



# The Other End of the Spear: The Tooth- to-Tail Ratio (T3R) in Modern Military Operations

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John J. McGrath

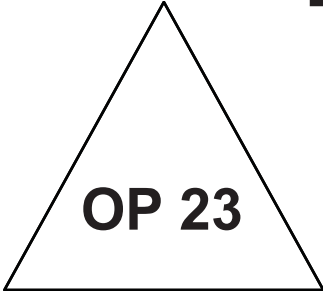


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## Foreword

John McGrath's *The Other End of the Spear* is a timely historical analysis and an important follow-on work to his earlier analysis of troop density trends in CSI Occasional Paper 16, *Boots on the Ground*. As that work showed, this paper also shows the timeless value of history and its relevance to current events. *Boots on the Ground* analyzed the ratio between the numbers of troops employed in military operations relative to the population in a number of irregular conflicts. This study analyzes the composition of such forces to answer the question: what have been the historical trends in the ratio of deployed forces directly engaged in fighting, relative to those engaged in noncombat functions? This ratio is commonly, if inaccurately, called the "tooth-to-tail ratio."

McGrath's study finds that the tooth-to-tail ratio, among types of deployed US forces, has steadily declined since World War II, just as the nature of warfare itself has changed. At the same time, the percentage of deployed forces devoted to logistics functions and to base and life support functions have both increased, especially with the advent of the large-scale of use of civilian contractors.

A segment of American military historians and policy makers has long been enamored with a genre of military history that seeks to quantify war, to reduce it to known variables, and to posit solutions to future military conflicts based on mathematical formulae. The practice of war contains a strong element of science, but in the end, the practice of war is an art. This study cannot be used to guarantee victory simply by composing a force of the proportional figures presented in the conclusion. However, it does provide a good baseline, based on historical precedent, for future planning.

This work, coupled with *Boots on the Ground*, provides a unique analysis of the size and composition of military forces as found in historical patterns. Policy makers, commanders, and staff officers should use these two studies as a basis from which to begin their analysis of the particular campaign at hand. They will then need to apply their understanding of the objectives, the nature of the conflict, and local and regional culture and conditions to the analysis to create a winning military plan. It is our belief at CSI that this kind of historical analysis will inform and educate today's military and civilian leaders as they carry out our nation's most important policies. *CSI—The Past is Prologue!*

Timothy R. Reese  
Colonel, Armor  
Director, Combat Studies Institute



## Acknowledgments

This work marks my second foray into the field of quantitative analysis of military history. As such, it serves as a companion volume to my previous such work, *Boots on the Ground: Troop Density in Contingency Operations*. The latter work studied the question of “how many troops do we need?” This volume analyzes the question “what kind of troops do we need?” While the tooth-to-tail ratio is a topic often discussed in military circles, found far less frequently are detailed analyses of the proportions of various elements within military force. I hope that this work fills that void. Despite the quantitative nature of this work, the mathematics used is of the elementary level, familiar even to most historians like myself.

I must acknowledge the pioneer of quantitative analysis of military history, the late Colonel Trevor Dupuy, as well as recent contributors to this field including Dr. Robert Rush of the US Army Center of Military History and Niklas Zetterling of the Swedish National Defense College.

Kendall Gott of the Combat Studies Institute’s Research and Publications Team provided excellent support and guidance on this project as did colleagues, superiors and associates within CSI. Contributing greatly to the success of this project has been its editor, Jennifer Lindsey, whose skill at the intricacies of composition and layout are evident in every line and graphic of this work. Publication was also greatly assisted by the efforts of Betty Weigand, Robin Kern and Michael Brooks.

The soldiers of the United States Army and the members of the other armed services require specific acknowledgment. It is my hope, that in some small way, this study will augment their superb efforts.

John J. McGrath  
Combat Studies Institute  
Fort Leavenworth, Kansas





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## Key to Symbols Used in This Work
























### Unit Size Symbols

Platoon	***
Company	
Battalion	
Regiment/Group	
Brigade	XXXX
Division	XXXXX
Logistical Command	XXXXX
Corps	XXXXXX
Army Group/Theater	XXXXXX
Theater	XXXXXXXX

### Modular Unit Type Symbols

	Stryker
	Stryker Aulbank
	Modular Combined Arms
	Modular Cavalry
	Modular FA
	Recon, Surveillance and Target Acquisition

### Unit Type Symbols

	Headquarters		Miscellaneous (type usually indicated)
	Infantry		Armored Engineer
	Machine Gun		Self Propelled FA
	Mechanized Infantry		Airborne
	Armor/Tank		Airmobile/ Air Assault
	Field Artillery		Reconnaissance
	Armored Cavalry		Attack Helicopter
	Engineer		Multiple Rocket Launcher System
	Signal		Supply and Transportation
	Anti-aircraft Artillery		Maintenance
	Air Defense		Medical
	Aviation		



# Chapter 1

## Introduction

This work is a companion to a previous volume entitled *Boots on the Ground: Troop Density in Contingency Operations*. *Boots on the Ground* analyzed historical precedent to develop a planning factor or average figure for the number of troops employed in successful contingency operations. The emphasis in that work was on the total number of troops needed, not the specific type of troops within that total. The historical examples represented various counterinsurgency, occupation and peacekeeping operations since 1900. It also looked at the organization and size of contemporary police forces, whose operations generally resemble counterinsurgency and peacekeeping activities.

*Boots on the Ground* concluded that a force of 13.26 troops per one thousand of local population was the minimum size needed based on historical precedent, with a minimum of 4.1 (roughly one-third of the force) devoted to police (i.e., combat in a counterinsurgency environment) duties. The rest of the force (9.16) could also conduct police duties or any other types of tasks that the force needed (Figure 1).

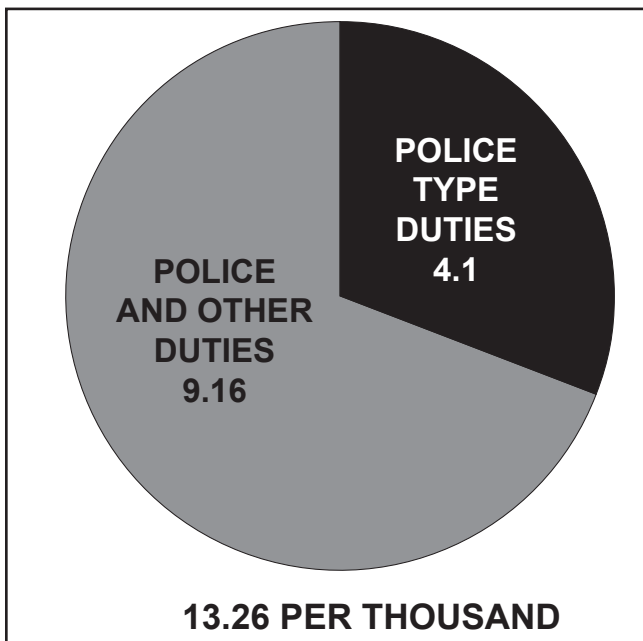


Figure 1. Historical Troop Density Ratio.

These conclusions were, at best, only a partial solution. They did not really address (aside from the minimum number of police troops) the composition of such a force, be it the historically based correct size. Theoretically, the composition of such an adequately sized force could consist of an inadequate proportion of elements to complete its assigned missions. To complete the picture, the current work looks at the composition of forces in historical campaigns or deployments, rather than their total numbers. It analyzes the composition of forces from historical US Army expeditionary operations using a quantitative methodology similar to that found in *Boots on the Ground*. This book looks at several troop categories based on primary function and analyzes the ratio between these categories to develop a general historical ratio.<sup>1</sup>

This ratio is called the Tooth-to-Tail Ratio (T3R). By definition, the T3R refers to the number of troops in a military organization employed in combat duties versus the number functioning in noncombat roles. Through historical analysis, this volume will develop trends concerning the T3R in modern military forces. The book presumes that historical trends provide insight into the typical or most desirable T3R and that conclusions based on historical trends can be drawn.

## **Methodology**

In certain respects, the methodology in this work differs from that in *Boots on the Ground*. While *Boots* used historical averages of force sizes from contingency operations and police forces, this work analyzes several expeditionary operations and deployments since World War I, rather than just contingency operations. The reason for this shift is the author's belief that in any operation requiring the employment of an armed force (i.e., combat elements), while its size may differ based on the mission type, the internal T3R of such forces remains similar.

Additionally, while this work will also develop historical averages because of the ranges of its factors, this volume also focuses on historical trends. In most cases, US forces were assembled for specific expeditionary operations or deployments. Force planners in the past designed the mix between combat and noncombat elements generally based on prior experience or around the number of combat forces.

The methodology in this work depends on documentary sources, primarily those of force orders of battle, official histories and tables of organization. Undoubtedly unnoticed in documentary sources is the common practice found in modern armies called taking "out of hide." Out of hide is the tasking of individuals and groups from combat units to perform non-



combat functions, while still being retained in the organizational structure as combat troops. In such instances, the tooth-to-tail ratio may actually be higher (i.e., the tail being larger) than is apparent from the types and numbers deployed. Where possible, anecdotal evidence has been examined to determine whether out of hide issues were present in a particular historical deployment.

The following chapter examined the evolution and proportional distribution of the combat and noncombat elements in US Army expeditionary operations. Specific case studies include World War I; the European Theater of World War II; Vietnam; Cold War Germany 1974; the Division 86 organizational change; DESERT STORM 1990; the modular Army organizational structure; and the deployment to Iraq, using January 2005 as the snapshot. Except in the case of purely organizational changes, the examination of each historical example looked at two levels: theater and division. In this work, the T3R was investigated for each level, using orders of battle and troop lists as source documents. Specific instances in the historical record where the tooth-to-tail ratio became an issue, such as in the 1944 European Theater infantry shortage, were analyzed as well.

Each historical scenario was examined from two angles. The first was the operational approach (operational T3R) and the second was by individual unit or category (functional T3R). In the former, the T3R was looked at Army wide. Army force planners organize the force into basic operational units to fight wars or conduct operations. For most of the period covered, this unit was the division. Under the US Army's modular concept developed early in the 21st century, the brigade replaced the division in this role. In either case, a comparison of the Army's basic operational units and their proportion of the Army and theater forces provided a general appraisal of what portion of the army is in its basic combat elements. This work looked at the operational unit proportion for each scenario presented.

The operational unit approach, heretofore referred to as the operational T3R, is less exact than the second, unit or category approach. In this approach, which will be referred to as functional T3R, Army units of battalion and above were divided internally, while company-size units were classified as a whole, into specific categories based on their primary function. After a unit-by-unit compilation, the proportion of the categories to each other was determined for each scenario to establish the scenario's functional T3R. The next section of this chapter details the categories.

Following this look at the historical case studies, the scenarios are examined as a whole for historical commonalities and trends. From this analysis were drawn general historical trends and conclusions.

## **Functional Tooth-to-Tail Categories**

Usually T3R refers to the contrast between fighters (combat troops) and support or logistical troops. However, in modern expeditionary warfare, the variety of troops who serve in units or elements whose direct primary mission is not to fight the enemy has grown to include such personnel as those operating life support functions at bases, reporting events for service publications, and those serving in headquarters elements at levels removed from the likelihood of direct combat action. Therefore, in terms of functional T3R, this work looks at four specific categories of troops: combat, headquarters or administrative, logistical, and life support. These categories are summarized in the table in appendix A.

### **Combat Elements**

The category of combat pertains to elements whose primary mission is to fight the enemy. While this includes the traditional combat arms of infantry, armor, cavalry, field and air defense artillery, it may also include many other elements organized or dragooned into a primary role of fighting the enemy. Combat support units, such as combat engineers, assault helicopter units, antitank units and reconnaissance elements in noncavalry combat units are also inherently defined as combat elements (in comparison to the noncombat elements discussed below).

In 1974, the US Congress codified what it considered to be the combat component of the Army. This classification included battalion and smaller units of infantry, armor, field artillery, air defense artillery, combat engineers, Special Forces and aviation.<sup>2</sup> However, since there are sizable headquarters and logistical contingents even in combat battalions, this work makes a finer distinction. For example, an infantry battalion with four rifle companies has more combat power than one with only three rifle companies. But such a battalion has the same support and headquarters elements. Accordingly, battalion-level support and headquarters elements are also factored into the analysis. Additionally, there are some elements which may or may not be considered to be combat elements based on the overall situation and their employment. Such units are considered as part of the combat category only if their primary role was the conduct of combat operations. For example, in a counterinsurgency operation where there is not a rear area, military police (MP) units operating as convoy security are conducting combat operations. However, MP units guarding a prison that houses US prisoners awaiting court-martial are not.

Consequently, this work includes as combat components company-size and above, units of infantry, armor, cavalry, field artillery, air defense

artillery, attack and assault aviation, and combat engineers. Also included in this category are special operations forces (SOF) units of any size (which possess only small headquarters and logistics elements), and advisors supporting the combat units of foreign armies, as well as military police and other units providing convoy protection (not self-protection, an inherent function of all deployed Army units) in forward areas. While unit headquarters and headquarters companies (HHC) primarily consist of noncombat headquarters elements, combat elements found in such units, for example a scout platoon in an armored battalion HHC, for the sake of this work, are categorized as combat elements.

### **Noncombat Elements**

Noncombat elements are the “tail” in the tooth-to-tail ratio. Traditionally, the tail has been considered to be the logistical element, such as supply trains and maintenance workshops supporting a force. But in modern expeditionary armies, the noncombat component is more complicated. Supporting troops may be divided into those elements directly supporting a combat organization, here referred to by category as logistical elements, and the support troops who run the base camps and provide other support (such as post newspapers, base infrastructure, theater infrastructure, base construction) that is separate from the conduct of operational missions. In this work, troops and units involved in such activities are called life support elements.

All Army units, whether combat, logistical or life support in function, have headquarters and administrative elements to direct their operations. In 1974, Congress recognized such units, usually found in the form of headquarters companies or detachments, to be noncombat elements, at levels above battalion. Although defined down to a lower level than that of Congress, this is the third category of noncombat elements.<sup>3</sup>

### **Logistical Elements**

The category of logistical elements consists of military units whose primary mission is to provide support to combat units and to other logistical units providing support to combat units. Falling into this category are most Army combat service support units: quartermaster, supply, service, maintenance, ordnance, ammunition support, adjutant general, transportation, medical, and small finance detachments. Excluded from this category are the headquarters elements of such units whose primary mission is to control such units. Also included in this category are the internal logistical elements in both combat and logistical battalions. Medical hospital units are specially organized to establish and run hospitals.

Accordingly, while such units have headquarters elements, these elements are an integral part of the functioning of the hospital and are considered as logistical elements rather than headquarters elements. In this work, aviation units with medical evacuation or heavy-lift missions are also considered to be part of the logistical category. Despite their prominent role in counterinsurgency operations, civil affairs units, because of the way they are organized, equipped and deployed, are considered also to fall within this category.

The type and quantity of equipment found in the combat elements being supported has a direct impact on the size of logistical forces. For example, units outfitted with armored vehicles need larger contingents of maintenance support and ammunition-carrying vehicles. This study looks at trends in the proportion of logistical forces based on the development of large motorized and mechanized forces.

## **Life Support Elements**

Life support elements are those that provide infrastructure support that is generally separate from the support provided to combat units. This category includes the establishment of semipermanent camps and bases as well as morale, welfare and recreation (MWR) facilities. Life support elements, designated as a separate noncombat category, is a particular characteristic of the US Army. In their large expeditionary operations in Europe in World War II, in Vietnam in the 1960s and Iraq in the present day, US forces established huge infrastructure organizations in the respective theaters. Where troop deployments were executed as part of a rotational scheme, this infrastructure remained in place as the troops rotated and were replaced.<sup>4</sup>

In most cases, life support functions are not operationally essential to the completion of the missions of the combat units. Types of units falling into this category include: base command and support units, signal infrastructure units, engineer units with primary missions of infrastructure construction and support, finance offices, judge advocate general offices, labor service support units, base public information units, and contracting units. Medical units running facilities such as base dispensaries, which function separately from the operational medical support system, are also included in this category.

Units and elements devoted primarily to life support functions are sometimes, particularly in earlier periods, difficult to discern from logistical elements in documentary records and troop lists. In the historical survey in the following chapter where this occurs, the categories of logistical and life support are merged into a single category called logistical.

## **Headquarters and Administrative Elements**

Headquarters and administrative elements form a third component somewhere in the middle between combat troops and support troops. While there may be some debate over whether headquarters elements of combat units, particularly those at lower levels, are combat troops or noncombat troops, this work considers the headquarters elements of all units higher than the company echelon as a separate category of noncombat troops. This category includes not just headquarters elements of combat units, but also those of headquarters units themselves and of logistical and life support units. This element is composed of troops whose primary functions are devoted to the command and control of other troops or the support of the command and control of other troops.

This category also contains administrative troops who work as part of a unit headquarters or whose primary mission is to help the command disseminate information, escort visitors or conduct ceremonies. Examples of such administrative troops are command information units, bands, and administrative companies, such as those found in modern US Army separate brigades, whose missions are to augment the staff strength of their higher headquarters.

The development of large headquarters units is a relatively recent development in the evolution of armies. Prior to World War I, American military organizations traditionally had small headquarters. While the Continental Army rejected the British organizational concept that field grade officers in regiments were also company commanders, basically shorting three companies of their full complement of officers, American regimental headquarters organization was still miniscule by later standards. In the 1776 infantry regiment, the headquarters consisted of 13 officers and specialists out of a force of 733, less than 2 percent of the regiment's strength. This proportion remained standard throughout the 18th and 19th centuries.<sup>5</sup>

Above the regimental level, higher units, such as brigades and divisions, were temporary wartime expedients which had tiny staffs usually decreed by acts of Congress. In 1861, at the beginning of the Civil War, Congress decreed that a divisional headquarters would have a staff of four officers and a brigade headquarters of six. When the corps echelon of command was authorized in 1862, the headquarters element consisted of seven officers. Any additional staffing was taken out of subordinate units or from the small personal staffs that each general officer was authorized.<sup>6</sup>

In addition to operational headquarters, the US Army fielded an administrative structure of territorial-based headquarters called military

divisions (usually commanded by a major general) and departments (subordinate to military divisions and usually commanded by a brigadier general). During wartime, department commanders usually also commanded the operational forces within their department and led them in the field. In peacetime, where there was no operational level of command above the regiment, military division and departmental commanders were responsible for the operational employment and activities of all Army units stationed within the geographical limits of their commands. Division and departmental commanders were taken from the small corps of general officers. If there was no available general officer, a senior colonel was detailed from his regiment to fill the post.

From World War I to the present, with the US Army involved in extensive expeditionary operations across the globe, its headquarters elements have evolved and grown. An evolution of communications technology has paralleled this growth, leading ultimately to the present digital age and modular (at the brigade level) organization of the Army. With enhanced communications, however, there has not been a concurrent decrease in the size of headquarters, but the complete opposite. This development is discussed later in this work.

This chapter established terms and methodology to be used in looking at the operational and functional T3R. The next chapter applies this methodology to a sampling of major US Army expeditionary operations and deployments since 1917.

## Notes

1. *Boots on the Ground* looked at contingency operations. Assuming that tooth-to-tail ratios are applicable to all expeditionary operations, the analysis in this work will not be restricted to just contingency operations.

2. John B. Wilson, *Maneuver and Firepower: The Evolution of Divisions and Separate Brigades*, Army Lineage Series (Washington, DC: US Army Center of Military History, 1998), 366, 376 note 31.

3. Ibid.

4. As the Operation IRAQI FREEDOM deployment extended into a second and third troop rotation, many casual observers (without historical backgrounds) commented on the American building of permanent bases in Iraq. For examples, see Erik Leaver, "Building Permanent US Bases in Iraq Sends Wrong Signal," *Seattle Post-Intelligencer*, 15 May 2005 [article on-line] available at [http://seattlepi.nwsource.com/opinion/224055\\_iraqbases.html](http://seattlepi.nwsource.com/opinion/224055_iraqbases.html); Internet; accessed on 21 March 2007; Doug Giebel, "Permanent Bases, Leave Iraq? Hell No, We Won't Go!" *Counterpunch*, 6 January 2004 [article on-line] available at <http://www.counterpunch.org/giebel01062004.html>; Internet; accessed on 21 March 2007. These observers failed to realize that since World War II, the Americans have established such elaborate infrastructure wherever US forces were deployed for an extended period of time and that while the facilities often looked like a permanent US presence, this was not the intent. By 2007, most of the permanent US facilities had been handed over to the Iraqis.

5. Robert Wright, *The Continental Army* (Washington, DC: US Army Center of Military History, 1983), 47.

6. *Revised United States Army Regulations of 1861* (Washington, DC: Government Printing Office, 1863), 506, 539; Robert M. Epstein, "The Creation and Evolution of the Army Corps in the American Civil War," *The Journal of Military History* 55 (January 1999), 34.





## Chapter 2

### Historical Experience

#### World War I

#### Theater Level

When the United States entered World War I, its Army had had only limited experience with expeditionary warfare and no experience in the type of warfare being fought in France. Accordingly, the types of support units needed in France were created from scratch. American planners made force development estimates based on the general principles found in the Army's field service regulations and from looking at the example of the composition of the French and British forces (Figure 2). The early T3R projection was that support elements would be 20 percent (or a ratio of 4:1 combat versus support) of the expeditionary force. But, as the organization developed, this percentage estimate was increased in September 1917 to 33 percent (or a ratio of 2:1 combat versus support).<sup>1</sup>

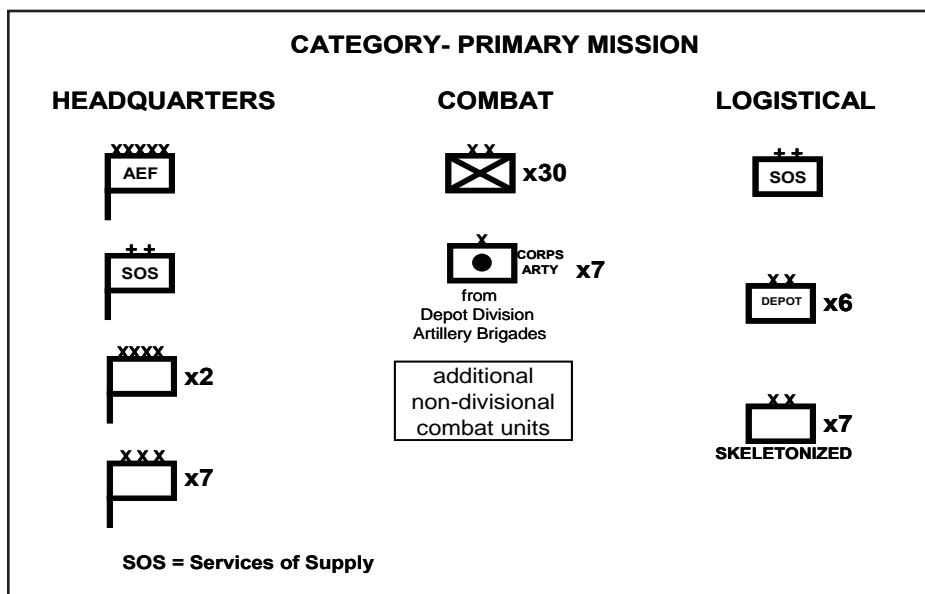


Figure 2. AEF Field Organization.

A look at the AEF as fielded in November 1918 (Figure 3) shows that the logistical structure ended up being close to the September 1917 estimate, with 32 percent of the force devoted to what was then called “line of communications” operations. The US troops who deployed to

France in 1917 and 1918 flowed into a mature, fully developed theater. It is therefore difficult to separate life support activities from logistical ones. Accordingly, the two are joined in the analysis of the proportional ratio in the American Expeditionary Force (AEF).<sup>2</sup>

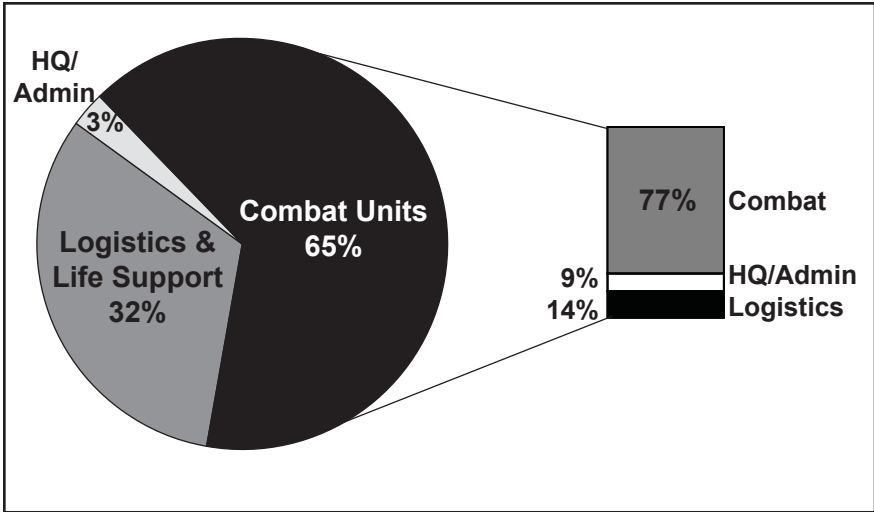


Figure 3. AEF Breakdown, November 1918.<sup>3</sup>

Headquarters at all levels of the AEF were austere. For example, in an organization of 1,866,184, only 31,813, or 1.7 percent, were found in headquarters units. Together with troops supporting headquarters operations, the headquarters category comprised only 3 percent of the force. The AEF itself maintained a headquarters of 4,271, less than 1 percent of the total AEF. Divisions with a size of 28,105 in November 1918, only had a headquarters element of 304 (1.1 percent). Infantry brigade headquarters controlled an organization with a strength of 8,072 with only 25 personnel (less than 1 percent). Infantry regimental headquarters were staffed with 349 personnel for a command of 3,770 (9 percent), of which 209 (or 5 percent) were staff personnel, while infantry battalion headquarters had a staff of 3 to lead a unit of 1,027 (less than 1 percent).<sup>4</sup>

At the theater level, the functional T3R was 1.8 to 1 in favor of combat elements. Combat units (i.e., divisions) were 65 percent of the AEF force breakdown in November 1918. These units also had their own logistical and headquarters elements. Figure 4 shows the theater level adjusted for the noncombat elements found in the divisions. Combat elements still

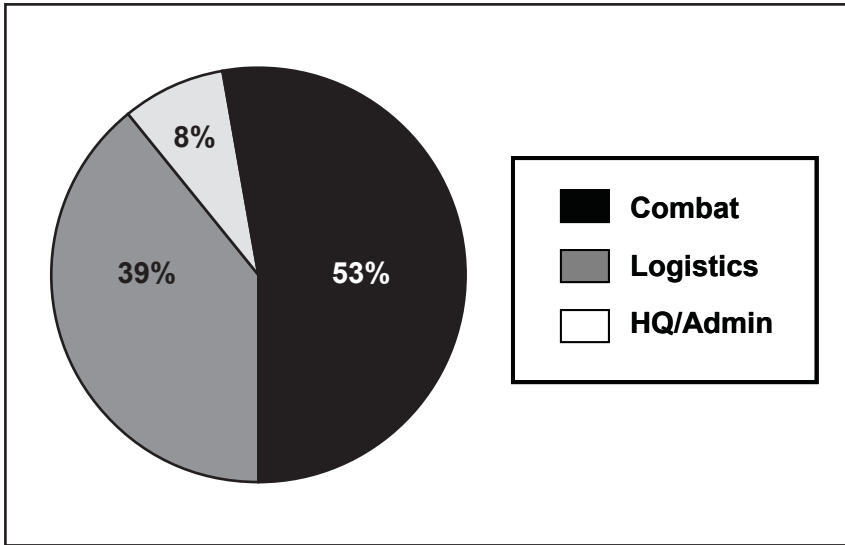


Figure 4. Revised AEF Breakdown, November 1918.<sup>5</sup>

made up more than half (53 percent) of the AEF's force structure, with a functional T3R of 1.1 to 1. Logistical elements formed slightly over a third of the revised structure (39 percent), while headquarters elements formed less than 1 in 10 (8 percent) of the deployed soldiers.<sup>6</sup>

### The AEF Division

The AEF division (Figure 5) had an even higher functional T3R than the AEF as a whole. As shown in Figure 6, 78 percent of divisional assets were devoted to combat operations (a ratio of 3.5 to 1 in favor of combat troops). Divisional headquarters elements roughly matched the proportion found at the theater level (9 percent versus 8 percent), but logistical elements within the division were a lot more austere (14 percent) to similar elements at the theater level (39 percent).<sup>7</sup>

Despite this high proportion of combat troops in the division, there was soon a shortage of infantry troops, forcing the AEF command to turn some deployed divisions into depot organizations to process replacements and to skeletonize others. Of the 42 divisions operational in France in 1917 and 1918, only 30 actually fought in the front lines, with 6 being converted to depot divisions and an additional 5 broken up to provide replacements for the 30 fighting divisions. Even the logistical forces eventually suffered from shortages. In November 1918, the AEF broke up a newly arrived

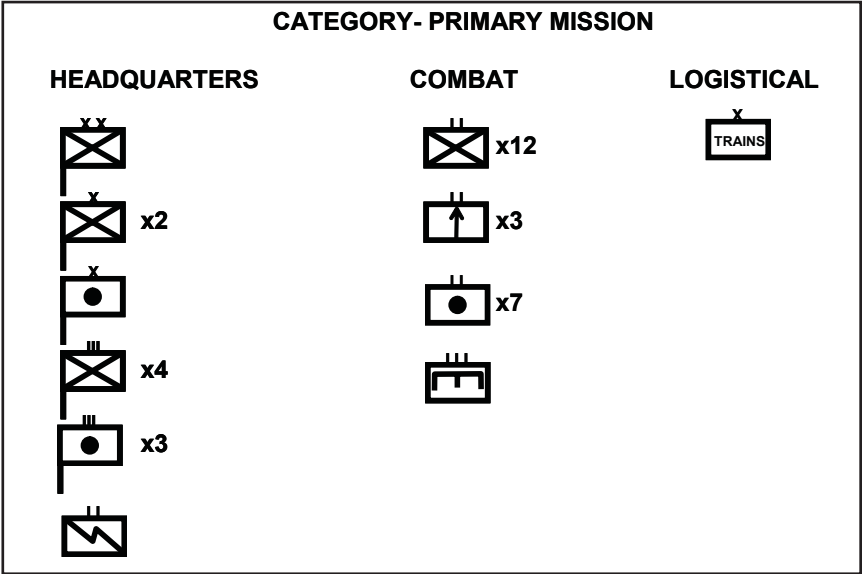


Figure 5. AEF Division Organization.

