutenant Colonel George C. Thorpe of the United States Marine Corps and published originally in 1917. In his introduction to this new edition of Thorpe's work, Stanley L. Falk tells us *Pure Logistics* stands out as a milestone between the seminal writings of Baron de Jomini, published one hundred years before, and later treatises examining logistics following World War II. Thorpe's observations and recommendations in *Pure Logistics* have held up over time, even in the face of the technological advances of nearly seventy years. His call for preparation in peacetime to accelerate defense industrial production in the event of war is as valid today as it was in 1917.

Despite its merits, *Pure Logistics* has been out of print for years and not conveniently available to members of the defense community. The republishing of this classic was suggested by two of our ICAF members whom we gratefully acknowledge: Colonel Barry M. Landson, US Air Force, Dean of Faculty and Academic Programs, and Dr. Ralph Sanders, J. Carlton Ward Jr. Distinguished Professor. Our hope is that both planners and scholars will discover—or rediscover, perhaps—Thorpe's fundamental and useful work.



Albin G. Wheeler
Major General, US Army
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of the Armed Forces

INTRODUCTION

Stanley L. Falk

The word *logistics* has been in use in the United States barely more than a century. For most of this period, members of the profession of arms, as well as military historians and theorists, have had difficulty in agreeing on its precise definition. Even today, the meaning of logistics is somewhat inexact—despite its frequent appearance in official and unofficial military dictionaries and its lengthy definition in service and joint regulations.

Logistics is essentially moving, supplying, and maintaining military forces. It is basic to the ability of armies, fleets, and air forces to operate—indeed, to exist. It involves men and materiel, transportation, quarters and depots, communications, evacuation and hospitalization, personnel replacement, service, and administration. In its broader sense, it has been called the economics of warfare, including industrial mobilization, research and development, funding, procurement, recruitment and training, testing, and, in effect, practically everything related to military activities besides strategy and tactics. Logistics, in short, in the words of one irreverent World War II supply officer, is “the stuff that if you don’t have enough of, the war will not be won as soon as.”

Stanley L. Falk is a military historian—author, lecturer, consultant, with MA and PhD degrees from Georgetown University. He has been Chief Historian of the Air Force, Professor of International Relations at the Industrial College of the Armed Forces, and Deputy Chief Historian for Southeast Asia at the US Army Center of Military History. He is the author of five books on World War II as well as textbooks on national security affairs and many articles and reviews. He has lectured at the National War College, the Army War College, the Smithsonian Institution, and elsewhere, and is active in professional and scholarly organizations.

Whatever its current definition, in 1917, when Lieutenant Colonel George C. Thorpe, USMC, published an unusual little book entitled *Pure Logistics: The Science of War Preparation*, the word *logistics* was not particularly understood nor even generally used in the United States. Thorpe, indeed, may well have been one of the few military thinkers anywhere in the world to employ the term prominently at this time—and almost certainly the only one to attempt to define it carefully as a science. Thus, his thoughtful and perceptive analysis stands out as a milestone between the ground-breaking treatise of Jomini, published nearly a century earlier, and later writings on logistics that did not begin to appear until about the time of World War II. More importantly, Thorpe's effort to define logistics was more than just an academic exercise. A proper definition, he argued, was essential for understanding the true role and function of logistics in war, for ensuring that none of its aspects were neglected, and for achieving ultimate victory in any conflict.

Logistical Systems

As Colonel Thorpe suggested, logistics has had a long, neglected, and often misunderstood history. Over the centuries, since primitive man first gathered stones to hurl at his neighbor, logistics has operated with various means and methods at both tactical and strategic levels. In its earliest form, it was simply a matter of individual warriors carrying sufficient food and weapons to support a battle or campaign. In later years, as warfare became more extended and complicated, more elaborate methods of provisioning and sustaining forces emerged. The logistical system that developed perforce for large military organizations saw armies bringing along their own supply of weapons and equipment while relying on the countryside in which they operated for food and forage. Thus, Xenophon and Alexander ranged far and wide over great distances from Greece to India; and Hannibal, cutting himself off from his base in Africa, for a dozen years lived off the land in Italy. Where local supply was inadequate, as was the case with Xerxes' much larger Persian armies, a series of depots and magazines along the route of advance assured a

continued supply.

The Romans blended all of these methods effectively into a far-reaching and flexible logistical system. Supported by carefully organized supply and service forces and a net of well-engineered roads to speed movement and communication, they carried their own stores, drew on local resources, and established fortified depots.

Feudal and medieval armies were less effective in supporting themselves, in part because of advances in offensive and defensive weapons technology. The development of heavy armor increased the weight of arms and equipment and the need for armorers and others to maintain and repair this material. The introduction of gunpowder and cannons further enlarged the number and weight of weapons and ammunition, and the size and number of wagons and the animals to pull them. And since heavy ordnance obviously could not be requisitioned locally, it had to be carried along with the army in sufficient amounts for the entire campaign.

As weapons became more powerful, so did the defenses erected against them. The walls of medieval castles and forts rose higher and thicker. This meant, on the one hand, a supply of heavy materials and machines with which to construct and repair them, and, on the other, more cumbersome war engines to knock them down. Siege and baggage trains grew in size and length, adding to the already overwhelming crowd of laborers, carpenters, tentmakers, repairmen, cooks, launderers, grooms, surgeons, and others who swarmed in the wake of an army. All of these people and thousands of animals had to be fed and supported. Although commanders made major efforts to collect, organize and transport supplies and equipment, they were severely hampered by the sheer bulk and numbers of their forces. Heavily laden wagons, poor or nonexistent roads, and frequent breakdowns hindered movement and flexibility. Armies travelled slowly and for short distances, stripping the countryside as they went of food, fodder, goods, and means of transportation.

In sharp contrast were the logistical efforts of the 13th century Mongol horsemen whose armies swept across Eurasia in a magnificent display of speed, flexibility, and well-disciplined military organization. Carefully planning their

routes and camp sites, they travelled with large trains of wagons, horses, pack animals, and cattle, supported by a network of grain stores. As they neared hostile forces, they moved swiftly ahead of their supply train, replenishing themselves from the countryside as they rode. Lightly armed and equipped, each warrior carried his basic rations and led a string of remounts to assure mobility and speed. Only the availability of pasture for the animals slowed or hindered Mongol movements. Long, static engagements could also be a problem because of the difficulty of resupply, so the Mongol logistical system could rarely support a drawn-out siege deep within enemy territory.

By the beginning of the 17th century, European armies had grown so large and ponderous that their movements were dictated primarily by supply considerations. Since logistical support from a permanent base was practically impossible, they lived almost entirely off the land and were thus forced to keep going in order to find new sources of replenishment in areas they had not already stripped and plundered. What supplies they did carry with them, as well as their weighty artillery, were most easily transported by water. So successful commanders like Maurice of Nassau and Sweden's Gustavus Adolphus planned their advances along the great rivers of central Europe, and sought as well to dominate those waterways in order to prevent their use by enemy forces. Gustavus also established depots in captured towns and made practical efforts to lighten his artillery and shorten his baggage trains. But even he had to live primarily off the country, and, despite his reputation for mobility and initiative, his movements were largely influenced by the need for food and forage.

The logistical pattern for the next two centuries was much the same. Despite innovations and improvements, armies were not self-sustaining but continued to rely for the bulk of their supplies on the land they occupied. Commanders attempted to calculate logistical needs more carefully and precisely, and they established series of fortified depots, or magazines, supported by well-defended supply convoys. This depot system sometimes worked during sieges. Yet by and large the system was only useful in the early days of a campaign. Magazines, whether fixed or "rolling," were incapable of providing more

than a fraction of what was needed once an army had advanced beyond its national borders. The huge military forces carried with them the same excessive "tail" of people and animals that earlier armies had to feed; to bring along sufficient provisions would have far exceeded the capacity of any means of transportation then available.

An elaborate system of requisitions through local authorities and of purchases from local merchants or contractors emerged to replace more primitive forms of plunder. Food and forage remained the primary requirements, for, despite advances in weaponry, ammunition expenditures were relatively low and could usually be handled without resupply. So military campaigns continued to be shaped by the need to find provisions in the field or to deny them to the enemy. And it was not unusual for a siege to be ended by the starvation of the defenders but rather because the besieging forces had exhausted the resources of the surrounding countryside and were forced to move on to more fruitful areas.

The Napoleonic logistical system was a combination of many earlier methods, used flexibly and according to the needs and problems of a particular campaign. Napoleon himself devoted a great deal of attention to logistic concerns, and planned and organized supply and support in careful detail. He counted heavily on swift campaigns, which would end before any logistic weakness could harm him or would, in victory, gain whatever supplies and provisions his armies required. To this end, he marched his troops at a faster pace and stripped his baggage trains of their heavier loads, shifting much of this weight to the backs of his uncomplaining soldiers. These rapid movements and an efficient requisition system made it possible for French armies to live off the land without exhausting local supply. In some campaigns, Napoleon did without depots or resupply convoys, while in others he depended heavily on magazines and an efficient transportation system. Nor did he hesitate to change plans or improvise as necessary. What was remarkable about Napoleonic logistics was not that it failed on occasion—as in Spain or Russia—but that it performed so well over such great distances in the face of stronger and more numerous enemies.

The century between Waterloo and World War I brought with it technological developments that were to have an important impact on logistics. The growth of railroads, the introduction of steam-powered ocean vessels, and the emergence of gasoline-driven motor vehicles provided new means and methods of supplying and supporting military forces. Advances in communications—the telegraph, telephone, and radio—assured commanders of swifter, surer means of transmitting their needs for logistical backup. Yet, at the same time, the arrival of mechanized transportation brought with it greater requirements for fuel supplies, while developments in weaponry increased quantity and weight of ordnance to be towed or mounted on warships and the amount of ammunition to be provided.

The impact of these developments would not be fully felt before the First World War. But in the Civil War in America, the Franco-Prussian War in Europe, and the Russo-Japanese War in the Far East, the signs of change were evident. The Civil War showed what railroads, steamboats, and the telegraph could do and, above all, made clear the military importance of industrial power. The Franco-Prussian conflict seemed to demonstrate the decisive effect of well-organized railways. And the Russo-Japanese struggle illustrated everything from the tactical value of telephone and radio communications to the strategic impossibility of waging war at the end of a long supply line unsupported by a modern rail system.

Much has been written about the Prussian logistical organization: the use of a carefully planned strategic rail net to carry troops and supplies forward, combined with the so-called *Etappen* system, shuttles of horse-drawn weapons and service troops to rush cargo from railheads to the front. It seemed to make possible for the first time a logistically self-sustaining force, continuously resupplying itself. In practice, as recent analysis has shown, this was not the case. The Prussian railroads performed admirably during the initial deployment but, once the shooting began, proved incapable of keeping up with the moving front and were not, in fact, even as good as the supposedly inferior French railways. To make matters worse, the *Etappen* system collapsed under the pressures of reality and failed to deliver much in the way of anything. So

Prussian forces lived off the land, thanks to a bountiful French harvest, and rarely needed more ammunition than they had with them, thanks to comparatively low ammunition expenditures and to the relative brevity of the war. The Prussian victory was less a logistical triumph than the result of more competent leadership, superior staff-work, and better artillery more efficiently employed.

The 20th century thus began with logistical systems basically unchanged from the traditional forms. Armies still lived primarily off the countryside, plundering or requisitioning as they went to meet food and forage requirements that military transportation was incapable of filling over more than short distances. Much of World War I was supported in the same manner, although heavily increased ammunition expenditures revealed the inadequacies of the traditional system even as they underlined the growing importance of industrial mobilization and production. Not until the Second World War did armies and fleets become anywhere near self-sustaining, or logistics develop into anything like the science that Colonel Thorpe had insisted it should be. And not until then did a significant body of literature about logistics begin to emerge.

Early Attempts at Definition

By World War I, as Thorpe noted, war had “become a business,” in which logistics was a basic and comprehensive element. Yet, he wrote, “while Strategy and Tactics are much talk of . . . , there has not yet been recognized a science of Logistics.” Few, indeed, either used or even attempted to define the word.

The term *logistics* is, in fact, of relatively modern origin. Although some writers attempt to trace it back to the Greek word *logistikos* (“skilled in calculating”) or the related Latin *logista* (a Roman or Byzantine administrator), both words and their derivatives have to do with mathematics, calculations, or other nonmilitary subjects. Not until the late 18th or early 19th century did *logistics* enter the military vocabulary and take on anything at all like its meaning today.

The term derives directly from the French *maréchal* or *maréchal-général des logis*, translated as “quartermaster general”

(*logis* meaning “lodging” or “quarters”). Established under Louis XIV, the *maréchal des logis*, like the Prussian *quartiermeister*, was responsible for billeting and subsequently for the routine administration of marches and camps. Under some circumstances, the *maréchal-général* became a sort of chief of staff, with greater administrative duties; these did not include, however, a number of supply and service functions. After the French revolution, the title *maréchal des logis* appears to have been dropped, but the word *logistique* remained.

It was the Swiss Baron Antoine Henry Jomini—who had served as a Napoleonic staff officer and who wrote extensively about the military campaigns of the period—who made the first significant use of the term *logistics*. In his classic *Summary of the Art of War*, published in 1838, Jomini established logistics as one of five basic tools for conducting war, the others being strategy, grand tactics, engineering (by which he meant fortification only), and minor tactics.

Jomini defined logistics as “the practical art of moving armies,” but he gave it a far broader and deeper meaning. The “old *logistique*,” he explained, had been “quite limited.” However, warfare and hence logistics had grown far broader and more complex. The narrow role of the administrative chief of staff had now expanded to take on a wide variety of duties “connected with all the operations of a campaign,” in fact practically everything except combat and planning for combat. Logistics thus included the “preparation of all material necessary for setting the army in motion”; the drawing up of initial and subsequent orders; provision for security and reconnaissance; movement and sustenance of the troops; establishment of camps, depots, and supply lines; organization of medical service and communications; and a host of other tasks.

Logistics, declared Jomini, “comprises the means and arrangements which work out the plans of strategy and tactics.” It was a major function of command, and a good commanding general required a skillful and efficient logistical staff and an even more competent logistician to head it. This chief of staff, Jomini wrote, “should be acquainted with all the various branches of the art of war,” for logistics, in its ultimate sense, was “nothing more nor less than the science of applying all

possible military knowledge.”

Jomini's works were widely read, but primarily for their strategic and tactical lessons. His use and broad definition of the word *logistics*, however accurate it may have been, did not find wide acceptance in the military literature of the 19th century. Clausewitz, Jomini's contemporary who also had drawn inspiration from Napoleon's campaigns, neither used the word nor considered logistical matters to be of major concern. Obsessed with the importance of operational over logistical considerations, of the moral forces of war over the material, Clausewitz paid lip service to logistics but refused to admit that it played any part in “the conduct of war properly so called.” War was strategy and tactics. All else was merely “subservient” services, useful and necessary perhaps, but insignificant in the actual clash of war.

That the widely read Clausewitz reflected the standard prejudice of fighting men against the noncombatant services may perhaps explain why logistics—both word and concept—failed to appear in other contemporary military writings. Yet, as the industrial revolution spread across Europe, few could ignore the growing logistical impact of industrial and technological developments on the conduct of war. Thus, Prussian and other military leaders gave increasing importance to the place of logistical activities in the structure of their military forces and in planning for conflict. But they did not write about it.

In the United States, meanwhile, Jomini's *Art of War* had been available in translation since very shortly after its original 1838 publication, whereas an English edition of Clausewitz did not appear until 1873. Thus, Civil War generals were said to have fought with a sword in one hand, a copy of the *Art of War* in the other. Perhaps so. But like their European counterparts, they were more impressed with Jomini's strategic and tactical advice than with what he had to say about the importance of logistics. The logistical resources of the North may have triumphed over the tactical skills of the South, yet few pointed it out in just those terms. Indeed, the first use of the word *logistics* in American military literature apparently did not come until the late 1870s. Its later employment by Army officers was limited and infrequent, focusing more on move-

ment and quartering than on the broader supply aspects suggested by Jomini.

The Navy, however, was beginning to show some interest in logistics. In 1888, in a lecture at the Naval War College, Captain Alfred Thayer Mahan introduced both the term and the concept to naval strategy. A subsequent lecture that year by another officer focused more directly on naval logistics, while still others, in articles and essays, soon began to stress the need for a system of bases for fleet support and to examine the economic foundations of naval power.

Mahan himself asserted that logistics—although he actually used the word infrequently—dominated warfare. Good supply lines, fixed and floating bases, and adequate stocks of fuel were essential for the projection of seapower. Moreover, control of the sea lanes, protection of national trade and commerce, and the destruction of the enemy's economy were vital functions of naval strategy: a broad logistical calculus in which the British naval historian Sir Julian Corbett would soon join him. And on the eve of World War I, the Navy's own growing awareness of the economic and industrial roots of its development lent a new and greater meaning to the concept of logistics. The word itself, however, was still not widely used.

Pure Logistics

It was in this atmosphere that then-Major George C. Thorpe arrived in Newport in December 1914 to spend a student year at the Naval War College and to write his stimulating essay on logistics. Like most Marine officers of the early 20th century, Thorpe had enjoyed a varied career. Born in 1875, he had served as a temporary 2d lieutenant during the Spanish-American War and then received a regular commission as 1st lieutenant in time to see action in the Philippines against the insurrection. There he earned a commendation for bravery and a brevet promotion. But he also suffered damaging foot injuries, which, along with a series of illnesses, were to plague him all his life, interrupting his career and leading to his early retirement.

In 1903, Captain Thorpe commanded the Marine detach-

ment accompanying the first American diplomatic mission to Addis Ababa. This was an assignment testing both his logistical and tactical skills, involving an arduous month-long trek by mule and camel across some 300 miles of Ethiopian desert and mountains, confrontations with hostile tribesmen, and a mutiny of spear-carrying camel drivers. Thorpe returned from the mission with a medal from the emperor and Ethiopia's gift for President Roosevelt of two live lions, which the enterprising Marines somehow managed to carry in cages on the backs of frightened camels.

Thorpe's subsequent career included service in the West Indies, Cuba, and the Panama Canal Zone; as Fleet Marine Officer of both the Atlantic and Pacific fleets and the European Station; and as commander of the Portsmouth, New Hampshire, naval prison. He graduated from both the Naval War College and the Army General Staff College, and served twice on the staff at Newport. His education also included two years at the US Naval Academy, studies in psychology and international law at Brown and New York Universities, and BS, LLB, and MA degrees. He was admitted to the bar in Massachusetts and New Hampshire, published several articles, and during the final years of his career was at work on a long, but never published, study of the evolution of warfare.

From 1917 to 1919, Thorpe was stationed in Santo Domingo as a regimental commander and brigade chief of staff. He also became the first commandant of the newly formed Guardia Nacional Dominicana and was commended for action against bands of outlaws that were terrorizing the countryside. By this time, he was a full colonel with a record that might well have supported further advancement. But his earlier injuries and continued illnesses were becoming too heavy a burden. Incapacitated for duty, he retired from active service in 1923. After years of increasingly severe medical problems, he died in 1936.

During his long career, Thorpe's most enduring contribution may well have been his authorship of *Pure Logistics*, published after one-and-a-half years as student and staff member at the Naval War College. The time at Newport had been most productive, for it was there that Thorpe enjoyed what may well have been his first real opportunity to study and think

about some of the broader aspects of the art of war. The few pieces of his correspondence that remain indicate his interest in military history, and it is clear that his interest soon focused on the area of logistics. He quickly discovered that military commentators other than Jomini offered only "silence" on the subject. The "conclusion is irresistible," Thorpe noted, "that the military themselves know next to nothing about Logistics." He thus began to write his own definition and analysis, and to develop a theory and set of principles for the organization and direction of this long-neglected branch of warfare. The result, *Pure Logistics: The Science of War Preparation*, was completed in the summer of 1916 and published the following year.

Thorpe viewed logistics as a science which, like other sciences, could be divided between "pure" and "applied," between theory and practical usage. "Applied Logistics" drew on the general principles of "Pure Logistics," concerning itself with the specific details of logistical functions before and during a war. "Pure Logistics" was theoretical, abstract, "a scientific inquiry into the theory of Logistics—its scope and function in the Science of War, with a broad outline of its organization." And this "scientific inquiry" was what Thorpe proposed to conduct.

Thorpe's conception of logistics was akin to that of Jomini: strategy and tactics constituted the conduct of war; logistics provided the means. But this means was not limited to the narrow functions of transportation and supply. Logistics indeed embraced the entire range suggested by Jomini as well as all those larger and deeper aspects subsumed within the economics of warfare.

