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THESIS

**IMPROVING THE SURVIVABILITY AND LETHALITY
OF AN INFANTRY RIFLE SQUAD AGAINST
A NEAR-PEER ENEMY IN THE YEAR 2020**

by

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December 2018

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ABSTRACT

The U.S. military does not possess the technological superiority gap it once enjoyed in the past. Thus, the problem this paper will address is how to improve the combat effectiveness of the U.S. Army, asking whether it is properly organized and equipped to survive in a future near-peer conflict environment. Given that the infantry rifle squad is the basic building block of the Army, infantry squad organization is the focus of this study. This paper argues that given the characteristics of the near-future operating environment, future research must design a balanced and more robust infantry squad organization that can effectively operate within the electromagnetic spectrum. This cross-domain capability will be critical to the survivability and lethality of the infantry squads of the future.

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LIST OF ACRONYMS AND ABBREVIATIONS

AoE	Army of Excellence
ASIRS	Research Study of Infantry Rifle Squad TOE
ATP	Army Techniques Publication
C2	Command and Control
CGSC	Command and General Staff College
CONARC	Continental Army Command
CORG	Combat Operations Research Group
EMS	Electromagnetic Spectrum
FM	Field Manual
GPS	Global Positioning System
IBCT	Infantry Brigade Combat Team
IRUS	Infantry Rifle Unit Study
LMG	Light Machine Gun
OCRSP	Optimum Composition of the Rifle Squad and Platoon
ROAD	Reorganization Objective Army Division
SATCOM	Satellite Communications
TRADOC	U.S. Army Training and Doctrine Command
UAS	Unmanned Aerial Systems
UN	United Nations

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EXECUTIVE SUMMARY

Since the invasions of Afghanistan and Iraq, the U.S. military has trained and equipped to fight in irregular wars where both the air and sea domains were uncontested, and adversaries have not possessed large, advanced armies. However, potential near-peer enemies have significantly different tactics, techniques, and technological capabilities. The U.S. military does not possess the degree of technological superiority it once enjoyed. Thus, the problem that this paper will address is how to improve the combat effectiveness of the U.S. Army, asking whether it is properly organized and equipped to survive in a future near-peer conflict environment. Given that the infantry rifle squad is the basic building block of the Army, the infantry squad organization is the focus of this study.

This paper argues that, given the characteristics of the near-future operating environment, future research must design a balanced and more robust infantry squad organization that can effectively operate within the electromagnetic spectrum. Enemy unmanned aerial reconnaissance platforms and electromagnetic tracking systems capable of locating and directing enemy artillery assets on friendly positions pose a significant threat to the infantry soldier. In addition, given the increased likelihood of operating in urban environments, which require more manpower and often result in greater casualties, it is imperative that the U.S. Army avoid the next near-peer conflict with the current nine-soldier squad organization, which is vulnerable to the effects of attrition. Equipping the infantry squad with the capability to jam enemy radio frequencies, disrupt enemy drone navigation and communication systems, geo-locate enemy signals, execute electronic deception, and map out the electromagnetic spectrum for actionable intelligence will all be critical for future engagements. Future research must determine how to incorporate these cross-domain capabilities at the lowest tactical level in order to increase unit independence, lethality, and survivability.

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I. INTRODUCTION

A. THE PROBLEM

The period in which the U.S. military has enjoyed freedom of action in both the sea and air domains may end. Future combat against near-peer adversaries will not allow such luxuries. The United States' effective use of precision munitions, night vision optics, satellite navigation and other innovative combat systems demonstrated to the world a new and evolved way of fighting. Consequently, Russia and China, the two strongest U.S. near-peer competitors, have downsized their older unit formations and modernized their forces to better confront this modern style of warfare.¹ Therefore, since 1991, our near-peer adversaries have changed significantly from their Cold War-era formations. This change in Russian and Chinese capabilities has significant implications for the U.S. military on the future battlefield.

In the 2017 *National Security Strategy of the United States of America*, the President of the United States highlights the military's global shift from a counter-terrorism focus to a "great powers" focus.² The government's decision to shift from the decades-old counter-terrorism focus requires new changes to how the U.S. military is organized, trained, and equipped. In 2016, David E. Johnson, a principal researcher at the RAND Corporation, stated, "Because of the recent and current focus on irregular operations in Iraq and Afghanistan, we are unprepared to deal with state-sponsored hybrid and state operations that fall at the other end of the spectrum of operations."³

¹ Anthony Cordesman and Joseph Kendall, *Chinese Strategy and Military Modernization in 2016: A Comparative Analysis* (Washington, DC: Center for Strategic and International Studies, 2016), https://csis-prod.s3.amazonaws.com/s3fs-public/publication/161208_Chinese_Strategy_Military_Modernization_2016.pdf; Lester W. Grau and Charles K. Bartles, *The Russian Way of War: Force Structure, Tactics, and Modernization of the Russian Ground Forces* (Fort Leavenworth Kansas: Foreign Military Studies Office, 2016).