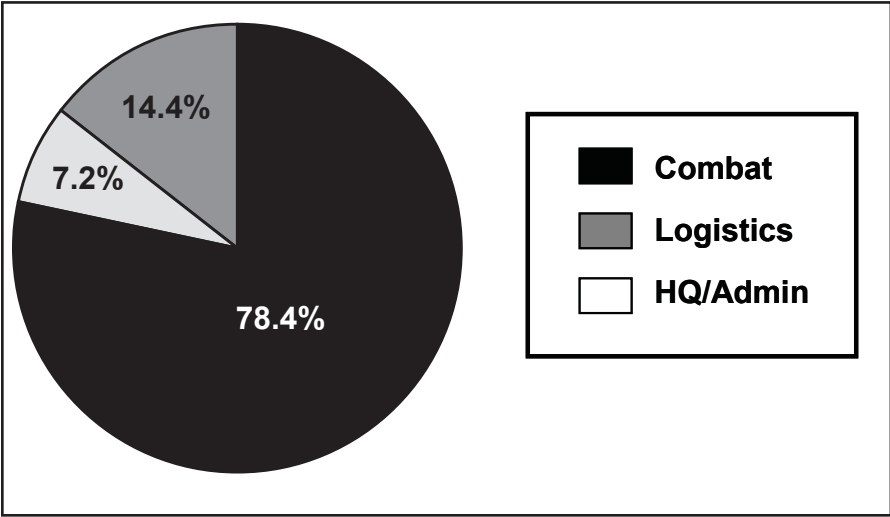


Figure 6. The AEF Infantry Division, 1918.<sup>8</sup>

combat division, using its personnel as reinforcements for the Services of Supply logistical command.<sup>9</sup>

Even though the AEF division was austere in terms of headquarters elements, it provides a good example of how command and control headquarters can be interjected into force structure when it is unneeded operationally. When the AEF was organized, planners wanted to place a machine gun company within every infantry battalion. However, Congress, in the National Defense Act of 1916, had restricted the infantry regiment to a specific size. If the Army had assigned three machine gun companies to an infantry regiment, the regiment would then lose two of its rifle companies. To bypass this restriction, force developers arrayed machine gun companies at three echelons: regiment, brigade and division. The infantry regiment received the one machine gun company it could keep within the restrictions. The brigade had a three-company battalion. Accordingly, between the regiment and brigade, there were available machine gun companies for five of the six infantry battalions in the brigade. To provide for this remaining battalion, the division had a four-company machine gun battalion, which provided two of its companies to fill out the machine gun company requirements for the two brigades in the division. In 1918, these two companies were assigned directly to the brigade machine gun battalion, raising it to four companies. Although the machine gun companies were almost always used in direct support of infantry battalions, making the machine gun battalion headquarters unnecessary, the AEF still maintained the headquarters.<sup>10</sup>

As mentioned in the introduction, one method to look at T3R trends, first used in World War II, but which can be retroactively applied to World War I, is to determine what percentage of the Army formed the portion of it organized specifically to execute combat operations. In this work, this is the operational T3R. The Army employed specific units, divisions or brigades, as its basic fighting elements. These are called the operational units. The proportion of the Army organized in such units provides an indicator of what percentage of Army forces are in the fighting echelon. In this work, this portion is called the operational slice. Its size is determined by dividing the total strength of the Army by the number of operational units in the Army's force structure. This number is then compared to the operational unit's authorized strength. The result is the proportion of the Army contained in the operational units. While the nondivisional elements can include headquarters and logistical elements, as well as nondivisional combat elements, they provide a useful guideline in determining trends in the relative number of troops in the force in comparison to those actually

in the operational combat units (divisions). Table 1 shows that divisions formed 50 percent of the whole Army and 45 percent of the AEF.

Table 1. AEF Operational Slice

Total Army						
a. Army Strength	b. Total Divisions <sup>11</sup>	c. AEF Division Size	d. Operational Slice (a/b)	e. Operational Percentage (c/d)	f. Non- Divisional Slice (d - c)	g. Non- Divisional Percentage of the Army (f/d)
2,395,742	43	28,105	55,715	50	27,610	50
AEF						
a. AEF Strength	b. AEF Divisions	c. AEF Division Size	d. Operational Slice (a/b)	e. Operational Percentage (c/d)	f. Non- Divisional Slice (d - c)	g. Non- Divisional Percentage of the AEF (f/d)
1,866,164	30	28,105	62,205	45	34,100	55

While the World War I US division is considered to be gigantic in size, in terms of the functional tooth-to-tail ratio it was austere in noncombat elements. Deployment to a developed theater with excellent infrastructure already in place assisted the AEF in retaining an austerity of noncombat elements. The next time the United States deployed a comparable expeditionary force, it was not so lucky.

## World War II

World War II was the United States' ultimate experience with expeditionary warfare. The war the Army fought was completely overseas and US forces were the main component in all theaters except China-India-Burma and Russia. The largest theater in terms of troops deployed was the European Theater of Operations (ETO). Troops in the ETO fought the war across France and into the heart of Germany in 1944-45. This section uses the example of the ETO to explore the expeditionary aspects of the T3R in World War II.

### Overall Planning Estimates

As in World War I, the basic operational element in the US Army in World War II was the combat division. During the war, Army leadership

made a deliberate decision to limit the number of divisions created in order to maintain a large industrial base in the civilian sector and large numbers of air force and logistical troops in the military sector. Accordingly, the Army raised only 89 divisions to fight in the war. Of these 89 divisions, 83 (16 armored divisions and 67 infantry divisions) possessed extensive organic logistical assets of their own as the bulk of the Army was motorized. When heavy casualties affected the combat elements of the divisions, a personnel crisis ensued in late 1944 that required the conversion of thousands of supporting troops to combat jobs.<sup>12</sup>

As part of the process of creating and fielding the 89 divisions, the Army Ground Forces (AGF), under Lieutenant General Lesley J. McNair, was the War Department agency responsible for developing the ground force including the correct mix between combat elements and supporting units. As such, the AGF became the agency most responsible for setting the tooth-to-tail ratio for the World War II Army. In planning, there was a great tendency for the tail to expand. McNair often fought his staff's recommendations on this point. In mid-1943, when the AGF was activating the last of the 89 divisions, McNair felt the projected expeditionary force structure (Figure 7) was askew. Only 29 percent of the force designated to fight the enemy was found in divisions. While McNair did not use the

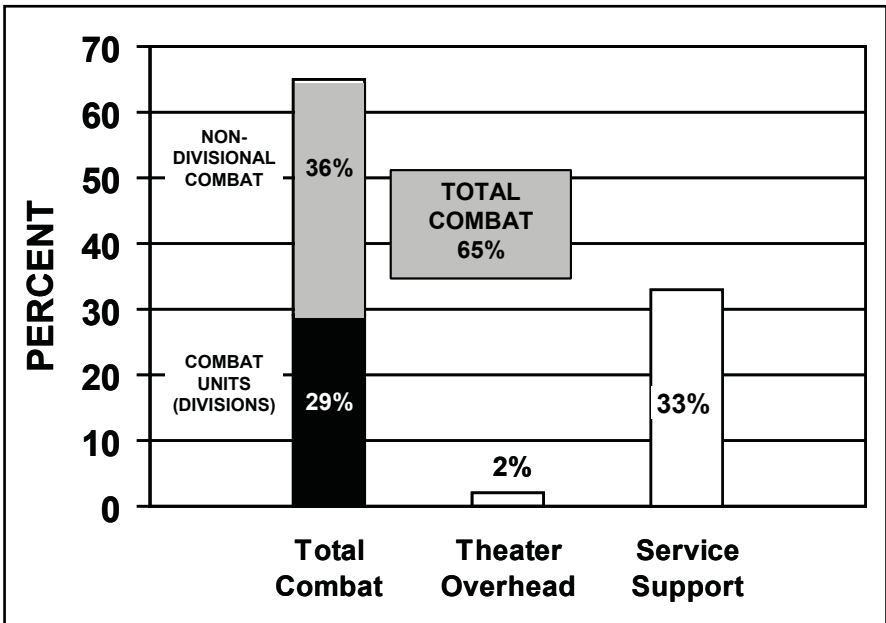


Figure 7. Projected Army Ground Expeditionary Force, Mid-1943.<sup>13</sup>

same categories found in this work and he deliberately sought economy in tables of organization and equipment, giving divisions minimal organic elements, he did recognize that the proportion of the organization found in divisions was a direct indicator of the amount of combat power represented in the Army.<sup>14</sup>

McNair's concerns were well founded. The projected 65-percent level of combat elements (before subtracting organic headquarters and logistics elements) was, in fact, never met when the Army's ground forces actually deployed. By the end of the war, the ground forces operational slice had risen to 67,900, with only 20 percent of ground troops found in divisions (Table 2).

Table 2. WW II US Army Operational Slice<sup>15</sup>

a. Total Strength	b. Number of Divisions	c. Standardized Division Size	d. Operational Slice (a/b)	e. Division Percentage of the Army (c/d)	f. Non- Divisional Slice (d - c)	g. Non- Divisional Percentage of the Army (f/d)
6,042,277	89	13,800	67,900	20	54,100	80

## The European Theater of Operations (ETO)

The place to where most of the divisions (72 percent), which the AGR raised, were deployed was in the European Theater of Operations (ETO) (Figure 8). Into this largest of all theaters, 64 divisions deployed and defeated Germany in an 11-month campaign. Theater-wide, the functional T3R at the end of the campaign is depicted by category in Figure 9. Within the theater, the ratio between combat and noncombat elements was 1 to 1.6.

Compared with the AEF in the same general theater, ETO forces contained 14 percent fewer combat elements. This was double the percentage of headquarters elements (16 versus 8) and an increase of 6 percent among logistical/life support elements. That there were larger logistical elements than in World War I can be expected considering that the ETO deployed by assault into a theater with minimal infrastructure in place, while the AEF deployed into a mature theater secured by Allies. But why did the number of headquarters double proportionally?



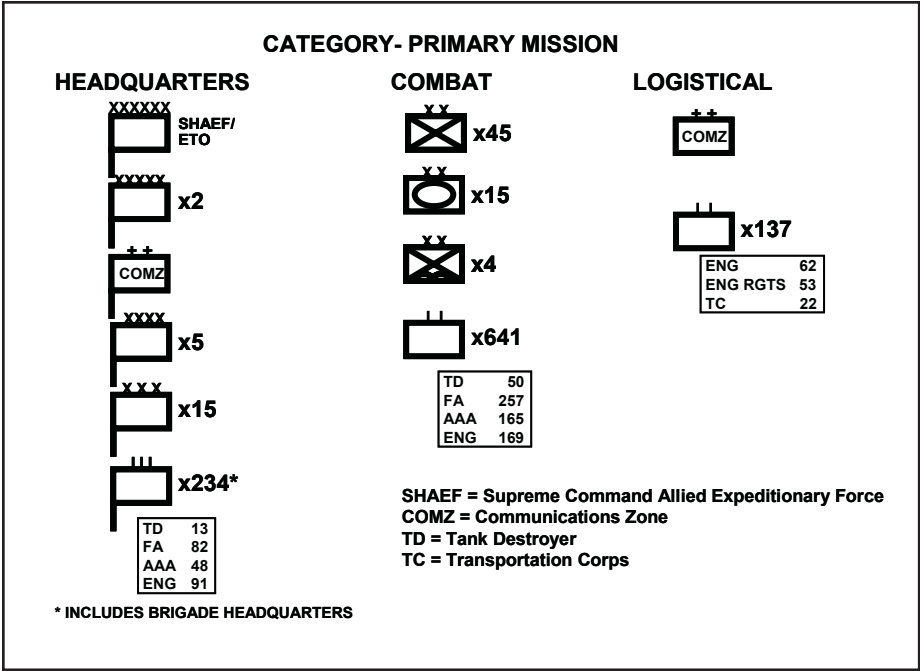


Figure 8. ETO Organization.

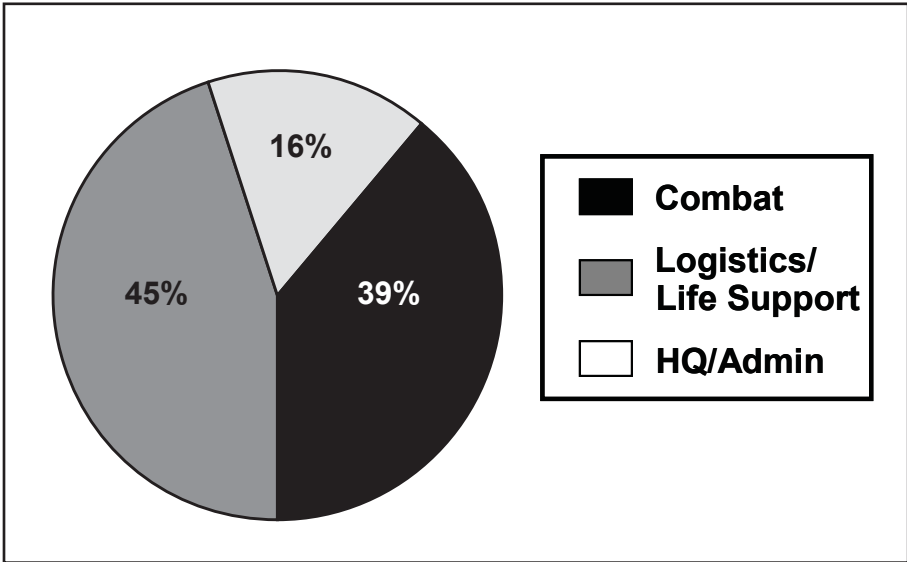


Figure 9. European Theater of Operations by Category, April 1945.<sup>16</sup>

While a factor in the doubling of headquarters size was surely an increase in higher headquarters organizations brought about by the number of forces employed and by the inclusion of headquarters elements in the larger logistics element, the Army's basic philosophy of organization may have also had something to do with the growth. As mentioned above, AGF head McNair believed in economizing tables of organization and equipment (TOEs). He also felt that divisions should be organized with only the minimum elements necessary for most operations and that additional elements would be attached to divisions only as necessary. While in practice, this system, called streamlining and pooling, usually resulted in the semipermanent assignment of many of the pooled elements to divisions. It also meant that the pooled elements required administrative headquarters to command and control them while in pooled status. Accordingly, in the ETO, there were 234 such headquarters controlling pooled units. To facilitate pooling, on 24 December 1942, the Army adopted a new organizational system where it reorganized so that regiments were replaced by separate battalions in all arms and services except the infantry. Whereas battalions under regiments had had small headquarters and usually no organic logistical elements, the separate battalions, because of their possible independent employment, had sizable contingents of both. In the ETO, there were 725 such battalions. Together, pooled headquarters and separate battalion headquarters elements consisted of 145,359 troops, forming 42 percent of the headquarters element slice of the ETO pie.<sup>17</sup>

At the theater level, logistical/life support elements were 45 percent of the total troops employed. The level of these elements seems to have been devised based on a combination of the number of troops to be supported (usually addressed in terms of specific unit types [army, corps, division] to be supported) and guesswork. For example, predeployment guidance called for ordnance (ammunition and maintenance) units to compose 6 percent of the total number of troops in a theater of operations. In the ETO, this goal was exceeded, with ordnance troops reaching 7.1 percent of the total deployed troop force. Several postwar studies considered that ETO support levels were adequate based simply on the overall success of the campaign. Nevertheless, they recommended modest increases in the size of logistical elements (Figure 10).

For instance, one study recommended a 12.5 percent increase in the number of service troops assigned to an army group. Despite this, studies of the ETO generally warned that no definitive conclusions concerning the T3R could be drawn from the ETO because of its unique nature.<sup>18</sup>

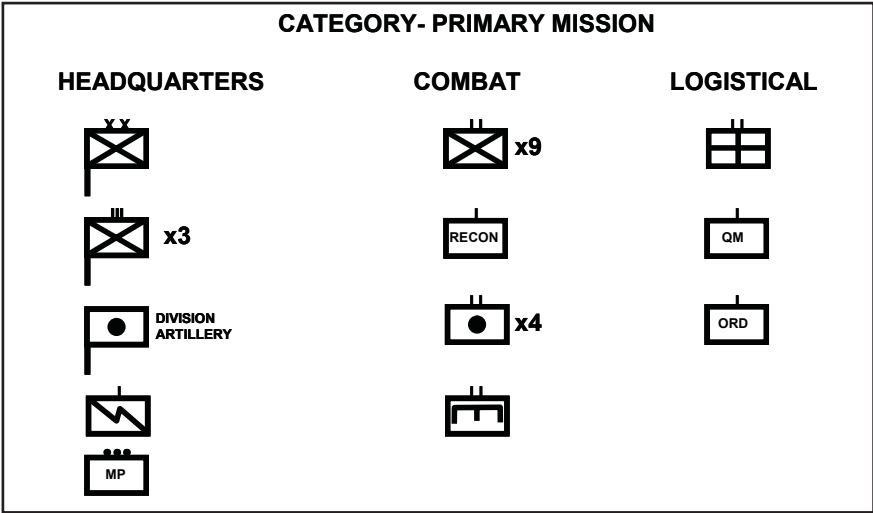


Figure 10. ETO Infantry Division Organization.

### Divisions in the ETO

Deployed in the ETO were a total of 62 divisions: 45 infantry, 15 armored and 4 airborne. Under the streamlining concept, these divisions were organized to maximize their combat power. The functional T3R ratio in the 1945 infantry division is shown in Figure 11. Compared with its AEF predecessor, the 1945 division was half the size with 14,037 versus 28,105. While the proportion of logistical elements remained the same

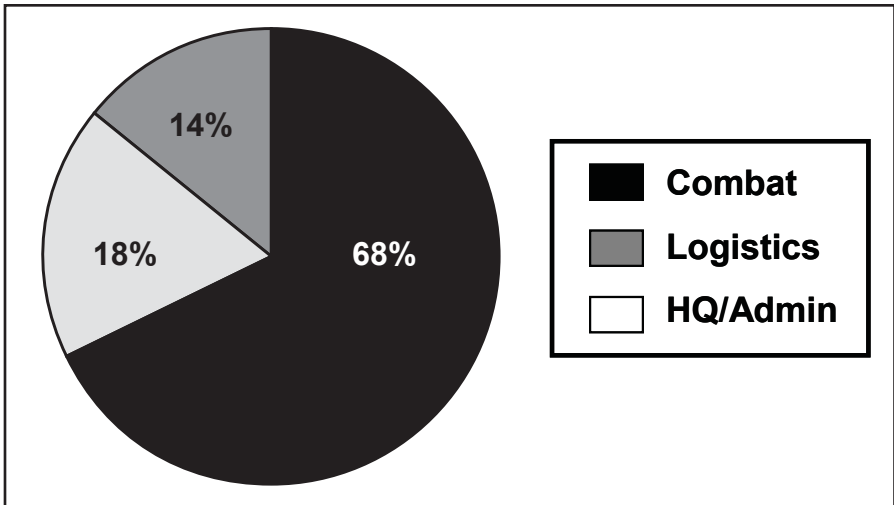


Figure 11. Infantry Division, 1945.<sup>19</sup>

in both divisions (14 percent), the combat element in the 1945 division was 9 percent smaller, with the difference being found in an increased headquarters element. Although the World War II division had eliminated an echelon of command (the brigade), its headquarters staffs had increased. A general expansion in the size of headquarters elements can account for part of this increase. The reorganization of the division's artillery, where separate battalions and a divisional artillery headquarters had replaced an artillery regiment with organic battalions, also played a role. Despite the expansion of command and control elements, the World War II infantry division was still primarily a combat organization, with one and a half combat soldiers for every support soldier (Figure 12).

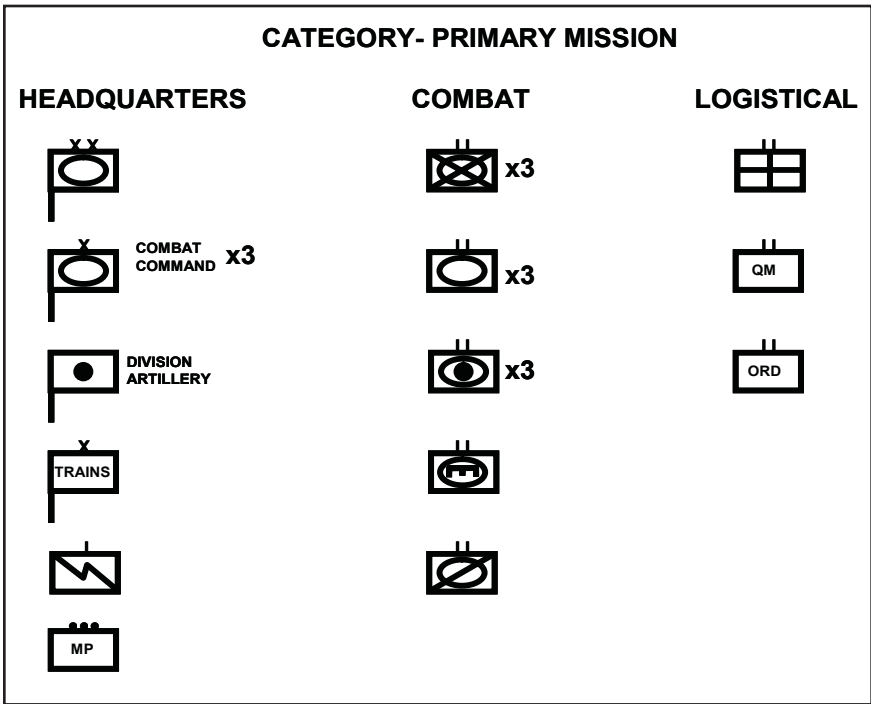


Figure 12. ETO Armored Division Organization.

The armored division was a new type of unit in the US Army when fielded in World War II. The ETO divisions came in two organizational varieties: the older heavy division, which retained dual regimental and combat command headquarters and a large number of combat battalions and the new light division that was smaller. Of the 15 divisions in the ETO, 13 were of the light variety, so it is that organization which is discussed here. Figure 13 shows the proportional organization for the armored division (light TOE).

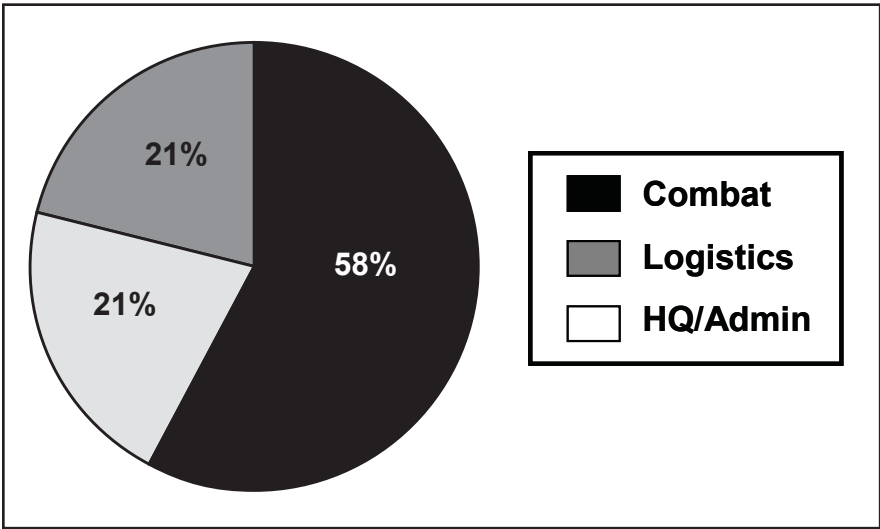


Figure 13. Armored Division 1943-45.<sup>20</sup>

As would be expected in an organization with almost all of its combat elements mounted on tracked vehicles and almost all of its other elements mounted on wheeled vehicles, the logistical element in the armored division was larger than that in the infantry division. The armored division support element was one-third larger than that of an infantry division (21 percent to 14 percent). With the expanded mobility of the division, often resulting in the organization being spread out across large areas and with its combat elements (tank and armored infantry) being organized into separate battalions, support elements were more compartmentalized and expanded than in the infantry division.

Similar to events in 1918, once combat operations in the ETO commenced, a personnel crisis soon ensued. In both cases, the problem was that forward combat elements, particularly the infantry, took losses at a higher rate than their proportion in the force, while there was no large pool of trained replacements. Almost from the start in July 1944, ETO infantry casualties were higher than projected. To keep up with losses, such a pool needed to be larger than the combined strength of the infantry in the operational units. In World War I, the AEF broke up uncommitted divisions to provide replacements. In World War II, however, the 89-division plan made this unfeasible as all the divisions were needed operationally and were supposed to be kept at full strength through a constant flow of individual replacements.<sup>21</sup>

The Army resolved the July crisis by depleting most of the pool of available infantry replacements. However, this left inadequate replacements if the current rate of losses continued. Therefore, as a start, excessive replacements in combat branches were retrained as infantry and the allocation of replacements in training was adjusted. These measures did not resolve the problem, but it was partially ameliorated because infantry casualties fell from August through October 1944 below the July rate. But casualties rose again in November and the Battle of the Bulge in December turned the replacement shortfall into a crisis. The Army initiated programs to alleviate the shortage including the transfer of participants of several specialist programs to infantry replacement training and also transferring the reassignment of several divisions originally earmarked for the Pacific to Europe. But the ETO was forced to take more immediate measures, primarily through finding new infantrymen from theater assets. Most were being taken from logistical and headquarters elements, via calls for volunteers. In January 1944, the ETO headquarters centralized the effort to find new infantrymen from within theater assets. At the same time, Lieutenant General John Lee, the commander of the Communications Zone (COMZ), the ETO's theater logistical headquarters, gave each of his subordinate units quotas to produce infantry candidates. In mid-January, the ETO declared all enlisted men assigned to noncombat units, within certain conditions, to be eligible for transfer to the infantry. These measures from inside and outside the ETO, along with a shift in operations from the high intensity battles as in the Ardennes, ended the crisis. The ETO and War Department had underestimated the attrition rate in the tooth and had to draw from apparently redundant assets in the tail to make up the difference.<sup>22</sup>

## **Korean War**

Beginning only 5 years after the end of World War II, the Korean War was fought with many of the same organizational structures and equipment as the earlier conflict. Accordingly, the functional T3R in Korea should resemble that of the ETO in World War II. The troops assembled in the Korean peninsula reached their height in July 1953, at the time of the signing of the armistice ending the conflict (Figure 14).