Logistics as thus broadly defined, argued Thorpe, constituted an entity. It comprised many activities, but was nonetheless a single whole. To ignore or reject its unity and the interrelationship of its parts—a common error—was to divide or splinter a natural functional category of the art of war. Separating supply and transportation, for example, from engineering, maintenance, hospitalization, administration, and other aspects of logistics was unnatural and dangerous. It left these interdependent activities to be planned, organized, and managed without unifying direction and coordination: a cer-

tain invitation to defeat in battle and disaster in war. Logistics, in short, was "a distinctive branch of warfare," embracing "a large number of activities that should be coordinated, but not confused, with tactical or strategical activities."

To prove the validity of this concept, Thorpe offered three historical examples: Napoleon in Russia, Sherman's Atlanta campaign, and the Prussian army in the war with France. Napoleon, noted Thorpe, had made great personal efforts to ensure sufficient supplies and transportation, yet his campaign failed because the logistical functions of the French army were poorly organized and coordinated. Sherman, on the other hand, had planned and established an efficient logistical organization which enabled him to carry out his bold, ambitious campaign. The Prussians had been the most foresighted of all, felt Thorpe. Several years before the start of the Franco-Prussian war, von Moltke had made a careful estimate of the logistical base of both the French and Prussian armies, planned for war accordingly, and organized his staff to ensure proper logistical support of his strategy and tactics.

Building on his analysis of the German general staff, Thorpe proceeded to draw up a suggested organization for the direction of American fighting forces. It was an ambitious and far-sighted plan, reflecting broad logistical considerations and concepts in many ways ahead of their time. Thorpe recommended the establishment of a National Board of Strategy to be responsible for strategic planning and national logistic considerations. The National Logistic Staff of the Board would manage those logistical activities common to both Army and Navy, including certain types of procurement and services, as well as peacetime industrial preparedness. Within each of the armed forces, logistical functions would be clearly delineated and handled by a separate logistical staff, manned by members of a permanent logistical staff corps. Comparable organizational arrangements would exist at major subordinate levels.

The entire military organization would be based on an effective military educational system; for education, argued Thorpe, was a part of logistics, in the sense that like all other support and service functions, it helped to prepare the nation's military system for "efficient operation." Thorpe did not

specifically discuss logistical training and education, but he did urge that all strategical and tactical problems examined at the staff colleges “be solved logistically” to determine the feasibility of any proposed action. By way of illustration, he provided a detailed example of such a logistical solution in an exercise involving a major fleet operation from an advanced base against an enemy effort to seize that base.

Several months after the publication of *Pure Logistics*, while commanding a regiment in Santo Domingo, Colonel Thorpe enlarged on his thoughts about military education. In a proposal submitted to the Secretary of the Navy, he urged the establishment of a National War College as a joint educational and planning organization atop the existing structure of Army and Navy schools. The proposed National War College would be an adjunct to a national strategic staff—presumably similar to the National Board of Strategy suggested in *Pure Logistics*—and would not only coordinate Army and Navy planning and education but also link logistics with strategy in national war planning. By the time of this proposal, however, the United States was fully engaged in World War I. Given the press of wartime requirements, it seems doubtful that Thorpe’s proposal received more than passing notice in busy Washington.

Nor did *Pure Logistics* fare any better. The small book—and Thorpe’s broadly conceived view of logistics and his ideas for implementing it—aroused little or no interest at a time when neither the Army nor the Navy was prepared to drop traditional concepts of supply and support. Nor did logistical developments in the aftermath of World War I do much to change this attitude. As Thorpe had anticipated, the war had emphasized the importance of industrial and economic mobilization, and the National Defense Act of 1920 gave the Army planning responsibility in this area. It led to the establishment in 1922 of the Army and Navy Munitions Board as a joint agency to coordinate planning for acquiring munitions and supplies and, in 1924, of the Army Industrial College to train officers in military procurement and industrial mobilization. For several years in the late 1920s, also, the Naval War College offered a course on logistics. Yet few shared Thorpe’s ideas.

Logistics, indeed, continued to be viewed narrowly. The word had entered the military lexicon but was still defined in the traditional sense of movement and supply of troops in the field, a definition that lingered on well into World War II. It was not until the later stages of that war that logistics began to take on the broad meaning ascribed to it by Colonel Thorpe. And it was not until well into the postwar period that this concept and its implementation had a noticeable effect on the American military establishment.

Post-World War II Writings on Logistics

In 1945, someone discovered five copies of *Pure Logistics* in the library at the Naval War College. The College considered publishing a revised edition, but nothing appears to have come of this. Since then, only a few copies of the book have been available in special libraries or personal collections. And, aside from a brief mention in a single encyclopedia article, *Pure Logistics* has received little public notice. Nevertheless, it remains unique as an analytical examination of a long-neglected subject and as an attempt to define scope and content and to establish a theory of practice. While much has been published on logistics in the years since World War II, book-length studies have been primarily historical and analytical rather than theoretical in nature. No new Jomini or Thorpe has emerged to offer a modern theory of logistics.

A few authors have, however, produced broad logistical overviews. The most recent, and most controversial in some of its conclusions, is Martin Van Creveld, *Supplying War: Logistics from Wallenstein to Patton* (1977), an analytical history of Western logistics from the 17th century through World War II. Among other useful insights in this book, Van Creveld's convincing examination of the Franco-Prussian War has destroyed the myth of Prussian logistical supremacy in that conflict. In *The Sinews of War: Army Logistics, 1775-1953* (1966), James A. Huston has written an impressive, comprehensive account of the American Army that includes an effort to establish some general principles of logistics. A complementary work is Erna Risch, *Quartermaster Support of the Army: A History of the Corps, 1775-1939* (1962). No comparable

volumes have been written for the Navy and Air Force, but Rear Admiral Henry E. Eccles discusses logistical history, organization, and planning in his broadly based *Logistics in the National Defense* (1959). One noteworthy earlier book, actually published on the eve of World War II, is George C. Shaw, *Supply in Modern War* (1938), which conceives of logistics in more traditional terms.

There have also been a number of efforts to examine logistics in specific American wars. No one, unfortunately, has seen fit to write a logistical history of military efforts during the colonial period. Lee Kennett, *The French Armies in the Seven Years' War: A Study in Military Organization and Administration* (1967), deals almost entirely with the European side of what Americans call the French and Indian War (1754–1763) but offers a valuable description of French logistical organization and practices of the time. By contrast, the American Revolution boasts several works on logistical subjects, including Erna Risch, *Supplying Washington's Army* (1981), David Syrett, *Shipping in the American War, 1775–1783* (1970), and R. Arthur Bowler, *Logistics and the Failure of the British Army in America* (1975).

Major volumes on Civil War logistics are scarce, Richard D. Goff, *Confederate Supply* (1969), being the only general study. Carl Davis, *Arming the Union: Small Arms in the Union Army* (1973), and Robert Bruce, *Lincoln and the Tools of War* (1956), cover weapons development and procurement in the North, while Frank E. Vandiver, *Ploughshares into Swords: Josiah Gorgas and Confederate Ordnance* (1952), does the same for the South.

Historians of logistics have tended even more to avoid World War I. Robert D. Cuff, *The War Industries Board: Business-Government Relations in World War I* (1973), examines industrial mobilization, one of the newer logistical themes emerging from that conflict. Beyond this volume, however, World War I logistics has been left to the memoirs of participants. Thus, Major General James G. Habord, *The American Army in France, 1917–1919* (1936), Brigadier General Johnson Hagood, *The Services of Supply: A Memoir of the Great War* (1927), and Admiral Albert Gleaves, *A History of the Transport*

Service (1921), reflect the wartime logistical experience of their authors. Former Assistant Secretary of War Benedict Crowell and Robert Wilson, *How America Went to War: An Account from the Official Sources of the Nation's War Activities* (6 vols., 1921), grew out of Crowell's experience in industrial mobilization, manpower management, and oversea munitions supply.

The bulk of recent writing on logistics has focused on World War II, much of it the product of the official history programs of the armed services. Richard M. Leighton and Robert W. Coakley, *Global Logistics and Strategy* (2 vols.; 1955, 1968), and Duncan S. Ballantine, *U.S. Naval Logistics in the Second World War* (1947), provide an overall view of worldwide logistics. R. Elberton Smith, *The Army and Economic Mobilization* (1959), Robert H. Connery, *The Navy and the Industrial Mobilization in World War II* (1951), and Byron Fairchild and Jonathan Grossman, *The Army and Industrial Manpower* (1959), examine economic and industrial mobilization and procurement. *Men and Planes* (1955), the sixth volume in Wesley Frank Craven and James Lea Cate (eds.), *The Army Air Force in World War II*, describes recruitment and procurement, and the latter topic is also the subject of Irving B. Holley, Jr., *Buying Aircraft: Materiel Procurement for the Army Air Forces* (1964).

John D. Millett, *The Organization and Role of the Army Service Forces* (1954), is a history of the Army's central logistical organization. Worrall Reed Carter, *Beans, Bullets and Black Oil: The Story of Fleet Logistics Afloat During World War II* (1953), and Carter and Elmer Ellsworth Duvall, *Ships, Salvage and Sinews of War: The Story of Fleet Logistics Afloat in Atlantic and Mediterranean Waters During World War II* (1954), do for the Navy what *Services Around the World* (1958), the seventh Craven and Cate volume, does for the Army Air Forces. Army theater logistics in Europe is covered in Roland G. Ruppenthal, *Logistical Support of the Armies* (2 vols.; 1953, 1959). More than a score of additional volumes in the official history series describe the activities of the Army technical services.

Logistics in the Korean War has yet to find a historian. But a useful picture of Army service operations in the field emerges from more than 100 interviews with participants that appear in Captain John G. Westover, *Combat Support in Korea* (1955).

Considerably more, however, has been published about logistics in Vietnam. Colonel Ray L. Bowers, *Tactical Airlift* (1983), is a detailed official account of an important aspect of Air Force logistics. Vice Admiral Edwin B. Hooper, *Mobility, Support, Endurance: A Story of Naval Operational Logistics in the Vietnam War, 1965–1968* (1972), takes a broader view of Navy logistics. And the Army's series of *Vietnam Studies* includes several logistical monographs by senior officers who served in Southeast Asia: Lieutenant General Joseph M. Heiser, Jr., *Logistic Support* (1974), Major General Robert R. Ploger, *U.S. Army Engineers, 1965–1970* (1974), Lieutenant General Carroll H. Dunn, *Base Development in South Vietnam, 1965–1970* (1972), Major General Thomas Matthew Rienzi, *Communications-Electronics, 1962–1970* (1972), Lieutenant General John J. Tolson, *Airmobility, 1961–1971* (1973), and Lieutenant General Charles R. Myer, *Division-Level Communications, 1962–1973* (1982). Finally, the US Joint Logistics Review Board, *Logistic Support in the Vietnam War: A Report* (3 vols., 1970), contains eighteen monographs on various aspects of logistics.

Despite the long, if somewhat spotty, list of books on logistics published since the appearance of *Pure Logistics*, Colonel Thorpe's slender volume remains unrivaled as a systemic and structural analysis. Many of his thoughts and ideas have been overtaken by the passage of time, but his primary view of logistics as an indivisible branch of war, co-equal with strategy and tactics, remains unchallenged. Indeed, his stress on logistical unity and central coordination is reflected in modern techniques of centralized management and control. His book can be read today both as a unique contribution to the all-too-limited literature of logistics and as a stimulating discussion of the "science of war preparation." Its republication at this time makes available a minor classic too long denied to modern readers.

PURE LOGISTICS

To
GEORGE BARNETT
MAJOR GENERAL, COMMANDANT
US MARINE CORPS

PREFACE

Napoleon never used the word *logistics*. Of course he employed all the elements of Logistics necessary to war in his day, as he did the elements of Strategy and Tactics. But while he conceived of the two last-named functions as distinct divisions of labor, he did not realize (except, perhaps, when it was too late) that logistical functions comprised a third entity in war functions.

It is curious, then, that the only classical literature now to be found in libraries on Logistics, *eo nomine*, was contributed by a prominent officer of Napoleon's Staff. To this subject Baron de Jomini devotes a part of one chapter in his "Précis de l'Art de la Guerre."

Nearly every civilian is familiar with the terms *strategy* and *tactics*, and nearly all intelligent patriots know that the former has reference to the general plan for the employment of the nation's fighting forces and the latter to the manner of fighting. But, if we may judge of the matter from the silence of books on the Science and Art of War, the conclusion is irresistible that the military themselves know next to nothing about Logistics. Some authors have mentioned Logistics as one of the three great divisions of war work, but then say no more about it—except, possibly, that it relates to transportation and supply.

Jomini goes to the other extreme, for, after reading over the list of activities that he assigns to Logistics, one wonders what can be left to Strategy and Tactics—very little indeed. But the Baron's exposition is worthy of serious consideration, for, it will be remembered, he served as historiographer for Napoleon during the Russian campaign, and thus was in a position to know all the facts of the most conspicuous logistical failure in the history of warfare.

That Logistics has received so little academic attention and is so little mentioned in the literature of war is readily explained.

Strategy is to war what the plot is to the play; Tactics is represented by the role of the players; Logistics furnishes the stage management, accessories, and maintenance. The audience, thrilled by the action of the play and the art of the performers, overlooks all of the cleverly hidden details of stage management. In the conditions now adhering to the drama it would hardly be incorrect to assert that the part played by the stage director, the scene-shifter, the property-man, and the lighting expert equals, if it does not exceed in importance, the art of the actor. This, of course, has been a relatively recent development, for during the earlier periods of the drama the actors were forced to rely almost entirely upon their interpretative skill in creating the illusion of place and time. Stagecraft, with its elaborate settings, its mechanical accessories, and its complete efficiency, is a comparatively recent addition to dramatic art.

Logistics is the same degree of parvenu in the science of war that stage management is in the theater. Battles between the earliest tribes probably were fought on the spur of the moment of provocation, without predetermined plan and without providing special means of fighting; that is to say, Tactics only was involved. After experience in battle, some intelligent warrior suggested to his fellows that they might secure advantages over their adversaries by planning the affair in advance; the plan naturally suggested the stratagem. Stratagems were multiplied and elaborated until the contest became something more than a single battle fought out in one day, the final decision, indeed, only being expected from a combination of battles. Hence in the earliest and simplest combinations of this sort we find the budding science of Strategy revealed. As soon as the battle became something more than the sudden fight of short duration, more or less of organization and preparation of means of fighting, or of executing stratagems, were called for: it was necessary to prepare hiding-places, traps, means of communication, and to provide food for warriors who would be prevented from hunting, by reason of military employ-

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ments, for a longer period than usual. This stage in the development of warfare marks the beginning of Logistics.

It is easy to imagine that these early warriors regarded such logistical functions as of somewhat less importance than their strategy, or plan, and the plan as of less importance than the actual fighting, since the contact was the most obvious contribution to the result. This relative order of the three roles is still recognized, but it is quite certain, that down through the stages of history Strategy has robbed Tactics of ever more and more of its glory, and that Logistics has been crowding both. As, mothered by Invention, improvements in the means of fighting one by one have come into use, the items of Logistics have accumulated. At the same time, while Strategy and Tactics are much talked of under the topic of Science of War, there has not yet been recognized a science of Logistics.

The campaign records of all modern wars cry out this *lache*; history repeats itself, war after war, giving the world story after story of muddled preparation of the means of fighting. War has become a business; therefore training and preparation for war is a business—vast and comprehending many departments. Like commercial activities, it is susceptible of analysis in order to determine upon proper division of labor, to estimate necessities required to meet the situation, and to avoid duplication and waste.

The obscurity of Logistics may be explained, again, by the fact that warfare itself is in a primitive stage of development. Despite the 3,165 years of fighting during the past thirty-four centuries,* represented by some 8,000 recorded wars,[†] it must be admitted that progress in war has been slow. We now know that there are five distinct elements to be considered as mediums of fighting: the land surface, the water surface, the air, the subterranean, and the submarine. Fighting on the first and second of these elements, only, has been fairly developed; the others are in the experimental stage; air fighting is not yet reliable, hence is only auxiliary; the same may be said of the submarine; and subterranean fighting is but slightly developed by means of trenches and sapping. The cycle of evolu-

*I. S. Block, *Modern Weapons and Modern War*, Preface, p. xcvi.

[†]J. Novicow, *War and Its Alleged Benefits*, New York, 1911, p. 14.

tion can not be satisfied until super-surface and sub-surface elements have been fully exploited. The quick emprise of the present century has induced lively consideration of these new theaters of war, with the result that the super-surface has yielded the best results—has contributed most to the ultimate object of war—as might have been expected, since the resistance encountered is less in the super-surface than in the sub-surface. When means and methods of fighting in the air have been intensively developed, greater attention will be given to the sub-surface. When all possibilities there have been exhausted, warfare will then be a finished art.

In more ways than one it is revealed to us that the way to universal peace lies in the direction of perfection of war means. Peace can come only through discouraging peoples from fighting; discouragement will follow close upon the heels of such excellent preparedness as will place belligerents against each other with no chance of launching an offensive that can not be met successfully. When nations so prepare for war that the offensive can not overcome the defensive, the eternal energies of man will find exercise in other pleasures than preying upon his fellows in industry and war. The criterion of wordly achievement will then shift from acquisitiveness to fellow service.

At the same rate in which we find modern war losing its mystery and chivalry, we find it ranging itself in close alliance with industry of the commercial kind, from which war is acquiring "business methods." The lessons of every war of the past hundred years have emphasized the importance of the business factor. As the nation at peace is a hive of industry, so the state at war is a nation in arms—every individual with a part to perform either in the actual fighting or in providing means for fighting. To be efficient, in this great task, there must be "team-work." The tasks to be performed must be classified and the performers distributed to the various classes of work in such manner as to eliminate duplication and waste. This is almost exclusively the province of Logistics.

If country X is preparing for war, she can not possibly conceal any considerable part of her preparatory activities; a large portion of her expenditures for armament must be made public; large armies can not be trained even in a year, or

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two years, and their existence can not be kept a secret; the smallest warships take many months in the building-docks and capital ships are under construction for years; not even defensive war can be successful without advanced bases, sheltered in islands in distant seas. These must be acquired and fortified in advance. In addition, alliances and *ententes* are usually arranged; an educational campaign is instituted; statesmen and educators talk to the people to arouse popular sentiment to an appreciation of the nation's peril or the nation's "destiny." Activities in preparation for war announce their own purpose as clearly as an actual declaration. Country Y, if it has modern machinery in the shape of a general staff, can keep posted as to X's activities and, by comparing them with that country's peace activities as well as occurrences that preceded X's last previous war, can arrive at a reliable estimate of X's probable intentions. Y's general staff can also secure and classify data as to X's resources convertible into fighting means at the outbreak of war and at successive later periods of its progress. With these data, Y's problem is to estimate the extent to which she herself must convert resources into means as an answer to X's preparations. Here we have a task that is divided between Strategy and Logistics: Strategy provides the scheme of utilizing our forces, and Logistics provides the means therefor.

The terms "pure" and "applied" may be used with the same meaning as to Logistics as to other sciences. Pure logistics is merely a scientific inquiry into the theory of Logistics—its scope and function in the Science of War, with a broad outline of its organization. Applied Logistics rests upon the pure, and concerns itself, in accordance with general principles, with the detailed manner of dividing labor in the logistical field in the preparation for war and in maintaining war during its duration. Pure Logistics thus can be presented in a few pages, while applied Logistics embraces a large number of subjects, such as the logistics of subsistence and other supplies, logistics of transportation, logistics of war finance, logistics of ship construction, logistics of munition manufacture, etc.

Pure Logistics only will be considered in the following pages.

PART ONE

LOGISTICS

I. DEFINITION

Assuming that Logistics is a branch of warfare, we are first interested to ascertain its nature and to present a definition or concept. For this purpose we may accept an authoritative analysis of war. Von Clausewitz says:

The Art of War is therefore, in its proper sense, the art of making use of the given means in fighting, and we can not give it a better name than the "Conduct of War." On the other hand, in a wider sense, all activities which have their existence on account of war (therefore the whole creation of troops—that is, levying them, arming, equipping, and exercising them) belong to the Art of War.

To make a sound theory it is most essential to separate these two activities.

The Conduct of War is, therefore, the formation and conduct of the fighting.¹

This he divides thus:

Tactics is the theory of the use of military forces in combat.

Strategy is the theory of the use of combats for the object of the war.