² Donald Trump, "National Security Strategy of the United States of America" (The White House, December 2017), 2–3.

³ David E. Johnson, "The Challenges of the 'Now' and Their Implications for the U.S. Army," *RAND Corporation*, 2016, <https://www.rand.org/pubs/perspectives/PE184.html>.

Since the invasions of Afghanistan and Iraq, the U.S. military has trained and equipped to fight in irregular wars where both the air and sea domains were uncontested, and adversaries have not possessed large, advanced armies. However, potential near-peer enemies have significantly different tactics, techniques, and technological capabilities. Contemporary assessments have shown that the U.S.'s near-peer adversaries possess equal or even superior capabilities, in varying military domains.⁴ Consequently, the U.S. military may not possess the technological superiority gap it once enjoyed in the past. Thus, the problem that this study will address is how to improve the combat effectiveness of the U.S. Army, asking whether it is properly organized and equipped to survive in a future near-peer conflict environment. Given that the infantry rifle squad is the basic building block of the Army, the infantry squad is the focus of this study. This paper will evaluate historical studies conducted in inter-war transition periods in order to draw upon not only their conclusions but also the logic from which they based their new designs. This historical analysis may provide future research with valuable insight from which to derive the next infantry squad organization, given the near-peer threats we face today.

This study argues that, given the characteristics of the near-future operating environment, future research must design a balanced and more robust infantry squad organization that can operate effectively within the electromagnetic spectrum. Given the increased likelihood of operating in urban environments, which require more manpower and often result in greater casualties, it is imperative that the U.S. Army avoid the next near-peer conflict with the current nine-soldier squad organization, which is vulnerable to the effects of attrition.

Additionally, enemy unmanned aerial reconnaissance platforms and electromagnetic tracking systems capable of locating and directing enemy artillery assets on friendly positions pose a significant threat to the infantry soldier. Equipping the infantry squad with the capability to jam enemy radio frequencies, disrupt enemy drone navigation and communication systems, geo-locate enemy signals, execute electronic deception, and

⁴ Sydney J. Freedberg, "Army Cyber Accelerates; Electronic Warfare Lags," *Breaking Defense*, February 10, 2017, <https://breakingdefense.com/2017/02/army-cyber-accelerates-electronic-warfare-lags/>.

map out the electromagnetic spectrum for actionable intelligence will be critical for future engagements. Therefore, future research should determine how to incorporate these cross-domain capabilities at the lowest tactical level in order to increase unit lethality and survivability.

B. AN ARMY IN TRANSITION

Since the conclusion of major combat operations in Afghanistan and Iraq, the U.S. military has entered a period of transition as it prepares for the next conflict. Military and academic experts have thoroughly studied interwar transition periods to understand why some nations succeed and others fail at modernization. In their edited book *Military Innovation in the Interwar Period*, Williamson Murray and Allan Millett gathered scholars to study the key factors that helped or hindered the innovation conducted in the interwar period between WWI and WWII. Murray and Millett's purpose was "to provide insights into the nature of the processes involved in major innovation" and organizational change.⁵ These authors investigated seven studies of military development. These case studies include armored warfare, submarine warfare, carrier aviation, strategic bombing, tactical bombing, amphibious warfare, and radar development.⁶ Murray and Millett found that "sheer technical innovation, as the Germans proved, does not win wars. Instead, the interaction of technical change and organizational adaptation within realistic strategic assessment determines whether good ideas turn into real military capabilities."⁷ Murray and Millett found that to maximize the combat effectiveness of new technology, the U.S. military would not only need to design new organizational structures, tactics, and doctrine around the new technology, but thoroughly train the soldiers to the new way of fighting.⁸ Murray and Millett also determined that a key factor in modernization was to understand the future security environment because it helped to discern how future wars would differ

⁵ Williamson Murray and Allan R. Millett, eds., *Military Innovation in the Interwar Period* (Cambridge: Cambridge Univ. Pr, 1996), 3.

⁶ Murray and Millett, 3.

⁷ Murray and Millett, 368.

⁸ Murray and Millett, 372.

from previous wars due to changes in technology and weapons.⁹ Thus, according to Murray and Millett, to modernize in this interwar period, the U.S. must first understand the future operating environment, develop new innovative designs that are optimal to that environment, and then train accordingly.