Figure 15 shows the functional tooth-to-tail ratio for the US Army units deployed to South Korea at that time. In comparison to 1945, the combat portion of the force had gone up 3 percent, while headquarters elements had proliferated an additional 5 percent. To make up for the increase in combat elements, logistics/life support actually declined from World War II by 8 percent. The expansion of headquarters elements is

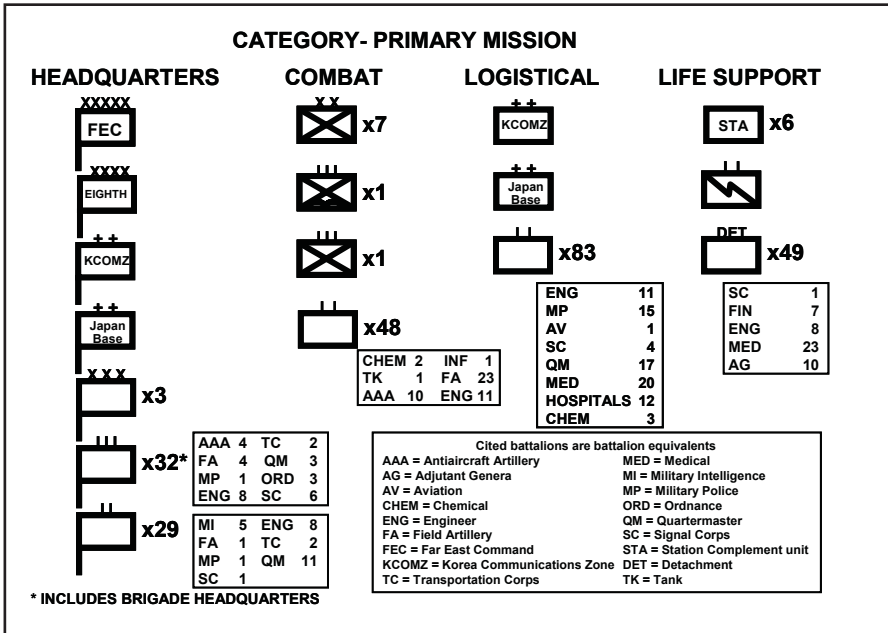


Figure 14. Korean War Theater Organization, 1953.

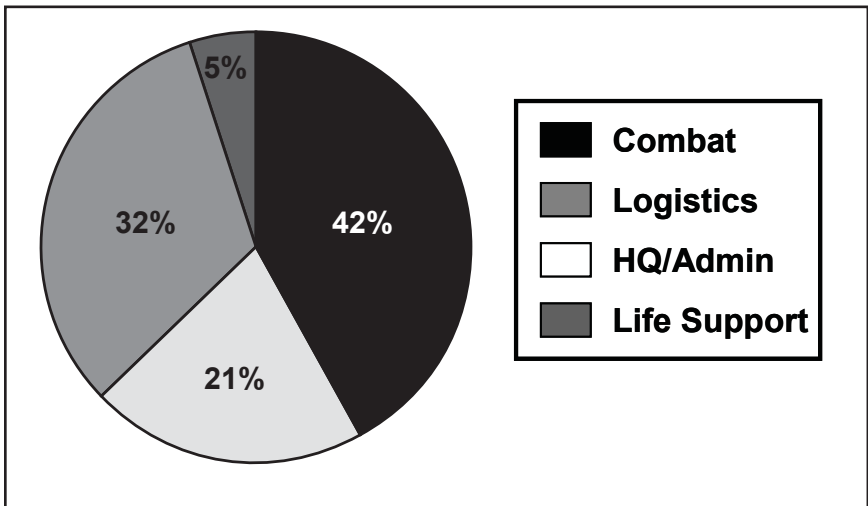


Figure 15. Korea, July 1953.<sup>23</sup>

evident in the order of battle by the presence of an army headquarters, three corps and seven division headquarters, and a communications zone headquarters controlling several major logistical headquarters elements. But the decline of logistic elements appears curious considering trends since World War I and the expeditionary nature of the Korean operation.

The context of the war helps to explain the situation. While 276,581 soldiers, including 89,361 logistical troops were in fact deployed to South Korea, the Army maintained a large logistical base in nearby Japan and many of the theater support elements were located there instead of in Korea itself. Figure 16 shows the functional T3R with the inclusion of the 78,079 logistical troops (and their headquarters elements) in Japan. With the addition of the Japanese base, the Korean War functional T3R more closely resembles the World War II ETO figures in terms of logistics: 43 percent to 45 percent in the ETO. Headquarters elements had still expanded by 8 percent from ETO totals, mostly at the expense of the combat elements, which declined by 6 percent. While in the ETO there was one headquarters soldier for every seven total soldiers, in Korea, this ratio had climbed to one headquarters staffer for every four soldiers. The ratio of combat to noncombat soldiers was one to three in Korea in 1953.

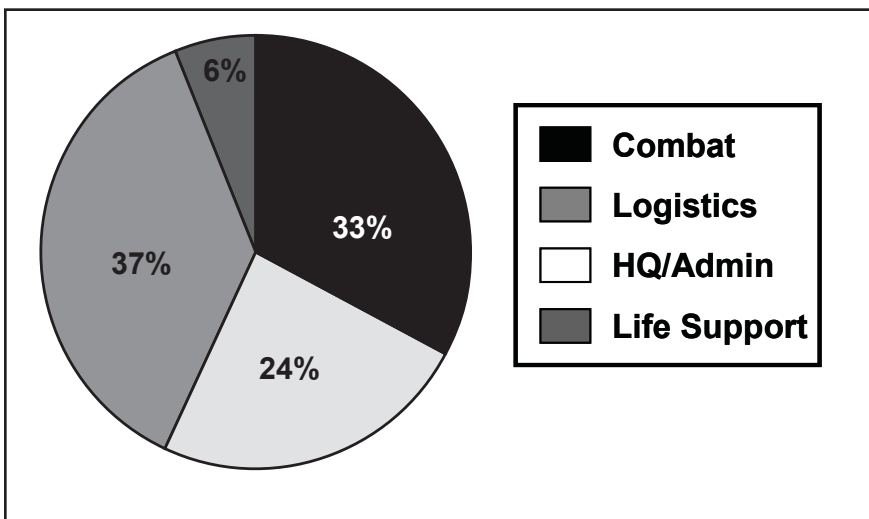


Figure 16. Korea, July 1953, including Japan Base.<sup>24</sup>

Since 1945, the Army had done away with some aspects of McNair's pooling concept. This resulted in additional divisional combat elements, primarily in the form of increased field artillery cannons in each battery and the addition of an anti-aircraft artillery (AAA) battalion and a tank



battalion. Accordingly, the Korean War infantry division was one-third larger than its 1945 equivalent, with a strength of 20,036 compared to the 14,037 of its predecessor organization.<sup>25</sup>

Figure 17 depicts the categories in the 1953 infantry division while Figure 18 shows the functional T3R ratio. While the gross number of combat troops increased within the division, so too did logistical and

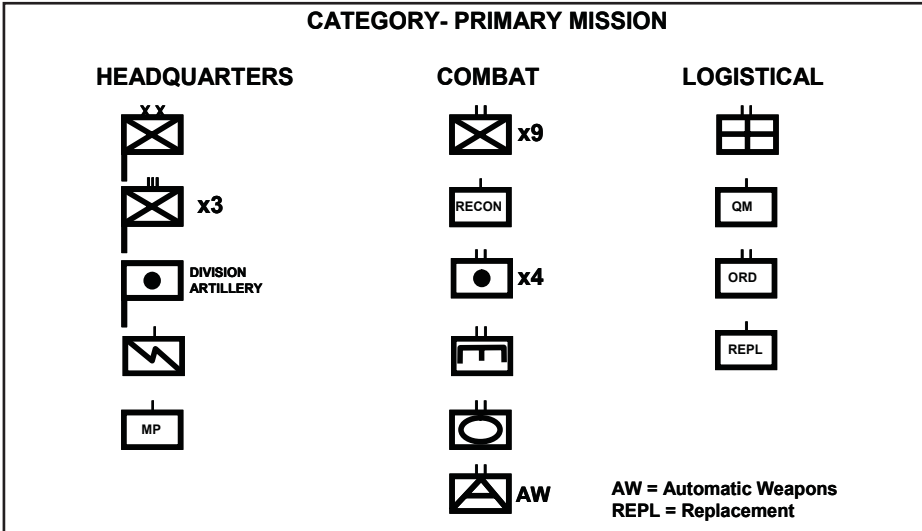


Figure 17. Korean War Infantry Division Organization.

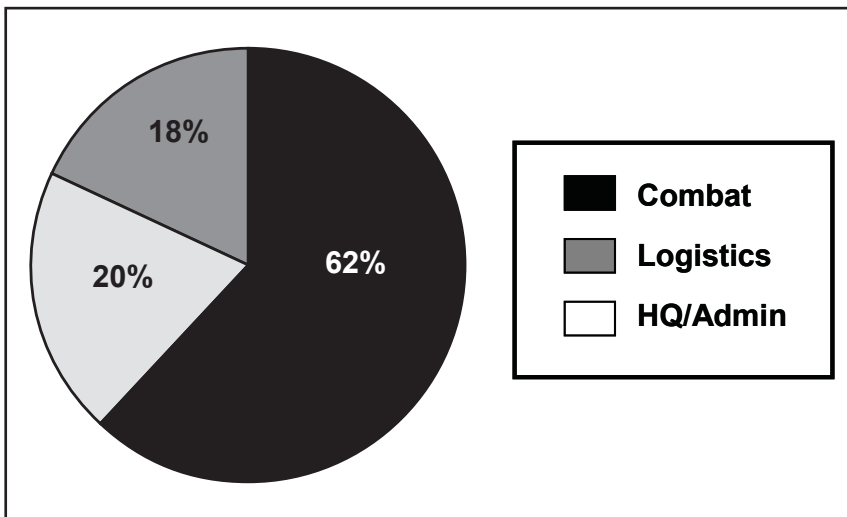


Figure 18. Infantry Division, July 1953.<sup>26</sup>

headquarters elements. Additional combat elements required additional headquarters. And the additional combat elements were also equipped with vehicles and equipment, increasing the divisional logistical component. Combat elements in the division declined by 6 percent from 1945 and headquarters elements increased by 2 percent and logistical elements by 4 percent. The biggest change in the division's logistical structure was the expansion of the divisional ordnance (i.e., maintenance) company to a battalion and the addition of a replacement company, whose strength could fluctuate from 41 to over a thousand, depending on the replacement status of the division.<sup>27</sup>

In July 1953, the US Army fielded a total force of 20 divisions, including the 7 in Korea. Table 3 shows the slice of the entire Army that the divisions represented. In comparison to World War II, the operational slice had risen 3 percent from 67,900 to 76,607. Reflecting the addition of formerly nondivisional elements into divisional structure, organic divisional elements now reflected 25 percent of the operational slice, as opposed to 20 percent in World War II.

Table 3. Korean War US Army Operational Slice<sup>28</sup>

a. Total Strength	b. Number of Divisions	c. Standardized Division Size	d. Operational Slice (a/b)	e. Division Percentage of the Army (c/d)	f. Non- Divisional Slice (d - c)	g. Non- Divisional Percentage of the Army (f/d)
1,533,815	20	18,804	76,691	25	57,887	75

## Vietnam War

Beyond doubt, the US forces in South Vietnam from 1965 to 1972 maintained a large infrastructure. But was this infrastructure so huge that the tooth-to-tail ratio was as high as is often claimed? Such assertions, almost always unsupported by data, generally range from 1 to 4 as cited by former Vice President Al Gore's biographer Bob Zelnick to Vietnam veteran and military analyst David Hackworth's 1 to 11, with the proportion of 10 support troops for every combat trooper as the most commonly cited figure.<sup>29</sup>

Do such high noncombat ratios stand up to scrutiny? Based on a unit-by-unit analysis, in April 1968, US Army units in Vietnam consisted of

305,156 troops. For a 10-to-1 ratio to be an accurate proportion, only 33,618 of these troops would have been serving in a combat capacity. But there were seven divisions deployed in the country (and the equivalent of one and two-thirds more in separate brigades.) Even excluding any nondivisional combat troops, this results in each division fielding only 4,802 combat troops. However, the typical infantry division used in Vietnam, organized under the Reorganization Objective Army Division (ROAD) configuration (Figure 19) consisted of about 16,902 soldiers. The Army reconfigured infantry divisions deployed to Vietnam into a “light” structure, which deleted much of the heavy equipment found in the division’s logistics tail and its combat elements, while adding additional companies and battalions to its infantry component.

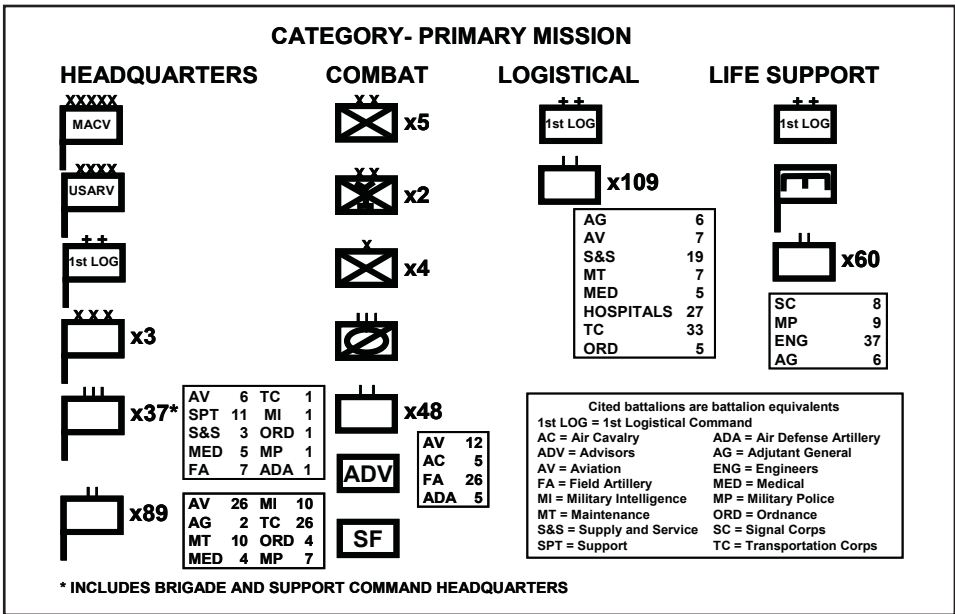


Figure 19. Vietnam War Theater Organization, 1968.

Based on the table of organization, the combat component of such divisions, while not as high as the World War II division’s 68 percent or the Korean War’s 62 percent, was approximately 9,769 troops or 58 percent of the divisional totals. Accordingly, the 7 divisions alone accounted for roughly 68,383 combat personnel. Within the division, headquarters units accounted for 31 percent and logistical elements were 11 percent of the total personnel based on function (Figure 20).<sup>30</sup>

Consequently, with over double the number of combat troops (68,383 versus 33,618), the functional tooth-to-tail ratio in Vietnam in April 1968

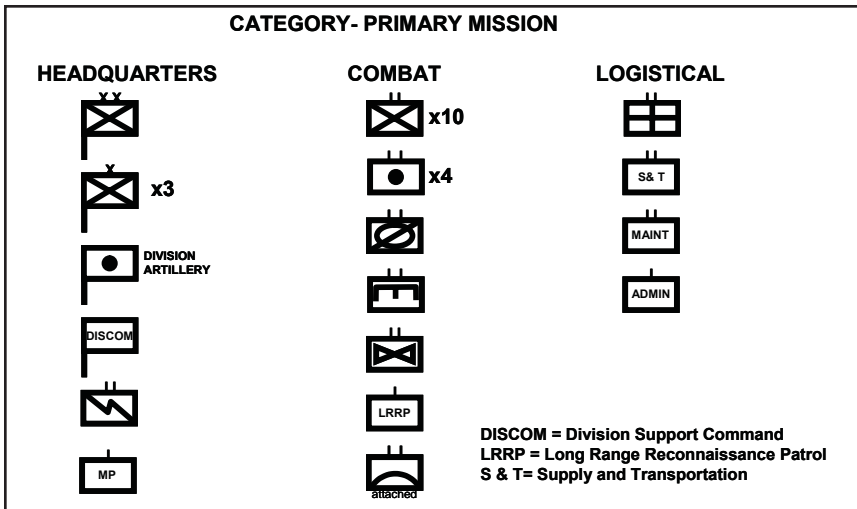


Figure 20. Vietnam War Infantry Division Organization.

could not be as high as 1 to 10. Divisional combat troops alone accounted for 22 percent of the total force in the country, a ratio of 3.5 to 1. Apart from the divisions, additional combat troops were found in four separate infantry brigades, an armored cavalry regiment, a large theater aviation brigade, nondivisional artillery battalions and in small units assigned as necessary to support other combat units. There were also over 9,000 advisors supporting the combat units of the Army of the Republic of Vietnam (ARVN). These additional troops totaled 51,044, giving Vietnam a total of 113,030 Army combat personnel in April 1968. This number was 35 percent of the 324,030 Army troops deployed in the country at that time. Such a proportion produced a functional tooth-to-tail ratio of slightly less than one combat soldier to every two support troops (Figure 21).

Figure 22 depicts the proportion of forces by primary function in South Vietnam in April 1968. Of the 65 percent, or slightly less than two-thirds of the total portion involved in noncombat roles, headquarters took up the lion's share, 30 percent of the whole and 46 percent of the noncombat elements. While it is often difficult to distinguish life support functions from logistical ones, the 12 percent cited as life support includes engineer units devoted to construction tasks, signal infrastructure units and military police elements devoted to running prisons and stockades for friendly forces. Logistics organizations formed almost a quarter of all theater troops.

Compared to the Korean theater, the Vietnam theater, while having 2 percent more combat troops, retained roughly the same ratio of combat troops to noncombat troops (1 to 2). However, the mix of noncombat ele-

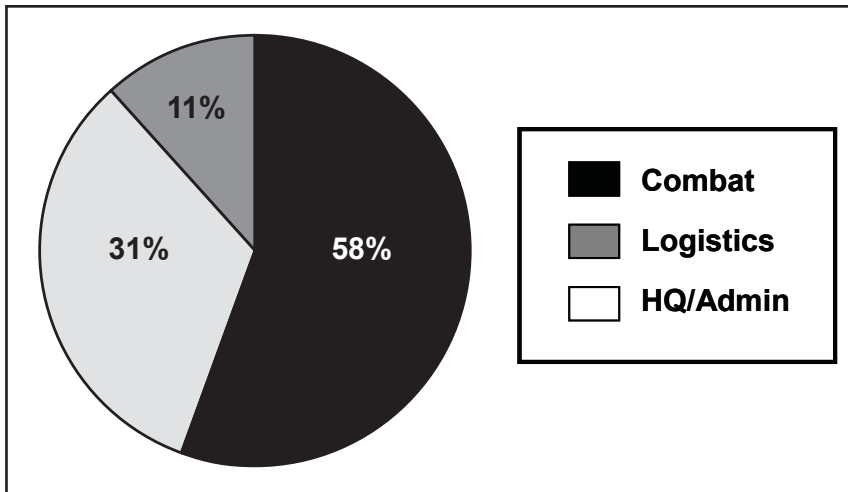


Figure 21. ROAD Light Infantry Division, Vietnam 1968.<sup>31</sup>

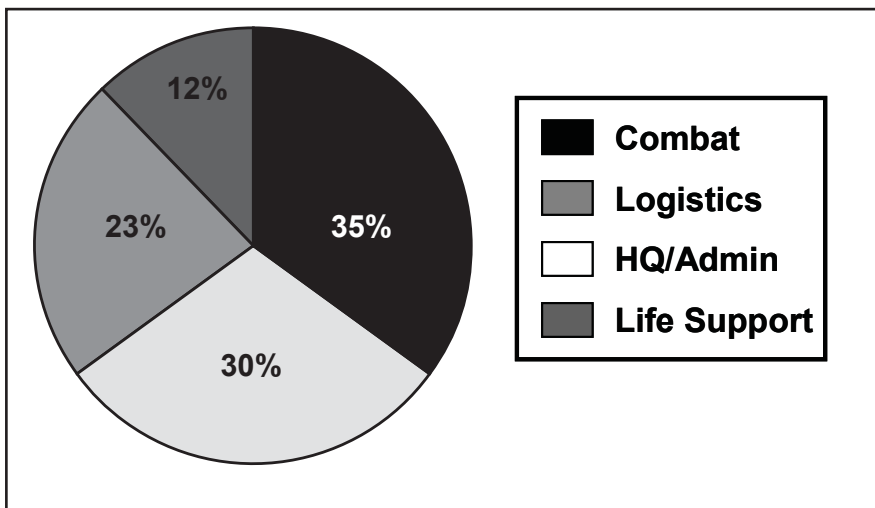


Figure 22. US Army, Vietnam, April 1968.<sup>32</sup>

ments had changed. Headquarters elements continued their trend of expansion, increasing 4 percent from Korea (and 14 percent from the ETO in World War II). Life support elements increased in Vietnam by 6 percent from Korea. Much of the increase in life support was seemingly at the expense of logistical elements. This may indicate the blurred line between these two elements, rather than an actual decline in logistical elements because of a life support increase. Overall, logistical and life support elements

represented 35 percent of total theater forces in 1968 Vietnam. This was a decrease from 42 percent in Korea and 45 percent in World War II. The decrease is accounted for by a concurrent increase in headquarters elements.

In 1968, the US Army fielded 19 divisions, of which 7 were in Vietnam. Additionally, there were six separate combat brigades, roughly the equivalent of two more divisions. Table 4 shows how the divisions compared to the total size of the Army. The resulting operational slice of 74,778 is roughly 1 percent less than the equivalent figure from the Korean War. The percentage of divisional elements in the slice decreased by 3 percent as well.<sup>33</sup>

Table 4. Vietnam War US Army Operational Slice.<sup>34</sup>

a. Total Strength	b. Number of Divisions	c. Standardized Division Size	d. Operational Slice (a/b)	e. Division Percentage of the Army (c/d)	f. Non- Divisional Slice (d - c)	g. Non- Divisional Percentage of the Army (f/d)
1,570,343	21	16,475	74,778	22	58k,303	78

## The Cold War Era, 1974

### The Nunn Amendment

As the Cold War confrontation with the Soviet Union evolved into an extended stand-off, occupation forces in Germany and Japan became defensive forces. During the Vietnam War, the demands for troops and equipment in Southeast Asia partially depleted the US units in Germany. At the same time, however, the Soviets conducted a unilateral build up of their forces in central Europe. They had upgraded all their tanks to newer models and increased the number of tanks in their motorized rifle divisions. At the same time, five tank divisions were added to the troops arrayed against North Atlantic Treaty Organization (NATO) units. Along with this numerical increase, the 1968 Warsaw Pact invasion of Czechoslovakia caught NATO planners and intelligence analysts by surprise. It seemed that the Soviets were building up for a surprise attack in Germany. Further signs of renewed Soviet aggressiveness were apparent in Kremlin threats to intervene in the crisis precipitated by the 1973 Yom Kippur War.<sup>35</sup>

that the Soviets were building up for a surprise attack in Germany. Further signs of renewed Soviet aggressiveness were apparent in Kremlin threats to intervene in the crisis precipitated by the 1973 Yom Kippur War.<sup>35</sup>

Therefore, new emphasis was placed on the American ground forces in Germany. Four combat divisions (two armored, two mechanized infantry), two separate brigades and two armored cavalry regiments had been stationed there since the 24th Infantry Division (Mechanized) had been transferred to Fort Riley in 1968. With Army troops in Germany since 1945, a large support structure had built up over the years. Figure 23 shows the Army forces in Germany in 1974 and 1976 by functional category.<sup>36</sup>

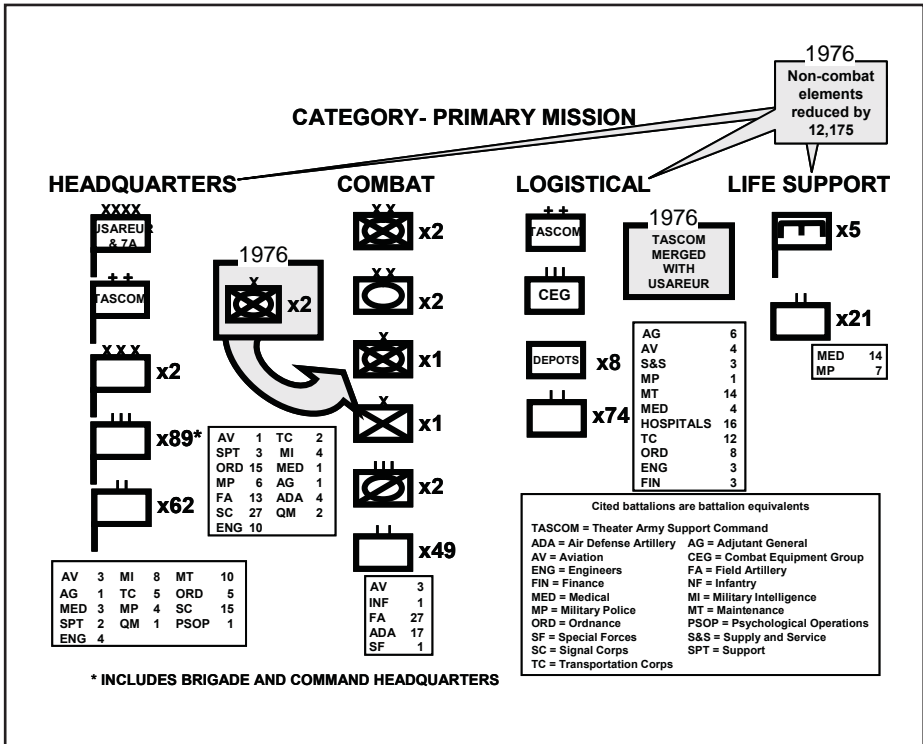


Figure 23. Germany 1974 and 1976 Organization.

As part of the Army's post-Vietnam reduction and conversion to an all-volunteer force, members of Congress expressed some concerns about the post-drawdown tooth-to-tail ratio.<sup>37</sup> Congress had the constitutional responsibility to authorize the armed forces' budget. It typically used this responsibility as a means to provide oversight of the armed forces and often attached specific provisions as amendments to the act approving the budget. In 1974, when members of the US Congress looked at the military

force structure in Europe, it was perceived to be too fat in support and headquarters elements in comparison to its combat elements. Senator Sam Nunn of Georgia sponsored and Congress passed a provision specifically designed to correct this perceived deficiency for the Fiscal Year 1975-76 budget which stated “the non-combat component of the total United States military strength in Europe authorized as of June 30, 1974, shall be reduced by 18,000.” The Army’s share of this total was 12,175. The amendment also allowed the Army to replace the noncombat components with combat elements. These were defined in particular as battalion-size units of infantry, armor, field artillery, air defense artillery, cavalry, engineers, special forces, and aviation.<sup>38</sup>

According to the Army’s Active Army Troop List, dated 31 March 1974, there were 186,822 troop positions authorized in Germany. This allotment of soldiers consisted of an authorized 51,170 combat troops (27 percent), 70,455 headquarters or headquarters support personnel (38 percent) and 65,094 positions (35 percent) for logistical or life support type positions (Figure 24).<sup>39</sup>

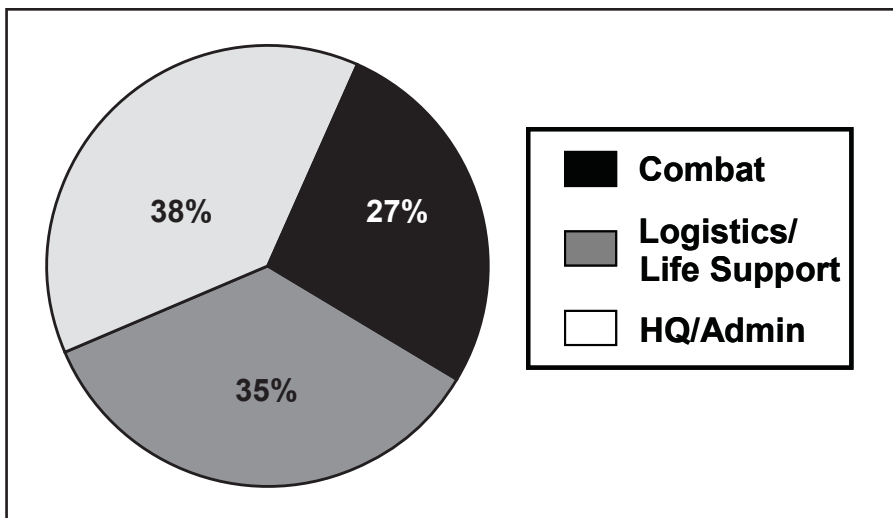


Figure 24. US Army in Germany, March 1974.