Then he goes on to say:

Our classification reaches and covers only the *use of the military force*. But now there are in War a number of activities which are subservient to it, and still are quite different from it; sometimes closely allied, sometimes less near in their affinity. All these activities relate to the maintenance of the military force. In the same way as its creation and training precede its use, so its maintenance is

always a necessary condition. But, strictly viewed, all activities thus connected with it are always to be regarded only as preparations for fighting; they are certainly nothing more than activities which are very close to the action, so that they run through the hostile act alternate in importance with the use of the forces. We have, therefore, a right to exclude them as well as the other preparatory activities from the Art of War, in its restricted sense, from the Conduct of War so called; and we are obliged to do so if we would comply with the first principles of all theory, the elimination of all heterogeneous elements. Who would admit in the real "Conduct of War" the whole litany of subsistence and administration, because it is admitted to stand in the constant reciprocal action with the use of the troops, but something essentially different from it?²

Among these different and subservient "activities," von Clausewitz mentions: subsistence, administration, care of the sick, supply and repair of arms and equipment, and the execution of the construction of entrenchments. These items have been augmented considerably during the century of progress since von Clausewitz wrote; modern inventions, enlargement of armies, and expansion of operations have greatly complicated the machinery of administration and the elaboration of details. Tactics still remains, however, "the theory of the use of forces in combat," and Strategy "the theory of the use of combats for the object of the war." The third branch of warfare, then, has increased its province, *pari passu*, with the accumulation and perfection of means of combat and the development of resources convertible to war service.

Some students of war speak of Logistics as having reference only to the transportation and supply of land and naval forces. For example, in academic solutions of problems, logistical requirements of an expedition are stated in terms of fuel, oil, rations, other supplies, and transportation thereof, for a fleet, and of supplies and transportation of supplies, for an army. At the same time these students speak of Strategy, Tactics, and Logistics as comprising the sum of the functional divisions of war. Since they do not quarrel with Von Clausewitz's definitions of Strategy and Tactics, it follows that their con-

ception of Logistics is much too narrow.

There is something more than academic interest in correctly defining Logistics, for the purpose of the definition is to establish a division of labor, and if two divisions are properly drawn while the third is not, there will be either duplication of effort or some functions will be overlooked entirely, with the result that certain preparations for war will not be made. Let us say, for instance, that the care of wounded is not provided for under any one of the three cardinal functions of war: Strategy and Tactics will indicate the extent of operations that are proposed, and Logistics will provide means therefor without making arrangements for the wounded; assuming that there are in the military organization doctors and hospital attendants, yet their numbers will not be based upon the requirements of the proposed campaign, nor the amount of their equipment and the manner of its employment. On the other hand, if care of the wounded had been placed under Logistics, all the requirements for attending the wounded would be a part of the logistical estimates.

"But," he says who narrowly defines Logistics, "why assign all these details to Logistics? What difference does it make if, say, of ten different principal activities, we give two to Logistics and distribute the other eight among several other classifications, or include them all under one head? Is not it merely a matter of terminology?"

The answer to this objection is the "estimate of the situation." As von Clausewitz has shown, in the abstract, the functions of war naturally fall into three classes, essentially different; so it is easy to see, in the estimate of any military or naval problem, there are three great divisions of work, or tasks, to be performed. The same is again found in the concrete in an analysis of any important campaign given us by history. Wherever we are given the detailed incidents of a campaign, it is quite clear that the belligerent enjoys the advantage in proportion as he truly defines the tasks and organizes accordingly.

That this conclusion may be an independent matter with the reader, based on facts, we may examine in detail a great campaign that failed because the elements of Logistics were not conceived as an entity and organized for coöperation.

II. RUSSIAN CAMPAIGN

Napoleon's campaign into Russia, 1811-12, is often carelessly spoken of as "a logistical failure because of the lack of food and transportation." What is the evidence?

Dodge says, in his *Great Captains*:³

Victual was in plenty, for Russia and Poland had for years not marketed their surplus grain, and Prussia could pay her indemnities in breadstuff; beeves roamed in droves in Galicia; and a well-operated supply train, organized in battalions, had already been created.

More was trodden under foot than eaten.⁴

In the middle of the summer of 1812, when the subsistence question was pressing hard, the Crown Prince of Bavaria wrote home:

If Ney demanded from the French divisions which precede us, even after a fashion, a little order, all the troops could be well nourished; but all these who go before us can, without being prevented, pillage and burn everything.⁵

It was not a question of there not being sufficient food available; the failure lay in the absence of coöperation between, at least, commissary, transportation, and military police.

Sufficient victual was got together, but the difficulties of distribution were not overcome.⁶

The main part of the victual, following the army in endless trains, could not be got along fast enough, proved to be of no avail, and mostly fell a prey to train-men.⁷

This delay of transport may have been due to delinquency of the train-men, to failure of engineers to meet requirements in road-making, or, possibly, tactical dispositions made too great demands. In any case it was a failure of coöperation. If the commissary, engineers, and transport had been coördinated under one logistical head, the different functionaries thereof would have been made to serve each other to meet the tactical requirement; or, if it became apparent to such logistical head that the tactical requirement could not be met, he, familiar with the coördinated effort, could more readily make the proper representations to the commander, so that the requirement could be modified, than could the several separated heads, who would not be able to say that the united efforts of commissary, engineer, and transport could not meet the requirement. Furthermore, if all these subservient functions are organized as a logistical unity, they work in coöperation in preparing the way for Tactics in response to the requirements of Strategy. So in this case of the failure of the victual trains to get up, there was not harmonious preparation.

Here is another of the numerous items of this history showing the same thing:

July had been rainy; scant or bad food had multiplied sickness; the usual rations were still in the rear, transporting from Königsberg to Kovno, under control of Admiral Basta. . . . The foragers generally brought in rye; the men had no mills to grind it, but dried as coffee would be, in any kind of utensil, being stirred all the time, it could be used like rice and cooked with meat or other things. About a pound a day per man was considered sufficient. The beeves driven along for meat were often unfit to eat. The water was mostly from swamps, or much muddied by constant use, and brandy to cut the water was absent.⁸

Better prearrangements about the river transport would have spared the necessity of using the rye, or a proper estimate would have shown the probability of requiring that grain and would have provided hand-mills, so that breadstuffs

could have been made of the rye. There was immense wastage of the beeves in the bad management of the drovers.

This historian recognizes the bad logistics in this significant sentence:

At the opening of the campaign he [Napoleon] had had his choice of a slower and *more methodical* advance into Russia, by keeping the troops back until his means of victualing them could be perfected.⁹

Now let us hear the evidence as to the allegation that the campaign failed for lack of transportation. The same author says:

Transportation was organized on the largest scale. With the marching columns were later too many wagons, and far too many servants. Officers were allowed a carriage apiece to carry rations.¹⁰

The officers had pack-horses and carriages far beyond regulation allowances; "for every three men in the Grand Army there was, including the artillery and ammunition train, at least one animal."¹¹

There was such an abundance of transportation that the army carried many women.¹²

The question of victual had already become difficult; large supplies were coming to Königsberg, whence they were to be wagoned forward to the marching armies; the shipping up the Niemen and Vilia was not yet organized; but he was unaccustomed to wait.¹³

This again shows the effect of not giving Logistics its proper place in the triad. The excess of centralization, in the French Army, resulted in deficiency in initiative in the subservient branches. Although Napoleon had an enormous Staff, there was not that decentralization of authority that is necessary to obtain large production of results in the several departments. There was a machine, the operator was strong,

but the parts of the machine did not have the strength requisite to meet the heavy burden imposed.

It should be remembered that Napoleon was not only commander of an army of over half a million men, but that he was charged with worries of the political situation of a great empire; strategical and political functions would seem to make a sufficient load for one man, but we find Napoleon giving attention to the smallest details. He was writing letters about badly made saddles for the army;¹⁴ about samples and prices of shirts; about the quality of cloths used in uniforms and their manufacture; about the knapsack;¹⁵ about the details of military diaries and bulletins; about the quality of the bread;¹⁶ about employing sailors as servants; about "a navy paymaster occupying Marshal Soult's house in Utrecht while Ney was lodged in a citadel like a captain"; about the details of fire drill and target practice; about expediting the trials of certain soldiers; about the purchase of horses;¹⁷ and so about innumerable details that should have been entirely and efficiently dealt with by staff officers, "the master's eye was on everything," with "diligence and care of detail."¹⁸

The history of the preparations for the Russian campaign reveals that the Russian Government had recently completed a map of the empire on a scale of 8 miles to the inch, and that although Napoleon had obtained a copy, no attention was given to providing the army with maps. As late as the middle of 1812 Davout complained that he had only seven maps in his whole corps. Instead of preparing maps in Paris before the start, hastily and improperly made sketches were made under the stress of the hard conditions prevailing at the front. Even the map that Napoleon had was devoid of such details as cross-roads, villages, forest, etc.¹⁹ This could not have happened if a Logistical Board had been analyzing all the requirements of the advance.

One of the most fatal defects in the organization was oversight of the police question. The results of disorder growing out of lack of police can scarcely be estimated. By failure to preserve order in Lithuania the people turned against the French and increased the difficulty of victualing.²⁰ Napoleon wrote, "Terror and desolation are in Poland from the conduct of the Würtembergers."

Straggling depleted the ranks; from Niemen to the
Dvina, St. Cyr daily lost the equivalent of a battalion.
Orders against plunder arrested no man.
Non-combatants were a host.²¹

In June, 1812, instructions were issued "to prevent the disorders that begin to desolate the country."²²

The fact that Napoleon's army organization was a machine that would not work, on account of lack of responsiveness of parts, can be illustrated by no more striking incident than the occurrence of July 26th, when he had a force of 120,000 in the presence of the Russian commander's 80,000 and the long-sought battle with the ever-retreating Russians was seemingly at hand; French coöperation was so sluggish that the tactical dispositions could not be made in time to profit by the opportunity. Here we have an example of the close interrelations between Tactics and Logistics; Logistics, furnishing the service of information and discharging the duties of communications, enables the tactical formations to be made promptly.

Without logistical coördination, the system of communication had so far lagged behind in meeting the requirements of the tactical dispositions that by June, 1812, the Emperor's orders, issued on the basis of belated information, were becoming impracticable of execution.²³

The hospital service shared the same fate of failure to meet the situation. After the battle of Lubino, Napoleon ordered the Chief of Staff to—

Write to the Intendant-General that the service of the ambulance is badly done; that it is astonishing that since yesterday, when there were engagements of the vanguard [really the battle of Lubino], the surgeons of headquarters, some ambulances and empty wagons . . . should not have been sent to the vanguard to pick up the wounded; and that the administration has no head.²⁴

As the service of information is so important an element in warfare, let us see to what extent it was attended to in the Russian campaign:

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The information Napoleon secured about the Russian armies was necessarily limited more than that of the Russians about him.²⁵

Although Napoleon was anxious to capture Vilna, for navigation extended up so far, and it was a good point to create a big dépôt, he was anxious to trace the Russian whereabouts before advancing too fast.²⁶

Napoleon was well known to have no compunctions about the use of spies. Had he taken the pains to employ them here, in good organization, his information about the Russians would not have been so meager and he would have been spared many costly delays incident to reconnaissance under difficult conditions.

The evidence is that the French intelligence service was not organized along the lines of unity for rapid collection, classification, verification, and distribution. Information is of no value unless it is quickly available for use. Where this function is located in a single bureau, reports can be compared to the end that conflicting reports will reveal errors and falsity, and the truth being thus sifted out can be sent to the commander to whose plans the information is material. That Napoleon had no such bureau in the field is evidenced by an order to the inefficient Jerome:

You should receive reports from your generals and of your vanguard colonels, and after reading them, you should send the originals to the Emperor. (He) reads these volumes of reports; and it is there he gets information according to which he directs his troops.²⁷

Is it not little short of marvelous that a commander, charged with so great responsibilities as was Napoleon at this time, could find the time to wade through the heterogeneous mass of original reports? It is not reasonable to suppose that the result must have been a neglect of more legitimate functions?

All through the account of these Russian days one meets the note that the commander was "puzzled by the lack of information." They were "directing affairs by couriers, upon information both late and partial."²⁸

Attention to details, instead of exclusive attention to the large questions of a commander, was the direct cause of failure. For example, on one occasion, Napoleon delayed seventeen days at Vilna.

Much of the Vilna work could have been left to others; the strategic situation could not. Had Napoleon accompanied Davout and the Guard from Vilna to Minsk, he would surely have headed off Bagraion, and with Jerome's assistance—or with that of a better leader—have beaten him. Or had he personally advanced on Barclay, with the Guard, Eugene and Davout, he could have reached Polotsk on the 12th and have thrown Barclay back on Riga, and this would have ended the campaign. The loss of seventeen days at Vilna was the error of Napoleon's military career most fraught with ill results.²⁹

By July, 1812, Napoleon was realizing the necessity of granting out authority as to details. Inasmuch as he had not organized logistics before the campaign, he had finally to make an organization, in the field, that would meet requirements. He instructed his Chief of Staff to—

Charge a general officer of your staff to occupy himself solely with the organization of the routes of communication from Vilkoviski to Kovno and from Kovno to Vilna.

The commander-in-chief became swamped under the details of Strategy, Tactics, and Logistics, and, when it was too late to repair the damage, began to leave the initiative to others. He told Berthier to write Reynier:

I do not prescribe anything to him; . . . that all that is left to his prudence."

Oudinot was also informed that—

He alone can decide what he can do; that he therefore has *carte blanche*.³⁰

That the French failure was not due to Russian superiority in anything except Logistics, we have the following testimony: Among the Russians there "seemed to have been no specific plan of campaign."³¹

In July, 1812, the two principal Russian armies were separated and were badly placed strategically. With better French organization, Bagration could have been cut off and defeated.³²

Of Barclay de Tolly, the Russian commander-in-chief during the greater part of the war, it is recorded:

With regard to his high military capacity the opinions were much divided, but what his adversaries could not deny him, without injustice, was his coolness and prudence in danger, his irrepressible perseverance, the *exemplary order* which he maintained, as well among authorities called to conduct affairs as in every part of his troops.³³

It is also said that he had a genius for organization. As to the other side:

Both in Spain and Russia, the Emperor's map strategy was perfect, but his logistics lacked the winning quality.³⁴

Summary

We have seen that there was an abundance of supplies and quite enough transportation. There was a great Staff, in numbers; in fact, the Staff alone had the numerical strength of about a division. The Emperor himself had given a great deal of thought in preparation for the campaign; he had looked into the widest range of details. The great deficiency lay in the fact that Logistics was not organized under one head as a branch of warfare for analysis of the requirements of the campaign and a coöperating response to such determined requirements. Such an organized Logistics, with the Chief of Staff at its head, would have had responsible chiefs of specialties all coordinating to meet demands of successive situations and each charged with the initiative in his department, instead of waiting for instructions from the commander-in-chief.

Without the power and authority of the initiative, subordinates, especially in the field of Logistics, soon acquire the habit of leaning on someone, with the result that they must always be prodded. It is only natural, then, that Napoleon should have remarked late in the campaign:

Neither the grand provost of the gendarmes, nor the wagon-master, nor the staff officers, not one of them serves me as he ought to do.³⁵

As the synthesis that we may get out of this lesson, it may be said that the Russian campaign reveals the following as some of the items incident to the preparation and prosecution of war that are not strategical or tactical, and that are, therefore, logistical functions:

Duties in connection with supplies;
Transportation;
Sanitary, hospital, and ambulance service;
Road-making and other engineer duties;
Civil administration of occupied territory;
Military police;
Maps and information collection and distribution;
Communications—*i.e.*, telegraph and messenger service;
Details of preparatory drills;
Repairing and supplying arms and equipment;
Clerical work.

It is not pretended that these are all, or nearly all, the functions that are within the province of Logistics; those mentioned in this summary are merely those that are made obvious in the small amount of testimony adduced herein.

Lest it be objected that the conditions under which one army operates are so different from those of another, and therefore that the evidence presented by one campaign is not sufficiently universal to be used as a basis for formulating principles, we will now briefly look at the methods employed in an army more than half a century later in operations of a quite different class.

III. ATLANTA CAMPAIGN

Major Eben Swift, United States Army, is authority for the statement that of the thirty-five officers of a certain regiment more than half, within the first few months of the Civil War, were made generals of the line, and that four of them were soon at the head of great armies. Speaking of the regiment, he says:³⁶

It was a good regiment and had been officered with great care. In a rather small way its experience had been great, for it had had much active work chasing Indians over a great expanse of country.

Of these experienced officers who became generals he says:

When it came to applying their previous knowledge to greater questions than came up at a frontier post or on an Indian scout, they found themselves without experience, instruction, or precedent. It was a year and a half before the troops which they organized and commanded were capable of really good work, notwithstanding all the aid that money, patriotism, and ability could bring to help.

The point is that our fighting forces were not organized for war. Although the clouds in the South had been growing darker for a long time, the officials of the Government charged with the duties of keeping the fighting organization in step with political developments had not even roughly analyzed the situation, or, as is now said technically, made an "estimate of the situation." In the first place, they did not properly estimate the probabilities of war. In the second place, they did not estimate the task that would be imposed if war

should come about, the strength and resources available to meet that task, and the details of applying such resources to attain the object of the war.

That the consequences of such indolence were nearly fatal is attested by the marked success of the rebellion for the first two years, during which period European critics of authority in the military profession referred to our armies as "armed mobs" and the battles of Bull Run and Shiloh (the latter fought after our generals had had a year's experience) as "comedies of errors."

That the rebellion would have been quickly suppressed, as a mere riot, if the Federal forces had reasonably developed Logistics, seems to be the best considered verdict of military authorities. The immense cost and hardships of a long war are items of the price paid for the immunity of attending to Logistics. The cost of this preventive, Logistics, would have been next to nothing.

As the Science of War consists of the systematic arrangement of facts, and the Art of War the employment of forces on principles based on facts, it is clear that the first step in preparing the fighting forces for readiness to meet the requirements of any probable war should be the collection and arrangement of material facts.

If this preparation is not made before the fighting forces are confronting the enemy, the ensuing battle will not be an exhibition of the Art of War, but merely a *mêlée*, particularly if both belligerents are untrained. A considerable part of the Civil War was a series of *mêlées*. But as experience is a good—if costly—school, both the Armies of the North and the Armies of the South acquired something of the science of war largely through learning what was not scientific procedure. As the two belligerents progressed at about the same rate toward proficiency, it is natural that the side that was backed by the greater resources should win in the end.

Instead of applying the lessons that might have been learned from a study of Napoleon's Russian campaign in 1811–12, and thus making an organization for war some time before 1861, we find the Federal forces acquiring the same lessons from their own bitter experiences and applying them in 1864.

General Sherman had learned the importance of Logistics, and many of his orders, issued before and after the capture of Atlanta, show that he conceived of Logistics as being something subservient to and different from Strategy and Tactics. This is best illustrated by the elaborate organization of the railways in the theater of operations and the power of initiative given to the superintendent of railways, a colonel and aide-de-camp.³⁷ The duties of sub-functionaries in this department were sharply defined and each kind of employment was properly correlated to every other kind of employment, so that they dove-tailed nicely and coöperated perfectly.³⁸ The road was kept open under great difficulties. Guerillas and Confederate raiders were constantly successful in tearing up the track. In October, 1864, General Hood succeeded in throwing his whole army on the road and in thoroughly destroying 35.5 miles of roadway and 455 lineal feet of bridges, besides killing or capturing a large number of the railroad men. The railroad organization worked automatically, as a good organization must, and even before Hood's men had left off their destructive work the construction gangs were at work relaying track. Hood's destruction of dépôt supplies necessitated the cutting of cross-ties for relaying the track, and the rails had to be taken up and brought from railroads south of Atlanta or from Nashville, nearly 200 miles distant. In spite of these delays, the whole track was ready for traffic in about seven days.³⁹

The duties of the quartermaster, commissary, and other staff officers were similarly well defined and their authorities to act were large.⁴⁰

The commander's orders, based on clear conceptions, made the objective clear to all, and the head of each department knew his own task.

That General Sherman was confronted with serious difficulties in his attempt to obtain an independent organization that could coöperate under his sole control is evidenced by his correspondence with the Washington authorities during April and May, 1864. It appears that he wanted General Allen to act as his chief quartermaster, and had written Allen to—

Draw me up a programme whereby orders may issue from the War Department enabling you to act as my chief with power to visit by yourself or inspectors every part of my command, to direct the course and accumulation of supplies, the distribution of the means of transportation, and all details purely pertaining to your department. I must have some quartermaster *whose sphere is coordinate with my own.* (Italics not original.)⁴¹

Apparently Washington had disapproved this arrangement, for in a letter of May 3, 1864, to General Meigs, he says:

I think Secretary Stanton has made a mistake in denying me the services of General Allen. By a general supervision of the whole department he could save more money to the Treasury than by scrutinizing 1,000,000 separate vouchers, of purchase and expenditure. Also, by providing means of transportation at the very time and in the manner demanded by events which can not always be foreseen, a quartermaster can assist in achieving success. . . . You often feel disposed to find fault with commanders of troops for not consulting the experienced quartermaster. I want to do so, but the chief quartermaster is at Louisville, another at Nashville, another here, all under my orders, but each so circumscribed by conditions that I can not disturb them. I know this is wrong, and instead of commanding an army thus, a general but drifts with his fate.⁴²

A similar argument is presented in his letter of April 6, 1864, to the Commissary General:

I ought to have near me an officer of your department clothed with power coëxtensive with my own, who could converse with me freely, learn my plans, the strength of my various columns, routes of march, nature of supplies, and everything, and who could direct the harmonious working of the whole machine. Now I have to deal with four distinct commissaries, with no common recognized head.⁴³

A study of the events of this campaign clearly shows that, although General Sherman was making estimates for an army

of only 100,000 men, in addition to guards for lines of communication, and 35,000 animals, he would have been unable to maintain his lines if his organization had been made on weaker principles; *i.e.*, if the heads of the various logistical departments had not been given large powers.

Strategy and Tactics here were minor problems in comparison with those presented by Logistics. It appears that General Sherman was his own chief logistical officer. With this small army and with no heavy pressure in the strategical and tactical functions, he was able to take the logistical supervision, especially in view of the good services his well-organized departments gave him.

With his fine coöperation, it is not surprising that the commander's orders were a model of conciseness—brief and terse. They were not encumbered with details and instructions about functions that the commander was assured (through the knowledge of his organization) were being attended to.

The whole army must be ready to march May 23d, stripped for battle, but equipped and provided for twenty days.

This is a typical paragraph from his field orders.

There is reason to believe that the department of military police, represented by the Provost Marshal, was not as thoroughly organized before or at the beginning of the campaign as were the supply and transportation departments; some of the matters referred to in Special Field Orders No. 17, 4 June, 1864, would not have then required the attention of the commanding general, for the delinquencies in question would have been nipped in the budding and, at least, would not have grown to the proportions represented. As an example, take the following:

Shirking, skulking, and straggling in time of danger are such high detestable crimes that the General commanding would hardly presume them possible, were it not for his own observation, and the report that at this moment soldiers are found loafing in the cabins to the rear as far back as Kingston. The only proper fate of such

miscreants is that they be shot as common enemies to their profession and country; and all officers and privates sent to arrest them will shoot them without mercy on the slightest impudence or resistance. By thus wandering to the rear they desert their fellows who expose themselves in battle in the full faith that all on the rolls are present, and they subject themselves to capture and exchange as good soldiers, to which they have no title. It is hereby made the duty of every officer who finds such skulkers to deliver them to any provost guard, regardless of corps, to be employed in menial or hard work, such as repairing roads, digging drains, sinks, etc., etc. Officers, if found skulking, will be subject to the same penalties as enlisted men—*viz.*, instant death or the hardest labor and treatment.⁴⁴

As a summary, we may state that Sherman's organization was a great step in Logistics; the organization was largely made in the preparatory stage, instead of after the battle was on. Through giving his chief logistical officers large powers and keeping them in close touch with the requirements that would be imposed, he secured the exercise of initiative and coöperation. But if the organization could have been made even earlier, and if it had been supported by a similarly well-organized Logistics throughout the War Department, the cost would have been very much less; for it is said that methods were not weighed on the basis of "How much will it cost?" but rather, "Can it be done at any cost?"

As this example in Logistics is an advance over that presented in the Russian campaign, so we have now to briefly consider a marked further advance.

IV. GERMAN ARMY

In 1868, two years before the Franco-Prussian War, Field Marshal von Moltke presented to his Government plans for the strategic concentration of the German Army, based upon the supposition of war against France alone, and against France with allies, and founded upon years of study of facts, including, of course, elaborate information as to the forces and resources of the supposed adversaries. The following is an extract from a translation of this remarkable document:⁴⁵

Should the French utilize their railway systems to form a quick concentration, they are compelled to detrain in two principal groups near Strassburg and Metz, separated by the Vosges Mountains. Should the probably smaller group at the outset not move against south Germany, its union with the principal force on the upper Moselle can only be effected by regular marches. In the Palatinate, we occupy interior lines of operation between these hostile groups. We can move against either one of them, or, if we are strong enough, against both at once. The concentration of all our forces in the Palatinate protects the lower as well as the upper Rhine and favors an offensive movement into the enemy's country; the last, executed at the proper time, will probably forestall any invasion of the German territory. The question is, Can we, without danger of being disturbed, effect our concentration beyond the Rhine in the Palatinate close to the French frontier? This question I unhesitatingly answer in the affirmative. Our mobilization is ready to the smallest detail. Six through railways are available for transport to the territory between the Moselle and the Rhine. The time-tables are prepared upon which are shown the day and hour when every unit starts and arrives. On the twelfth day, the first troops can detrain near the French frontier; on the fifteenth day, the combatants of the two

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army corps are there; on the twentieth day, the numbers have increased to 300,000 men; on the twenty-fourth day, the armies are supplied with their trains.

We have no reason to believe that the concentration of the French Army, for whose mobilization no data exists, can be made more rapidly. Since Napoleon I., France has only effected partial mobilizations, by which the units of the part of the army which took the field were increased from those which remained in garrison.

On account of the effectiveness of their railway systems, and the ample supply of rolling stock, the French can, by emptying the garrisons and camps in their north-west territory, and without waiting for the incorporation of reserves, unite on the frontier in a very short time an army of 150,000 men. This carrying out of a rash initiative is in accordance with the national character, and has been discussed in military circles. Assuming that such an improvised army, well provided with cavalry and artillery, is decided upon, it would be united at Metz on the fifth day, and on the eighth day might cross the frontier at Sarrelouis. We should still have it in our power to stop our railway transport, and detrain our troops on the Rhine. To that line the invasion would still require six marches, and would be brought to a standstill by an equal force on the fourteenth day. Having control of the river crossing, we could in a few days assume the offensive with an army of double the numerical strength of the French army....

In case we should have war with France alone, 31,000 men could be added to the above as the I. and II. Bavarian Corps and would at once join the Third Army; this would increase its strength to 130,000 men and the total force to 384,000 men. At the end of twenty days, after the railways had completed the concentration of the troops above mentioned, the I., II., and VI. Corps could be forwarded; this would increase our total force to 485,000.

Two years later this plan was executed substantially as here stated, except that the time required for the concentration was reduced, by an amended plan, by four days.

The quoted estimate of the situation is pertinent to our subject, in that it reveals:

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- (1) The thoroughness of the organization of the German fighting forces;
- (2) That the strategy and resources of the enemy had been analyzed;
- (3) That there had been a very detailed analysis of German resources;
- (4) That the latter had been applied to the requirements of Strategy and Tactics to attain the object of the war.

That this immense work should have been so well done and that the organization was so responsive to actual conditions may be accepted as conclusive evidence that the achievement was the result of a wise division of labor based on accurate analysis of the task.

As a system of division of labor, or of "activities" (to use von Clausewitz's word), for the maintenance, in a broad sense, of the fighting forces, is the *desideratum* for which we are working, we can not do better than to examine the Germany system in its general outline in search of principles that may have universal application, in any form of government, to the subject of Logistics.

The War Ministry is the highest administrative authority for the bulk of the German Army. "In a general way, it may be said that all affairs relating to administration, organization, and armament fall within the scope of its functions. With personal, disciplinary, and purely military matters it has only indirect connection, the theory being that in these the commanding generals—subject, of course, to imperial direction—are supreme. Yet, as it controls the purse-strings, hardly any disposition, no matter what department of the service it may affect, can be carried to completion without its coöperation, if not without its concurrence."⁴⁶

The Ministry is divided into the following branches, each headed by an army officer:

(1) **Central Division**, charged with: all military affairs requiring the personal decision of the minister; affairs of the personnel of the ministry and intendancy; administration of the library and archives; public printing; and all matters relating to military decorations.

(2) **General War Department:** tactical formations and organizations, subdivided in function to:¹⁷

- (a) *Army Branch:* peace and war organization, Ersatz, the furloughed State and Landsturm, the more extensive tactical exercises, changes of station, railroad system, construction of roads and bridges, military conventions.
- (b) *Branch for Foot Troops:* special affairs relating to the infantry, rifles, foot artillery, pioneers, railroad troops, aërial navigation divisions, infantry institutes, garrison schools, army music, target ranges for small-arms, system of military training and education, military libraries, literary affairs, statistics.
- (c) *Branch for Mounted Troops:* special affairs relating to cavalry, field artillery and the train, Military Riding Institute, veterinary system, gendarmerie, target ranges for cavalry and field artillery.
- (d) *Fortification Branch:* affairs relating to engineer corps, siege warfare, construction, armament and maintenance of fortresses, explosives, telegraph system, mines connected with bridges and tunnels, carrier-pigeon system, Fortification Construction School.

(3) **Department of Military Economy:**

- (a) *Finance Branch:* under a civilian styled "actual privy war councilor."
- (b) *Subsistence Branch:* under a civilian with title as above.
- (c) *Clothing Branch:* under a military officer;
- (d) *"Servis" Branch:* under a military officer; deals with questions relating to barracks, quarters and shelters, military churches, cemeteries, maintenance of places of exercise, indemnification for injury to private property.

(4) **Department for Invalid System:**

- (a) *Pension Branch:* under a military official.
- (b) *Relief Branch:* under a civilian official.

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- (c) *Appointment Branch*: under charge of a military officer; employment of retired officers (commissioned and non-commissioned), institutes for invalid soldiers, war associations, execution of judicial sentences, labor and disciplinary companies, military justice, church attendance, extradition, taxation, elections, muster-in rolls, standards and colors.

(5) **Arms Department:**

- (a) *Small-arms Branch*.
- (b) *Artillery Branch*.
- (c) *Technical Branch*: affairs pertaining to arsenals or artillery manufacturing establishments. (Each branch under a military officer.)

(6) **Remount Division**: under a military officer; has charge of the itinerant horse-purchasing commissions.

(7) **Medicinal Division**: headed by the General Staff medical officer of the Army.

The War Ministry controls the general military treasury; the cavalry committee; inspection of field artillery, infantry schools, small-arms and ammunition factories, military veterinary system, military penal institutes; the commissions for testing artillery, for testing small-arms, and for examining military physicians; the Military Riding Institute; the Medico-Surgical Military Academy; the military clergy; and the military intendants.

There is also a "Division for Personal Affairs," whose chief is an adjutant-general of high rank, which is a part of Imperial Headquarters, and its functions need not be discussed here, as not material to logistical studies.

Next to be considered is the Great General Staff. Its head, the Chief of the General Staff of the Army, is directly subordinated to the Sovereign.⁴⁸ "Within the sphere of his action fall all matters relating to the disposition of the army in war, and the leading of all large bodies of troops; and, in conjunction with other departments, he deals with all questions touching

the fighting condition of the troops and the defense of the country." "The Railway Brigade, together with the Aërial Navigation Division, as well as the War Academy, as regards all scientific matters, are subordinated to him. He superintends the training of officers for the General Staff, as well as the higher training of officers already members of that body. Once a year he submits to the Sovereign a list of those officers, who, in his judgment, should be returned from the General Staff to the troops, and from the troops to the General Staff. The Chief of the General Staff is in constant communication with the Minister of War upon all questions relating to the military training of the army, its organization in peace and war, and its transition to a war formation." He is also in direct communication with the General Staff serving with corps.

The Chief of the General Staff of the Army has three immediate assistants, who "constitute an intermediate authority between him and the divisions of the Great General Staff."⁴⁹ One of these assistants is his representative when the Chief is prevented from discharging his duty from any cause. These assistants take final action on certain minor matters, acting "by authority."

The division of labor in the Great General Staff is as follows:

Central Division: conducts correspondence of the Chief with "institutes and individuals within and without the sphere of his authority"; has charge of the "economic affairs of the entire General Staff, as well as of the personal affairs of the officers and those of officials of the Great General Staff."

First Division: "collects and arranges material affording information in reference" to certain foreign armies.

Second Division: collects and furnishes information as to the military strength and resources of the German Empire.

Third Division: duties similar to those of the First Division except in reference to certain other foreign armies.

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Fourth Division: questions of technical nature and touching siege warfare.

Railway Division: embraces the preparation "of military transports for war; the conduct of military transports in connection with the maneuvers; the transportation of men furloughed from or joining their regiments; the training of officers in the duties pertaining to the military railway system; the examination of projected lines from the military point of view; the collection of statistics of home and foreign railways, as well as all other matters connected with the military railway system."

Division of Military History: collecting and arranging all material falling within its province; critical description of past wars; administration of war archives and of the Great General Staff library.

Geographical Statistical Division: compiles military geographical data as to all parts of territory that may become important in connection with the conduct of wars; also geographical and statistical matter necessary for General Staff work; has charge of maps prepared by its personnel.

Chief of Survey: divided into the following:

- (a) *Trigonometrical Division:* covers several of the German States with a network of principal triangulation, and carries out a complete triangulation of the same; prepares general topographical surveys.
- (b) *Topographical Division:* topographical surveys of certain German States.
- (c) *Cartographical Division:* charged with preparation and correction of General Staff and other maps; printing and photographic work for military purposes.

The General Staff serving with troops or at fortresses is subject to the orders of the General, Gouverneur, or Kommandant of the unit with which it is serving. General

Staff officers serving at corps headquarters perform their General Staff duties under the direction of the Chief of the General Staff of the Army Corps, who has also a general oversight over the office work of the Adjutantur, the Intendantur, Corps Auditeur, and other staff officers at headquarters. In the absence of the commanding general, he carries on current business "by authority" (of the general), questions of courts-martial and leaves of absence being referred to the senior division commander of the corps.⁵⁰

The duties of General Staff officers at headquarters of a division are similar to those of corps headquarters, except that the Chief has no supervisory authority over the other departments of the Staff.

The following is a general outline of the peace duties of General Staff officers serving with troops and at fortresses:⁵¹

- Calculations and arrangements for marches;
- Sheltering and providing for the distribution of troops;
- Transportation: the use of roads, railways, and telegraphs;
- Political questions;
- Strength, conditions, and distribution of neighboring armies;
- Non-technical matters connected with artillery, engineers, pontoons, bridges, defense of fortresses; questions with foreign Governments touching the apprehension and return of deserters, maps, plans, reconnaissances, and topographical sketches.

In war the duties of the General Staff serving with troops and at fortresses are:

- Drafting and working out necessary instructions relating to shelter, safety, marching, and fighting;
- Timely transmission of orders;
- Collecting, sifting, and classifying information relating to the nature and proper utilization of the theater of war; procurement of maps and plans;
- Collection and valuation of incoming information relative to the hostile army;

Maintenance of effectiveness of the troops and keeping constantly informed of their condition in every respect;
Keeping historical records of events of campaigns being prosecuted, and preparing proper reports thereon;
Special tasks, especially reconnaissance.

The Higher Adjutantur: selected from graduates of the War Academy who have not entered the General Staff, or from officers who have shown special aptitude as battalion or regimental adjutants. An adjutantur is assigned to each brigade, and to each division, and two or more to each corps.

The duties of the adjutantur branch are similar to those of the adjutant-general's branch in the American service, so far as such duties do not fall within the province of the General Staff (German).⁵²

Intendantur: is a department attached to the headquarters of each corps and to each division.

The corps intendant is head of the Corps Intendantur. The Corps Intendantur is an intermediate authority between the War Ministry and the special subordinate supply departments. The Chief Intendant deals directly with the War Ministry, but is subject to the orders of the commander of the corps.

The functions of the Corps Intendantur are: appointment of paymasters; procurement of forage and breadstuffs, cloth and other articles required to clothe and equip the troops, and land, buildings, and utensils required for comfort and shelter of troops; the supervision of granaries and bakeries, the personal affairs of the officers of the supply departments, and of the administration of barracks and hospitals; coöperation in the administration of funds and property pertaining to the system of military education and training; certain affairs relating to the mobilization of corps administrative departments, to pensions, and to technical institutes of the artillery and engineer systems, and to remount dépôts; compensation to municipal authorities on account of quarters, subsistence, forage, and transportation furnished troops; the military economic affairs of staffs, troops, non-regimental offi-

cers and officials of the corps not attached to divisions, or who are not allotted to the Division Intendantur.⁵³

The Corps Intendantur is divided into:

- (a) Finance division;
- (b) Division of supplies in kind other than clothing;
- (c) Clothing division;
- (d) "Garrison Administration" division;
- (e) "Hospital Administration" division.

A chief constructor is assigned to each corps intendant for expert reference in building matters.

The functions of the Division Intendantur embrace all matters relating to the pay, commutation of quarters, and travel allowances of divisional troops and officers; the examination and settlement of property and money accounts, including the unexpected inspections of the disbursing offices pertaining to the divisional troops; matters relating to the clothing and equipment of such troops; participation in the biennial musters; the subsistence of troops and reservists.⁵⁴

Since the Chief of the General Staff serving with troops has general supervision over the Adjutantur and Intendantur, and immediate control over the General Staff, the commanding general is relieved of all details. He has only to formulate his general plans and communicate them to the staff. Although the general is the supreme authority in his unit and although he can assume authority in a particular case, the General Staff and Administration officials are in direct communication with their respective heads in Berlin and are responsible themselves in their provinces.

As this organization is uniform and a growth of years of experience, it becomes more and more a natural machine and, as a matter of course, works with unfailing coöperation. Furthermore, it represents a division of labor that tends to cultivate the officers concerned therein as highly specialized experts. The often-heard objection to such machine-like organization, that it robs the individual of the power of acting alone—robs him of the power of the initiative—is not applica-

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ble here, because each functionary has the responsibility and considerable authority within his sphere. The organization is in harmony with modern methods of doing business, wherein specialization is the key to success.

V. NATIONAL ORGANIZATION OF FIGHTING FORCES

However good the German Army system may be, in reference to the administration of details, it does not necessarily follow that such system, in its entirety, would be applicable to armies and navies under forms of government different from the German.

The broad characteristics of the German system are:

- (1) Centralization of control, and
- (2) Decentralization in education.

To enquire whether or not these characteristics are favorable to the attainment of certain results under all, or certain, conditions, we must specify the conditions and pose the results desired.

We are concerned with warfare. Now the object had in view by a State when it goes to war is to so demonstrate its applied fighting power as to eliminate effective resistance to the realization of the State's policies.

Hence the State, through its central power representing the General Will, must determine when its policies are being resisted to an extent which necessitates the employment of the fighting forces, and, as such central power may be presumed to have the best evidence of the nature and location of the resistance to its policies, it is logically the power to determine the manner, or broad general plan, of employing the fighting forces in order to accomplish the political object.

But the central political power is not usually represented by military or naval experts. No one office can be presumed to specialize, or to be able to specialize, in statecraft, in military employments, and in naval employments. Hence, there naturally will be provided, in close touch with the political author-

ity, a commission of experts who will be able to perfect plans, responsive to the political demands, that will make the most effective use of the fighting forces, based on resources available.

The employment of the whole fighting force thus will be centrally controlled by the political power through the latter's declaration of war, its decision as to the object to be attained by the war, and its direction to cease hostilities when the political authority decides that the object has been attained or that it can not be attained.

In other words, Strategy is controlled by, and originates with, the political government. The advantages of thus centralizing Strategy are so obvious that it would seem unnecessary to discuss the matter if we were not confronted with examples, in history and governmental organizations, of practice not in harmony with this theory. Wherever we find commanders sent to the theater of operations without a well-defined mission, or a nation's Strategy being resolved by separate boards for the Army and Navy, we have decentralized Strategy, which must be expected to result in estimates of the situation too narrowly viewed or based on insufficient facts.

But this centralization extends only to *control*; as to *execution*, there must be decentralization. And by *execution* is meant the working out of the details of the use of military forces in combat and the details of the use of combats for the object of the war. The *execution* must be in the hands of experts. The political authority signifies *what* is to be done; military and naval experts decide *how* it shall be accomplished.

Now, the object of the war is to be attained through the aggregate results of combats, and the theory of planning these combats as a whole, looking to the object of the war, is Strategy, according to von Clausewitz. Some of the combats will be sea battles; some will be land battles; and some may be a combined employment of land and sea forces in a single combat. But since the object of the war is to be accomplished through the amalgamated result of all the battles, the great plan must be based upon a composite view of the land and sea possibilities, and the best strategic decision will be that which makes

the most economical combined use of the army and navy. This implies that the details of Strategy must be determined by a commission of military and naval experts.

Centralization in control and decentralization in execution rest on the same principle; namely: that the task is left to the functionary, or functionaries, who is, or are, in the best situation to estimate the task. The central location gives a general view of all the parts in their proper inter-relations and reveals what should be required of each part. Such general view could not be had by any of the parts. On the other hand, the local view reveals the local situation in much greater detail and exactitude than does the general view; as the manner of execution depends upon the local situation, the local commander is the one to decide *how* he will execute.