Congress required reductions in the 73 percent which did not consist of combat elements. The Nunn Amendment allowed for two courses of action: the elimination of the 12,175 noncombat positions outright or their replacement by combat positions. Both actions had to be completed within 2 years. Naturally, the Army chose the latter and instituted the short-lived Brigade-75 and Brigade-76 programs to produce the lion’s share of the positions.<sup>40</sup> With these two choices, the Nunn Amendment’s provisions



provided a tooth-to-tail spread allowing combat elements to be between 29 and 34 percent of the total organization in Europe (Figure 25). This yielded ratios between combat and noncombat forces of 1 to 2.4 and 1 to 1.9. Congress, accordingly, in 1974 considered an acceptable tooth-to-tail ratio to be roughly two noncombat soldiers for every combat soldier.

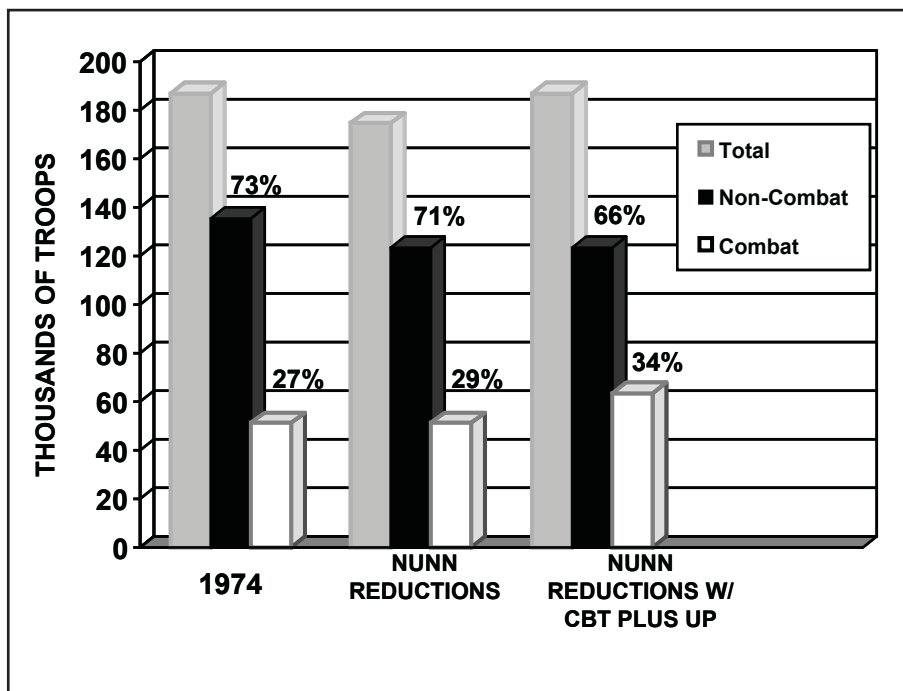


Figure 25. The Nunn Amendment Tooth-to-Tail Ratio.

There is no direct indication as to how Congress determined its tooth-to-tail ratio. It seems to have been a combination of factors. The fear of the Soviet threat in central Europe drove much of the discussion. After the Vietnam drawdown, it seemed essential to get the most combat power out of the available manpower. Congressional reports produced in 1973 and 1974 also made it clear that Congress was most concerned with what it saw as a proliferation of headquarters organizations. A third, and possibly key point, was that at the height of the Vietnam deployment, as previously discussed, combat troops made up 36 percent of forces, a higher ratio of combat troops than the 27 percent found in Germany in 1974 and even higher than that required by the Nunn Amendment's top figure (34 percent). The difference in figures may be ascribed to a greater need for life support in Germany. Unlike in Vietnam, many families of soldiers

accompanied them to Germany and lived in government-provided housing facilities. These facilities required a proportion of support that had not been necessary in Vietnam.<sup>41</sup>

### ROAD Armored Division

The 1974 Cold War Army still used the ROAD structure, as employed in Vietnam. While most of the units in Vietnam were light infantry divisions, the divisions in Germany either were all mechanized infantry or armored. For the sake of this work, the Vietnam infantry division was compared with the 1974 ROAD armored division. Figure 26 categorizes the divisional elements. Figure 27 shows this armored division proportionally divided into combat, logistical and headquarters categories. With attachments for combat, usually aviation elements, the Vietnam divisions were 1,843 larger than their counterparts in Germany. Additionally, while 1968 Vietnam divisions usually had 11 combat battalions (10 infantry and 1 cavalry), and the two 1974 armored divisions in Germany had 12 combat battalions (6 tank, 5 mechanized infantry, 1 cavalry), the combat slice in the 1974 division was smaller by 3,059. Some of these differences may be accounted for by the difference in size between tank units and infantry units. Tank battalions were only about two-thirds of the size of infantry battalions. As expected of a unit equipped largely with mechanized vehicles, logistical

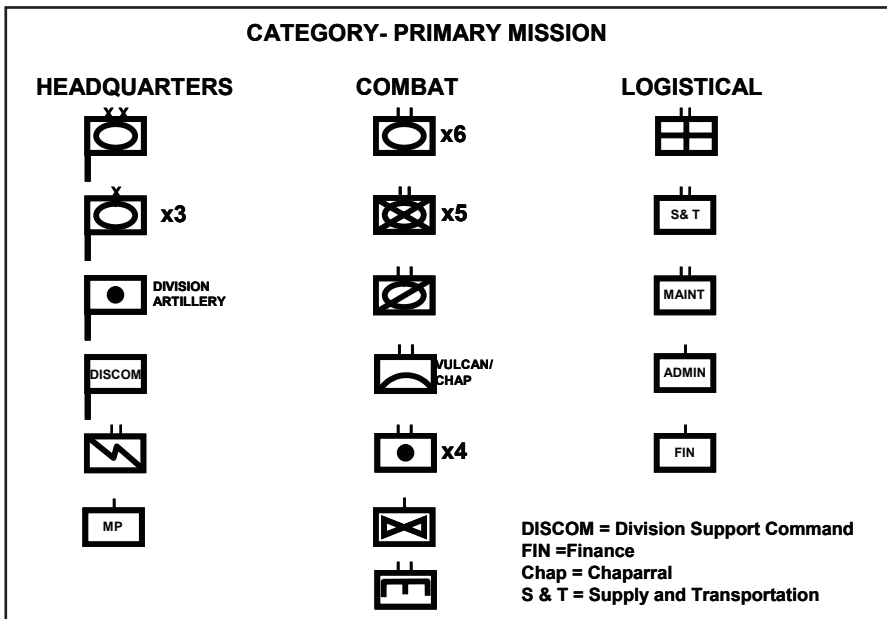


Figure 26. Armored Division Organization, 1974.

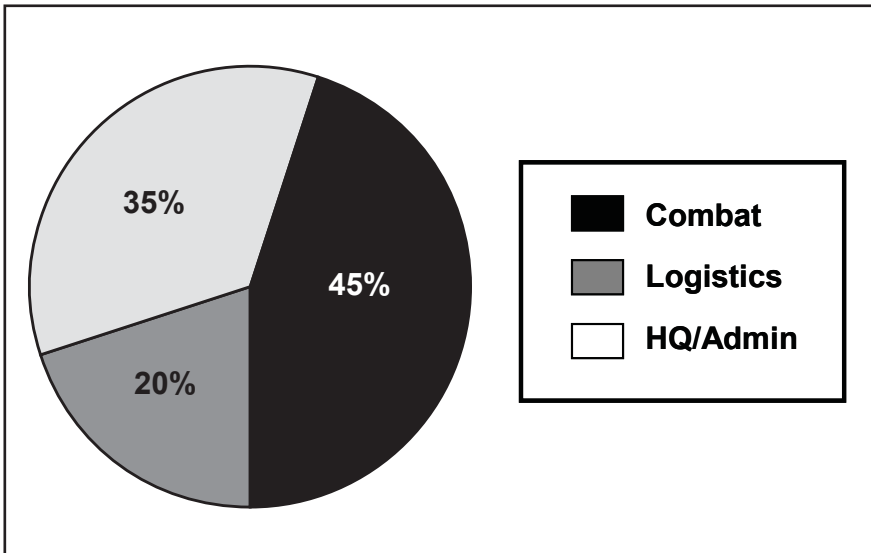


Figure 27. ROAD Armored Division, 1974.

personnel account for most (9 percent) of the 13 percent difference in combat strength between the Vietnam division and the 1974 organization. However, not all of the difference consists of logistical elements. Four percent of the difference was in a proportional increase in the size of headquarters. Of course, logistical elements had their own headquarters units to control their operations.<sup>42</sup>

In a comparison with the 1943-45 armored division, the ROAD 1974 armored division was 40 percent larger with 4,369 additional personnel spaces. But within these additions, the combat element had been proportionally reduced by 13 percent, while the headquarters slice increased by 14 percent. Even though World War II armored divisions only had 6 combat maneuver battalions (3 tank and 3 armored infantry) compared to 11 (6 tank and 5 mechanized infantry) in the ROAD division, the larger battalions in the World War II division totaled 2,736 combat positions as opposed to 4,237 combat slots in the 1974 counterpart. For a 120 percent increase in the number of maneuver battalions, the ROAD division only contained a 55 percent augmentation in combat troops. The ROAD division was organized into smaller units with a proportional increase in headquarters elements and decrease in combat positions.<sup>43</sup>

The Nunn Amendment related to the operational slice. It ultimately ended up being an attempt to increase the number of division equivalents in the force structure without expanding the overall strength of the organization. Between 1974 and 1976, the Army did increase its number

of division equivalents by 2.5, with basically the same overall strength. Table 5 shows the operational slice for 1974 and 1976. The original slice, condemned by Congress, was actually smaller by almost 17,000 (or the equivalent of one division) than the equivalent figure during the Vietnam and Korea eras. The percentage of the slice containing divisional troops was actually 6 percent higher than during the Vietnam War and 3 percent higher than that of Korea. By 1976, the Army had expanded to 16 divisions. This expansion was done largely by merely moving some logistical and combat elements to the reserve components. Nevertheless, the operational slice was reduced by almost 11,000 troops, with the proportion of the Army found in combat divisions being increased by 6 percent. However, many senior Army officials felt the tail had been reduced below minimal levels. In 1980, General Edward Meyer, the then Army Chief of Staff, even referred to the Army at the time in a famous comment as being “hollow,” referring to deficiencies in equipment, manning and modernization.<sup>44</sup>

Table 5. Cold War, 1974 US Army Operational Slice

a. Total Strength	b. Number of Divisions	c. Standardized Division Size	d. Operational Slice (a/b)	e. Division Percentage (c/d)	f. Non- Divisional Slice (d - c)	g. Non- Divisional Percentage of the Army (f/d)
783,330	13.5	16,475	58,024	28	41,549	72
779,417	16	16,475	48,714	34	32,239	66

The Congressional foray into the tooth-to-tail ratio, aside from establishing a general mandate of 34 percent combat troops, also provided one of the first realizations that headquarters units, even those headquarters commanding combat troops, were not part of the tooth, but the tail. Despite this realization, when the Army conducted its next major force structure reorganization, the Division 86/Army of Excellence Program, headquarters elements were increased, not decreased. While providing an interesting look at the T3R and the only publicly prescribed minimum ratio in the modern era, the Nunn Amendment seemed to have no lasting effect on the way Army force planners designed units.

## **Division 86/Army of Excellence/DESERT STORM 1991**

Starting in the late 1970s, with the projected fielding of new weapons systems including the M1 tank, the M2 infantry fighting vehicle and the AH-64 Apache attack helicopter, US Army force planners began looking at an organizational structure to replace the ROAD configuration. This redesign was originally called “Division 86” and then later, when extended to the Army as a whole, as “the Army of Excellence.” In redesigning the division, Army planners were given an operational concept, which was projected to produce the following rough ratio between its components in a division about 17,500 in size: combat—77.5 percent, headquarters—9.7 percent, and logistics—12.8 percent.<sup>45</sup>

Planners only classified the division and brigade headquarters companies and the signal battalion as headquarters elements. Such elements in combat battalions and in logistical units were considered to be combat and logistical elements. Accordingly, a direct comparison with the ROAD structure is not possible. Discounting headquarters and logistical elements in combat battalions and headquarters elements in logistical units, a ROAD division possessed 45 percent of its strength in combat elements, 35 percent in headquarters elements and 20 percent in logistical elements. One thing is clear from the Division 86 planning guidance: logistical elements, already smaller than under ROAD, even including their headquarters units, were projected to be streamlined in the new organization.

Army force developers also accounted for an additional 29,500 nondivisional combat and combat service support elements designated to support each division. Of this total 47,000-troop package, divisional elements were projected to form 37 percent.<sup>46</sup>

The Division 86/Army of Excellence (AOE) reorganization went through many permutations before the first divisions converted to the new configuration in 1983. While the AOE reorganized all the types of divisions found under ROAD (infantry, light infantry, air assault, airborne, armored and mechanized infantry), this work focuses on the armored division (Figure 28) because it was the most common type of division used in DESERT STORM, the case study for the employment of the AOE structure. In a nutshell, the reorganization removed support elements from the company level in maneuver combat battalions while adding combat power with the addition of a company to each tank and mechanized infantry battalion, and two additional cannons to each field artillery howitzer battery. An aviation brigade was also added to each division with one or two attack helicopter battalions and other aviation elements. Concurrently, divisional service

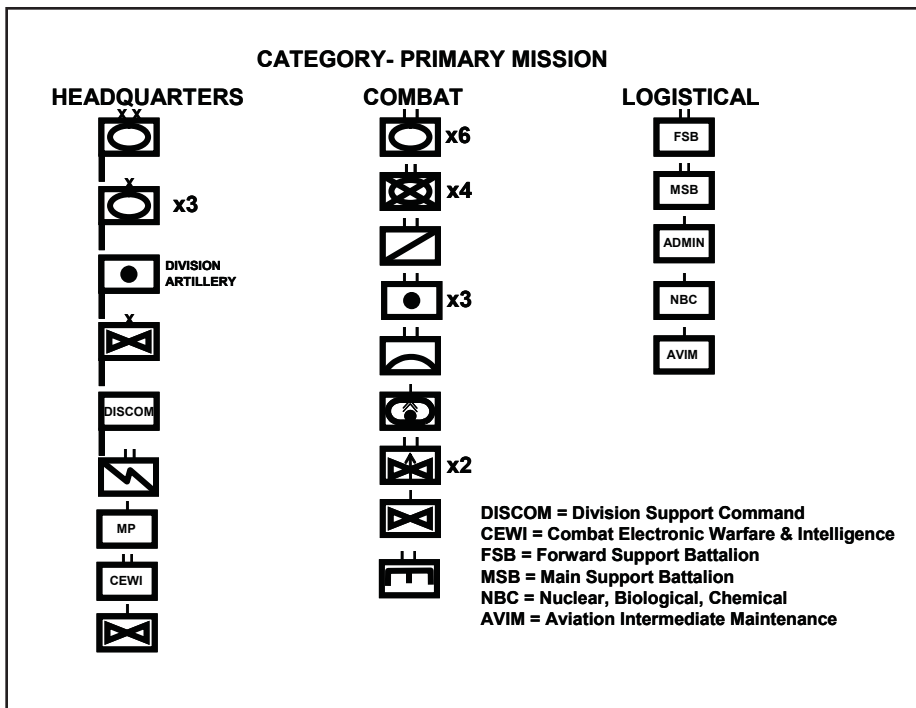


Figure 28. Armored Division Organization, 1986.

support elements were streamlined into multifunctional units groomed specifically to support particular division combat elements.<sup>47</sup>

Figure 29 shows the functional T3R in the AOE armored division as it was finally fielded in 1986. With roughly the same number of personnel, the new organization increased the combat portion of the division by 4 percent, while reducing the headquarters portion by 10 percent, despite the addition of the aviation brigade headquarters. Logistics increased by 6 percent. This could be credited at least partially to increased maintenance and supply requirements for the newly fielded equipment such as the M1 tank. Additionally, the increase in helicopters in the division brought with it increased aircraft maintenance requirements. At the division level, the Army of Excellence program successfully streamlined the division.<sup>48</sup>

External to the division, combat service support assets were also reorganized. Most corps-level service support units were organized into corps support groups (CSG) which controlled nondivisional logistical units within a geographical area. For the most part, one CSG was paired with each division as part of a concept called “fix forward,” which pushed nondivisional direct support and general support logistical activities

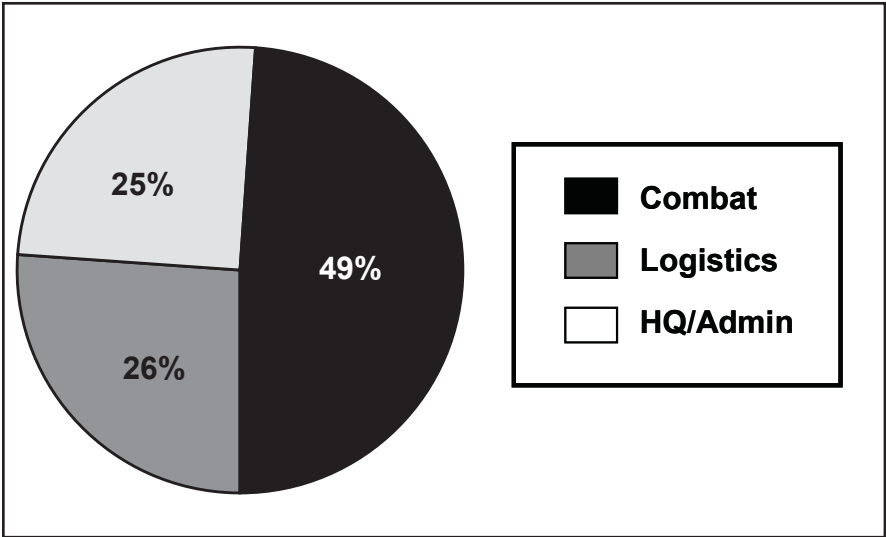


Figure 29. AOE Armored Division, 1986.

forward into the division's rear area. CSGs organized most of their support operations under multifunctional corps support battalions (CSB), with one direct support CSB working in the division area. Some logistical units still worked under the older functional (i.e., single type of support) command, particularly medical and transportation.<sup>49</sup>

The DESERT STORM campaign in early 1991 was the first test of the AOE organizational structure. For the operation, the Army deployed a field army headquarters, two corps headquarters and the equivalent of seven divisions, along with extensive combat support and combat service support assets at the corps, army and theater levels. The total Army force in the theater of 333,565 represented 58 percent of Active Army strength and the deployed divisions were slightly less than half of the Army's divisional force structure. It was the Army's largest deployment since Vietnam and the fastest expeditionary build up in US history.<sup>50</sup>

Figure 30 depicts the functional tooth-to-tail ratio for the Kuwaiti Theater of Operations (KTO) at the end of the ground war portion of the campaign. While in each of the seven combat divisions deployed to the KTO, the ratio between combat to noncombat elements was 1 to 2, the overall KTO ratio was 1 to 3.3. The difference between the AOE division (Figure 17) and the theater as a whole consisted of increased headquarters (3 percent) and logistics/life support (16 percent) elements. The expeditionary nature of the operation and the large number of forces may account for the increased logistics/life support proportion. A major proportion of the

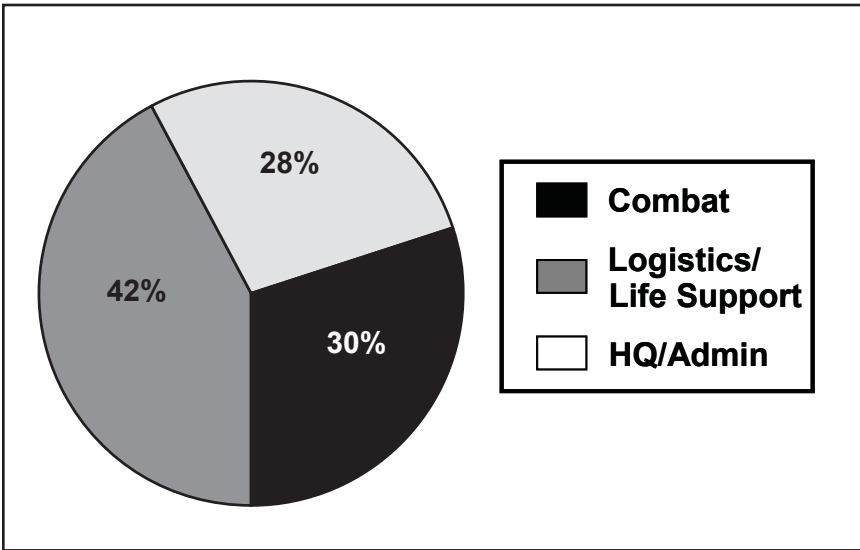


Figure 30. Kuwaiti Theater of Operations (KTO), March 1991.

logistical piece was found in medical units, as US planners expected heavy casualties. Surprisingly, the headquarters element was 10 percent smaller than in Cold War Germany (Figure 11) and the logistics/life support portion was 7 percent higher. The latter statistic may be partially accounted for in the large amount of host nation support available to logistical elements in Germany.<sup>51</sup>

However, the proportions in the KTO are not that different from the ratios in the previous similar US Army expeditionary operation, the deployment to Vietnam (Figure 22). In Vietnam, combat troops were 35 percent of the total, while the KTO figure was a decrease of 5 percent. Headquarters elements decreased by 2 percent in the KTO deployment compared to Vietnam, while logistical/life support elements increased from Vietnam to the KTO operation by 7 percent.

Some Army officers, particularly logisticians, feared that the T3R in the post-Nunn Amendment era had been tilted in favor of combat forces to an extent where the logistical forces had become a “thin line . . . behind the combat forces.”<sup>52</sup> In 1987, LTC John Vann observed negatively that Army logistical unit levels had never been restored to the levels before and during Vietnam, and had actually declined. The operational slice from 1991 (Table 6) clearly reflects Vann’s assessment. Army wide, the slice, at 39,046, was the lowest it had ever been since the Army fielded the division as its basic operational unit. This meant that divisions took up the largest proportion of Army strength ever since World War I at 44 percent. However, the slice for the divisions deployed to Southwestern Asia for



Table 6. DESERT STORM US Army Operational Slice<sup>53</sup>

a. Total Strength	b. Number of Divisions	c. Standardized Division Size	d. Operational Slice (a/b)	e. Division Percentage (c/d)	f. Non- Divisional Slice (d - c)	g. Non- Divisional Percentage of the Army (f/d)
<b>Worldwide</b>						
572,423	14.66	17,104	39,046	44	21,945	56
<b>DESERT STORM</b>						
333,565	7	17,104	47,652	36	30,548	64

DESERT STORM was 5 percent and 8,606 soldiers higher. This reflected the Army's deployment of a larger proportion of nondivisional forces to SWA than was normally found overall, with divisions forming 37 percent of the Gulf force, while they formed 44 percent of the Army as a whole.

### The Modular Army and the New Millennium

After DESERT STORM, the Army retained the AOE structure throughout the 1990s, tweaking it primarily by removing antitank companies from mechanized infantry battalions, deleting one of the line companies from the tank and mechanized infantry battalions, and adding an engineer battalion and a motorized reconnaissance troop to each brigade. In the latter part of the decade, the perceived impact of digital communications resulted in the development of a streamlined version of the AOE called Force XXI. The primary distinctive feature of the Force XXI concept was that logistical activities were consolidated in the units of the division support command (DISCOM). Digital communications were considered capable enough of tracking logistical needs to allow for the consolidation of the traditional unit and direct support echelons of combat service support and most logistical elements were deleted completely from combat battalions. The Force XXI changes were not completely implemented, only being fielded in one division and parts of a second, before the program was supplanted with the modular Army concept.

Unlike the AOE change, which was basically a streamlined version of the ROAD structure, the shift to the modular structure in the early years of the new millennium was a conceptual shift from the division to the brigade as the basic operational organization. The development of the brigade-based Stryker program was its direct precursor.

## Stryker Brigades

The modular Army had its origins in the development of the Stryker Brigade. The creation of Stryker units began in 1999 as the latest in a series of Army attempts to develop an acceptable light armored wheeled vehicle to equip infantry units. Such a vehicle gave infantry much more of the firepower and survivability inherent in heavy (mechanized infantry and armored) units while retaining most of the strategic mobility of light infantry units. The program soon developed the Stryker combat vehicle as its basic piece of equipment. The biggest departure from the past was the use of the brigade, rather than the division, as the basic operational unit in the Stryker program. While most Stryker brigades retained divisional designations, the brigades were organized as completely self-contained units with all the supporting divisional elements being part of the organization (Figure 31). For this reason, the brigades were usually referred to as brigade combat teams (BCT). Reinforcing this notion, as of early 2007, no Stryker brigade had yet been employed operationally under its titular division headquarters.

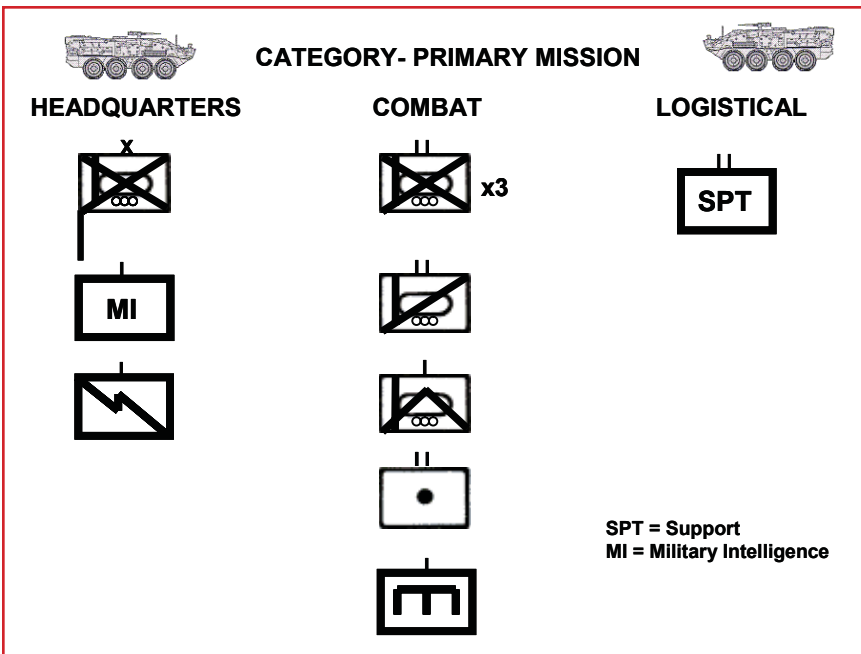


Figure 31. Stryker Brigade Organization, 2004.

Stryker brigades used the digital packages developed for Force XXI to enhance their fighting and command and control capabilities. Accordingly, the headquarters elements in the Stryker brigades were reduced by 7 percent

proportionally from headquarters in the AOE division. This decrease was split almost in half between the brigade's logistical and combat elements, with combat forces increasing by 3 percent and logistical elements by 4 percent. The ratio between combat and noncombat elements is shown in Figure 32.

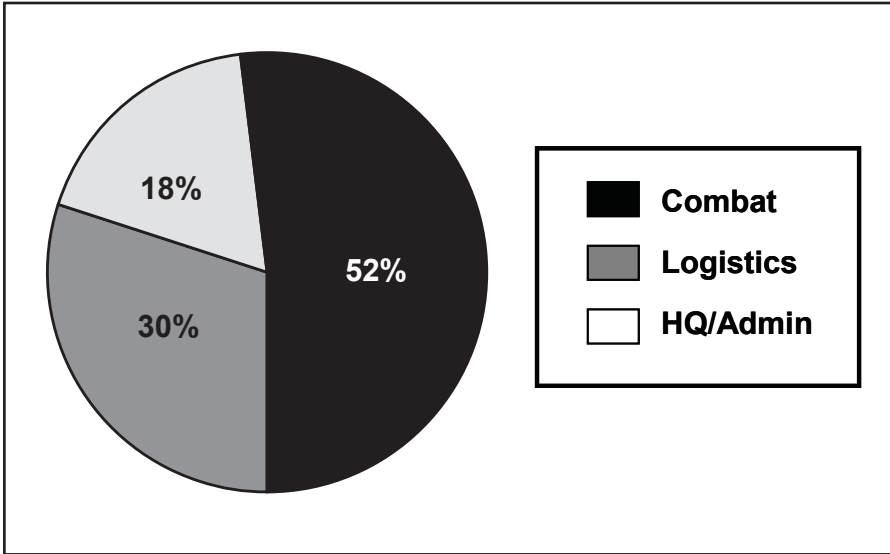


Figure 32. Stryker Brigade, 2004.