The agency through which control is to be centralized and the great tactical tasks assigned should be a National Board of Strategy. If it be composed of members representing the political authority and members representing technical knowledge of the employment of forces in combat, the Board will be a meeting-point where the political object will be expressed in tactical tasks for the land and naval forces.

Assuming for the moment that these principles are sound, we may test them by practical application, say, to a case where both belligerents have land and naval forces, the country of belligerent A being separated from the country of belligerent B by an ocean, and belligerent B being *en route*, with land and naval forces, presumably to invade the country of belligerent A.

The centralized Board of Strategy of belligerent A estimates the situation by comparing the opposing forces, their respective strengths and distributions, whereby the enemy's probable intentions and answering courses open to us, may be premised, and conclusions reached as to what further dispositions should be made of the defending forces in order to defeat the invader's plans. Such decisions would assign tasks to the Army and to the Navy, so that these two main divisions of labor would fit nicely together, without overlapping or duplication.

The War Department would receive the Army task and

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would parcel it out to the largest Army units. Commanders of the latter would be in possession of the best evidence of the local circumstances of their respective commands, and thus would be in the best position to decide what should be done within their jurisdictions to accomplish their tasks. These commanders would, of course, further divide tasks for distribution to lower commands. In each step the order would state *what* was to be done—not *how* it should be done.

Similarly, the Navy Department would receive the Navy's whole task and parcel it out to its fleets, from which missions would go out to subordinate units.

Attached to the headquarters of large Army administrative units and to the flagships of large Navy administrative units are staff officers for expressing and accomplishing the will of the commander. When the commander, upon whose staff these officers serve, receives orders assigning his unit a task, he notifies his Chief of Staff thereof and of his general plan for satisfying the mission. The appropriate assistant formulates orders for the execution of the plan. These orders, duly promulgated, start the machinery of each staff department, such as subsistence, equipment, sanitary and medical, pay, engineer, transport, etc., for the accomplishment of all means necessary to the execution of the orders, as respectively estimated by these functionaries. The latter, being specialists in their departments, are in the best position to estimate their tasks, based on facilities available, and they are therefore the proper officials to be charged with the responsibility for such execution, and to that end should be given large authority therein. While under the general supervision of the Chief of Staff, as the intermediary between these subsidiary functionaries and the tactical commander, and under the general control of their respective chiefs at the seat of government, they should be given the widest possible freedom of action within the limits of complying with the law and adhering to necessarily fixed regulations.

As to the nature of the centralization of control within the tactical unit: the military command, of course, must be supreme and the administration subsidiary. The commander's function is that of deciding upon questions of conflict of au-

thority within his jurisdiction, of imposing disciplinary requirements, or even of deciding that some particular staff officer's proposed method of complying with orders is not such as the commander desires and directing that some different method be followed; but, as a matter of routine, the commander would not care to overhaul the execution of details by his staff officers, for the commander has quite enough to engage his attention in his own large province. He would not care, for example, to approve requisitions, vouchers, estimates, etc., for if he dissipates his working hours in making the endless calculations that would be necessary to the intelligent approval or disapproval of these details, there will be neglect of the large functions. Approval, without such calculations, as a matter of routine, must be based on the respective staff officer's recommendation, and is therefore meaningless and contributes only to delay and a waste of labor. So long as the staff officer is efficient, the responsibility should be placed on his shoulders; if he is not efficient, he should be displaced and either sent back to school or eliminated.

The centralization of control over these staff officers must be had from the seat of government by intermediaries between such staff serving in the field of operations and the political government, for the arrangement of estimates for legislative consideration, the distribution of appropriations, the collection and distribution of information material to each department, etc. There must be a kind of strategy of Logistics, centrally located, and a tactics of Logistics decentralized.

While there should be but one Board of Strategy—the National Board for the consideration of plans for the employment of the whole fighting force—Tactics and Logistics, in general, are specialized functions for the different services.

But there are features of Logistics that are not peculiar to either the land or naval forces, but common to both, and where they can be exercised in unity, in the interests of economy and efficiency, they should be organized as national Logistics.

Commercial manufacturing industries teach us that one factory organization can turn out a given quantity of standard product more economically than can several factory organiza-

tions. There is a saving in standardization of machinery and methods and in overhead costs. This knowledge should be applied in consolidating factories producing articles for the whole fighting force.

(1) *Ordnance*: In addition to the argument for reducing cost, it is desirable to standardize ordnance material for the whole of the national services, as far as the nature of these services will permit, for the following reasons:

(a) The product of the united expert thought of the two services, as to improvements, should be enjoyed by both services. During the experience in actual war it often happens that one branch of the service is much more actively engaged than the other, with the result that the former obtains the lion's share of experience that makes for progress of its ordnance. New inventions spring up out of this experience, and the ordnance factory is the tangible clearing-house through which these proposed improvements pass; if ordnance manufacture is divided between the services, the factory representing the branch of the service that is the more actively employed will advance more rapidly than will the other branch. If the manufacture is under one management, the proposed improvements will, as a matter of course, be weighed for their applicability to both Army and Navy ordnance, from the first.

(b) Interchangeability of weapon permits of interchangeability of ammunition, which is a very great advantage, because at a given point in the theater of operations one branch of the service may be exhausted of ammunition and the other branch supplied under circumstances where the tactical requirement would demand the employment of the branch that lacks ammunition. The experience of the Spanish-American War and the Philippine Insurrection, during which the Navy and Army were supplied with different small-arms, resulted in the adoption of the same rifle for both the Army and Navy of the United States.

(c) Interchangeability of weapons would also permit greater latitude in the temporary use of naval guns on shore at critical points.

(2) *Uniforms and Clothing*: Many articles of clothing are al-

ways the same for both branches of the service such as shoes, underclothing, socks, etc. Furthermore if the determination of the uniforming of the two branches of the service is scientifically based, there would appear no reason why they should not be uniformed alike, each distinguished only by insignia devices. Both branches must be provided against the extremes of climate; the remaining determinants are nature of work and visibility. The soldier, like the sailor, is largely employed in managing machinery; there is no work required of either branch that necessitates a peculiarly naval or military uniform. The question of visibility is probably somewhat more important with the Army than with the Navy; and yet there are circumstances under which enemy craft might be close aboard, where silhouetted figures would be at a disadvantage. Prevalent naval uniforms, of flapping trousers, flat hat, and open breast, are not scientific selections, and are so out of harmony with modern dress that the sailor is made unpleasantly conspicuous and is discriminated against in public places ashore; he is at a disadvantage, as to dress; with his soldier brethren. Therefore uniforms and clothing should be standardized, as between the Army and Navy, and should be manufactured under one organization, which might provide the uniforms and clothing of officers as well as of men.

(3) *Hospital and Sanitary Service:* The functions of this branch are precisely the same for both branches: sanitation, prevention of disease, and care of the sick and wounded. These, with the medical officer's functions in regulating national quarantine and immigration, are most economically carried out by a single corps—the National Sanitary and Medical Corps. It includes within its jurisdiction the post-graduate education in preparation for the efficient discharge of the stated functions, the detailing of officers to the different national requirements, and the ambulance and hospital services. One great saving in such consolidation, instead of maintaining separate organizations for the several public needs, would be effected through having a single hospital at a given point available to the united services, instead of maintaining partially filled hospitals at a single place for each of the services.

These are the principal logistical features that could be consolidated in the interests of efficiency and economy. To be strictly logical, it would seem that a National Bureau of Intelligence, for obtaining all information that would be useful to the fighting services, and classifying and distributing the same, should be included under the logistical function. On the other hand, the product of such a bureau's activities consists principally of facts for reasoning in Strategy and Tactics, and so should be brought into the closest possible touch with tactical and strategical functionaries. Information is obtained in many ways; not only by means of attachés and intelligence officers, in times of peace, and by spies, but by means of scouting and reconnaissances on a large scale, in time of war. If we are to assign the intelligence function to Logistics, the logistical staff would be charged with responsibility for reconnaissances—activities not peculiar to Logistics. Of course, a great deal of information obtained is valuable to logistical functionaries, and would naturally be systematically supplied to them from the information bureau, no matter whether the latter be placed under Logistics or elsewhere.

To find a place for these national Logistics we must look to the National Board of Strategy; as the latter distributes plans common to all the forces, so the former distributes means common to all. We may look at the organization of this national Strategy only so far as is necessary to orient Logistics.

Outline of National Board of Strategy: The selection of members of this Board should be based on qualifications presumed to be possessed by reason of other employments and training. As the Board's estimates will be reasoned from: (1) the international political situation, (2) national policies, (3) principles of international law, (4) technical principles of warfare, (5) information of existing relative situations and conditions of possible enemy forces and our own, it would seem that an appropriate composition might be as follows:

- (1) Head of Department of State, or Foreign Affairs: presides and advises as to international political situation and national policies in general.

- (2) Head of War Department: advises as to condition of Army and military policy.
- (3) Head of Navy Department, or Marine: advises as to condition of Navy and naval policy.
- (4) One selected Army officer.
- (5) One selected Navy officer.
- (6) President of National War College.
- (7) Chief of National Bureau of Intelligence.

In addition to its function of determining the national strategy, the Board should have authority to appoint the President of the War College and the Chief of the Bureau of Intelligence, with the limitation or proviso that the incumbents of such two offices should not, at the same time, be officers of the same branch of the service. The Board should also be charged with the duty of recommending to the General Staffs of the Army and of the Navy officers to be appointed as the fourth and fifth above-named members.

There should be an administrative officer attached to the Board of Strategy to attend to its business needs; he would be charged with the following functions:

- (a) Supervise clerical force necessary for the discharge of the Board's business;
- (b) Be charged with the economic affairs of the Board, such as defraying expenses, making estimates, etc.
- (c) Act as organ of expression as between the Board of Strategy and the three national logistical departments;
- (d) And otherwise act as secretary of the Board of Strategy.

Through its administrative officer, the Board of Strategy would be the connecting link between the political departments of the government and the national logistical branches, and between the latter and the War and Navy Departments.

The National Bureau of Intelligence would collect, classify, and appropriately distribute, either upon initiative or request, all information material to the fighting forces to:

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- (1) National Board of Strategy.
- (2) Navy Department General Staff.
- (3) War Department General Staff.
- (4) The several logistical departments.
- (5) Other functionaries throughout the service.

The Bureau would also receive suggestions from every part of the fighting services as to points upon which information is desired so that the Bureau may have concrete tasks in the way of collecting information. (The search for facts is apt to be better rewarded when the searcher has a particular thing to find, or a particular subject to demonstrate, than when he is simply to search for facts or truths in general.)

We may now survey the field as to the division of Logistics in the different elements of the fighting machine, and in each case it will be necessary to have a general outline of the whole organization in order to see the exact relation of Logistics.

VI. NAVAL ORGANIZATION

Assuming that the great estimate of the strategical situation is made by the National Board of Strategy, and that it differentiates Army and Navy tasks and makes the proper apportionments, we arrive at the point where the Navy task reaches the Navy Department and the Army task reaches the War Department. Let us first consider the division of labor that will be necessary on the part of the Navy to execute its task.

The Navy Department is presided over by a representative of the political government, styled Minister of Marine, Secretary of the Navy, or some such title. Let us adopt "Minister of Marine."

He is intermediary between the political government and the Navy—passive as to the former, active as to the latter. Whether he be a civilian without expert knowledge of naval technics or an officer of the Navy, he must have assistants among whom will be divided the functions of parceling out the naval task to the different elements of the machine. As Strategy has already been attended to by the National Board, the functions remaining to the Navy are tactical and logistical. "Tactical" is here used in the broad sense of meaning "the theory of the use of military forces in combat." As the "theory of the use of combats for the object of the war" (*i.e.*, Strategy) is provided for by the National Board of Strategy, that branch of warfare is outside of the separate considerations of the Army and Navy Departments. These, working separately, are interested only in the use of forces in combat. "Logistical" is used as having reference to the provision of means for prosecuting war.

The head of the Navy Department, then, will be assisted by two definite cabinets or boards: (1) a General Staff, as rep-

representing the tactical functions, and (2) a Logistical Staff, representing the logistical functions.

The task assigned by the National Board of Strategy to the Navy will be the latter's mission; it will be expressed, of course, in general terms. In order that the task may be accomplished, its expression must be converted from general terms to specific tasks, and each specific task must be assigned to an appropriate functionary. This converting process involves a vast amount of technical work in distributing the task to the naval machine, through the promulgation of technically expressed orders, in such manner that the various units and functionaries will be coördinated for harmonious execution. A General Staff, composed of experts representing the different elements that must contribute to this performance, is the logical agency to act as the intermediary between the Minister of Marine and the remainder of the Navy. Thereby we provide for the utilization of naval forces to win the combat.

The supreme direction of the functions of providing the means is likewise a task too large for one man, both as to mass and diversity of activities required therefor. The agents of the supreme authority of the Navy for these various logistical functions compose the Logistical Staff.

Similarly, the commanders of units receiving missions too large for the direction of one man must be provided with tactical and logistical staffs.

The General Staff and Logistical Staff should be homogeneous organizations; *i.e.*, the different general and logistical staffs should be miniature representatives of the corresponding central organizations. This can best be realized through general staff corps and logistical staff corps, the former composed by temporary, the latter by permanent, details of sufficient numbers of officers and men of different grades to supply all the staffs after proper training therefor.

In order to eliminate needless routine and wasted effort, each functionary of these staffs should be given a wide range of authority to dispose of business pertaining to his department. Each should be regarded as charged with the execution, in coördination, of a part of a whole plan, or a definite part of an entire administration, and as a specialist, therefor; his func-

tions regulated, in general, by the law creating his office and by the general regulations of the organization; the functional details of his office are either routine or such as grow naturally out of orders promulgating a general plan or administration; in either case, he is a specialist to estimate and discharge such details, and should be answerable only for results. Thus each specialist works in his own province without the meddling of non-specialists.

The General Staff may be regarded as a personality, or corporation, for certain purposes, such as the determination of plans for the employment of the tactical units, naval policy, etc. For arriving at corporate decisions there should be prescribed for it stated meetings, as well as meetings at the call of the Chief of Staff, its presiding officer. For deliberations, in preparation for its conclusions, it may unite with itself in corporate meeting such of the members of the Logistical Staff as may be presumed to be cognizant of facts that might be material to the question under consideration.

The Logistical Staff should also have stated, or special, meetings, presided over by the Chief of Staff, to compare their estimates of important plans, to understand how coördinate departments propose to execute important matters, so that they may harmonize their executions or submit possible conflicts to the Head of the Navy Department for decision.

Taking this logistical division of functions as a guide, the division of labor as to details might be expected almost to effect itself naturally; but this is not as simple a matter as it might seem at first glance, for in many cases there will be found conflicting reasons for assigning a minor task to one branch or the other. At the same time we will be assisted in reaching the correct distribution by remembering that the object of classification is to eliminate duplication and waste; such elimination is effected by grouping functionaries with reference to the intimate relationships of their functions.

Starting, as a premise, with the fundamental division of labor as herein proposed, the prime function of the General Staff is to formulate tactical plans for the employment of naval forces, during war as well as during peace in preparation for war. In order that its plans may be based on facts, the first es-

sential is that the General Staff should include within itself means for collecting, classifying, and distributing the latest intelligence in reference to possible or actual enemies. There should be, therefore, the closest connection between information-collecting and tactical plan-making. A second branch of the primary function of the General Staff, according to our premise the organ of the Head of the Navy, is that of promulgation of orders resulting from planning. The General Staff must, then, have within its own organization a branch for formulating orders.

Secondary, but intimately connected, functions are:

(1) Securing the personnel necessary for tactical employment: prescribing qualifications of officers and men, and exercising supervision over all recruiting and admissions, except to logistical branches.

(2) Prescribing education and training for all personnel within its jurisdiction, and exercising general supervision over such educational and training systems, in order that the General Staff may be assured that the personnel is qualified to meet tactical requirements imposed in tactical plans.

(3) Directing assignments of all tactical personnel and administering the law as to promotions. Assigning logistical functionaries upon recommendation of the Logistical Staff.

(4) Exercising higher functions as to the administration of discipline throughout the whole Navy.

(5) Prescribing rules of procedure for the General Staff in accordance with the law authorizing the creation of such staff.

(6) Making such organizations as may be necessary to effectuate its other functions.

(7) Making such inspections, by members of the General Staff, as to inform itself of the state of efficiency of the Navy.

The Logistical Staff assumes the functions of providing all means not provided by the General Staff itself for the execution of the orders of the General Staff and for the general economic administration of the Navy. These functions include:

(1) Education and training of logistical functionaries.

(2) Prescribing qualifications for admission into this branch of the service; making requisition to the General Staff for the appointment and assignment to the Logistical Staff of the personnel necessary therefor.

(3) Making recommendations to the General Staff in reference to promotions in the Logistical Staff.

(4) Exercising all the functions of construction and repair of ships, and of all public works at shore stations.

(5) Manufacturing all ordnance, equipment, uniforms and clothing, and repairing and distributing or receiving the same.

(6) Exercising all functions in connection with Hospital and Sanitary Services, including their supply.

(7) Procuring and distributing, in kind, or authorizing the purchase of, subsistence.

(8) Procuring and distributing, in kind, or authorizing the purchase of, all other requisite supplies.

(9) Exercising all the functions in connection with pay and allowances of the personnel of the Navy, including accounts thereof.

(10) Exercising all the functions of auditing accounts.

(11) Disbursing funds.

(12) Exercising the functions of providing transportation for the Navy and overseas transportation for the Army, and collecting, classifying, and distributing upon initiative or demand (especially to the General Staff) data concerning transportation facilities that might be material to tactical considerations.

(13) Providing for the civil government in naval districts of occupied territory, including advanced bases, not otherwise provided with a competent civil government.

(14) Providing the legal services necessary to the administration of the Navy.

(15) Formulating estimates for submission to the Congress or Parliament.

(16) Providing for the religious and ethical needs of the personnel.

(17) Investigating and making recommendations upon claims for pensions and claims for damages caused by naval employments.

(18) Exercising all the functions of construction, repair, and maintenance of machinery used or to be used in the Navy, and providing all the personnel for the maintenance and operation of such machinery. In this connection the term "machinery" shall include all mechanical appliances, short of the ship itself, not included under ordnance.

(19) Exercising supervision over the administration of shore establishments, such as dockyards, barracks, and magazines.

It is not pretended that the foregoing are all the functions of either the General Staff or the Logistical Staff; the grouping merely indicates the general line of division.

An outline of the organization of the whole Navy, then, would appear as follows:

Minister of Marine: political Head of the Navy; intermediary between the National Board of Strategy and General and Logistical Staffs; and between such staffs and the Head of State and Legislative Branch. Has authority of disapproval and direction over any and all offices or functionaries of the Navy, within such limitations as may be prescribed by law.

I. General Staff of the Navy:

1. *Chief of Staff:* organ of expression of the Head of the Navy to all subordinates in tactical matters and for the General Staff acting as a whole; presides over the General Staff and Logistical Staff when in assembled session, and has general supervision of the administration of the offices of such staffs.

2. *Chief of Personnel:* exercises general supervision over appointments of cadets and officers, except to Logistical Staff; recruiting; casualties; reinforcements; assignments of officers of the line except to flag rank; directs practical training, in general, of personnel (except of the Logistical Staff Corps) before assignment to the Fleet, but has no control over personnel at the National War College or Staff College except to assign to duty therefrom; is the organ of expression of the Head of the Navy in the higher administration of disciplinary

measures; administers the law in regard to promotions and reductions.

3. *Chief of Staff College*: presides over the academic staff of the Naval Staff College and is responsible for the administration and efficiency of that college; presents for the consideration of the General Staff tactical principles developed by historical research or original work at the Staff College; presents war plans and plans for instructional employment of the fleets; presents information of technical value acquired from the National Bureau of Intelligence; advises as to doctrines; is responsible for the classification and deposit of war diaries; advises as to educational matters throughout the Navy beyond the province assigned to the Chief of Personnel.

4. *Chief of Operations*: executes or directs the execution of plans adopted by the General Staff for the employment of the fleets, through the issuance of technically formulated orders; assigns flag officers and chiefs of logistical branches; presents to the General Staff recommendations for promotions of officers to flag rank; orders boards of inspection to ascertain the efficiency of large units, reviews reports of such inspections, and submits a summary thereof to the General Staff; has general supervision over coast defense and other shore establishments under naval jurisdiction.

5. *Chief of Naval Militia*: exercises full direction over organization of naval militias and their mobilization in accordance with the general plans adopted by the General Staff; prescribes courses of training and education for such militias, and inspects them to determine their fitness for service, submitting reports thereon to the General Staff.

6. *Chief of Communications*: advises the General Staff as to lines of communication that may be employed during war; organizes such lines as are required for the plans adopted by the General Staff; exercises general supervision over their operation.

7. *Chief for External Affairs*: relations with enemy and enemy territory; interpreters, press, and various agents; secret service; telegraphic service; miscellaneous tactical affairs not assigned to the jurisdiction of the whole staff or to other members thereof.

II. Logistical Staff: the following sections, each headed by a Director:

1. *Mechanical Engineering:* has jurisdiction over the designing, construction, and repair of all propulsion machinery employed in naval craft, other than aerial, and of shops and agencies for such work; prepares estimates for this section's requisites, including estimates for fuel and other supplies required for the maintenance and operations of the propulsion machinery of naval craft other than aerial; etc.

2. *Ordnance:* provides the National Ordnance Factory with specifications of kind and amount of ordnance required; makes requisition thereon for ordnance and repairs to ordnance, and exercises generally the function of supervision of the efficiency and distribution of naval ordnance.

3. *Naval Construction:* has jurisdiction over the designing, construction, and repair of all naval craft, other than aerial, and of shops and agencies for such work; prepares estimates for this section's needs.

4. *Finance and Supply:* has jurisdiction over the disbursement of all funds appropriated to the Navy, the purchase of all supplies not provided for under other sections, the rendition of estimates, not otherwise provided for under other sections, keeping accounts incidental to these duties, etc. Also provides the National Uniform and Clothing Factory with specifications of kind and amount of its product that will be required for the Navy, and makes requisitions thereon from time to time.

5. *Sanitation and Medical Service:* notifies the Chief of the National Sanitary and Medical Service of the numbers of officers and men, amounts and kinds of supplies, equipment, and hospital accommodations that will be required for the Navy, makes distribution thereof, and supervises their execution of duties.

6. *Advanced Base:* provides for the military defense of such advanced bases as the general plan indicates should be held; provides and supervises training of personnel for such bases; provides personnel for land security of other shore establishments, including the coast defenses; submits estimates to other sections for such supplies and equipment as may be necessary.

7. *Signal Service:* provides for the telegraphic and signal

services, messenger and courier services.

8. *Aërial Service*: has jurisdiction over the construction and repair and designing of aërial craft and the shops and agencies for such work; organizes the aërial service to meet the requirements of the general plan; trains and exercises the organization; submits estimates and requisitions for the needs of the section.

9. *Legal Service*: renders legal advice whenever required in any department or section of the Navy Department; directs the preparation of charges coming under the original jurisdiction of the Navy Department, and follows their prosecution; reviews the records of such cases for final approval and execution of sentence; represents the Navy Department in any other legal controversies that may arise; interprets the law applicable to the Navy upon proper application; military convicts and prisoners of war.

10. *Religious Affairs*: follows the social and religious welfare of naval personnel and makes recommendations for its constant improvement; provides for organized work among prisoners of war; etc. This section may also conduct investigations along sociological lines as to conditions among civilian labor classes and report any conditions found that might be supposed to prejudice or prevent, in time of war, a proper flow of labor in mines or factories upon which the naval or military forces would depend for fuel, munitions, or other supplies.

11. *Transportation*: has supervision over the investigation of all transportation facilities that are or might be available to the Navy, in peace or war; perfects arrangements for the ready employment of such means; submits estimates of amount and kinds of transport that are lacking; satisfies all legal requisitions for transportation; provides oversea transport for the Army; estimates for maintenance and operation of section.

12. *Pensions and Claims*: investigates all claims for pensions and damages by reason of naval employment; submits recommendations as to their allowance; submits estimates of appropriations that will be required to cover such allowed claims and pensions.

13. *Public Works*: has jurisdiction over designing, con-

structing, and repairing buildings and docks and other public works at shore establishments; estimates for same.

14. *Subsistence*: purchases and distributes food supplies for the naval personnel, or authorizes the purchase thereof; estimates for same.

The Chief or Director of each section recommends to the Chief of Staff in regard to the appointment, promotion, and duty assignments of the personnel of his own section and of the members of that specialty in the whole Logistical Staff Corps. He is also charged with the education and training of that personnel, except in the case of the Sanitation and Medical Service (in which case the education is national, and not departmental); also keeps records of cost of administration of, and makes estimates for, his section.

The next subordinate stage of control in the organization presents four classes of units: (1) Fleets, (2) Home Shore Establishments, (3) Coast Defense Establishments, (4) Lines of Communications.

A. The Fleet: The supreme authority in the Fleet is the Admiral. As a great tactical representative, he is subject to the central control of the Head of the Navy through the central General Staff; this control is exercised through the assignment of tasks and the expectation of results; the guiding principle should be that the Admiral will be subjected to centralized *direction* only so far as is necessary to secure his coöperation with other units; in other words, his orders from central control specify details only to the extent of prescribing what he must do to coöperate, which prescribed details would not be a necessary selection with a less specific order. His staff organization is a miniature of the central staffs and the staff members are units of organized staff corps.

I. *General Staff*: Chief of Staff.

1. Assistant for Personnel.

2. Assistant for Operations.

3. Assistant for External Affairs.

Among these three will be distributed all the functions that belong to the General Staff, and each will correspond to one or more of the offices of the central General Staff.

II. *Logistical Staff*: Each section will represent one or more sections of the central Logistical Staff and will be under the general control of the central logistical section having authority over the subject matter under consideration. Each section will be headed by an "Inspector."

1. Mechanical Engineering.
2. Ordnance.
3. Construction.
4. Finance and Supply.
5. Sanitation and Medical Service.
6. Advanced Base.
7. Signal Service.
8. Aërial Service.
9. Legal Service: also represents Pensions and Claims.
10. Religious Affairs.
11. Transportation.
14. Subsistence.

B. Home Shore Establishments: Supreme authority vested in a Commandant, whose status is analogous to that of the Admiral in the Fleet. His staff organization:

- I. *General Staff*: Chief of Staff.
 1. Assistant for Personnel.
 2. Assistant for External Affairs (miscellaneous).

II. *Logistical Staff*: general outline same as for Fleet, each chief of section being an "Inspector," except add:

13. Public Works.

C. Coast Defense Establishments: Supreme authority vested in a Commandant, whose status is analogous to that of a Commandant of other Shore Establishments. Staff organization:

- I. *General Staff*: Chief of Staff.
 1. Assistant for Personnel.
 2. Assistant for External Affairs (miscellaneous).

II. *Logistical Staff*: "Inspectors" for:

1. Mechanical Engineering (including electrical appliances).
2. Ordnance.
3. None.

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4. Finance and Supply; also represents the central sections of Transportation and Subsistence.
5. Sanitation and Medical Service.
6. Advanced Based Establishment; to provide mobile supports for land defense.
7. Signal Service.
8. Aërial Service.
9. Legal Service; also represents Pensions and Claims.
10. Religious Affairs.
13. Public Works.

Where a Shore Establishment (Dockyard) and a Coast Defense Establishment are at the same geographical location, there will be one Commandant for both, one General Staff, and one Logistical Staff so modified as to membership as to provide for all the functions of manufacture, repair, and defense.

D. Lines of Communication: The second stage in the line of control here is represented by the administration of bases and advanced bases, and the manner of their connection. The secondary units would be so varied, ranging from the commander of a supply train acting outside of the jurisdiction of any fleet, to the commandant of a base, that the organization would have to be adjusted at the time of its employment. The organization would, however, always follow the general rule of providing functionaries to represent such offices of the central General and Logistical Staffs as the nature of the duty required.

The third stage is represented by the Division, subordinate to the Fleet, the supreme authority in which is the Rear Admiral, who has his General Staff and Logistical Staff, organized like corresponding staffs of the Fleet, except the numbers would be fewer and some of the staff offices would have to represent more than one staff office of the Fleet.

The last stage is that of the Ship, the supreme authority of which is the Captain. The General Staff there would be represented by the Captain and his Adjutant. The Logistical Staff would consist of:

1. Chief Engineer.
2. Ordinance Officer.

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3. Construction.
4. Finance and Supply Officer; also represents Transportation and Subsistence.
5. Sanitation and Medical Officer.
6. Advanced Base Officer (representing military affairs).
7. Signal Officer.
8. Aërial Officer.
- 9 and 10. Chaplain; also representing the Legal Officer.

VII. ARMY ORGANIZATION

As the purpose of this essay is to present in broad, general outline a scheme of organization, in the abstract, without any consideration as to its applicability to any particular fighting service, in order merely to show the relative position of Logistics in the Science of War, there is no pretense that the division of labor, or functions, within the respective provinces of the General Staff and Logistics, is accurate or complete.

The thesis is that Logistics is a distinctive branch of warfare, and that it embraces a large number of activities that should be coördinated, but not confused, with tactical or strategical activities.

A certain elaboration of details has been presented in discussing naval organization, but only as an example of method and to inject a touch of causality and reality into a subject that, at best, is dry and impersonal.

It seems undesirable, however, to pursue the elaboration through several pages dealing with Army organization, for the division of labor in that branch of the national service would follow the same lines as for the Navy, and would employ almost identical terms of the organization of the Army departments, the same relation to the National Board of Strategy, and the same lines of control down through armies and army divisions to the regiment. Such conception is justified by the weight of authority declaring that fundamental principles are the same in war on land and war on the sea. In fact, we have many examples of naval battles being merely a contest between bodies of infantry on floating platforms instead of upon *terra firma*. The naval battle now is largely a contest between floating artilleries as on land it is becoming more and more a contest between mobile batteries; casualties among Army personnel are reported as high as 70 per cent artillery-inflicted as

against 15 per cent credited to small-arms; and of course damage to matériel is almost entirely credited to the ordnance. If the functions of the Army and Navy are so nearly identical, is it not reasonable to propose that the organization to effect the functioning should be made along the same lines?

It is therefore deemed sufficient to present a general outline of organization to indicate the lines of control and the place of Logistics in the Army.

Minister of War (Minister for the Army): political head of the Army; intermediary between the National Board of Strategy and General and Logistical Staffs; and between such staffs and the Head of the State and Legislative branch; has authority of disapproval and direction over any and all offices or functionaries of the Army.

I. General Staff of the Army (members detailed from General Staff Corps):

1. *Chief of Staff of the Army*: organ of expression of Minister of War to all subordinates in tactical matters and for the General Staff acting as a whole; presides over the General and Logistical Staffs when in assembled session; has general supervision over the administration of the affairs of such staffs.

2. *Chief of Personnel*: similar to like-named office in Navy General Staff.

3. *Chief of Staff College*: presides over the academic staff of the Army Staff College, and otherwise performs functions similar to those prescribed for the like-named office of the Navy.

4. *Chief of Operations*: functions similar to those prescribed for the like-named office in the Navy, substituting "armies" for "fleets" and "general officers" for "officers of flag rank"; but has no jurisdiction over coast defense establishments.

5. *Chief of Militia*: same as similar naval chief.

6. *Chief of Communications*: same as Navy.

7. *Chief of External Affairs*: same as Navy.

II. Logistical Staff of the Army: Directors of:

1. Engineers: public works, field works, military map-making, pioneer work; etc.

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2. Ordnance and Artillery: similar to office of Ordnance in Logistical Staff of the Navy.

3. Remount Division: functions in connection with providing mounts for the Cavalry.

4. Finance and Supply: same as Navy.

5. Sanitation and Medical Service: same as Navy.

6. Subsistence: same as Navy.

7. Signal Service: same as Navy.

8. Aërial Service: same as Navy.

9. Legal Service: same as Navy.

10. Religious Affairs: same as Navy.

11. Transportation: provides land transportation.

12. Pensions and Claims: same as Navy.

13. Military Police.

The next subordinate stage of control in Army organization presents three classes of units: (1) Armies in the field, (2) Permanent Military Posts, (3) Lines of Communication.

Functions will be distributed to these on lines followed for the Navy, the equivalents being:

“Armies in the field” for “Fleets”;

“Military Posts” for “Home Shore Establishments”;

“Lines of Communication” for “Lines of Communication.”

Outline of Organization for an Army in the Field: The supreme authority is in the General, whose position is similar to that of the Admiral in the Fleet.

I. *General Staff:* Chief of Staff.

1. Assistant for Personnel.

2. Assistant for Operations.

3. Assistant for External Affairs.

II. *Logistical Staff:* Each section will represent one or more sections of the central Logistical Staff and will be headed by an “Inspector.”

1. Engineer: field works, military map-making, pioneer work, etc.

2. Ordnance and Artillery.

3. Remounts.

4. Finance and Supply.
5. Sanitation and Medical Service.
6. Subsistence.
7. Signal Service.
8. Aërial Service.
9. Legal Service: includes Pensions and Claims.
10. Religious Affairs.
11. Transportation.
13. Military Police.

The Corps may be regarded as a tactical unit, analogous to the Navy's Squadron, and not an administrative unit, unless acting alone, when it becomes a field army.

The next subordinate administrative unit would be the Army Division, the supreme authority in which is the Major-General. Like the Navy Division, its organization would be a miniature of the next higher organization, but with fewer functionaries, some staff officers, in the Logistical Staff, representing more than one section.

The last stage to be considered is the Regiment, the supreme authority of which is the Colonel. The General Staff is represented by the Regimental adjutant, who also exercises the logistical function of the section of the military police in connection with the employment of his regiment.

The regimental Logistical Staff consists of:

4. Finance and Supply; also represents (6) Subsistence and (11) Transportation.
5. Sanitation and Medical Service.
7. Signal Service.
10. Religious Affairs; also represents the Legal Service.

While in the Navy the ship is the smallest administrative unit, the Army's company is the smallest. But as the Captain of the Company performs all the functions of directing administration, and needs no assistance therefor, there is no call for a consideration of this unit.

Before leaving the discussion of Army organization, it must be said, with emphasis, that there is no pretension herein to present anything more than general principles of organization; hence it is not open to challenge for omission of details.

VIII. THE FIGHTING MACHINE

It is important to realize that the Army and Navy as a unit is a fighting machine.

When any other kind of machine is constructed, it is in view of a distinct use. If that use is not contemplated, the machine is not made. The need of the machine is first apparent and the machine is an answer to the need.

Is the fighting machine different in this respect?

If there is any need of the fighting machine, it is to enforce the State's policies. If a State can not enforce its policies, it can not maintain its sovereignty. But we constantly see great States' policies opposed. Diplomatic negotiation is full of expressed, tacit, or veiled threats. Opposition to States' policies is successful unless threats of resistance to such opposition are based on power. A machine is an organization of powers for application to a specific purpose. The fighting machine is an organization of powers to resist opposition to a State's policies. The need of the fighting machine is apparent, then, if we assume that the State is determined to maintain its sovereignty.

Having determined that there is need for a machine, our next inquiry is as to the nature of the machine, because there are different kinds of machines.

The leading characteristic of some machines is that they are designed to function actively, to do a positive work; such as the mower to cut grass or weeds. Others are designed to prevent, or modify, the working of forces; such as the dam to obstruct the flood.

The dam may be employed to accomplish two tasks: by obstructing the flow of water in one direction to protect adjoining property; by interposing a water-wheel at the spillway to generate power. Some dams are designed for the primary purpose of protecting adjoining property against floods, the

generation of power being only incidental; other dams are designed for the primary purpose of generating power, and possibly, incidentally, to protect property.

The fighting machine may be employed like the dam—as a protection; thus conceived, it is an organization of forces to resist forces; like the dam, it may interpose active mechanisms (as the spillway's water-wheel) to do positive work in support of the static function. This is the fighting machine on the defensive. But it also may be conceived of as in the mower class—operating positively, say, to mow the field of weeds of opposition. This is the fighting machine on the offensive.

Between these two great classes of fighting machines, we have to choose the one that will do the particular work in hand. If State policies are threatened by a flood that will be stemmed by a dam, the dam is the machine desired. If the threat is in the shape of a rapidly growing army in the enemy's fields that we can mow down there before the virulent growth reaches our own fields, we must send out our mowers.

Sometimes a man with fair fields is threatened by a flood from one side and by a growth of weeds in a neighbor's field on the other side. He must then employ both the dam and the mower. So a nation to protect its State may find it necessary to mow a neighbor's field on its southern boundary, but only necessary to dam its northern frontier.

Merely deciding upon the nature of the machine does not determine the design of its construction.

The engineer, to design a dam, must gather data as to meteorological conditions, the nature of the terrain, the strength of concrete, etc. His design will not provide for a dam to resist a minimum rainfall, but his calculations will be based upon the greatest volume of water that reasonably could be expected to gather against the dam, in view of past experiences and known conditions—with a liberal margin of safety added.

The modern husbandman does not contemplate employing the scythe for any considerable mowing or reaping job; if he did, he would be lost in the competitive struggle.

The fighting machine, whether it be intended for offensive or defensive use, or both, must be strong enough to take the work that calculations show reasonably may be expected to

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accumulate. As the dam is worthless if any section of it is not strong enough to hold, the fighting machine, in a defensive strategy (if the analogy between the dam and fighting machine is true), fails if it is not strong at every point. A defensive strategy is highly hazardous for that reason; if it fails at any point, it lets in the destructive flood, whereas the offensive strategy failing at a single point is not irreparable.

The point is, so far as Logistics is concerned, that the fighting machine must be constructed as a unit adapted, in kind and strength, to meet such tasks as may be imposed. The logisticon is interested in the design of the whole machine, because a large part of the preparation is in the field of Logistics. The qualitative and quantitative analysis of the logistical task must be based on the nature and extent of the task of the whole unit. The logistical task will be different in a defensive national strategy from what it would be for an offensive strategy.

IX. PEACE-TIME LOGISTICS

Whether a nation's strategy be offensive or defensive, there are certain logistical functions, not always obvious, that should be active at all times.

The most important of these operates largely in estimates of the non-combatant factor.

In times of peace the organization must be assured that, during the high tension of war, there will be an even flow of supplies of all kinds used by fighting machines. In other words, there must be an assurance that the supply factories will not only run smoothly, but that they will be able to "speed up" to a greatly increased production, without breaking under the stress. (It is said that the supply needs of the German Army, particularly as to ammunition, have been many times greater than the amounts computed, in peace times, as the probable requisites for war conditions.)

In factories under government control, as well as in those under private control, the personnel must be willing workers: they must be indoctrinated with a strong desire for the success of our combatant forces; that is to say, they must be real patriots—as ready to give their lives to the task of making munitions or shoes as are the combatants to give theirs on the field of battle; they must also be efficient workers.

Let us suppose opposite conditions as existing: that there is a large element among the non-combatant workers in factories and mines that is ignorant, inefficient, dissatisfied with their lot as workers; that even under normal conditions of peace times strikes in these industries are frequent. Is it reasonable to expect that these ignorant, unhappy people, who think they have little reason to love the social order in which they live, will suddenly, at the outbreak of war creating abnormal and more difficult conditions, be transformed into intelli-

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gent, efficient, self-sacrificing individuals, willing to put forth maximum effort in the great coöperation?

Suppose a nation's fleet, operating to block an invading fleet, is suddenly deprived of its coal supply by reason of a strike of unionized coal miners!

Suppose the laborers in one large munition plant should strike when the Army and Navy need every shell they can get!

Without naming many such suppositions, it is quite apparent that a fighting machine that is to hold the line must have the coöperation, and efficient coöperation, of the laboring man.

Therefore, preparation for war is not complete until the laboring man is prepared for war. It is one of the functions of the fighting organization to enquire into the labor problems of the nation. Of course, these enquiries should begin at the mines and factories that are most immediately connected with the military and naval supply. But, it may be asked, what shall we enquire about? And, assuming that we find unsatisfactory conditions, how can the logistical officer remedy them, say, in case the employer is a private corporation or individual?

Of course this problem, like most others that are worth solving, has its difficulties: the laborers' demands may be quite unreasonable, on the one hand; the employer may be wanting too much for his money, on the other hand; the laborers may be ignorant, the employer too eager, etc.

But let us say that there is an office in a National Logistical Staff charged with the duty of preparing the labor situation for war. Armed with his commission he goes to the different factories and mines, and consults with those in control who must recognize the authority of their national customer's agent. An investigation, by the government's officer, of the labor conditions at that factory, should result in showing what, if anything, is lacking to insure the reliability of that factory in time of war. The officer should ally himself closely with the labor organizations, and as a neutral, honest, and impartial go-between be able to exercise a controlling influence in all cases of important disagreement between employer and employees. He should also be able to inject into the social life of the laboring men certain doctrines of loyalty to the government as well as doctrines of social reasonableness, so that the

laborer, in the great crisis of war, would be in the right frame of mind to serve his country.