### **Modular Brigades**

As early as 2002, the Army began developing plans to expand the Stryker organizational structure to the rest of the Army. Starting in early 2004, these designs were implemented in a construct known as the modular Army. The modular Army changed the basic operational unit from the division to the brigade, but did not remove the division from the organizational structure. Under modularity, divisions acted primarily as command and control headquarters with their subordinate elements tailored based on the division's mission. However, when AOE divisions converted to the new structure, most of the former divisional elements remained under their old division. This gave a notional modular division organization as shown by category in Figure 33.

Such a division consisted of a division headquarters, four combined arms brigades (from the division's three former maneuver brigades), and one each of the following: a fires brigade (the former division artillery headquarters with a multiple rocket launcher system (MLRS) battalion); an aviation brigade (former divisional aviation brigade); a reconnaissance,

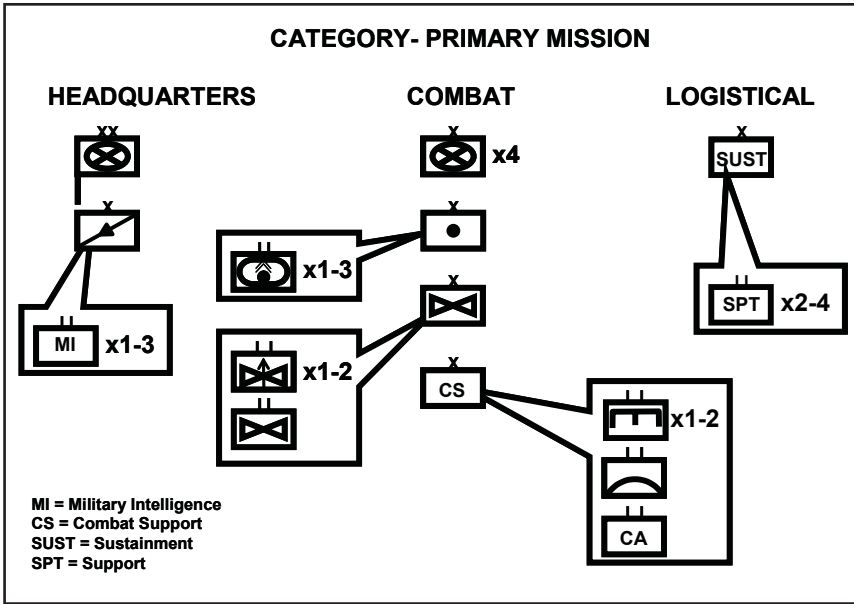


Figure 33. Notional Modular Division Organization, 2004.

surveillance, and target acquisition (RSTA) brigade (an expansion of the former divisional military intelligence battalion); a sustainment brigade (the former division support command headquarters with division-level support elements); and a combat support or maneuver enhancement brigade (containing former divisional elements such as the air defense artillery (ADA) and engineer battalion and an expanded nuclear, biological, chemical (NBC) company).<sup>54</sup>

The notional modular division, containing almost all the elements found in the AOE division, was larger by 5,127 positions, an increase of 30 percent. Headquarters elements formed more than half (56 percent) of this increase, while most of the rest (41 percent) was an increase in logistical elements. A task-organized modular division was slated to be even larger with additional battalions typically attached to the brigades (Figure 34).<sup>55</sup>

Because it was a system based on brigades, that echelon was key to the modular concept. The modular nature of the concept was the ability to employ, organize and move around Army operational forces based on standardized brigade organizations, a smaller and therefore more operationally flexible unit than the division. The brigades were reorganized into three basic types: light (light infantry), heavy (tanks and mechanized infantry) and medium (the Stryker brigades that were being developed separately). Within these types, the brigades were also designed to be

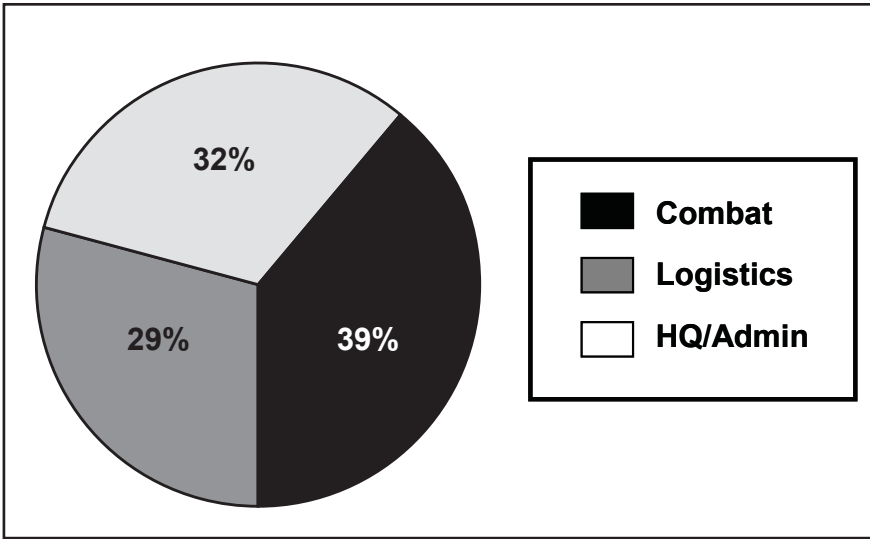


Figure 34. Notional Modular Heavy Division, 2004.

self-contained and interchangeable. The new modular brigades were also designed smaller than their equivalent predecessors as 36 AOE brigades were to be converted to 48 modular brigades, a 25 percent increase, with the same amount of troops. This increase was done primarily by retaining only two maneuver battalions in the new organization's strength of 3,735.

As mentioned above, the heavy (mechanized infantry and armored) or combined arms brigade contained most of the elements which the division had routinely assigned to support the brigade in the AOE organization. This included two combined arms maneuver battalions containing two companies each of tanks and mechanized infantry, as well as an engineer company and a dedicated support company. The brigade field artillery battalion contained the minimum force to support the two maneuver battalions. There was also a small cavalry squadron in the brigade (Figure 35).

The proportional relationships in the modular combined arms brigade are shown in Figure 36. In relation to the AOE division, the smaller units contained proportionally fewer combat elements (43 percent versus 49). Most of this difference matched a similar rise in logistical elements (33 percent versus AOE 26 percent). The new structure reduced headquarters elements by 1 percent. Therefore, in the modular brigades, the functional T3R was 1 to 1.3 (combat to noncombat), a slight decline from the 1 to 1.02 ratio of the AOE division. At the divisional level, using the notional modular division as a model, the ratio was more drastically different; one to 1.6, versus the AOE's 1 to 1.02. In any event, at the operational unit

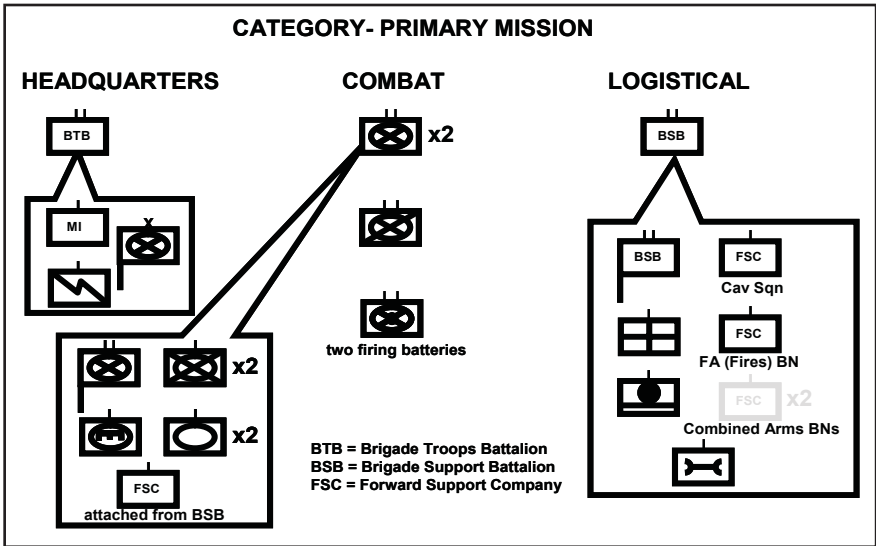


Figure 35. Combined Arms Modular Brigade, 2004.

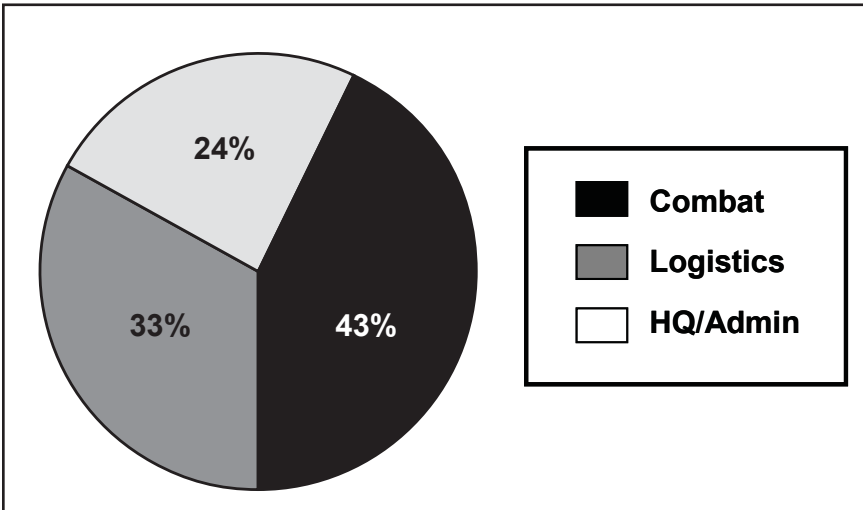


Figure 36. Modular Combined Arms Brigade, 2004.

(i.e., brigade) level, combat elements in the new millennium were not far removed from being on par with noncombat elements.

As part of its adoption of the modular brigade as the basic operational unit, the Army also instituted a program called Force Stabilization or Unit Focused Stability. Unit Focused Stability supplanted the individual

replacement system in the new modular brigade combat teams with a unit manning life cycle at the brigade level. Once the system was implemented, the cycle for each brigade would be 3 years, ensuring that brigade soldiers served together for that period. The Army coupled stabilization with another new program called “home basing.” Home basing was designed to ensure that new soldiers remained at the same post for at least 6 or 7 years when they joined the Army, except when deployed overseas. The two programs together were focused on the brigade as the stabilized and home-based unit.<sup>56</sup>

Another characteristic of the modular organization was an overhaul of headquarters to structure them to match actual field employment. Headquarters at the brigade, division and corps levels were organized by function and most units considered in this work to be headquarters elements, such as signal and military intelligence (MI) organizations, were consolidated under a headquarters or troops battalion. At the brigade level, the former headquarters company was replaced by a brigade troops battalion (BTB) of about 500 that included headquarters staffs for both the brigade and the troops battalion, as well as an MI company and a signal company. Under the BTB’s brigade headquarters company, there were two command posts (CP), a small tactical (TAC) CP and larger main CP, and a mobile command group (MCG). The brigade commander headed the MCG, while the newly created position of deputy commander headed the TAC CP and the brigade executive officer (XO) the main CP.<sup>57</sup>

At the division level, with a staff of about 1,000 soldiers, a headquarters and headquarters battalion replaced the former HHC and was organized around four command and control elements, two TAC CPs, a main CP and a MCG. The personnel in these command posts were organized under an HHC, while support personnel, such as cooks and vehicle mechanics, were in a separate headquarters support company. A signal and security company filled out the battalion. At the corps level, troop strength was about the same as at the division at around 1,000. The headquarters was organized within a troops battalion and contained four headquarters elements, a MCG equipped with its own aviation assets, an Early Entry Command Post (EECP), an operational CP and a main CP. The corps logistical commander headed the main CP and usually operated out of a semipermanent fixed location. The EECP was a subcomponent of the operational CP, acting as the advance party for that element. The operational CP was the forward headquarters, while the MCG was the small group centered on the corps commander. Corps headquarters were designed to command joint forces and, if necessary, to be the senior headquarters in a theater.<sup>58</sup>

With the brigade now supplanting the division as the basic operational unit, the portion of the Army found in the brigade is a significant indicator of an operational T3R. Once all 48 active modular brigades are fielded in late 2007, the projected brigade slice for the brigades would be 10,417 (Table 7). Based on this figure, modular brigades were 36 percent of the Army's overall organizational structure. While this percentage is close to the percentage found during the Cold War in 1976 (34 percent) after the Nunn Amendment reforms, it is 8 percent less than the AOE Army-wide figure from 1991 (44 percent). However, when AOE divisions were deployed in 1990-91 to fight in the Gulf War, their support elements were augmented, reducing the ratio to 36 percent, which matches exactly the modular brigade slice percentage.

Table 7. Modular Army Projected Brigade Operational Slice, 2007

a. Total Strength	b. Number of Brigades	c. Standardized Brigade Size	d. Operational Slice (a/b)	e. Brigade Percentage (c/d)	f. Non- Brigade Slice (d - c)	g. Non- Brigade Percentage of the Army (f/d)
500,000	48	3,735	10,417	36	6,682	64

Since four modular brigades were roughly equivalent to the division organizations used in previous divisional slices, using four brigade slices produces a figure of 41,668, a total slice that is less than all divisional slices cited in this work except for the Army-wide AOE slice from 1991 (39,046).

### Iraq and the Tooth-to-Tail Ratio

In the ongoing Operation IRAQI FREEDOM, the Army employed a mix of Force XII, AOE, Stryker, and, in later stages, modular organizations. Before the projected Baghdad surge of 2007, the highest US Army troop levels within Iraq, 135,000, were achieved in January 2005. Figure 37 shows the general organization of the forces in Iraq at that time and Figure 38 depicts the functional T3R of the Army forces. While the counterinsurgency aspects of the Iraqi operation often place elements cited in this work as noncombat into combat situations, organizations whose primary mission was the conduct of combat operations consisted of about 53,768 troops or 40 percent of the deployed force. Accordingly, the functional T3R was 1 to 2.5 (combat to noncombat).



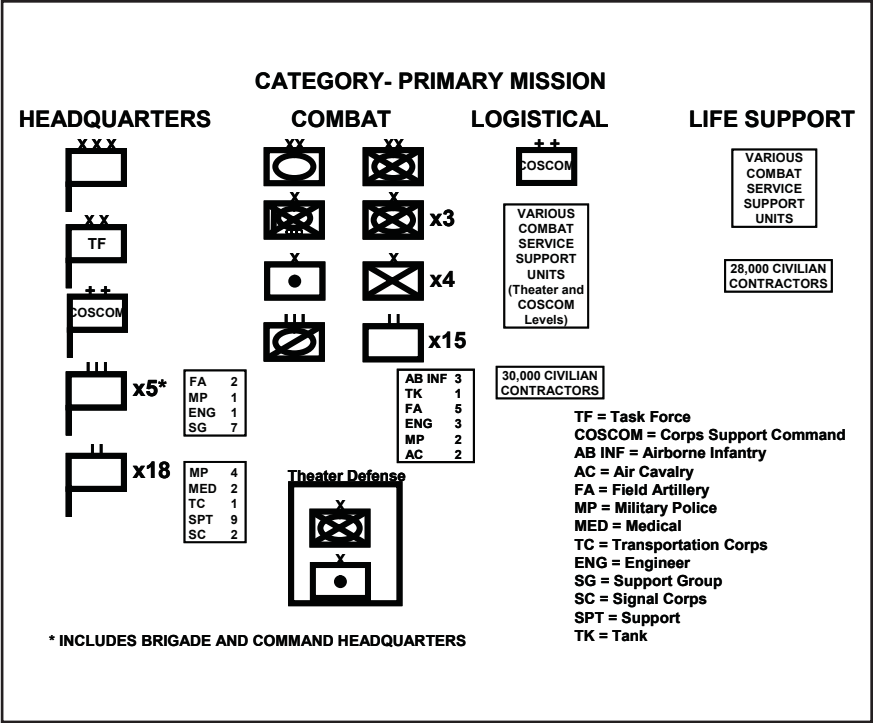


Figure 37. Iraq, January 2005.

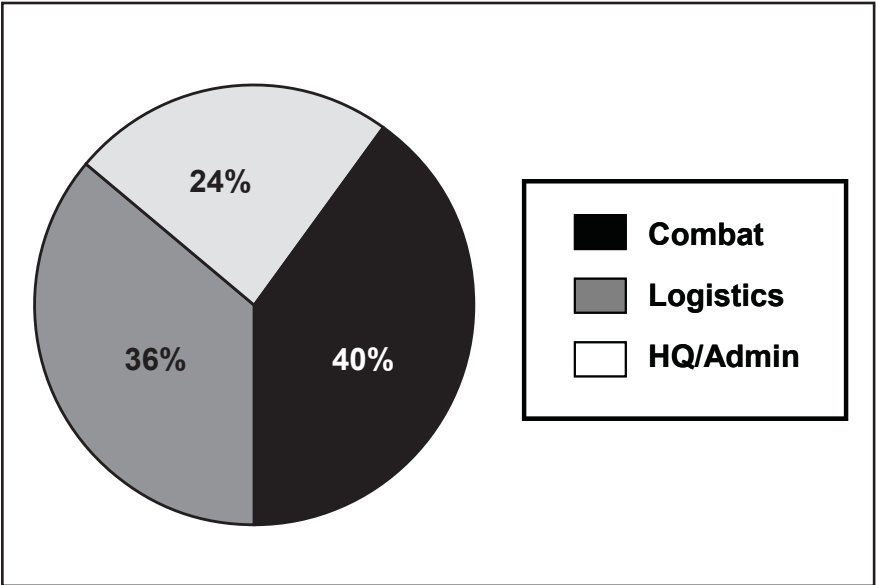


Figure 38. Army Forces in Iraq, January 2005.

This proportion was 10 percent higher than the 1991 KTO deployment and was comparable to combat proportion in the ETO in World War II (39 percent). It was a considerably higher proportion of combat troops than in Vietnam (35 percent) and Korea (33 percent) and the Nunn Amendment minimum acceptable level of between 29 and 34 percent. Yet, many commentators have cited the extensive life support activities occurring concurrent with combat operations throughout Iraq.<sup>59</sup>

It is difficult to cull life support elements from those conducting logistical activities. Unique from previous historical examples discussed in this work, the extensive use of civilian contractors in Iraq has muddied the waters in relation to the functional tooth-to-tail ratio. Estimates of the number of contractors in Iraq in January 2005 vary. The commander of the Army’s major theater-level logistical organization cited a figure of 9,000 civilians working in his organization and a total of 30,000 logistics contractors working throughout Iraq. In *Boots on the Ground*, a total contractor figure of 58,000 was used. That figure is retained here, divided for 30,000 logistical and 28,000 life support contractors.<sup>60</sup>

Adding the 58,000 contractors to the functional T3R equation produces the pie chart depicted in Figure 39. The 58,000 are divided almost evenly between the logistical and life support categories. This increase (shown by category in Figure 40) raises the overall logistical element level to 41 percent from 33, while reducing headquarters elements proportionally by 7 percent and combat elements by 12 percent. Contractor inclusion adds a

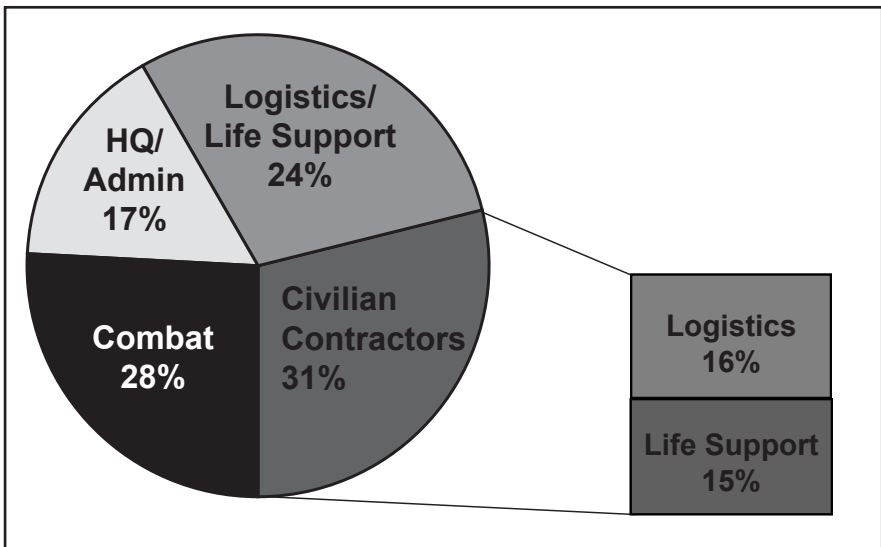


Figure 39. Army Forces in Iraq including Contractor Support, January 2005.

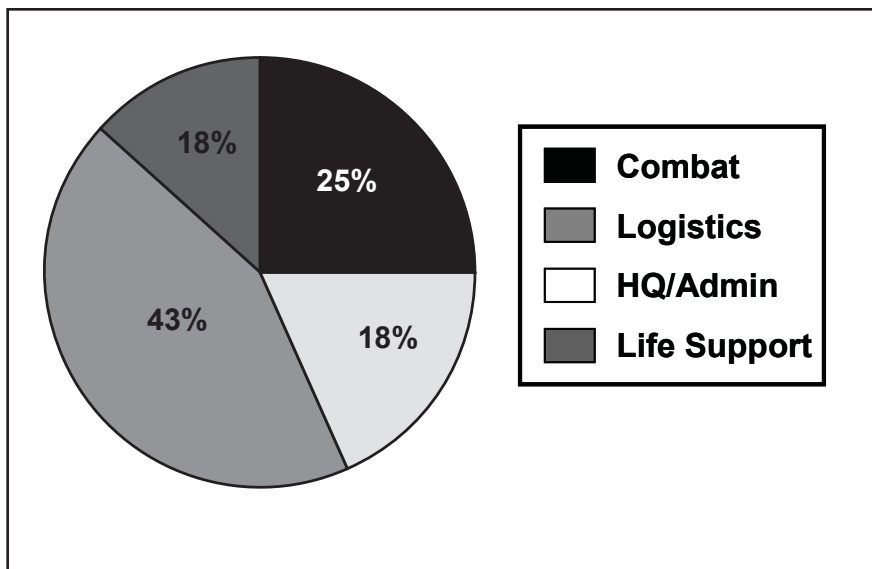


Figure 40. Army Forces in Iraq including Contractor Support, Consolidated by Category, January 2005.

separate life support category of 15 percent. This total, in fact, represents a minimum total for this category. An undetermined number of Army troops listed under the logistical category were undoubtedly primarily devoted to life support functions as well. The 15 percent figure compares with 6 percent in Korea in 1953 and 12 percent in Vietnam in 1968.

However, similar to Korea in 1953, the Army maintained a large logistical base nearby, in this case in Kuwait. Many theater support elements were located there instead of in Korea itself. Figure 41 shows the functional T3R with the inclusion of the roughly 30,000 troops in Kuwait. Categorically, these forces consisted primarily of logistical elements (60 percent), but also included a sizable headquarters component (25 percent), life support (7 percent) and combat (9 percent) elements. With the addition of the Kuwaiti theater base and contractors, the Iraq functional T3R shows a decline in combat elements below the Nunn Amendment level, with only a quarter of the force (a functional T3R of 1 to 3).

Operationally, the division remained the basic unit in January 2005. Accordingly, the operational slice is examined for Iraq, not the brigade slice (Table 8). Overall, the Army fielded a force of 10 active divisions in 2005, out of a total strength of 468,578. This equated to an operational slice of 48,857 and an Army-wide percentage of divisional forces of 35, slightly more than a third of the Army. Focusing more narrowly on Iraq,

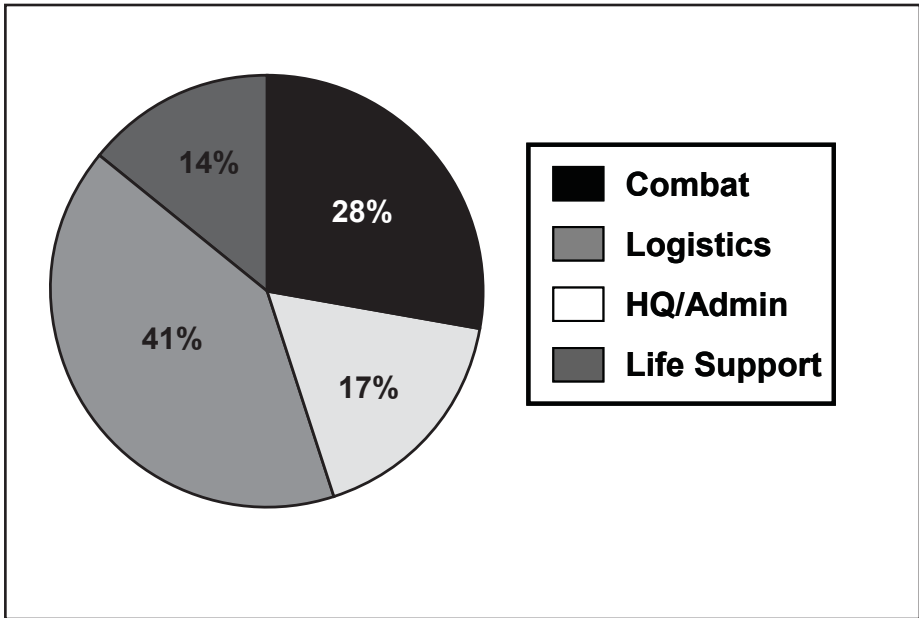


Figure 41. Army Forces in Iraq by Category, including Contractor Support and Forces in Kuwait, January 2005.

Table 8. Iraq, January 2005, US Army Operational Slice<sup>61</sup>

a. Total Strength	b. Number of Divisions	c. Standardized Division Size	d. Operational Slice (a/b)	e. Division Percentage (c/d)	f. Non- Divisional Slice (d - c)	g. Non- Divisional Percentage of the Army (f/d)
<b>Worldwide</b>						
488,579	10	17,104	48,857	35	31,753	65
<b>Iraq, January 2005</b>						
135,000	4	17,104	33,750	51	16,646	49

the four division equivalents deployed to Iraq in January 2005 equated to a theater operational slice of 33,750. Accordingly, 51 percent, slightly more than half, of the troops in Iraq were found in divisional organizations.

### **Summary**

The historical examples cited in this chapter provide a series of case studies that can be readily compared and examined collectively to discover organizational trends, develop historically based force development estimates and provide an understanding of T3R development since 1917. This analysis is presented in the next chapter.

## Notes

1. US War Department, *The US Army in the World War, 1917-1919*, Volume 1, "The Organization of the American Expeditionary Forces" (Washington, DC: US Army Center of Military History, 1988), 144-5 [hereafter "The Organization of the American Expeditionary Forces"].

2. The AEF maintained a force of nondivisional Corps of Engineers units consisting of 241,613 troops, representing 12 percent of the total AEF force. Categorizing this force is problematic. I have chosen to place the whole engineer element in the combat category, but undoubtedly, at least some of this force belongs in the logistical category as the engineers also maintained the railroads. However, determining what portion of the 241,613 belonged in which category would require a level of research beyond the scope of this work. The placement of the 241,613 in the combat category is, therefore noted. Accordingly, up to 13 percent of the total of combat troops could possibly be placed in the logistical category instead. See "The Organization of the American Expeditionary Forces," 8; COL Carl Schmidt, "The Operational Slice in Two World Wars," *Military Review* 31 (October 1951), 56.

3. US War Department, *Order of Battle of the United States Land Forces in the World War, American Expeditionary Forces: General Headquarters, Armies, Army Corps, Services of Supply, Separate Forces* (hereafter *Order of Battle*), Volume 1, 8.

4. "The Organization of the American Expeditionary Forces," 141; *Order of Battle*, Volume 1, 8; 446-7; US War Department, *Order of Battle of the United States Land Forces in the World War, American Expeditionary Forces: Divisions* (hereafter *Order of Battle: Divisions*), Volume 2, 446-7. The infantry regimental headquarters company was so much larger proportionally because it contained a signal platoon that provided communications for the entire regiment. See US War Department, *United States Army in the World War 1917-1919, Organization of the American Expeditionary Forces, Vol. 1* (Washington, DC: US Army Center of Military History, 1988), Table 6, 345.

5. *Ibid.*; "The Organization of the American Expeditionary Forces," 141; US War Department, *Order of Battle*, Volume 1, 8; 446-7.

6. *Order of Battle: Divisions*, Volume 2, 446-7.

7. *Order of Battle: Divisions*, Volume 2, 446-7; John B. Wilson, *Maneuver and Firepower: The Evolution of Divisions and Separate Brigades*, Army Lineage Series (Washington, DC: US Army Center of Military History, 1998), 55.

8. *Order of Battle: Divisions*, Volume 2, 446-7.

9. "The Organization of the American Expeditionary Forces," 142; Wilson, 68-71. The cited division was the 87th.