A government official accomplishing a great social work in improving a wide range of conditions among the laboring men should be able to wield great influence among them. So-called social work would thus be under governmental direction; it would thus be standardized, and so accomplish much more actual improvement than is now accomplished in most countries through spasmodic, disorganized, unscientific efforts along these lines. Efforts to "improve" the condition of the laboring man are now often in the hands of irresponsible and misguided persons. Whether the government is good or bad, the people of every class living under that government owe it to themselves to be loyal to it, as a child owes loyalty to his strong or weak father. If the government is bad, the loyalty of all the people will result in reforming it; disloyalty will have the opposite effect. It is only necessary to convince the laboring man of this fact to cement his loyalty. The government's sociological officer can accomplish much through off-hour schools, and, possibly, quite as much through seeing that the proper indoctrination is introduced into the public schools for the child has great educational power in the home, since he is the instructor that is loved, and sympathy between instructor and instructed is an essential in educational methods. The laboring man would thus be educated in loyalty to the government, as well as in reasonableness in his demands upon his employer.

On the other hand, employers must be made to do their share in perfecting the coöperation by a readiness to respond to reasonable demands. Probably employers would need some education as to indoctrination of loyalty, as well as the employees. Legislation can enforce a reasonable régime even in private industrial enterprises. Our government official's recommendations, based on knowledge of conditions at the various plants, should be of prime importance in assisting the legislators in shaping this class of legislation.

The regulation of relations between employer and employees in private munitions plants was regulated in England by the Ministry of Munitions Act, 1915, and the Munitions of War Bill.

X. FACTORY PREPAREDNESS

Without analyzing the task of each department of the Logistical Staff, as we have just done for one department, it may be stated generally that each logistical officer should survey his task from end to end, with the broadest view and in the greatest detail, for the purpose of accomplishing the most intensive development in order to produce the maximum product. And he should organize his forces for war, not alone for peace. It sometimes seems as though fighting machines provide for almost everything except war.

A department that has to do with manufacturing, for instance, should provide not only for peace consumption, but for the maximum production that may be required for war. All machines and tools that will be required for manufacturing purposes in war-time should be built or made in peace-time. Arrangements should be made with private factories that will be expected to manufacture munitions, in war-time, whereby such factories will anticipate requirements by having on hand all necessary machinery, or the specifications and means for quickly providing it, for the special and additional manufacturing. They should be provided with blueprints and full specifications, and with gauges for testing the products, to see that they meet requirements. All these details should be worked out during peace times so that, when war comes, it will be necessary to give only a brief order to start the process going. Provision for mobilizing raw materials should also be made and peace-time legislation should prescribe what must be done in this regard upon a declaration of war. A Commission should be provided for, with authority to compel producers to honor requisitions for raw materials and to fix the prices to be charged therefor. This was accomplished by the "Raw Stuff Bureau" of the War Department in Germany dur-

ing the present European War.

Another function of any department charged with the manufacture of a war product is to obtain information as to the most modern improvements and inventions that have become known, so that his product may be the best that can be turned out for the purpose intended. To this end, producing officers must be familiar with the nature of their use and be alert to discover wherein they may be improved.

As modern wars are to so great an extent competitions in mobilization of the contending nations' resources, it would seem that the belligerent will win who makes the more economical effort—who gains the maximum result out of a given expenditure of effort or means, who selects the most economical weapon—*i.e.*, the weapon that will, for a given cost, accomplish the greatest destruction of enemy war resources, etc. It is said, in reference to the present European War, that the last 100,000 reserves and the last million pounds of credit will win.

Where the contest is drawn so closely between well-organized nations in arms, it is of the utmost importance that economy be exercised in every department of the fighting machine.

In this connection, it is interesting to note that the unit cost per soldier for some armies is from 12 to 16 times greater than for the unit cost of the Germany Army, from 17 to 20 times as great as the unit cost in the Japanese Army, and from 18 to 23 times as great as for the Swiss Army. The difference in pay of personnel contributes only in a small degree to the total differences. The explanation lies in economical administration—the elimination of waste. It may be said also that the efficiency that results in economy will produce excellence in other respects.

Each department of Logistics must select and administer on the basis of economy.

The various departments sitting in conference will be able to compare their needs and divide between them the tasks of satisfying such needs, in order to avoid duplication. For example, if one department requires certain machines for manufacturing, and another department may use some or all of the same kind of machines, a consolidation should effect a great saving. Or, if the Sanitation and Medical Department requires

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transportation for ambulances, it would seem that its needs could be best satisfied by the Transportation Department.

Thus throughout the whole list of activities consolidation and the elimination of waste should be effected.

XI. LOGISTICAL PROBLEM

Students of warfare should not be content with studying Strategy and Tactics in the abstract and concrete. The mere fact that a measure may be correctly founded on strategical or tactical principles is not conclusive that such measure is acceptable or that it may be adopted. War games and chart maneuvers are well enough as far as they go, but they do not provide the necessary logistical instruction.

In planning the employment of any particular military force, it is not only necessary to decide what is desirable, but what is possible. Therefore every strategical and every tactical problem should be solved logistically to determine what measures logistical resources will afford.

The reader is invited to imagine himself as a student at a staff college and to suppose that his instructor has assigned a problem constructed along the following lines:

Problem

The political situation indicates probability that Blue and Red countries will be at war within a month.

Geographically, Blue is west of Red; the two countries are separated by an ocean about 5,000 miles in width, as measured from X (Blue's principal eastern continental base) and T (Red's most western base). Blue has an advanced base (Island Z) about 3,000 miles east of X; it is believed to be in a state of self-defense that could be sustained about two weeks against any attack that Red could throw against it.

The situation was long previously estimated by Blue's National Board of Strategy, which had adopted, to meet the situation, "Plan A," which is familiar to the General and Logistical Staffs of the Navy and War Departments.

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In turn the two departments have adopted tactical "Plan B," also well understood by said staffs, to meet the requirements of strategic "Plan A."

Red could not expect to advance west of Advanced Base Z unless or until it had been taken from Blue, as Red can not afford to have its line of communications thus threatened.

Strategic "Plan A" and tactical "Plan B" contemplate the employment of Blue naval forces to try conclusions with the Red Fleet probably campaigning, or to campaign, to oust Blue from Z, and Blue military forces to be concentrated at strategic points on the Blue coast.

The Blue Fleet consists of 20 dreadnoughts, 20 pre-dreadnoughts, 10 battle-cruisers, 30 scouts, 60 torpedo-boat destroyers, 40 submarines, 120 hydroplanes, and such Train as Logistics demands, as deduced in the solution of this problem.

To make the problem as simple as possible, we will premise that the naval force will steam from X to Advanced Base Z at 10 knots per hour, except the battle-cruisers and scouts, which must do 20 knots (as far as reckoning fuel-consumption is material); the Fleet will rest at Advanced Base Z three days, after which half the scouts and half the battle-cruisers will be on scouting duty for ten days at an average speed of 20 knots; the whole Fleet will then operate for ten days at 20 knots by day and 10 knots by night, the battle-cruisers, scouts, and destroyers carrying steam for 30 knots; the Train will remain at Z seven days after the return of the Fleet from the said ten days' operations, during which time the fuel-ships must refuel all ships, except gasoline-users, and have sufficient fuel to carry them back to X.

It will be assumed that the Fleet will consume fuel as follows:

	<i>Speeds</i>				
	<i>10K</i>	<i>20K</i>	<i>25K</i>	<i>30K</i>	<i>In Port</i>
Dreadnoughts, oil, tons	.3	.7	...	...	20
Pre-dreadnoughts, coal,					
tons	.4	1.0	...	...	20

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Battle-cruisers, coal, tons . .	.4	.8	1.2	3.0	20
Scouts, coal, tons	.3	.5	.9	1.3	10
Destroyers, oil, tons	.08	.1	.15	.25	4
Submarines, gasoline; not to be computed.					
Hydroplanes, gasoline; not to be computed.					
Repair-ships, coal, tons	.12	...	...	...	20
Ammunition-ships, coal, tons	.12	...	...	...	12
Hospital-ships, coal, tons . .	.12	...	...	...	12
Ambulance-ships, coal, tons . .	.12	...	...	...	12
Colliers, 10,000-ton, coal, tons	.17	...	...	...	12
Colliers, 7,500-ton, coal, tons	.12	...	...	...	10
Colliers, 5,000-ton, coal, tons	.09	...	...	...	8
Tankers, 7,500-ton, oil, tons	.09	...	...	...	8
Tankers, 5,000-ton, oil, tons	.06	...	...	...	6
Tankers, 2,500-ton, oil, ton .	.03	...	...	...	3
Refrigerator-ships, coal, tons	.12	...	...	...	12
Supply-ships, coal, tons	.12	...	...	...	10

(NOTE: Figures in first four columns represent amounts consumed per knot; last column, per day.)

Required in solution of problem: (1) General scheme of activities of the Logistical Staff of the Fleet; (2) composition of Fleet Train; (3) amount of fuel required; (4) quantities and kinds of rations to provide for three months (92 days) after arrival at Z. Assume that Blue will have no naval vessels available to act as escorts for carrying vessels after the departure of the Fleet from X.

Solution

To comply with the special requirements of this problem:

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(1) General scheme of activities of Logistical Staff of the Fleet: taking the Logistical Staff presented in Chapter VI., we have:

1. Mechanical Engineering: (*a*) informs Transportation Department of number of repair-ships that will be included in Train; (*b*) computes amount of fuel that will be required.

2. Ordnance: informs Transportation that 5 ammunition-ships will be required.

3. Construction: special requirements of problem call for nothing, as Advanced Base Z is assumed to be a complete advanced naval base with provision for docking and repairing ships.

4. Finance and Supply: informs Transportation that 5 supply-ships will be added to Train.

5. Sanitation and Medical Service: Advanced Base Z is assumed to have Shore Hospital facilities, but as the special requirements of the problem include composition of the Train, this department must estimate the number of hospital-ships and ambulance-ships that must accompany the Fleet. The approximate personnel composition of the Fleet will be:

20 dreadnoughts	20,000
20 pre-dreadnoughts	16,000
10 battle-cruisers	9,000
30 scouts	9,000
60 destroyers	6,000
40 submarines	1,000
120 hydroplanes	<u>720</u>
Total	61,720

Assuming 20 per cent casualties, sickness and wounds and deaths, gives 12,344 casualties; assuming 20 per cent of these die, there are 9,258 remaining to be cared for; probably 10 per cent of these will be permanent ineffectives, or 925, who should be returned home, so as not to be a drain on resources at the front; for this purpose four ambulance-ships should be provided; returning empty colliers or supply-ships can not be used for this purpose, because the invalids could not then be protected by the Red Cross flag. For the 8,333 invalids for

whom hospital attendance must be provided at the front, 50 per cent can be cared for in the fighting ships' "sick-bays"; that will leave some 4,000; as they will not all be invalidated cases at the same time, and as there are presumably extensive hospital facilities at the Advanced Base, it would seem safe to say that six hospital-ships, each with capacity for 350 patients, would provide for any conditions that might be expected within reason. Therefore, this department notifies Transportation that ten ships must be added to the Train for Sanitation and Medical Service. A similar, but more detailed, notice must be sent to Mechanical Engineering for fuel computation, and to Subsistence for ration computation.

6. Advanced Base: special requirements of problem call for nothing under this head, as Advanced Base Z is supposed to be complete.

7. Signal Service: nothing special.

8. Aërial Service: nothing special.

9. Legal Service: nothing special.

10. Religious Affairs: nothing special.

11. Transportation: must make up Train in accordance with calculations that will follow below.

14. Subsistence: must compute approximate number of rations and components thereof according to data that will follow below.

(2) As to complying, now, with the second, third, and fourth requirements of the problem, it is evident that Mechanical Engineering Department will not be able to compute the aggregate amount of fuel that will be required until the full composition of the Train is determined; the Subsistence Department will not be able to compute the whole number of rations until it is known how many rations must be provided for the Train: Transportation Department, on the other hand, will not be able to state the composition of the Train until the requirements of other departments are reported. At the very beginning of the problem we are struck with the importance of there being a Logistical Staff, of which the members work in official coördination and constant consultation.

The 1st, 5th, and 14th offices of the Staff may make tentative, or preliminary, estimates, and the estimates may be

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made complete after conference with the 11th office.

Mechanical Engineering's first estimate:

(a) Repair-ships: 1 for hydroplanes, 1 for submarines, 1 for destroyers, and 4 for remainder of Fleet, should be sufficient in addition to the repair facilities afforded by the complete Advanced Base at Z.

(b) Fuel for the combatant vessels of the Fleet plus the 7 repair, 5 ammunition, 5 supply, and to 10 hospital and ambulance vessels:

(1) Steaming from X to Z; 3,000 miles, speed 10 knots:

		<i>Oil</i>	<i>Coal</i>
20 dreadnoughts	.3 x3000x20	18,000	....
20 pre-dreadnoughts	.4 x3000x20	....	24,000
10 battle-cruisers	.8 x3000x10	....	24,000
30 scouts	.5 x2000x30	....	45,000
60 destroyers	.08x3000x60	14,400	....

(2) At Advanced Base Z three days:

30 vessels at 20 tons coal per day,		
30x20x3 . . . . .	....	1,800
20 vessels at 20 tons oil per day,		
20x20x3	1,200	....
30 vessels at 10 tons coal per day,		
30x10x3 . . . . .	....	900
60 vessels at 4 tons oil per day,		
60x4x3	720	....

(3) Next ten days: half scouts and battle-cruisers scouting, remainder Fleet in port:

5 battle-cruisers, scouting at 20 knots,		
.8x20x24x10x5 . . . . .	....	19,200
5 battle-cruisers, in port, 20x10x5 . . . . .	....	1,000
15 scouts, scouting .5x20x24x10x15 . . . . .	....	36,000
15 scouts, in port, 10x10x15 . . . . .	....	1,500
20 dreadnoughts, in port,		
20x10x20 . . . . .	....	4,000
20 pre-dreadnoughts, in port,		
20x10x20		4,000
60 destroyers, in port, 4x10x60	2,400	

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(4) Fleet operating ten days:

	<i>Oil</i>	<i>Coal</i>
20 dreadnoughts:		
.7 x 120 k. x 12 hrs. x 20 x 10	33,600	
.3 x 10 k. x 12 hrs. x 20 x 10	7,200	....
20 pre-dreadnoughts:		
1 x 20 k. x 12 hrs. x 20 x 10	....	48,000
.4 x 10 k. x 12 hrs. x 20 x 10	....	9,600
10 battle-cruisers:		
1.2 x 20 k. x 12 hrs. x 10 x 10	....	28,800
1 x 10 k. x 12 hrs. x 10 x 10 .....	....	12,000
30 scouts:		
.9 x 20 k. x 12 hrs. x 30 x 10	....	64,800
.5 x 10 k. x 12 hrs. x 30 x 10	....	18,000

(5) Repair-ships:

.12 x 3000 x 7 (<i>en route</i>) .....	....	2,520
20 x 30 (days in port) x 7 .....	....	4,200

(6) Ammunition-ships:

.12 x 3000 x 5 (<i>en route</i>) .....	....	1,800
12 x 30 x 5 (in port) .....	....	1,800

(7) Supply-ships:

.12 x 3000 x 5 (<i>en route</i>) .....	....	1,800
12 x 30 x 5 .....	....	1,800

(8) Hospital- and ambulance-ships:

.12 x 3000 x 10 .....	....	3,600
12 x 30 x 10 .....	....	3,600

Total fuel, in tons, required for the foregoing parts of the Fleet and Train	81,520	359,720
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Subsistence, tentative estimate:

As shown above, in consid-
ering Sanitary and Medical
Services' estimates, there

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will be in combatant vessels	61,720
Add for: 7 repair-ships at 160	1,120
5 ammunition-ships at 138	690
5 supply-ships at 138	690
10 hospital- and ambulance-ships at 160,	<u>1,600</u>
Total,	65,820

Providing for three months, say 92 days, we
have: $65,820 \times 92 = 6,055,440$ rations.

We will not determine the components of the ration until the total number of rations has been ascertained, after determining the composition of the Train. We will now only seek an estimate of the number of refrigerator- and subsistence-ships that will be required. Allowing a pound of fresh meat and .43 pound tinned meats as the ration per man, and adding 9 per cent for losses, there would have to be refrigeration for 6,420,429 pounds of meats. Allowing about 3.9 pounds to each ration for the components other than fresh meats, and adding 9 per cent for losses, we would require transportation for 25,741,675 pounds. Twelve refrigerator-ships with refrigeration for 535,000 pounds of meats and for stowage of 2,000,000 pounds of other stores, each, would be nearly sufficient carriage for all the Fleet and Train except the colliers and these provision-carriers. The colliers must be expected to carry their own rations, except as to fresh meats; they will be in position to get fresh meats from the refrigerator-ships only while at the Advanced Base (about 30 days). Assuming that there will be about 55 colliers and tankers with crews of about 50 men, they would take only $55 \times 50 \times 30 \times 1 \frac{3}{4}$ fresh meat, or 144,375 pounds. The twelve refrigerator-ships, with crews of about 138 men and officers, would require 152,352 rations, or about that many pounds of fresh meats and about 600,000 pounds of other provisions. A thirteenth refrigerator-ship will therefore be required, and it will provide for the personnel at Z.

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The fuel required for refrigerator-ships will be:

From X to Z: .12 x 3000 x 13	4,680
In port: 12 x 30 x 13	<u>4,680</u>
Total,	9,360

Add this sum to the amount of fuel previously estimated, and we have 81,520 tons of oil and 369,080 tons of coal that the fuel-ships must deliver, in addition to the quantities they will need for their own bunkers.

Colliers usually have bunker capacity equal to about 10 per cent of their cargo capacity. Each collier will use 720 tons of coal, which amount we must deduct from the cargo capacity plus bunker capacity to obtain the net delivery. Assuming that colliers of 10,000, 7,500, and 5,000 tons cargo capacity are available in the proportion of 1, 4, and 10, our Train would require the following numbers of colliers:

4 at 10,000 cargo capacity	+ 2,000 bunker - 720 used =	45,120
16 at 7,500 cargo capacity	+ 750 bunker - 720 used =	120,480
<u>43</u> at 5,000 cargo capacity	+ 500 bunker - 720 used =	<u>205,540</u>
63	Total delivery,	371,140

Assuming that tankers of 7,500, 5,000, and 2,500 tons cargo capacity and 10 per cent additional bunker capacity as oil-burners are available in the proportion of 1, 4, and 8, and that each tanker will burn 480 tons of oil, the Train will be increased by the following tankers:

2 at 7,500 cargo capacity	(+ 750 bunker - 480 used) =	15,540
7 at 5,000 cargo capacity	(+ 500 bunker - 480 used) =	35,140
<u>14</u> at 2,500 cargo capacity	(+ 250 bunker - 480 used) =	<u>31,780</u>
23	Total delivery,	82,460

The Train can now be made up, and will be as follows:

- 7 repair-ships,
- 5 ammunition-ships,
- 5 supply-ships (for general supplies).

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6	hospital-ships,
4	ambulance-ships,
13	refrigerator-ships,
63	colliers,
<u>23</u>	tankers,
Total,	126

With the total number of ships thus determined, Subsistence Department has sufficient data upon which to base calculations as to exact quantities and components of rations to be carried:

Combatant vessels (see above) .	61,720	...
13 vessels at 160	2,720	...
10 vessels at 138	1,380	...
23 tankers at 40 (30 days' fresh meats only)	...	920
63 colliers at 50 (30 days' fresh meats only)	<u>...</u>	<u>3,150</u>
92 days' rations for	65,820	
Additional fresh meats for 30 days for		4,070

Rations for these would be made up as follows, the quantities providing 9 per cent additional to cover losses of stores:

<i>Components</i>	<i>Dry Pounds</i>	<i>Fresh Pounds</i>
Tea	42,125	...
Coffee	559,470	...
Cocoa	98,730	...
Sugar	1,645,500	...
Biscuit	987,300	...
Flour	5,997,518	...
Cornmeal	296,190	...
Lard	419,932	...
Beef, fresh	...	3,685,920
Beef, fresh (Train, additional) .	...	74,321
Mutton, fresh	...	346,213
Mutton fresh (Train, additional)	...	6,981
Pork loins, fresh	...	1,267,693

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	<i>Dry Pounds</i>	<i>Fresh Pounds</i>
Pork loins, fresh (Train, additional)	...	25,561
Veal, fresh	...	346,213
Veal, fresh (Train, additional) .	...	6,981
Chicken, fresh	...	230,370
Chicken, fresh (Train, additional)	...	4,645
Pork sausage, fresh	...	346,213
Pork sausage, fresh (Train, additional)	...	6,981
Bacon, tinned	526,560	...
Corned beef, tinned	526,560	...
Ham, tinned	131,640	...
Salmon, tinned	263,280	...
Ham, smoked	1,151,850	...
Pork, salt	576,583	...
Bologna, fresh	...	82,933
Bologna, fresh (Train, additional)	...	1,672
Frankfurters	...	164,550
Frankfurters (Train, additional)	...	3,318
Vegetables, fresh	6,566,203	...
Tomatoes, tinned	828,016	...
Beans, dry, 50,023 gals., weight approx	400,000	...
Milk, tinned	412,033	...
Pickles	235,636	...
Vinegar, pints	329,100	...
Oil, pints	140,635	...
Butter, tinned	822,750	...
Cheese	235,636	...
Sirup, pints	235,636	...
Rice	82,933	...
Corn, tinned	346,213	...
Peas, tinned	197,460	...
String beans, tinned	148,753	...
Lima beans, tinned	98,730	...
Oatmeal	65,820	...
Cornstarch	17,113	...
Peaches, tinned	271,178	...
Pears, tinned	221,155	...
Apricots, tinned	73,718	...