10. "The Organization of the American Expeditionary Forces," 142; Wilson, 53, 67; John McGrath, *The Brigade: A History* (Fort Leavenworth: Combat Studies Institute Press, 2004), 33-4.

11. This figure includes 13 divisions formed and training in the United States as of November 1918.

12. Maurice Matloff, "The 90-Division Gamble," *Command Decisions*, Kent R. Greenfield, ed. (Washington, DC: Office of the Chief of Military History, US Army, 1960), 374; Shelby Stanton, *Order of Battle, US Army, World War II* (Novato, CA: Presidio, 1984), 4. In terms of motorization, a US infantry division was roughly the equivalent of a German *panzergrenadier* (armored infantry) division. While the Germans raised over 200 divisions in World War II, only a small proportion (13) of these were *panzergrenadier* units. The six excluded divisions were five airborne divisions and one mountain division.

13. Kent R. Greenfield, Robert Palmer, and Bell I. Wiley, *The Organization of Ground Combat Troops, United States Army in World War II: The Army Ground Forces* (Washington, DC: Department of the Army, 1947), 227.

14. Greenfield, Palmer and Wiley, 196, 223, 226-7, 297-299.

15. Robert W. Coakley and Richard M. Leighton, *Global Logistics and Strategy 1943-1945*, The War Department, The US Army in World War II (Washington, DC: Office of the Chief of Military History, 1968), 839.

16. This chart was compiled by looking at a combination of sources concerning the ETO, particularly the following works: Shelby Stanton, *Order of Battle, US Army, World War II*, (Novato, CA: Presidio, 1984); US Army, Forces in the European Theater, *General Board Reports*, Bad Nauheim, Germany: 1945-46, No 2 "Organization of the European Theater of Operations," and No 127 "Organization and Functions of the Communications Zone."

17. Wilson, 180; The 210 headquarters included 83 field artillery groups, brigades or corps artillery headquarters, 48 antiaircraft artillery group and brigade headquarters, 13 tank destroyer group headquarters, 83 engineer group and brigade headquarters; Stanton, *World War II Order of Battle*, 5-6. The branches reorganized were antiaircraft, armor, artillery, field artillery, mechanized cavalry, and combat engineers. Other branches, such as tank destroyers, were already organized on a battalion basis.

18. US Army, Forces in the European Theater, *General Board Reports*, Bad Nauheim, Germany: 1945-46, No. 101 "The Employment of Ordnance Staff Sections, Ordnance Combat Service Units and Ordnance Service Units in the European Campaign," 25, 36, Appendix 15 and 16; US Army, Forces in the European Theater, *General Board Reports*, Bad Nauheim, Germany: 1945-46, No 30 "Service Troop Basis," 3, Appendix 1 and 2.

19. Greenfield, Palmer and Wiley, 274-5.

20. Greenfield, Palmer and Wiley, 320-1.

21. Roland G. Ruppenthal, *Logistical Support of the Armies*, The United States Army in World War II: European Theater of Operations, Volume II (Washington, DC: Office of the Chief of Military History, 1959), 304.

22. *Ibid.*, 310-1, 315, 317, 321, 323, 326-9. 332-4; Matloff, 380.

23. This, and the following two figures, were compiled from information contained in the following sources: Shelby Stanton, "Korean War Order of Battle," manuscript in the archives of the US Army Center of Military History, Washington, DC; "Statistical Data on Strength and Casualties for Korean War and Vietnam," Historical Manuscripts Collection (HMC) file 2-3.7 AD.M, US Army

Center of Military History. Categorized as life support were only units whose primary mission was clearly that of life support functions. Some units, therefore, categorized as logistical may have also actually been committed to life support functions.

24. Ibid.

25. Wilson, 225-7.

26. Stanton, "Korean War Order of Battle"; "Statistical Data on Strength and Casualties for Korean War and Vietnam."

27. Stanton, "Korean War Order of Battle," Book V, Part XIC, 21-27; Wilson, 225-7.

28. Stanton, "Korean War Order of Battle"; "Statistical Data on Strength and Casualties for Korean War and Vietnam."

29. Bob Zelnick, "Soldier Gore: The Story of the Veep and Vietnam," *National Review* (22 November 1999) [article on-line], available at [http://www.find-articles.com/p/articles/mi\\_m1282/is\\_22\\_51/ai\\_57436684](http://www.find-articles.com/p/articles/mi_m1282/is_22_51/ai_57436684); Internet; accessed on 20 March 2007; for 11 to 1, see David Hackworth, "Needed: More Warriors, not Military Toys," *Defending America*, 26 July 1994 [article on-line] available at <http://www.hackworth.com/26jul94.html>; Internet; accessed on 20 March 2007.

30. Ibid. Wilson, 333-6. Since Korea, the Army had reorganized its divisions twice, first to the short-lived Pentomic structure in the late 1950s, then in the early 1960s to the ROAD organization. ROAD basically applied the World War II light armored division structure to all divisions, with an increased number of combat battalions. The ROAD organization received its baptism of fire in Vietnam.

31. Shelby Stanton, *Vietnam Order of Battle* (Washington, DC: US News Books, 1981), 7, 69-230 passim.

32. Stanton, *Vietnam Order of Battle*, 1-385 passim.

33. Wilson, 333, 336-339.

34. Stanton, "Korean War Order of Battle"; "Statistical Data on Strength and Casualties for Korean War and Vietnam."

35. Major Paul Herbert, *Deciding What Has to Be Done: General William E. DePuy and the 1976 Edition of FM 100-5, Operations*, Leavenworth Paper Number 16 (Fort Leavenworth: Combat Studies Institute, 1988), 5-6.

36. Wilson, 336-7.

37. Michael J. Meese, "Defense Decision Making under Budget Stringency: Explaining Downsizing in the United States Army," (PhD diss., Princeton University, 2000), 240-242; Major Creighton A., Abrams, Jr. "The Sixteen Division Force: Anatomy of a Decision." (MMAS thesis, US Army Command and General Staff College, 1975), 27-30.

38. [US Army] Chief of Staff Memo 74-5-70 for Heads of Army Staff Agencies, Subject: Increased Combat Capability in Europe, 2 August 1974, Brigade 75 file, Force Structure and Unit History Branch, US Army Center of Military History; "How DoD is Improving the Combat Proportions of U.S. Forces in Europe," *Commander's Digest* 18 (20 November 1975), 2-3; Wilson, 366, 376 note 31; Abrams, Jr., 27-30.



39. "US Department of the Army Force Accounting System, Active Army Troop List," as of 31 March 1974, Part IV, Active Army Troop List, 3-6, 8-9, 13-28, 44-45. This document is found in the archives of the US Army Center of Military History. This computation differs from the rationale used by the Nunn Amendment (but not different from that used throughout this work) by figuring in the headquarters and support elements of battalion-size units, as well as units larger than battalions.

40. These programs set up two brigades whose combat troops rotated through Germany without their dependents for 6-month periods. The rotation concept was soon abandoned and the additional brigades, with dependents, were permanently stationed at Wiesbaden and Garlstedt.

41. Abrams, 15, 19, 26-8.

42. The differences between the 1968 Vietnam US Army infantry division and the 1974 US Army armored division are outlined in the following table:

	Infantry Division 1968		Armored Division 1974		Difference (ID - AD)	
	Number	Percent	Number	Percent	Number	Percent
Total	16,902	100	15,059	100	-1,843	NA
Combat	9,769	58	6,710	45	-3,059	-13
Log	1,932	11	3,070	20	+1,138	+9
HQ	5,201	31	5,279	35	+78	+4

43. Statistical comparison between the 1943-45 armored division and the 1974 armored division:

	Number	Percent	Number	Percent	Number	Percent
Total	10,670	100	15,059	100	+4,369	NA
Combat	6,180	58	6,710	45	+530	-13
Log	2,225	21	3,070	20	+845	-1
HQ	2,265	21	5,279	35	+3,014	+14

The comparison between the maneuver battalions of the 1943-45 armored division and the 1974 armored division:

	Armored Division 1943-45			Armored Division 1974			Difference (AD 43/45 - AD 74)			
	No	Total	Cbt	No	Total	Cbt	Bns	%	Cbt Total	%
Combat Bns										
Tank	3	2,100	1,335	6	3,120	1,902	+3	+100	+567	+42
Armored/Mech Inf	3	2,985	1,401	5	3,830	2,335	+2	+67	+934	+66
Total	6	5,085	2,736	11	6,950	4,237	+5	+184	+1,501	+55

44. George C. Wilson, "Joint Chiefs of Staff Break with Carter on Budget Planning," *Washington Post*, 30 May 1980, A1.

45. John Romjue, "A History of Army 86, Volume 1 Division 86: The Development of the Heavy Division September 1978-October 1979." (Fort Monroe,

VA: US Army Training and Doctrine Command, 1980), 37. These ratios have been adjusted to fit the categories used in this work.

46. John L. Romjue, *The Army of Excellence: The Development of the 1980s Army* (Fort Monroe, VA: US Army Training and Doctrine Command, 2004), 51-2, 204-5. The rough figures were as follows:

Divisional Elements	17,500	37
Non-Divisional Combat Elements	7,800	16
Non-Divisional Support Elements	22,100	47
Total	47,000	100

47. Romjue, *The Army of Excellence*, 89.

48. The standard figure for the ROAD armored division total strength was 16,475, while the AOE division strength was 17,104. For ROAD strength, see “Active Army Troop List,” 31 March 1974; for AOE strength see Romjue, *The Army of Excellence*, 195.

49. Department of the Army, *FM 54-30 Corps Support Groups* (Washington DC: Department of the Army, 1993), 1-4, 1-5, 1-8, 1-17; LTC John Vann, “The Forgotten Forces,” *Military Review* (August 1987), 11.

50. The figure of 58 percent is slightly skewed. The Army mobilized Army National Guard and Army Reserve units, whose strengths are included in the DESERT STORM totals but not in the total size of the Army. In actuality, the portion of the Active Army strength deployed to Southwest Asia was probably closer to 50 percent of its total strength, a size that meshes with the deployment of 7 out of 14.66 divisions, whose elements all came from the Active Army. The build up to over 300,000 troops took place in less than 180 days and was actually two consecutive 90-day deployments” XVIII Airborne Corps, August-November 1990 and VII Corps, November 1990-February 1991.

51. Thomas D. Dinackus, *Order of Battle: Allied Ground Forces of Operation Desert Storm* (Central Point, OR: Hellgate Press, 2000), 6-7; Vann, 12.

52. Vann, 2.

53. The Army had been using the concept of the operational slice since World War II to determine how many troops in the total force were needed to field the Army’s basic operational organization. But after Vietnam planners developed an additional conceptual slice—the division force equivalent (DFE). The DFE was devised by adding the strength of the division to the nondivisional forces dedicated to support it in combat. The nondivisional portion of the DFE was divided into combat and service support increments. While the DFE was tailored for particular theaters, Army-wide, its service support increment (called the tactical support increment), represented primarily by the corps support group, had risen to over 20,000. The DFE for armored or mechanized infantry divisions projected to deploy to Southwestern Asia (SWA) was 41,000. In 1983, the DFE was reevaluated as the Army Chief of Staff, General John Wickham, did not believe it accurately represented the T3R in the division and its supporting forces. The Army’s Training and Doctrine Command, therefore, devised a new methodology,

which did reflect the T3R more in line with the findings in this work. The new planning concept was called the “operational slice.” The table below shows the differences between the two concepts. See Romjue, *The Army of Excellence*, 29-30, 54, 204-5. The new usage of the expression operational slice referred to only a comparison of a predetermined slice of the Army designed to support a division (including the division itself). In this work, operational slice will still refer to a comparison of the forces contained in a division versus the total strength of the Army.

a. Total	b. Division Increment	c. Non-Divisional Combat Increment	d. Tactical Support Increment	e. Division Percentage (b/a)
Division Force Equivalent				
41,000	12,900	7,900	20,200	31
Revised as “Operational Slice”				
47,400	17,500	7,800	22,100	37

54. US Army Training and Doctrine Command (TRADOC) Pamphlet 525-3-90, *O & O, The United States Army Objective Force Operational and Organizational Plan for Maneuver Unit of Action*, (Fort Monroe, VA: TRADOC, 2005), 25, 41, 47; Task Force Modularity, US Army Training and Doctrine Command, “Army Comprehensive Guide to Modularity, Version 1.0” (Fort Monroe, VA: 2004), vi, 5-4.

55. “Army Comprehensive Guide to Modularity,” 5-5.

56. Joe Burlas, “Force Stabilization Increases Readiness, Predictability,” *Army News Service*, 9 February 2004 [article on-line] available at [http://www4.army.mil/ocpa/read.php?story\\_id\\_key=5653](http://www4.army.mil/ocpa/read.php?story_id_key=5653); Internet; accessed on 10 April 2007.

57. “Army Comprehensive Guide to Modularity,” 8-2; John McGrath, *Crossing the Line of Departure: Battle Command on the Move: A Historical Perspective* (Fort Leavenworth: Combat Studies Institute Press, 2006), 226-230.

58. Department of the Army, Force Development Division, “Modular Division 87000G900 Modularity Note 36A,” 8 March 2006, PowerPoint Briefing; “Comprehensive Guide to Army Modularity,” 4-3, 4-4, 5-7, 5-8, 5-9, 5-10, 5-11, 8-2; McGrath, *Crossing the Line of Departure*, 226-230.

59. See note 4, Chapter 1.

60. BG Yves J. Fontaine and MAJ Donald K. Wols, “Sustaining the Momentum: The 1st Corps Support Command in Iraq, *Army Logistician* 38 (March-April 2006), 3-8; John McGrath, *Boots on the Ground: Troop Density in Contingency Operations*, Global War on Terrorism Occasional Paper 16 (Fort Leavenworth: Combat Studies Institute Press, 2006), 135. Some contractors were undoubtedly employed in headquarters activities and supporting the Iraqi

armed forces. However, since these forces usually remained on bases guarded by uniformed personnel, such contractors are included in the life support category.

61. Betty Maxfield, "Army Profile FY 05" (Washington, DC: Department of the Army, Army G1, 2005), 2. Army National Guard (33,177) and Army Reserve (189,005) strength is not included in these totals even though parts of both of these components were activated in 2005. While several divisions were reconfiguring into the AOE structure in 2005, the AOE strength is used as all divisions in Iraq in January 2005 were of the AOE structure.

## Chapter 3

### Analysis

#### Overview

As mentioned in the Introduction, T3R can be analyzed on two levels: by operational slice (operational T3R) and by overall proportion (functional T3R). The operational slice ratio is significant because it shows organizationally what portion of the force the Army organized into its basic fighting units. For most of the period between 1917 and 2007, the basic unit was the division. Under the modular system, fully implemented in 2007, the brigade replaced the division. Figure 42 shows a comparison of the operational slices for the Army in the various historical examples discussed in this work.

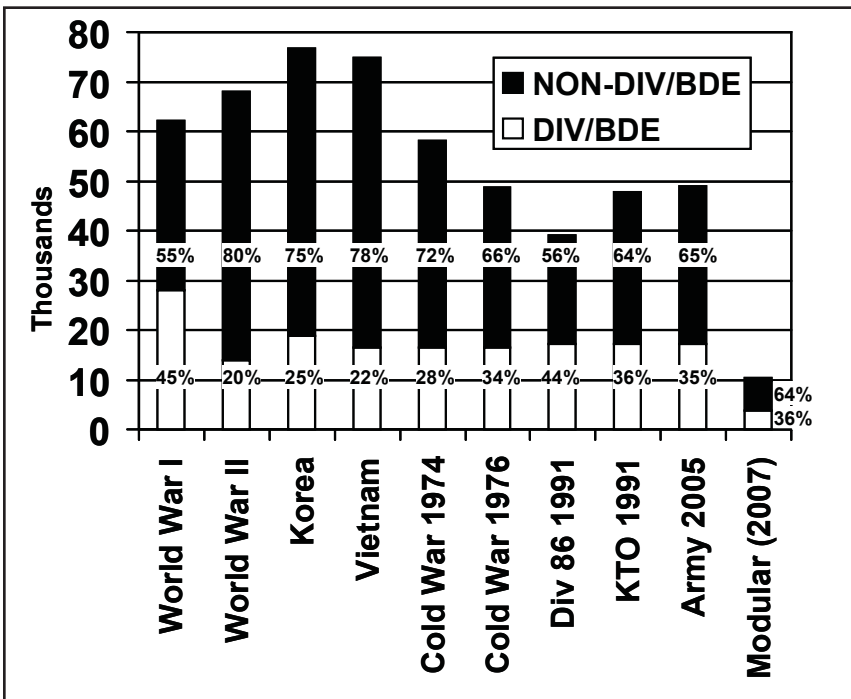


Figure 42. Operational T3R Trends, 1917-2005.<sup>1</sup>

Division percentages as part of the total force ranged from a high of 45 percent in World War I to a low of 20 percent in the McNair/World War II era. Divisions, therefore, varied from almost half of the Army strength to a fifth. Since the implementation of the Nunn Amendment in the mid-1970s, division/brigade proportional strength had risen from the lows of

the Vietnam era. In the Gulf War, the proportion was 36 percent or slightly more than a third of the force, a ratio maintained by the brigades under the modular Army structure.

While operational unit proportion gives a good general indication as to the T3R of the Army overall, the operational units themselves do not consist entirely of combat elements and some combat elements are not found in divisions or brigades. For example, the World War II operational slice was so low because AGF Commander Lieutenant General Lesley McNair organized divisions with minimal organic elements. This pooled many combat and support elements, which in other eras were intrinsic parts of the division.

Accordingly, the overall proportion system, or functional T3R, which analyzes deployments unit-by-unit and categorizes them into one combat and three noncombat elements, is a more precise indicator of the tooth-to-tail ratio. Figure 43 gives an overview of the functional T3R in these categories for the case studies examined in this work.<sup>2</sup> Since 1917, combat elements have remained between 20 and 50 percent of the total force. Since the mechanized/motorized era (1941), the proportion has remained roughly between 30 and 40 percent, until the mass employment of contractors in Iraq. A more detailed examination of trends in each category follows.

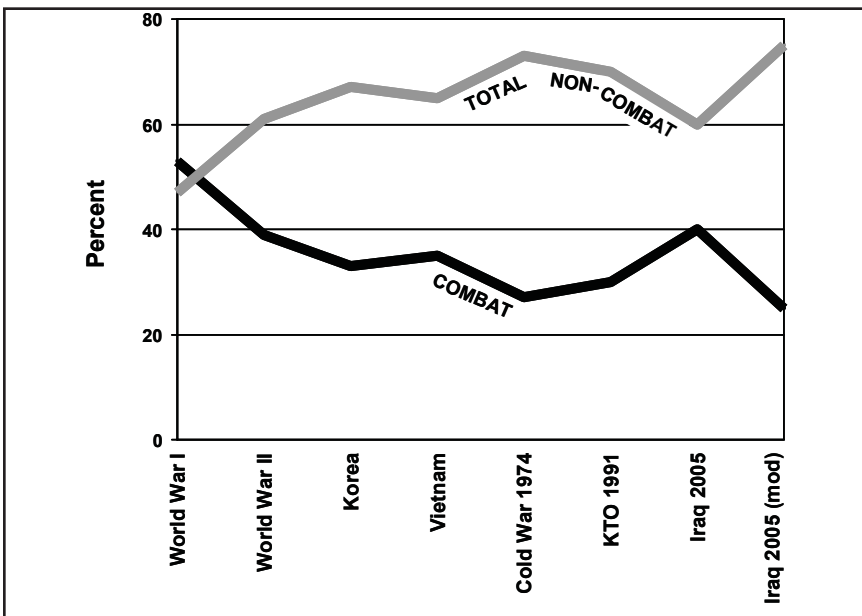


Figure 43. Functional T3R Overview, 1917-2005.

## Combat Elements

Combat elements progressively declined from over 50 percent in 1918 to 33 percent in Korea, 35 percent in Vietnam and 27 percent in 1974 Cold War Germany. Levels then rose with the adoption of an all-volunteer Army. Congress intervened to enforce economy and mandate a minimum level of combat elements of 29-34 percent. It is uncertain where Congress, led by Senator Sam Nunn, came up with this figure. But since 1918, Army combat forces in the historical examples examined in this work only dipped below the 29 percent figure twice. This occurred once in 1974 when Nunn enacted his amendment and again in 2005 in Iraq if contractors and the theater base in Kuwait are included in the totals.

Looking at combat elements in relation to the whole Army shows how small the combat forces actually were in proportion to the whole force (Figure 44). The pure combat portion of the Army was as low as 6.5 percent in the 1974 Cold War. However, these figures are slightly skewed because they only account for the portion of the Army's combat forces committed to the theaters of war studied in this work. Forces held

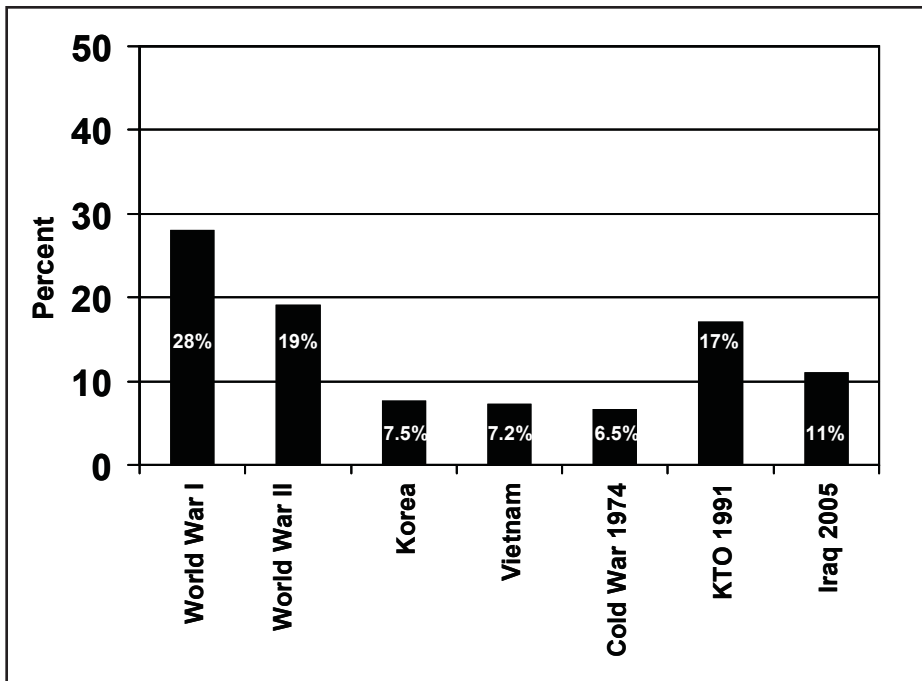


Figure 44. Combat Proportion of the Army, 1917-2005.

in reserve or in inactive theaters are not accounted for except in the AEF and ETO examples. In the case of the AEF, there were essentially no inactive theaters. In the ETO example, total strength was reduced to the proportional percentage (72) of divisions sent to that theater. While the US Army had worldwide commitments unaccounted for in the Korea, Vietnam, and Germany case studies, the operations in Kuwait in 1991 and in Iraq in 2005 were the Army's main focus, reflecting their higher totals. Accordingly, the trend has been for raw combat forces to have hovered between 10 and 20 percent of the total size of the Army.

Historical precedent, as depicted in Figure 45, shows that since 1917 combat elements have only dipped below 30 percent of the total deployed force on two occasions. In the first instance, during the immediate post-Vietnam period in 1974, Congress immediately noticed and intervened to raise the combat level. In the second instance, the modified 2005 Iraq example, the Army employed a large number of civilian contractors as part of the force to conduct noncombat activities.

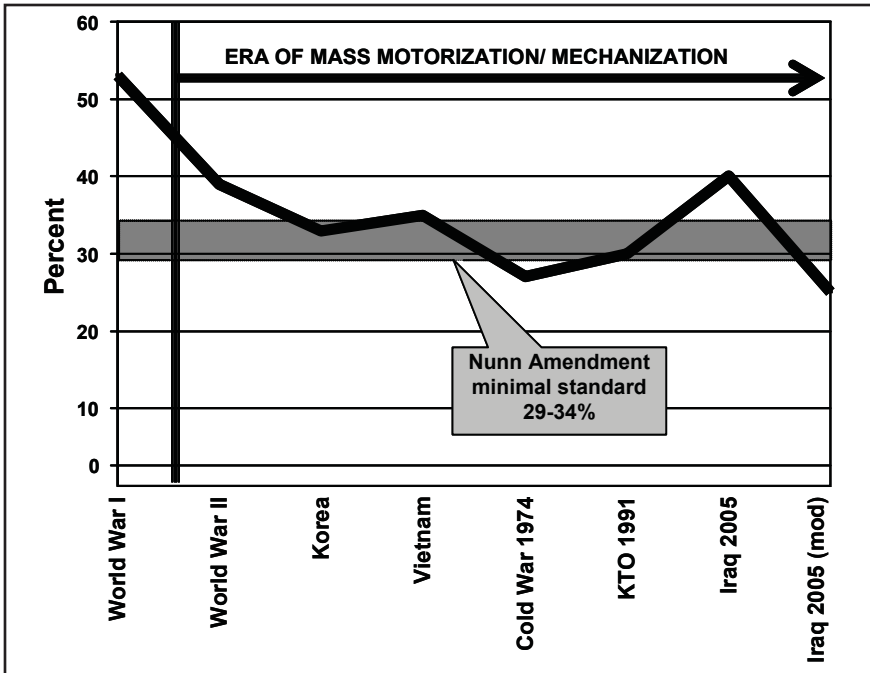


Figure 45. Combat Trends, 1917-2005.

In the modern era of mass motorization and mechanization, which began with World War II, the proportion of combat elements has only varied between 40 and 25 percent of the deployed force. The Nunn Amendment



of 1974, with its minimum-prescribed range for combat forces proportion (28-34 percent), provided a proportion slightly higher than the combat levels in Iraq in 2005. Combat force levels there were already 3 percent lower than Nunn's worst-case proportion, and lower than they have ever been since 1917. The range of combat elements in the modern era (i.e., since 1941) has been, therefore, between a high of 39 percent, or 1 to 1.6, and a low of 25 percent or 1 to 3.<sup>3</sup>

### Noncombat Elements

In terms of range, noncombat elements have been, obviously, the inverse of the combat elements (Figure 46). Since 1941, they have ranged from a low of about 60 percent to a high of 75 percent of the total force. The proportion of noncombat elements since 1917 has progressively increased from under 50 percent to over 70 percent in DESERT STORM. In Iraq in 2005, military logistical forces declined by 10 percent from 1991, but the extensive use of civilian contractors in support roles formerly manned by soldiers accounts primarily for this decline. By including contractors and support elements in Kuwait in the totals, noncombat elements rose to 75 percent, levels exceeding those of pre-Nunn Amendment Germany. Each noncombat element is examined separately in the following sections.

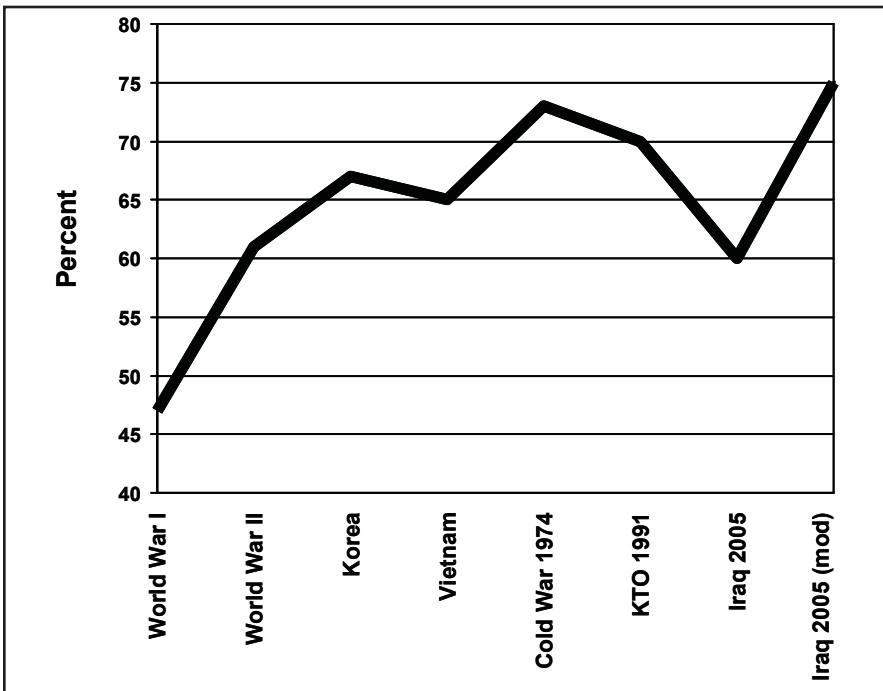


Figure 46. Noncombat Trends, 1917-2005.

## Trends in Logistics

Logistical and life support elements together rose from under 40 percent to about 45 percent of the total force after World War I, with the development of mass Army mechanization and motorization. Together, these two elements hovered in the range between 45 and 47 percent. This is between one-third and one-half of the force, for the rest of the period studied (Figure 47). Fluctuations in the size of logistical elements undoubtedly reflects factors such as host nation support in Germany and in Iraq in 2005, where civilian contractors assumed responsibility for many logistical (and life support) functions. To approximately account for these factors, it seems that the higher range (40-45 percent) of the historical size of logistical elements, including life support, which will be discussed separately below, is a good guideline for a minimum proportional figure. In support of this, one postwar study presented a figure of 44 percent as the appropriate level of logistical support for a division from all theater assets.<sup>4</sup>

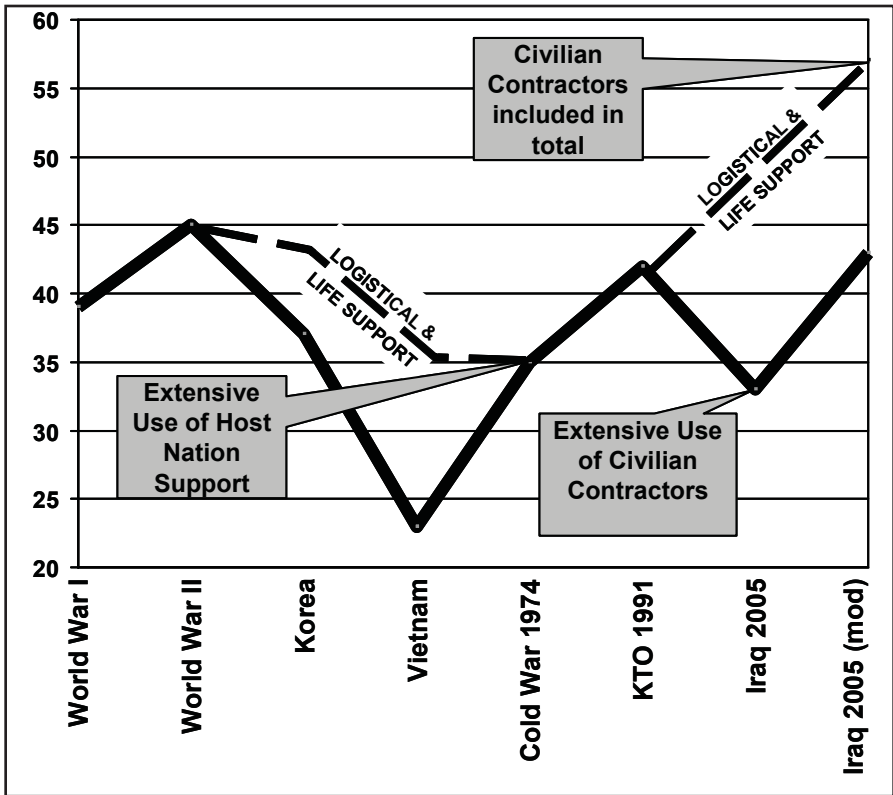


Figure 47. Logistical Trends, 1917-2005.

Trends in logistical strength do not seem to have kept up with the growth of logistical support requirements. These requirements increased markedly during the course of the 20th century and on into the 21st, due largely to advancements in weapons technology. Weapons became progressively larger, more complex and more mobile, theoretically requiring a larger number of logistical troops to support them. The M1 tank, for instance, required three times the fuel of its predecessor, the M60. And between 1970 and 1991, the necessary minimum stockage level for equipment repair and spare parts increased by 20 percent (or one-fifth larger). However, logistical elements only rose about 5 percent proportionally during this period.<sup>5</sup>

Logistical elements were surprisingly one area where the Army often chose to economize, particularly in the 1970s and in later force design initiatives. This led some logisticians to fear that logistical elements had been proportionally reduced to a dangerous level. However, trends in Iraq, with the extensive use of host nation support and civilian contractors, seem to have mitigated these fears as the logistical proportion of the force rose to levels not seen since World War II.<sup>6</sup>

Since motorization in 1941, logistical elements (including life support) ranged between 36 and 57 percent of the total force or between about half to three-fourths of all noncombat elements. The variation seems dependent on the availability of host nation support and civilian contractors. The higher figure of 57 percent does, in fact, include civilian contractors. Overall, including contractors, logistical elements have seen a steady increase, particularly since 1974.

### **The Rise of Headquarters**

The proliferation of headquarters is a long-recognized feature of modern armies. Such headquarters have not just expanded to command and control combat elements, but have also risen to manage noncombat elements. A good example of this was the creation of the materiel management center in ROAD divisions in the 1970s, an agency responsible for managing the assets and functions of divisional and nondivisional logistical units. In this work, the headquarters elements of all units, battalion and above, have been taken into account, no matter what type of overall primary mission the unit had. In the early 1970s, Congress was the first to define headquarters elements, even those controlling combat unit operations, as rightfully belonging to the tail rather than the tooth in the T3R. Congress, however, unlike this work, did not include headquarters elements at battalion level as part of this equation.

Headquarters elements rose from a level below 10 percent in World War I to a height of almost 40 percent in the 1974 Cold War period in Germany. Since 1974, via various organizational restructurings, the proportion of headquarters elements has progressively declined to a level of 18 percent in Iraq in 2005 (Figure 48). Since motorization in 1941, the range of proportional size of headquarters varied between 16 and 38 percent. Surprisingly, considering the apparent proliferation of headquarters in organizational changes since 1974, there may have been more headquarters (such as aviation and engineer brigade headquarters in AOE divisions), but these headquarters were overall smaller in size than when there were fewer, but larger headquarters in Korea, Vietnam and pre-1976 Cold War Germany.

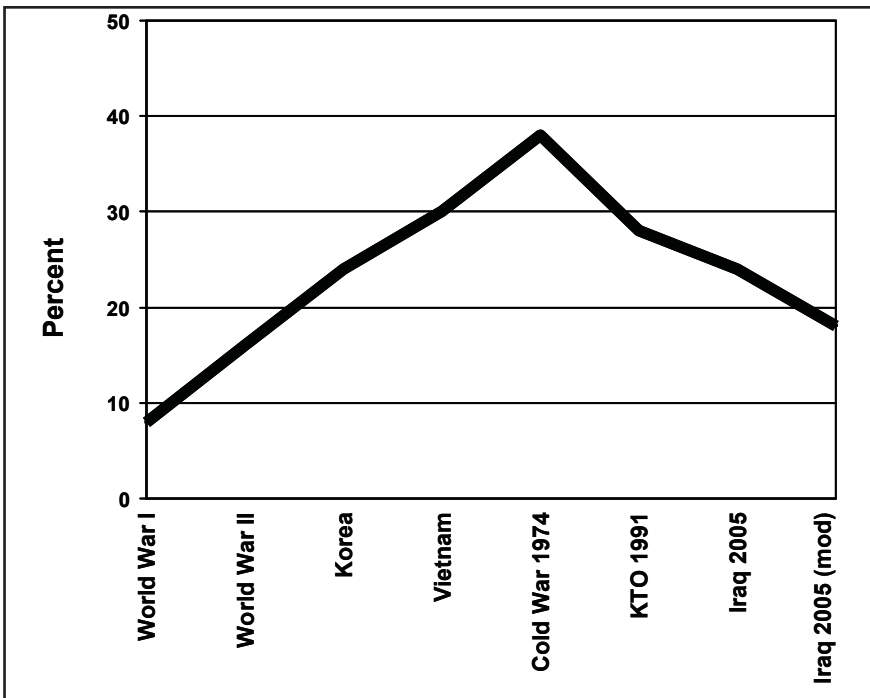


Figure 48. Headquarters Trends, 1917-2005.

### Life Support Functions

The last noncombat category is life support. Expeditionary operations, particularly extended expeditionary operations, require a certain proportion of the deployed force be employed in infrastructure and other support missions, which, while not directly supporting combat operations, provide MWR and base camp support of various types. In a theater where troops

or units are rotated on a regular schedule, life support provides continuity between the rotations by providing preexisting camps and services (Figure 49).

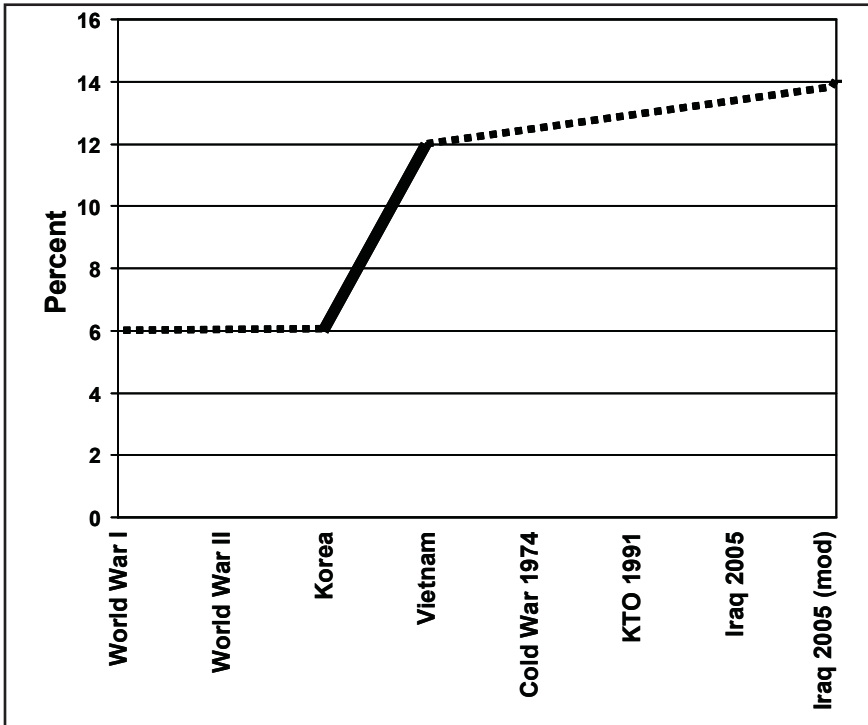


Figure 49. Life Support Trends, 1917-2005.

Although generally removed from direct combat, life support functions can have an indirect effect on the combat element of a force, as well. For example, in the Iraqi deployment in 2005 two combat brigades were virtually permanently devoted to guarding major installations and their life support activities. In recent deployments, civilian contractors have played an increased role in life support functions. Since traditionally such personnel are not soldiers, they need someone to protect them whenever they are doing their functions. This study considers such contractors, except those conducting logistical missions, to be part of the life support element.

Units performing primary missions of life support are often difficult to determine from looking at orders of battle or other documentary materials. Accordingly, as highlighted in the logistical elements section of this chapter, life support functions have often been consolidated with logistical ones. In several case studies, (Korea, Vietnam, Iraq), examination has

discerned separate elements with primarily life support missions. In these cases, life support functions varied between 6 percent and 14 percent (Figure 47).

### The Functional T3R within Operational Units

The previous discussion of operational units (divisions, brigades) in this chapter stressed their relationship to the Army as a whole. However, the internal composition of these organizations also contained both combat and noncombat elements. The preceding chapter discussed this internal functional T3R in each presented historical example. Figure 50 summarizes the proportional figures from these case studies. Average percentages for the post-1918 era were 54 percent for combat elements, 22 percent for logistical components and 24 percent for the headquarters portion.

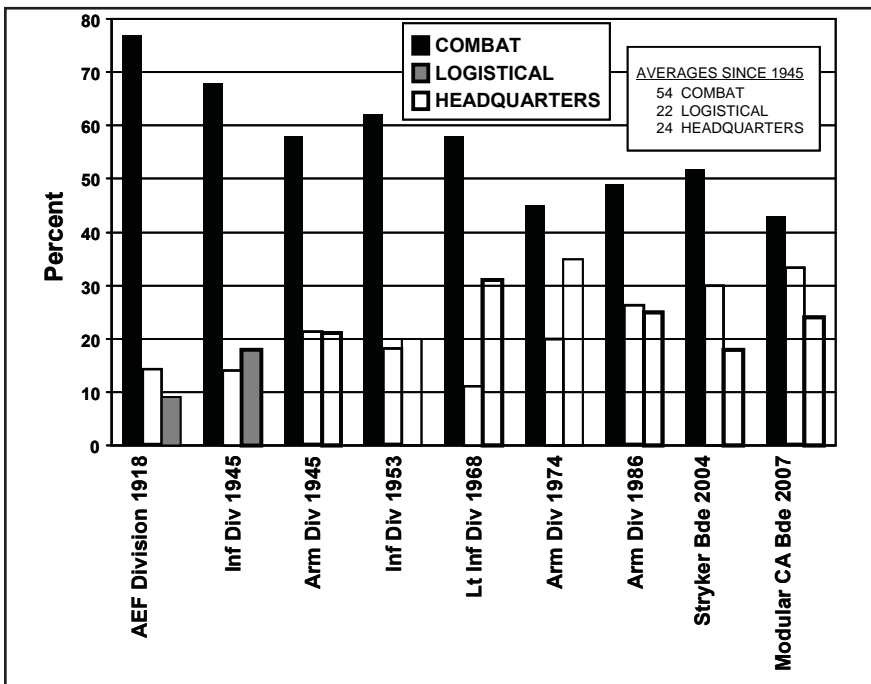


Figure 50. Operational Unit Functional T3R, 1917-2005.

The post-1918 functional T3R average for combat elements of 54 percent, or slightly more than half of the soldiers in divisions and brigades, were 21.5 percent higher than similar figures throughout the force or theater. In the latter cases, combat forces were about a third of the force. At the same time, Army or theater-wide, noncombat elements formed, on an

average, about two-thirds of the whole force. In the division/brigades, they formed less than half. Among the noncombat elements, headquarters elements were approximately the same size in operational units as overall (24 versus 27 percent). But the average strength of the logistics elements was more than 20 percent lower (22 versus 47.5 percent combined life support and logistical proportion). Combat elements had been, therefore, increased primarily at the expense of logistical elements in division/brigades.

### Summary

Since 1917, the US Army’s functional tooth-to-tail ratio has progressively risen in favor of noncombat elements until 1974. The Congressionally mandated T3R of that year temporarily slowed this trend. However, by 2005, noncombat elements had risen proportionally to three-fourths of the force size, primarily because of the mass employment of civilian contractors in Iraq in the new millennium. Each of the categories (combat, logistical, headquarters and life support) has shown an overall range of values since 1941 as indicated in Table 9.

Table 9. Range of Functional T3R Percentages by Category<sup>7</sup>

	<b>a. Highest Percent</b>	<b>b. Lowest Percent</b>	<b>c. Average</b>	<b>d. Adjusted Average</b>
Combat	39	25	32.5	32.5
Total	(76)	(60)	74.5	67.5
Noncombat				
Logistical <sup>8</sup>	43	32	37.5	34
Headquarters	38	16	27	24.5
Life Support	14	6	10	9

Column c is the average figure of the high and low values. Column d adjusts these figures to a sum of 100 percent, using the average combat figure as an unchanging baseline (see note 7). The figures in column d provide a snapshot of what the noncombat factors would be based on historical average when the combat element is at its historical average. This is useful because it provides the mean percentage or mean functional T3R found in the US Army from 1945 to the present.

This work has provided a quick look at the tooth-to-tail ratio since 1917. The biggest shift in the functional T3R ratio was between World War I and World War II. Reflecting the effects of mass motorization and

mechanization, the percentage of combat forces fell from 53 percent to 39 percent. While a drop of 14 percent is not as great as the post-World War I range (15 percent—see Table 9) of combat values, never do combat figures rise higher than 40 percent again. This provides a range or band of combat and noncombat values. Using average figures, combat forces have been about a quarter of the force, while logistics elements were roughly a third of the force or half of the noncombat elements. On an average, headquarters elements composed a quarter of the force (or slightly more than a third of all combat elements). Units or contractors providing life support functions formed less than 10 percent of the total force and slightly more than a tenth of all noncombat elements.

While combat elements averaged 32.5 percent and ranged between 40 and 25 percent since 1941, recent trends in combat forces are weighted toward the lower end of the range, rather than the higher end or even the average. When civilian contractors are included, combat elements, with the exception of a Congressionally mandated increase in the mid-1970s, have progressively declined since 1945. This, and other issues, are discussed in the next chapter.



## Notes

1. The data used to make this graphic is found in Table B-3.
2. The column marked, "Iraq 2005 (mod)," on this and subsequent charts refer to the Iraqi deployment in January 2005, including contractors and troops in Kuwait.
3. In this calculation, the 40 percent figure for Iraq excluding contractors and the Kuwait base is not used as the high figure because when modified, with these additions, it is reduced to 25 percent. Similarly, the 42 percent for Korea in 1953 without the Japan base is also not used because it too, upon modification is reduced, in this case, to 33 percent.
4. LTC Harry Page and LTC Lawrence Fuller, "Use of 'Operational Slice' Factors," *Military Review* 28 (January 1949), 42.
5. Vann, 10-11.
6. Ibid.
7. The noncombat figures in this column are adjusted proportionally in order to attain a total percentage of 100. Unadjusted, the percentage is 107 percent. In order to attain 100 percent, the average combat figure of 32.5 is retained as a baseline. The noncombat elements, accordingly, need to be reduced together from their sum of 74.5 to 67.5 percent. This adjustment factor is 0.906402 ( $67.5/74.5$ ). In other words, the noncombat factors in column c are multiplied by this factor to produce the figures in column d, which represent 91 percent of the averages in column c.
8. Life support elements are not included in this figure as they were in the sectional discussion.



## Chapter 4

### Conclusions

#### General Conclusions

As highlighted in the last chapter, combat elements have progressively declined as a proportion of the total force since 1945. This trend is discussed in detail in the next section of this chapter. Apart from the decline of combat forces, there are several other general conclusions that can be drawn based on the historical study of the tooth-to-tail ratio.

#### **The Impact of Mass Motorization Caused the Largest Shift in T3R**

While in general terms, the creation of the AEF marked the creation of the modern US Army, particularly in organizational terms, as far as the functional T3R. The level of noncombat elements was far lower (47 percent) than it has ever been since then. While logistical troops formed over a third of the force (39 percent), headquarters were tiny (9 percent), far smaller than the modern (post-1941) range of 16-38 percent. When the Army expanded and reorganized to fight World War II in 1940-41, the Army Ground Forces introduced motorization and mechanization across the board. Ironically, this transformation affected logistics the least. Logistical/life support elements rose only 6 percent (39 to 45) to 1945 and an average increase of 8.5 percent (47.5) in the period since 1941. At the same time, headquarters doubled in size, proportionally, between 1918 and 1945 (8 to 16 percent) and continued to rise after World War II, with an average increase of 19 percent (37.5).

#### **The T3R in Vietnam Was Not Abnormal**

The paucity of combat elements in Vietnam has been cited publicly so often, and usually without attribution, that to many military observers, the low proportion of combat troops in that conflict has become axiomatic. However, an analysis of the US Army order of battle in South Vietnam after the Tet Offensive in 1968 reveals that combat troops actually formed a third (33 percent) of the force deployed in country. This total was actually slightly higher than the combat troop average (32.5 percent) since 1945. While life support elements were slightly higher than the post-1941 average (13 versus 10 percent), the logistical component was actually 7.5 percent lower than that average (30 versus 37.5). In terms of the functional tooth-to-tail ratio, Vietnam was well within the range of postwar proportions. The ratio of combat versus noncombat elements was 1 to 2.

## **Headquarters Expansion Was Not as High as Could Be Expected from Observing US Army Reorganizations since 1941**

Almost every US Army reorganization since the beginning of World War II has entailed the expansion of headquarters elements. General Lesley McNair's pooling created a number of separate battalions, each with headquarters elements roughly equivalent to the size and role of regimental headquarters prior to 1941. McNair also created numerous group headquarters to control separate battalions. Later reorganizations added logistical, aviation, engineer and artillery headquarters, both to the division and nondivisional forces. This expansion reached a height of 38 percent in the Army in Cold War Germany in 1974. But the major lasting effect of the Nunn Amendment was, perhaps at least in spirit, a trend in headquarters reduction. After 1974, headquarters proportional size progressively declined, first to 28 percent in the 1991 Gulf War, then to 18 percent in Iraq in 2005. The latter figure was only 2 percent higher than that of the 1945 Army (18 versus 16 percent).

## **Life Support Elements Are Hard to Differentiate**

In all modern expeditionary operations, the presence of life support elements is apparent in the infrastructure of camps and their intrinsic support elements. However, interpreting which units are primarily conducting life support operations, as opposed to logistical support operations, is difficult to discern from orders of battle. Accordingly, in this work, these two elements often had to be merged. In the 2005 Iraq deployment, a large number (28,000) of civilian contractors performed life support operations.

## **The Logistical Component Continues to Rise**

While this point may seem obvious, in the 1980s, some senior officers commented on fears that the Army or the Department of Defense had reduced logistics elements to dangerously low levels.<sup>1</sup> These fears proved unfounded. While logistical/life support elements did decline to a low of 35 percent in Germany in 1974, deployments in Saudi Arabia in 1991 (42 percent) and in Iraq and Kuwait (57 percent), where large numbers of troops were dispatched to areas without previous US-style infrastructure, the logistical/life support elements rose to their highest levels ever. Since 1991, there has been a great expansion in the use of civilian contractors, most of whom are employed in logistical or life support functions.

## **Divisions and Brigades Contain a Higher Combat Functional T3R than the Army as a Whole**

As shown in Figure 50 (page 72), the functional T3R for Army divisions (1945-2005) and brigades (2004-07) averages 54 percent in combat

elements. This level is over 20 percent higher than the average level for the Army as a whole during the same period (32.5 percent). The increase in combat elements was reflected in similar reductions in the noncombat components of the division/brigade. Accordingly, the logistical portion averaged 15.5 percent less than that of the Army overall (22 versus 37.5) and headquarters troops composed 3 percent less of these organizations than of the entire Army (24 versus 27).

In terms of trends rather than averages, divisional and brigade combat elements have remained higher than the Army-wide average in recent reorganizations, but to a lesser extent. The 1986 armored division maintained a proportion of 49 percent combat elements, while the Stryker brigade (52 percent) was slightly higher and the modular combined arms brigade a bit less (43 percent). In the noncombat portion, while overall this portion of the division remains smaller proportionally than the Army as a whole, the logistical element in divisions and brigades has risen almost to its level Army-wide.<sup>2</sup> This segment was 20 percent in the 1974 Armored Division, 26 percent in the Division 86 armored division and 30 and 33 percent, respectively, in the Stryker brigade and in the 2007 modular Combined Arms Brigade. The latter figure in particular is only 4 percent lower than the Army-wide average (33 versus 37.5).

### **At the Operational Level, a Third of the Army is Found in Units Designed to Fight the Enemy**

Since 1917, the US Army employed basic operational units, divisions and brigades (the latter under the modular system adopted Army-wide by 2007). These units comprised between 45 and 20 percent of the total force, with an average proportion of 32.5 percent. Accordingly, throughout the 20th century and on into the 21st century, a third of all soldiers were organized into operational units. While at the tactical level, these units were not composed solely of combat troops, and many combat elements were not in divisions, from the perspective of the Army as a whole, these divisions and brigades were roughly equivalent to the combat elements at lower levels. Accordingly, it is interesting that the historical average of operational T3R proportion, 32.5, exactly equals the historical average of combat elements in the functional T3R (32.5—see Table 9).

## **Trends and Ranges**

### **Trends**

Based on the analysis in the previous chapter, it is possible to devise average figures for each functional T3R category based on historical examples since 1941. Table 9 depicted these averages. Figure 51 places Table 9 onto a pie chart.<sup>3</sup>

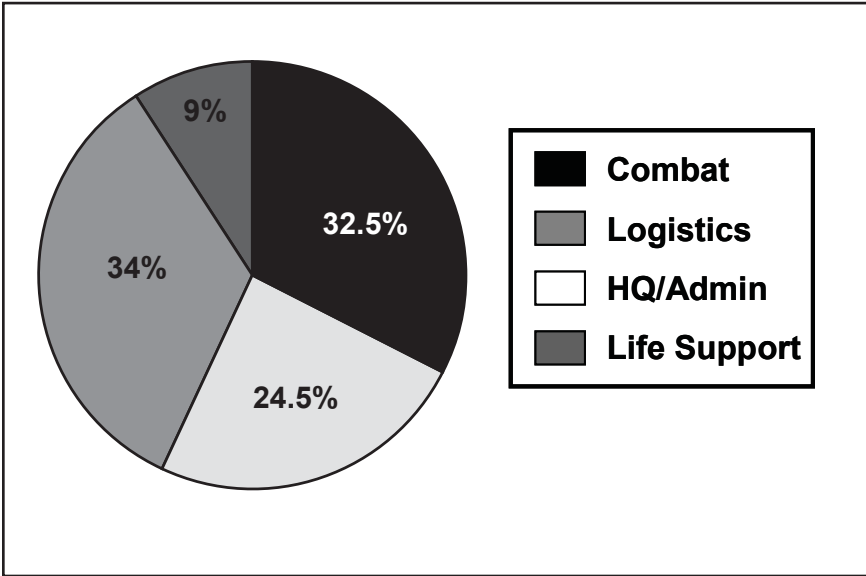


Figure 51. Functional T3R Averages, 1945-2007.

While useful to give an overview of proportional ratios, averages do not tell the whole story. The averages give a mean figure over a period of time (since 1945), but trends may have certain categories increasing or declining above or below the average figure. For example, while headquarters elements averaged 24.5 percent, in the most recent deployment, Iraq 2005, the headquarters portion was only 18 percent. The inverse is also true. While logistics elements averaged 34 percent, in Saudi Arabia in 1991 (42 percent) and in Iraq in 2005 (57 percent) the proportion was much higher.

Combat elements reflect this as well. They have consistently declined since 1945 (Figure 52). The average figure of 32.5 primarily reflects combat levels before 1974. Since then, combat elements have fallen further and further below the 32.5 average percent. In 1974, Congress mandated a minimum combat level of between 29 and 34 percent of the total force deployed in Germany. The resulting increase in combat levels remained below the average level. After 1991, combat elements further declined in proportional size, falling 7.5 percent below the average figure and 4 percent below Congress' 1974 minimum figure.

Even though in Iraq and Kuwait in 2005 the combat proportion dipped to 25 percent, this level is a historical low, 7.5 percent below the mean since 1941 and a 5 percent decrease since 1991. It was also 4 percent below the Nunn Amendment's recommended proportion (29-34 percent).

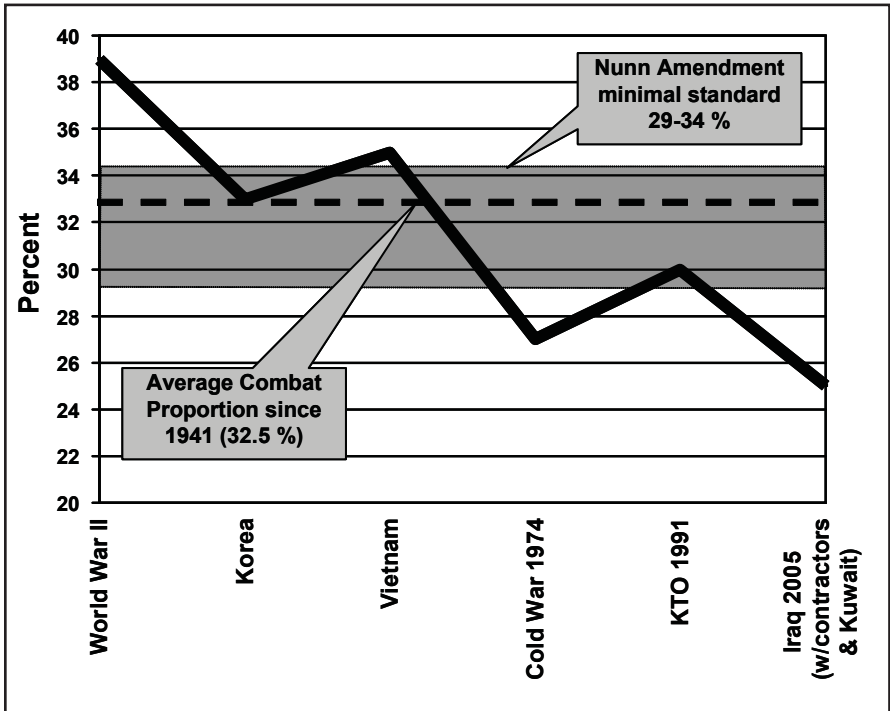


Figure 52. Combat Trends Since 1941.