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	<i>Dry Pounds</i>	<i>Fresh Pounds</i>
Prunes, tinned	123,742	...
Apples, dried	98,730	...
Peaches, dried	61,871	...
Raisins, dried	25,695	...
Salt	235,636	...
Macaroni	235,636	...
Baking power	14,480	...
Pepper	28,960	...
Spices	7,898	...
Hops	52,656	...
Lemon extract, 658 gals., weight approx.	5,264	...
Vanilla extract, 2,632 gals., weight approx.	21,056	...
Mustard	<u>28,960</u>	<u>...</u>
Total weight, except fresh meats	25,890,540	
Total weight for refrigeration		... 6,600,565

As these totals are less than the estimates made above in determining the number of refrigerator-ships that would be required, there will be space in those ships for additional provisions for the Train and for the Advanced Base.

This solution has only superficially considered a small part of the logistical activities that would be required in organizing for an expedition a comparatively short distance from the home base and for a short campaign, but it suggests the enormous proportions of the logistical task for a more serious enterprise.

PART TWO

EDUCATION

Thus far we have dealt only with that part of organization which has to do with classification of functions. The organization is of no practical value unless every part will so function that the whole machine will run smoothly; *i. e.*, there must be assurance that the functionaries are fitted and ready to respond to any requirements that may be imposed.

A consideration of pure Logistics can not be complete, then, without some reference to a theory of preparing the parts of the organization for efficient operation. Efficiency of the parts is required.

Efficiency may be said to be the power that accomplishes a designed work; as the state of possessing adequate knowledge for the performance of a duty; as the ratio of effect produced to the energy expended in producing it. The outstanding essentials appear to be: *power* and *knowledge* as subjective; *task* as objective. The subjective conditions must be proportioned to the objective requirements; that is to say, the quantity and quality of power and knowledge to be possessed by functionaries in the military machine must be measured and provided to meet the requirements of the task. It is really the estimate of the task, then, that should determine the measure of efficiency that must be conditioned.

Minor tasks allotted to the hosts of the fighting machine are widely varied, but the major task is the same for all. So, while qualifications for minor tasks require specialization, fundamental qualifications are uniform. To illustrate: the captain's specialty is that of control through the exercise of command: the gunner's specialty has to do with the manipulation of guns; neither the captain nor the gunner is expected to be qualified for the other's specialty. The great task for both is to defeat the enemy. This may be thought to be a statement of

the task in so general terms as to fail to sufficiently suggest requisite qualifications, but this is not so; for, as a practical proposition, if every unit of the fighting machine is not imbued with a strong impulse to win, the battle may be lost through the defection of one man, and if every unit is imbued with an intense desire to conquer the enemy, the battle is already almost won. The individual qualities that support the winning impulse are: will, resolution, application, prolonged attention, perseverance, clear conceptions of end and purpose, and physical and moral courage. These qualities largely satisfy the element of *power* in efficiency; they constitute the impulse to action, while the guide to action is in the *knowledge* element of efficiency. This *knowledge* qualification is of two classes: specialization, already mentioned, and fundamental knowledge, or an understanding of the laws of Nature, which must be common to every element of the machine.

While it can not be said that it is as essential for the lowest subordinate to be "efficient" as for the commander, since the results of the latter's inefficiency will be more widely distributed, there may be occasions when the stupidity of the lowest subordinate may lose a battle upon which the fate of an empire hangs.

It is said that the great Frederick's infantrymen were kept in line through fear of the sergeant who walked behind with a stick, and that as between the enemy in front and the cat-o'-nine-tails in rear, the soldier chose to brave the former. But that was in the day of small armies of compact masses, when wars were not the terrifically energetic and scientific affairs that they are today. Forty-five years ago the analytical Germans realized that—

With the intensity of fire attained by modern armaments (in 1870) the combat and tactical formations have become correspondingly loose. How is one, with this looseness, to control scattered bodies of men, so as to maintain their cohesion, keep their direction, and force them up to the shock?⁵⁵

This means that, with modern wide deployments, the individual infantryman must be qualified to act with intelligence

so that he can be relied upon to properly act in the initiative and coöperate with his flanks.

With the ship in action we find a similar condition. The captain can not be everywhere in his ship, nor the officer everywhere in his turret, at the same moment. In the overwhelming confusion of battle each man must be able to respond instantly to extraordinary situations. Really high intelligence may be demanded of the lowest unit, say, in case of accident in the engine- or boiler-rooms, or in case of the occurrence of the unforeseen in the ammunition magazine. The "man on the spot" can not justly be blamed when his initiative is stupid if he does not understand the relation of cause and effect in a wide range of phenomena.

With this view of the necessity for efficiency, we are next concerned with the means of attaining efficiency, which means is usually asserted to be training. What, then, is training?

A dictionary definition runs thus: "Systematic instruction and drill, as in some trade, art, or profession; methodical tuition of mind or body; course of education." Education is defined as "the systematic development and cultivation of the normal powers of intellect, feeling, and conduct, so as to render them efficient in some particular form of living, or for life in general." To educate is to "develop the normal faculties by systematic training, instruction, and discipline."⁵⁶

Training has special reference to the development of faculties in execution (art), while education comprehends the totality of development of a living being. The members of the fighting personnel must have something more than training; feelings must be "educated" in order to give patriotic impulses and to develop the appreciative faculties. In short, to fully complete the organization, education is necessary, and, as we have already seen, the whole personnel must be educated.

But education, according to the definition, is a process of wide range. While we shall probably conclude in the end that education in this broad sense is requisite, we may first look for the necessity of educating the personnel in a narrower sense, regarding education as the "universal distribution of extant knowledge," without regarding questions of discipline and culture, but taking account solely of information.⁵⁷

Since every member of the fighting machine may be re-

quired, at any moment, to estimate a difficult situation and take the right action, he must have sufficient general knowledge to be able to reach the right conclusion. The mere fact that the individual may be normal, or even more than normally active-minded, does not insure the correctness of his conclusions. Mazzini said:

Without education you are incapable of rightly choosing between good and evil; . . . you can not arrive at a correct definition and comprehension of your own mission; . . . without it your faculties lie dormant and unfruitful.⁵⁸

Lester Ward says:

To minds devoid of general knowledge all special knowledge presents a chaos. . . . The mind is in a state of confusion and bewilderment, and thought in such a mind, if it can be so called, forms no guide to life or action.⁵⁹

By *knowledge* he does not imply the idea of memorizing a mass of facts, but he means knowledge of laws and principles—generalized knowledge, “under which all facts and details necessarily fall.”

Causality is the most fundamental of all the faculties of the human mind. Man is differentiated from the animal by his power of ratiocination; it is his nature to reason about his surroundings; when his conclusions are false, it is because he has failed to assemble, or consider, all the facts material to the case reasoned about. For example, in ancient America, during a period of advanced civilization when men reasoned much, it is said that as many as eighty thousand willing human victims were sacrificed on the tomb of a chief. This was a logical proceeding based on false premises. It was then reasoned that since a chieftain on earth must be accompanied by a considerable force of protectors and servants during a journey, he will require certainly as large a force to serve him on the great journey into the Unknown for an interminable sojourn.⁶⁰

Animals are said not to reason, but they certainly have a certain amount of knowledge—sufficient for their needs—and so their abstention from reasoning keeps them out of error.

Ignorance is comparatively safe. It is error that does the mischief, and the stronger the reasoning faculties working upon meager materials, the more misleading and disastrous the erroneous conclusions thus drawn are for mankind.

Of course, the great *desideratum* is to supply the data for thinking, . . . but the problem is, how to do this. Truth is unattractive. Error charms. It holds out all manner of false hopes. It is a siren song that lures frail mariners upon desert isles, where, with nothing to nourish the soul, they perish and leave their bones to bleach upon the barren sand. All the shores of the great ocean of Time are strewn with these whitened skeletons of misguided thought.⁶¹

The point is, that even if the officer does not expect reasoning faculties among his men, and requires only blind obedience, he can not prevent them from reasoning. Man will, and must, reason. He will not rest in mere animal ignorance, but, if uninstructed, will be in a state of confused error. What a difference the lack of a single fact or the misconception of a single principle may make in the conclusions of our reasoning! In the solution of military problems, for instance, the conditions proposed as to strength and disposition of opposing forces in being altered ever so slightly may demand an entirely different solution. A logical mind will not lead its possessor to a correct conclusion without full information about the question in hand.

Ward makes the startling assertion that every human being of mature age and sound mind should be put in possession of all that is known. He explains thus:

Such a proposition may sound Utopian, but it is not at all so when the idea is fully grasped. It would perhaps be clearer to some minds to say that every such being should be in possession of all truth. . . . When the great truths are known, every minor truth, every small item of knowledge, every detail in the whole range of experience and of nature, finds its place immediately the moment it is presented to consciousness. And only to a mind in possession of general truths do such details possess any meaning or any value.⁶²

The guiding principle in accomplishing education should be that the most general knowledge is the most practical. Such generalities, of which we should have knowledge, are the laws of nature. They are related to each other as cause and effect. To understand these laws, we must study them in this relation. Thus, in order to understand psychology, we must know the fundamental laws of life—biology; but biology shows the living being to be a chemical organism; chemistry is based on physics, and physics on cosmic astronomy; the natural order of studying these subjects should, then, be astronomy, physics, chemistry, biology, psychology. In acquiring knowledge of each principle in this causal order the learner is, at every stage, on sure ground; his mental atmosphere is clear. If the body of his knowledge may be likened to a tall structure, he can be sure, when at the top, of every element beneath him. Any other order of learning must make for confusion and the process be tedious and stumbling, while the natural order may be pursued with pleasure and exhilaration.

It well may be asked if this theory of synthetic education may be applied in the training of a fighting force. And, if it may, to what extent? Should only the officers be so trained? Or should we include every man in the organization? How does this scheme harmonize with the idea of specialization?

To answer the last question first: Specialization would be promoted, for only after mastering the fundamental laws can one know for what specialty he is best fitted; then, again, when he begins work in his specialty he is on sure ground, emancipated from studies outside of his specialty; on the other hand, when education is not in natural order there can be no assurance that the beginning of specialization is properly timed as to qualifications or properly placed as to kind.

This disposes of the other questions proposed, for the duties of officers and enlisted men are merely specializations; these two great divisions of labor in military organization are represented by the characteristics *command* and *obedience*, which are, respectively, *direction* and *execution*. The two are on common ground as to fundamental laws, since the officer must know what command is applicable to a certain situation, and be assured, from his knowledge, that he is not giving an

order impossible of execution; and the enlisted man must understand such laws, in order to know *how* to execute the command, for the officer can not pretend to tell his subordinate in full detail how to do every act implied in the execution; for the officer to follow out the details would be contrary to the whole theory of command and obedience or direction and execution. The trend of progress in modern military organization is toward decentralization in execution—the development of the initiative in subordinates. The commander of many units issues his order in general terms, specifying only so far as is necessary to secure united action; the commander of each unit grasps his task out of the grand order and, in turn, issues an order for the employment of his unit without depriving his subordinate heads of departments of the power of initiative; the petty officer receives an order from his commissioned officer and parcels out the work to the lowest grades; at every stage of the succession there must rest, to a greater or lesser extent, the power to decide as to methods of execution; therefore, even the lowest subordinate must understand fundamental laws, some on one occasion, others on another occasion. His knowledge must be as accurate, within its scope, as that of the commissioned officer or of the highest commander. The difference between the knowledge of the lowest and of the highest is in the degree of specialization. At one time the general was learning the private's duties; little by little his specializations have carried him to higher command. The gradation of specialization is the very essence of military organization, and in order that it may function true to the theory of such organization there must be a common foundation of understanding of fundamentals; otherwise the officer can not merely direct, but must also execute, with the result that his time will be dissipated in minor executions when it should be devoted to larger functions.

The most conspicuous failures in civil societies, as well as in the military and naval forces of all nations, are found in penal institutions. Anyone who has observed prisoners can not but be impressed with either, (1) the stupidity of the majority as to their general surroundings, or (2) the remarkable dullness of a few as to some particular aspect or aspects of their

surroundings, while acute as to other matters. Those of the first class are thoroughly ignorant, while those of the other class are abnormally (*i.e.*, unnaturally) educated, usually manifesting a development along some one line much in advance of their understanding of most matters. Every prison administration is embarrassed by demands for literature on advanced studies, the requests usually coming from prisoners who rebel against school attendance and whose records in elementary studies are unsatisfactory. Such unnatural education causes an overbalance that upsets the subject's sense of proportion and results in erratic conduct and criminality. The second class of criminals are by far the more nearly hopeless of reformation, for they can not be restored to infantile ignorance or to a status from which they can be normally developed. In the other class there is much less of the overbalance requiring neutralization for a good start.

One prison official, after considerable experience with prisoners, arrived at a similar analysis of the personnel under his care, and expressed his opinion, in substance, as follows: Men become prisoners because they do not appreciate the beauty and value of normal living; they know too few of the facts of existence to properly estimate it. The remedy, he concluded, lies in supplying the deficiency through a course of lectures explaining the phenomena of Nature in their natural order.

A few years ago the proposition of expecting a lot of prisoners to listen to lectures on the natural laws would have excited the risibility and jests of most practical citizens—who would have preferred to hang the prisoners; but today practical criminologists have no contempt for such ideas, and correctional institutions are doing things along these lines with excellent results.

No doubt, however, some may find amusement in the picture of a hardened old cavalryman or a seasoned salt listening, with any profit, to lectures of this kind. Such amusement would be justified. The natural order of education would be opposed, on principle, to the idea of beginning the education at the end of life; no such undertaking can be contemplated. The natural order must, of course, begin with the early peri-

ods of life. The whole thesis is, that the natural order can not be reversed profitably. Furthermore, it is not denied that there may be much value in knowledge that comes out of experience independently of theoretical instruction. But experience is a slow teacher and the method is costly. It takes experience a life-time to do for a man what systematic instruction will accomplish during the formative period. The instructed youth will, then, be as efficient at the beginning of his practical career as will the man with mere experience at the end of his life.

Admitting that the stated fundamental education for enlisted men is essential to their highest efficiency in complicated modern war, it may be asked how such education is to be attained. It is said that the officers of every army and navy are fully occupied in the routine of technics and that they have no time for "teaching school" in the elements. This difficulty is answered by the alternatives of either increasing the officer personnel so that there will be sufficient numbers to attend to all educational requirements, or by rearranging the course of common school education so that it will follow a natural order and deliver to the army and navy men properly qualified to begin technical training. Of course the latter alternative implies coöperation between the direction of military policy and the educationalists. There is no doubt but that, in time, the educationalists will coöperate with all classes of users of education, industrial as well as national, obtaining from the users specifications of what is demanded and shaping instruction to meet that demand. Such achievement in national efficiency may not be realized for a long time, and, until then, the military must prepare its own personnel, supplying everything that the public schools have omitted and that is essential.

This implies that Army and Navy officers must be efficient teachers. There is an extremely small part of their working hours that is not employed in that capacity. The fighting machine is in battle a short time, indeed, compared with the time spent in preparation—*i.e.*, in training or education. The directors of this preparation, the teachers, should be familiar with the best methods of imparting instruction; *i.e.*, should be familiar with the science of pedagogy, which should be an

item in military curriculums. Teaching thus reduced to an art would make the officer's task both easier for himself and more effective for the instructed.

Assuming that the personnel of the national fighting forces is composed of men, physically and mentally normal, who have an elementary education, including a knowledge of the fundamental laws of Nature, a scheme of technical education might be outlined as follows:

I. Army, Primary.

(a) Army cadets:

- (1) Such knowledge of foreign languages as may be deemed necessary for the acquirement of military science through technical literature.
- (2) Sanitation and first aid to the injured.
- (3) Administration, including methods of doing business with staff departments.
- (4) Military Law and procedure.
- (5) Regulations and customs of the Army.
- (6) International Law applicable to armies.
- (7) Mechanical and free-hand drawing and military map-making.
- (8) Photography.
- (9) Infantry, cavalry, and artillery drills, to teach the capacities of these arms and to inculcate discipline, as well as for the purpose of affording the cadet an opportunity of discovering for which arm he is best fitted.
- (10) Pedagogy.
- (11) Psychology.
- (12) Mathematics: descriptive geometry and calculus.

(b) Enlisted men:

- (1) Sanitation and first aid to the injured.
- (2) Administration.
- (3) Military Law, to the extent of instructing the man as to his legal rights thereunder and as to his legal status in the military.
- (4) Regulations and customs of the Army.
- (5) International Law applicable to armies, in so far

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as it regulates the individual soldier's conduct in relation to enemy combatants and non-combatants.

II. Army, Secondary.

(a) *Officers:*

- (1) Practical and theoretical instruction in the employment of the arm to which the officer is permanently attached.
- (2) Electricity for military use.
- (3) Military history and policy.

(b) *Enlisted men:* practical instruction in the employment of the arm to which the soldier is permanently attached.

III. Army, Tertiary.

(a) *Officers:*

- (1) Theoretical instruction in the employment of armies in war.
- (2) Duties of the General Staff.
- (3) Duties of the Logistical Staff.

(b) *Enlisted men:* instruction in the minor duties of staff work, such as clerical work, map-making, order-writing, photography, etc.

IV. Navy, Primary.

(a) *Navy cadets:*

- (1) Such knowledge of foreign languages as may be deemed necessary for the acquirement of naval science through technical literature.
- (2) Sanitation and first aid to the injured.
- (3) Administration, including methods of doing business with staff departments.
- (4) Naval-Military Law and procedure.
- (5) Regulations and customs of the Navy.
- (6) International Law applicable to the Sea.
- (7) Mechanical and free-hand drawing and map-making.
- (8) Photography.

- (9) Nautical exercises, such as swimming, rowing, and sailing.
- (10) Infantry drills, to inculcate discipline.
- (b) *Enlisted men:*
 - (1) Sanitation and first aid to the injured.
 - (2) Administration.
 - (3) Naval-Military Law, to the extent of instructing the man as to his legal rights thereunder and as to his legal status in the Navy.
 - (4) Regulations and customs of the Navy.
 - (5) International Law applicable to the sea and sea forces, so far as it relates to the individual sailor's conduct in relation to enemy combatants and non-combatants.

V. Navy, Secondary.

- (a) *Officers:*
 - (1) Instruction in the details of the employment of the branch to which the officer is permanently attached.
 - (2) Naval history and policy.
- (b) *Enlisted men:* practical instruction in the employment of the branch to which the man is permanently attached.

VI. Navy, Tertiary.

- (a) *Officers:*
 - (1) Theoretical instruction in the employment of fleets in war.
 - (2) Duties of the Navy General Staff.
 - (3) Duties of the Navy Logistical Staff.
- (b) *Enlisted men:* instruction in the minor duties of staff work, such as clerical work, map-making, photography, order-writing, etc.

Vacancies in the general staff corps of the Army and Navy should be filled entirely by graduates of their respective staff colleges, the detail carrying with it a certain amount of additional promotion. Attendance at the staff college should

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be determined by selection, based upon merit and fitness. The commanding officers of certain units should have authority to nominate one or more officers annually to take a competitive examination in technical subjects. Vacancies at the staff college should be filled by the best survivals of the competition. The fact that a staff detail promised extra promotion would be an incentive to officers to try for the staff college, and would spur them to their best efforts from the moment they decided upon a military or naval career.

ENDNOTES

¹Carl von Clausewitz, *On War*, Vol. I, Bk. II, pp. 85–86.

²*Ibid.*, p. 86.

³Lieutenant Colonel T. A. Dodge, US Army, *Great Captains—Napoleon*, Vol. III, p. 425.

⁴*Ibid.*, p. 480.

⁵*Ibid.*, p. 501.

⁶*Ibid.*, p. 446.

⁷*Ibid.*, p. 466.

⁸*Ibid.*, p. 508.

⁹*Ibid.*, p. 510.

¹⁰*Ibid.*, p. 443.

¹¹*Ibid.*, p. 479.

¹²*Ibid.*, p. 443.

¹³*Ibid.*, p. 465.

¹⁴*Ibid.*, p. 428.

¹⁵*Ibid.*, p. 429.

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