However, in terms of trends, it continues the proportional downward movement in combat percentage.

Figure 53 illustrates the trendlines for combat and noncombat elements over time since World War II. The trend for combat forces has been to decline roughly 2.16 percent over time in the next campaign/deployment, with noncombat elements increasing by a similar percentage.

Such trends are abstract mathematical concepts applied to military history. There are many factors involved in future operations, such as the nature of the operation, weapons and equipment, and technology. These will affect whether combat elements will continue to decline at a 2.16 percent rate in future operations, or remain the same or even increase in proportional size.

## Ranges

Despite their steady decline, the importance of the combat elements cannot be overemphasized. All the other categories primarily support the activities of the combat portion, either directly or indirectly. Accordingly, a comparison between functional T3Rs at both ends of the combat

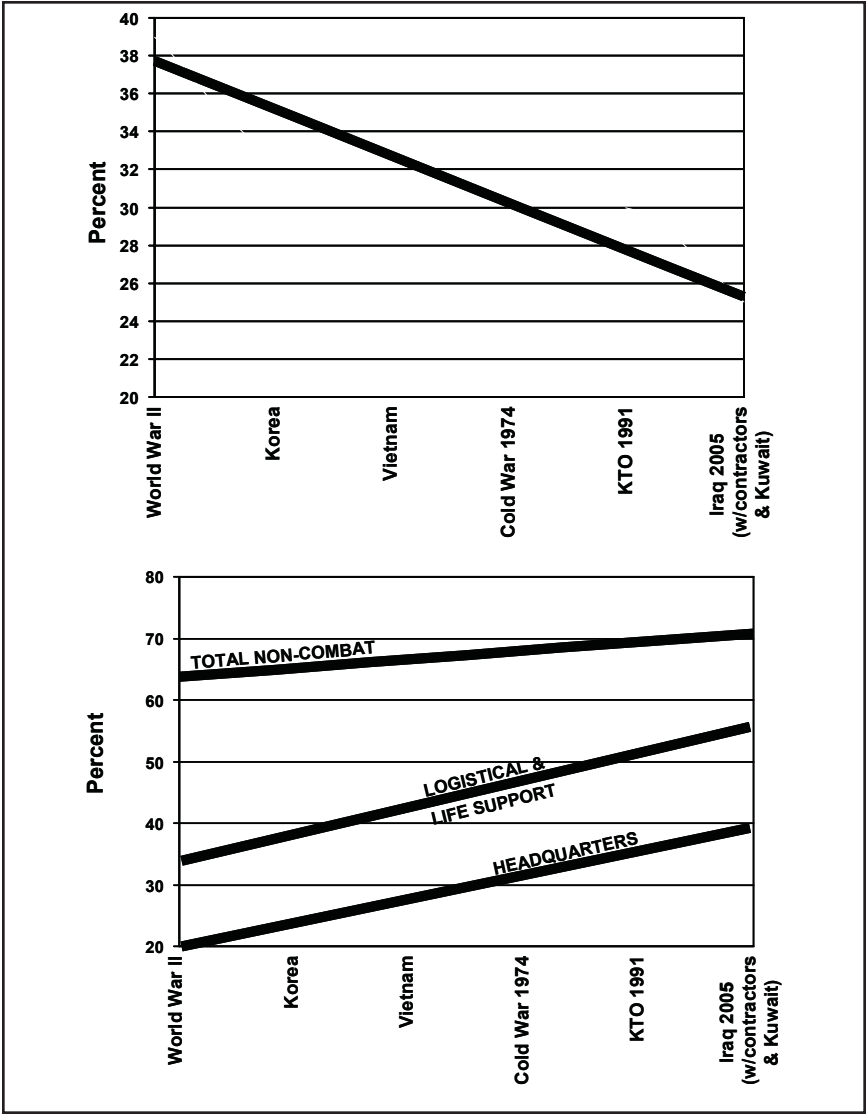


Figure 53. Functional T3R Trendlines.

proportional range provides insight into the size of the noncombat elements and their fractional relationship to the combat portion. Figure 54 illustrates the proportions using the minimum (Iraq 2005) and maximum (ETO 1945) combat figures in the motorization era to illustrate the extreme ends of the combat spectrum as illustrated in the examples used in this work. In the maximum value, logistical and life support elements are combined based on the availability of data from the ETO deployment.



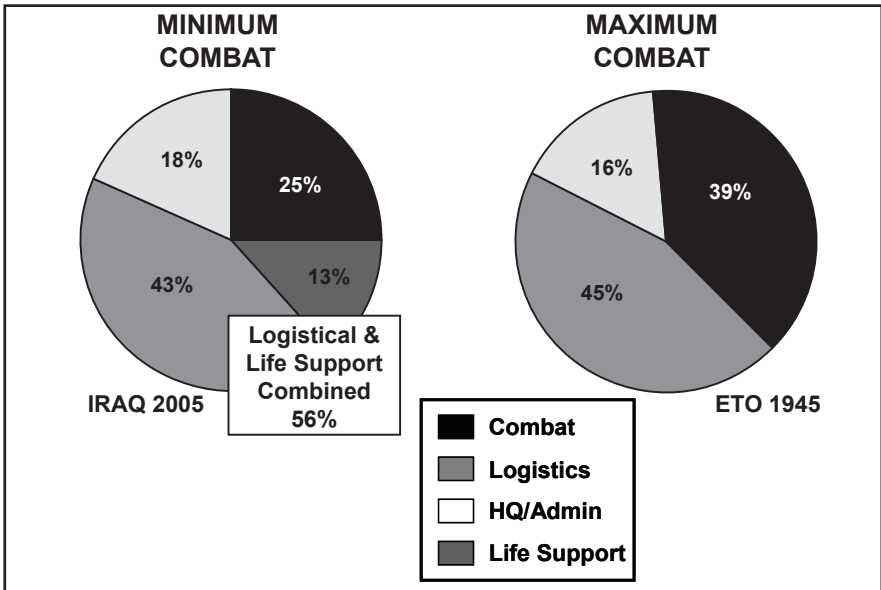


Figure 54. Maximum and Minimum Functional T3R Levels.

In these examples, the variations between the minimum and maximum values give the ranges for each category (Table 10). While both combat and logistical/life support ranges varied by more than 10 percent, headquarters values remained within a range of 2 percent in both the minimum and maximum examples. This would tend to indicate that within the functional T3R framework, headquarters elements can be expected to form about 17 percent of the force under most conditions, despite a general trend to increase by 3.3 percent.

Table 10. Range of Functional T3R Percentages Based on Minimum and Maximum Combat Percentages

	a. Maximum Combat	b. Minimum Combat	c. Range Variation Trend
Combat	39	25	14
Total Noncombat	61	75	14
Logistical & Life Support	45	56	11
Headquarters	16	18	2

## Troop Density and the Tooth-to-Tail Ratio

As mentioned, this study is a companion volume to a previous work, *Boots on the Ground*, which looked at the number of troops (or troop density) required to successfully conduct contingency operations. While that study estimated a proportion of 13.26 troops per 1,000 of civilian population, it did not detail the composition of the 13.26. In general terms, this work fills that void. Although *Boots* only addressed contingency operations and this work looks at major deployments of all types, military forces employed in contingency operations are always general purpose forces rather than specialized troops. The forces studied in this volume were also general purpose troops. Accordingly, T3R ranges and trends developed from the study of such operations may also be applicable to contingency operations. Figure 55 places the minimum and maximum percent pie charts from Figure 54 into the numerical context of the 13.26 troop level.<sup>4</sup>

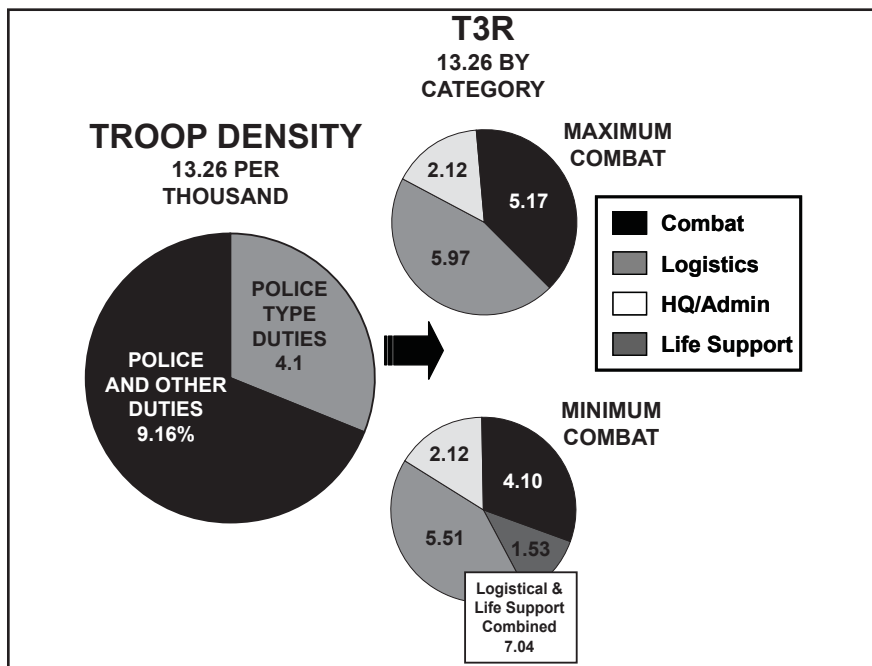


Figure 55. T3R and Troop Density.<sup>5</sup>

*Boots on the Ground* postulated, based on the force levels of contemporary urban police departments, that in a contingency operation, a minimum of 4.1 soldiers per thousand of population were recommended to be devoted to the conduct of police-type (i.e., combat) operations.<sup>6</sup> The

4.1 figure is part of the overall ratio of 13.26 per thousand of population. While the combat number in the maximum example exceeds this figure (5.17), the proportional total in the minimum sample (13.26 x 25% or 3.3) was below the figure by 0.74. In Figure 55, the combat figure was raised to the minimum of 4.1 and the noncombat categories were accordingly decreased by the same amount (see note 4).

The fact that the unadjusted combat proportion figure in the minimum combat sample (3.3) was below the minimum prescribed in *Boots on the Ground* (4.1) is interesting because the minimum combat sample represents the deployment in Iraq in January 2005. Accordingly, the number of combat troops in that operation was 0.74 less soldiers/police per thousand of population. This seemingly slight difference actually represents overall 5.5 percent of the suggested figure of 13.26 total troops per thousand of population. Pending the outcome of operations in Iraq, future planners need to look at and analyze the significance of this minor variance in troop composition.

### Summary

This work examined the major US Army overseas deployments since World War I and analyzed them in terms of the tooth-to-tail ratio—the proportion of combat troops to noncombat troops—at two levels: the operational T3R (proportion of divisions and brigades in the whole Army) and at the tactical level, the functional T3R, which divided Army units into categories by function and determined the proportions. Interestingly enough, the average historical proportion of combat forces for both the operational and functional T3Rs were the same: 32.5 percent of the total force.

With regard to the functional T3R, since the advent of motorization at the start of World War II, the T3R has only varied 14 percent in terms of proportional change between combat and noncombat elements. However, in this 14 percent, trends show a steady general decline in combat forces of about 2 percent per operation during the period studied. While the 1974 Nunn Amendment temporarily prescribed a minimum proportional combat level of 29 percent, recent trends in combat size have been as low as 25 percent. While headquarters elements expanded throughout the period, they showed a variance of only 2 percent between the minimum and maximum historical examples, showing, perhaps, a trend of leveling off in this area.

Applying T3R proportions to troop density proportional size calculations presented in *Boots on the Ground* reveal that combat element levels in Iraq in 2005 may have been slightly (5 percent) below the recommended level if troops in the Kuwait base and civilian contractors are included in the overall figure.

As one would expect, the T3R combat proportion declined over time at a relatively steady rate. This trend measures roughly a 2.16 percent decline per each subsequent campaign. There are many possible reasons for this decline. Perhaps the nature of warfare and technology has changed to the extent that lesser combat troops are needed. The large-scale introduction of civilian contractors into expeditionary warfare in the recent Iraq deployment is the most significant of such changes. Increased technology, primarily in the form of digital communications, provides, possibly, higher levels of command and control and situational awareness, allowing for decreased combat forces. Perhaps different types of operations require lower levels of combat troops or more specialized forces. However, as the percentage of combat troops deployed declines, it raises the question of whether such a deployment is, in fact, a military deployment at all, or some other type of operation not requiring military forces, or at least not the general purpose forces traditionally used in most overseas deployments.

Whatever the reason for the trend of declining combat elements, future force designers need to be aware that combat troops have formed a range between a quarter and slightly over a third of all general purpose forces deployed by the United States since World War II. They also need to be aware that, within this range, the historical trend is that the most recent deployments have had the smallest proportions of combat elements and the oldest deployments the highest levels. While the trend shows an overall decline in the combat portion, force planners need to realize that any force levels following the 2.16 percent trend of decline would also be producing an unprecedented low level of proportional combat elements. At some point, there will be a level of diminishing returns where general purpose forces deployed overseas will have too few combat troops to successfully complete military missions.

Perhaps the lowest threshold for combat force proportion has been reached or is close to being reached. With only a quarter of its force devoted to combat activities, the deployment in Iraq has lasted over 5 years. And even this size estimate may be an overestimate. The employment of contractors and other elements less able to defend themselves tends to result in combat elements protecting these elements. For example, in Iraq in 2005, two combat brigades were devoted specifically to theater defense roles. These brigades primarily defended large logistics bases and provided security for convoys between the large bases.

In 1974, Congress passed the Nunn Amendment, specifically prescribing a tooth-to-tail ratio for US forces in Germany. The legislators felt that

combat levels of less than 29 percent provided too small a proportion of combat troops. While combat elements have decreased over time at a steady rate, the Nunn standard has only been violated in the Iraqi deployment (25 percent). The nature of warfare or the unique circumstances involving that particular deployment may call for a reduced employment of combat elements. On the other hand, this line has only been crossed once, making the Iraq 2005 level a unique occurrence. Whether this is a true continuation of trends since 1945 or a special situation is a debatable point. A thorough study of the Iraq deployment is necessary to determine whether the combat troop level is adequate or a case of diminishing returns.

In almost every previous expeditionary operation, the United States has employed general purpose forces. These are forces designed to conduct military operations across the spectrum of intensity and against various threats. Planners need to consider this in the development of the proportional level of combat elements in such a force. While the force may be tailored for nation building, peacekeeping and counterinsurgency, a general purpose force is still primarily a fighting element. Otherwise, soldiers would not be given this mission in the first place.

This work provides a brief quantitative look at the tooth-to-tail ratio in US forces in major deployments and operations since 1917. As such, it illustrates trends, ranges and averages based on force levels of the past. While expeditionary warfare is often changing and situationally dependent, as force designers plan for the future, the past illustrates T3R ranges and trends previously considered to be effective. Deviations from the historical record should only be made with caution based on compelling reasons.

## Notes

1. For examples of these comments, see Vann, 2-3.
2. While the AOE armored division contained 51 percent of noncombat elements, the ratio Army-wide in 1991 was 70 percent. In Iraq in 2005, while the noncombat proportion was 75 percent, AOE divisions (51 percent) and Stryker Brigades (48 percent) were still considerably smaller proportionally.
3. This figure displays the average combat figure and the noncombat figures reduced by a factor of 0.9, adjusted to fit a 32.3 combat percentage.
4. John J. McGrath, *Boots on the Ground: Troop Density in Contingency Operations*, Global War on Terrorism Occasional Paper 16 (Fort Leavenworth: US Army Combat Studies Institute, 2006), 109.
5. The minimum T3R figures on this chart require some explanation. The original proportion combat figure was 3.36 (25 percent of 13.26). However, in accordance with *Boots on the Ground*, a minimum of 4.1 troops out of the 13.26 need to be devoted to police/combat duties as a minimum (see McGrath, *Boots on the Ground*, 106). Therefore the 3.36 figure has been raised to 4.1, an increase of 0.74. Accordingly, the three noncombat categories have to be reduced by this 0.74 or 0.246 each. These adjustments are reflected in the minimum pie chart. The table below shows these shifts:

Category	a. Percentage	b. Number (13.26 x a/100)	c. Adjustment Factor	d. Adjusted Figure
Combat	25.32	3.36	+0.74	4.10 (b + c)
Logistical	43.34	5.75	-0.25	5.51 (b - c)
Headquarters	17.89	2.37	-0.25	2.12 (b - c)
Life Support	13.45	1.78	-0.25	1.53 (b - c)

Note: Fractions were rounded off.

6. McGrath, *Boots on the Ground*, 79,106. In the context of contingency operations (peacekeeping, counterinsurgency, occupation duties), police-type duties are considered to be synonymous with combat functions. In fact, in this work, military police units operating in Iraq, in January 2005 were counted as combat elements.

## Glossary

AAA	antiaircraft artillery
AD	Armored Division
ADA	Air Defense Artillery
AEF	American Expeditionary Force
AGF	Army Ground Forces
AOE	Army of Excellence
ARVN	Army of the Republic of Vietnam
BCT	brigade combat team
BDE	Brigade
BN	Battalion
BTB	brigade troops battalion
CA	Combined Arms
CBT	Combat
COMZ	Communications Zone
CP	command post
CSB	Corps Support Battalion
CSG	Corps Support Group
DFE	Division Force Equivalent
DISCOM	Division Support Command
DIV	Division
EECP	Early Entry Command Post
ETO	European Theater of Operations
HHC	Headquarters and Headquarters Company
HQ	headquarters
ID	Infantry Division
KTO	Kuwaiti Theater of Operations
ID	Infantry Division
KW	Korean War
MCG	Mobile Command Group
MECH	mechanized
MI	Military Intelligence
MLRS	Multiple Rocket Launcher System
MP	Military Police
MWR	Morale, Welfare and Recreation
NATO	North Atlantic Treaty Organization
NBC	Nuclear, Biological, Chemical
ROAD	Reorganization Objective Army Division
RSTA	Reconnaissance, Surveillance, and Target Acquisition
SHAEF	Supreme Command Allied Expeditionary Force
SOF	Special Operations Forces
SWA	Southwestern Asia
T3R	Tooth-to-Tail Ratio
TAC	Tactical Command Post

TC	Transportation Corps
TD	Tank Destroyer
TOE	Table of Organization and Equipment
TRADOC	Training and Doctrine Command
US	United States
XO	executive officer



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# Appendix A

## T3R Categories

Table A-1. Categories of the Tooth and the Tail

		Noncombat		
		Headquarters & Administrative	Logistical	Life Support
Mission	<p>Units whose primary mission is the conduct of combat and combat support operations.</p>	<p>Units or elements of units which provide command and control for combat, combat support and combat service support units; units which provide support to headquarters units.</p>	<p>Conduct service support operations (CSS), including internal combat service support operations in CSS units.</p>	<p>Conduct infrastructure support.</p>
Types Of Units	<ul style="list-style-type: none"> <li>• Company/troop/battery/detachments of infantry, armor, cavalry, field artillery, air defense artillery, combat engineers.</li> <li>• Special operations forces units of all sizes.</li> <li>• Advisors and other elements directly supporting the combat forces of foreign armies.</li> <li>• Attack and assault aviation units of company or smaller size.</li> <li>• Military police units providing convoy protection.</li> </ul>	<ul style="list-style-type: none"> <li>• Headquarters battalions/companies/troops/batteries/detachments of all types of command from battalion to theater headquarters (including logistical units).</li> <li>• Most signal units.</li> <li>• Most military intelligence units.</li> <li>• Command and control aviation units.</li> <li>• Military police units tasked with command and control functions (traffic control), headquarters guard.</li> <li>• Command public information units.</li> </ul>	<ul style="list-style-type: none"> <li>• Most combat service support units (quartermaster, supply, service, maintenance, ordnance, adjutant general, transportation, medical, small finance).</li> <li>• Internal logistical elements in combat battalions.</li> <li>• Internal logistical elements in logistical units.</li> <li>• Combat service support aviation units (air ambulance, heavy lift, etc.).</li> <li>• Military police units running POW camps, etc.</li> <li>• Civil affairs units.</li> </ul>	<ul style="list-style-type: none"> <li>• Base support units.</li> <li>• Signal infrastructure units.</li> <li>• Construction and infrastructure engineer units.</li> <li>• Military police units running prisons for friendly forces, etc.</li> <li>• Larger finance units.</li> <li>• JAG offices.</li> <li>• Labor service support units.</li> <li>• Headquarters units for units conducting life support functions.</li> <li>• Base public information (adjutant general) units.</li> <li>• Contracting units.</li> <li>• Medical units assigned directly to bases or camps.</li> </ul>



## **Appendix B**

### **Comparative Data Tables**

Table B-1. Operational Unit (Division/Brigade) Composition Comparisons\*

Table B-2. Theater Comparisons by Category\*

Table B-3. Operational Slice Comparisons\*

Table B-4. Overall Combat Forces Proportion\*

Table B-5. Historical Data

\*The data in these tables were produced through an analysis of various order of battle and troop list documents found in official histories and stationing lists. To determine categories for units above company level, tables of organization for the specific units were examined.

Table B-1. Operational Unit (Division/Brigade) Composition Comparisons

Unit Type	Division/ Brigade Size <sup>1</sup>	Combat		Noncombat			
		Number	%	Logistical		Headquarters & Administrative	
				Number	%		Number
AEF Infantry Division, 1918	28,105	22,040	78	4,048	14	2,017	7
Infantry Division ETO, 1945	14,037	9,544	68	1,911	14	2,572	18
Armored Division ETO, 1945	10,670	6,180	58	2,225	21	2,265	21
Infantry Division Korea, 1953	20,036	12,345	62	3,610	18	4,081	20
ROAD Infantry Division Vietnam, 1968	16,092	9,769	58	1,932	11	5,201	31
ROAD Infantry Division Germany, 1974	15,059	6,710	45	3,070	20	5,279	35
AOE Armored Division, 1968	17,003	8,403	49	4,300	26	4,300	25
Stryker Brigade, 2004	4,798	2,515	52	1,443	30	840	18
Notional Modular Heavy Division, 2004	22,177	8,586	39	6,394	29	7,197	32
Modular Combined Arms Brigade, 2004	3,735	1,618	43	1,222	33	895	24

1. The strengths in these columns are strengths in the field. Authorized strengths, which are used for the operational slice figures, where different, are: 18,804 for the Korean War 1953 infantry division; and 16,475 for the ROAD infantry and armored divisions.

Table B-2. Theater Comparisons by Category

Theater		Combat		Noncombat					
		Logistical		Life Support		Headquarters and Administrative			
		Number	%	Number	%	Number	%	Number	%
AEF, 1918	1,866,184	53	782,262	39				153,805	8
ETO, 1945	2,156,739	39	979,017	45				349,320	16
Korea/Japan, 1953	354,819	33	131,651	37	21,452	6		86,135	24
Vietnam, 1968	324,030	35	75,120	23	39,571	12		96,801	30
Germany, 1974	186,719	27	65,094	35				70,455	38
KTO, 1991	332,565	30	139,239	42				94,545	28
Iraq, 2005	135,000	40	48,705	33				32,527	24
Iraq, 2005 (incl. contractors and Kuwait)	223,000	25	96,641	43	29,996	13		39,903	18

Table B-3. Operational Slice Comparison

a. Area or Element	b. Total Strength	c. Number of Divisions/ Brigades	d. Standard Divisional/ Brigade Size	e. Total Operational Slice (b/c)	f. Division/ Brigade Percentage of the Army (d/e)	g. Non-Divisional/ Brigade Slice (e-d)	h. Non-Divisional Percentage of the Army (g/e)
Army, 1918	2,395,742	43	28,105	55,715	50	27,610	50
AEF, 1918	1,866,184	32	28,105	58,318	48	34,100	55
Army (World War II) 1945	6,042,277	89	13,800	67,900	20	54,100	80
Army (Korean War) 1953	1,533,815	20	18,804	76,691	25	57,887	75
Army (Vietnam War) 1968	1,570,343	21	16,475	74,778	22	58,303	78
Army, 1974	783,330	13.5	16,475	58,204	28	41,549	72
Army, 1976	779,417	16	16,475	48,714	34	32,239	66
Army, 1991	572,423	14.66	17,104	39,046	44	21,945	56
Kuwaiti Theater of Operations, 1991	333,565	7	17,104	47,652	36	30,548	64
Modular Brigade, 2007	500,000	48	3,735	10,477	36	6,682	64
Army, 2005	468,578	10	17,104	48,657	35	31,753	65
Iraq, 2005	135,000	4	17,104	33,750	51	16,646	49

Table B-4. Overall Combat Forces Proportion<sup>1</sup>

	<b>World War I 1918</b>	<b>World War II (ETO)</b>	<b>Korea 1953</b>	<b>Vietnam 1968</b>	<b>Cold War 1974 Germany</b>	<b>KTO 1991</b>	<b>Iraq 2005</b>
Total Army Strength	3,514,137	4,308,114 <sup>2</sup>	1,533,615	1,570,343	783,330	572,423	468,578
Combat	984,116	828,402	115,581	113,820	51,170	99,781	52,768
Percent	28	19	7.5	7.2	6.5	17	11

1. Robert R. Palmer, "The Mobilization of the Ground Army," Army Ground Forces Study Number 4 (Washington, DC: Army Ground Forces, 1946).

2. This figure represents 72 percent of the Army's 1945 strength (the proportion of the Army in the ETO).

Table B-5. Historical Data

a. Area or Element	b. Total Strength	c. Combat Elements	d. Total Noncombat Elements	e. Logistical Elements	f. Headquarters Elements	g. Life Support Elements
AEF, 1918	1,866,184	984,116	282,068	128,262	153,806	*
AEF Division, 1918	28,105	21,620	6,485	4,048	2,437	NA
ETO, 1945	2,167,409	834,582	1,332,827	981,242	351,585	*
Infantry Division, 1945	14,037	9,554	4,483	2,572	1,911	NA
Armored Division, 1945	10,670	6,180	4,460	2,225	2,265	NA
Army Korea (including Japan)	354,660	115,419	239,241	131,654	86,135	21,452
Korea Infantry Division, 1953	20,036	12,345	7,691	3,610	4,081	NA
Army Vietnam, 1968	305,156	100,553	204,603	72,694	92,338	39,571
Vietnam Infantry Division, 1968	16,902	9,769	7,133	1,932	5,201	NA
USAEUR Germany, 1974	186,822	51,170	135,549	57,626	70,455	7,468
Armored Division, 1974	15,059	6,710	135,549	57,626	70,455	
Armored Division, 1986	17,104	8,403	8,701	4,446	4,255	NA
Army-DESERT STORM, 1991	333,565	99,781	23,784	139,239	94,545	*
Army Iraq (including Kuwait) 2005	223,000	56,456	166,540	96,641	39,903	29,996
Stryker Brigade, 2004	4,798	2,515	2,283	1,443	840	NA
Modular combined Arms Brigade 2007	3,735	1,618	2,117	1,222	840	NA

\*Included in figure in column e.



## About the Author

Boston native John McGrath has worked for the United States Army in one capacity or another since 1978. A retired Army Reserve officer, Mr. McGrath served in infantry, field artillery and logistics units, both on active duty and as a reservist. Before coming to work at the Combat Studies Institute, he worked for 4 years at the US Army Center of Military History in Washington, DC, as a historian and archivist. Prior to that, Mr. McGrath worked full time for the United States Army Reserve in Massachusetts for over 15 years, both as an active duty reservist and as a civilian military technician. He also served as a mobilized reservist in 1991 in Saudi Arabia with the 22d Support Command during Operation DESERT STORM as the command historian and in 1992 at the US Army Center of Military History as a researcher/writer. Mr. McGrath is a graduate of Boston College and holds an MA in history from the University of Massachusetts at Boston. He is the author of numerous articles and military history publications and the following books: *Theater Logistics in the Gulf War*, published by the Army Materiel Command in 1994; *The Brigade: A History*, published by the US Army Combat Studies Institute in 2005; *Crossing the Line of Departure: Battle Command on the Move*, and *Boots on the Ground: Troop Density in Contingency Operations*, both published by the US Army Combat Studies Institute in 2006. Mr. McGrath was also the general editor of the proceedings of the Combat Study Institute's 2005 Military History Symposium, *An Army at War: Change in the Midst of Conflict* and contributed to CSI's anthology *In Contact!* Aside from a general interest in things military and historical, his areas of particular interest include modern military operations, the German Army in World War II, August 1914, and the Union Army in the Civil War. He also has a keen interest in ancient history, historical linguistics, the city of Boston, and baseball. McGrath is also a current PhD candidate at Kansas State University.



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