However, understanding the future operating environment is not necessarily easy. Some might believe that we are always doomed to fight the next war as we fought the last war. In his book *Winning the Next War: Innovation and the Modern Military*, Stephen Rosen studies organizations that successfully modernized or failed to modernize their military. Rosen's study focuses on understanding the underlying causes that made these organizations successful. Rosen structures his research by comparing and contrasting various British and American organizations engaged in similar innovative research. Rosen then analyzes why one organization succeeded and the other did not. Rosen finds that interwar innovation or "peacetime innovation" drives "how military communities evaluate the future character of war, and how they effect change in the senior officer corps."¹⁰ Thus, like Murray and Millett, Rosen believes that a key factor in understanding how technology will change the nature of warfare is by having a good understanding of the future operating environment.

In a contemporary society where technology has become increasingly specialized, professional military education and specialization will have a greater importance in the modernization process. Given the complexities of modern technology, professional military education is critical to improving soldier's survivability and lethality on the battlefield. In the book *Preparing for War: The Emergence of the Modern U.S. Army, 1815–1917*, J.P Clark found that given the influences of contemporary society, the U.S. Army of the 1800's prepared for war differently than the U.S. Army of the Twentieth Century, which relied less on an individual's natural leadership abilities and more on

⁹ Murray and Millett, 406.

¹⁰ Stephen Peter Rosen, *Winning the next War: Innovation and the Modern Military*, Cornell Studies in Security Affairs (Ithaca, NY London: Cornell University Press, 1994), 52.

professional military education.¹¹ Therefore, given the complexities of modern technology, civilian and military education programs that develop soldiers understanding of modern systems is becoming more important. For example, a leader who better understands the technicalities of the electromagnetic spectrum will better know how to leverage it in combat.

Interwar transition periods are not new the U.S. military. Following Vietnam, the U.S. military found itself in a similar situation as it finds itself today. In the book *Forging the Sword: Doctrinal Change in the U.S. Army*, Benjamin Jensen, like the authors above, studied how the U.S. military innovated during interwar periods. In his book Jensen illustrates how General William E. Depuy, a World War II and Vietnam veteran, led the U.S. Army Training and Doctrine Command (TRADOC) in the development of the new “Active Defense” doctrine.¹² Like today, the U.S. military needed to redesigning the U.S. military to fight the Soviet Union after the military had spent nearly two decades conducting irregular warfare in Vietnam.¹³ General Depuy used the contemporary 1967 Arab-Israeli conflict as a foundation from which to envision how the Soviet Union would fight in Europe.¹⁴ Jensen illustrates General Depuy’s developmental process in the following sequence: first, threat analysis, then concept development, and lastly doctrinal development.¹⁵ Jensen found that using this developmental model, General Depuy successfully developed a new organizational and doctrinal concept from which the defense community could reimagine future warfare.¹⁶ Jensen found that although organizational hierarchy and bureaucracy historically restrict innovation, he found that “incubators”

¹¹ J. P. Clark, *Preparing for War: The Emergence of the Modern U.S. Army, 1815–1917* (Cambridge, Massachusetts: Harvard University Press, 2017), 1–9.

¹² Benjamin M. Jensen, *Forging the Sword: Doctrinal Change in the U.S. Army* (Stanford, California: Stanford Security Studies, an imprint of Stanford University Press, 2016), 25.

¹³ Jensen, 25.

¹⁴ Jensen, 35.

¹⁵ Jensen, 34–35.

¹⁶ Jensen, 53–55.

outside the hierarchy and the “advocacy networks” successfully moved innovation forward.¹⁷

Perhaps it is time for the U.S. military to fundamentally reanalyze itself as it had following Vietnam. Jensen’s ideational framework (Threat → Analysis → Concept → Doctrine) provides a clear sequential path for future research to follow.¹⁸ Like General Depuy, this study will analyze the future operating environment and the near-peer threats the infantry rifle squad will likely encounter on the future battlefield. This paper will also analyze the major U.S. Army studies on the infantry squad organization that were conducted during other interwar periods in order to draw out the key factors that influenced the squad’s organizational change. With a general understanding of the future operating environment, future research can better develop new infantry concepts.

Rosen, Clark, Murray & Millett found that understanding the future nature of warfare to be an important factor in the interwar developmental process. However, understanding the past can also be beneficial to the developmental modernization process. In “Enhancing Combat Effectiveness, The Evolution of The United States Army Infantry Rifle Squad Since The End Of World War II,” Lieutenant Colonel (ret.) Timothy M. Karcher states, “Typically, the Army would need to conduct costly studies and research to determine optimum unit organizations, but, fortunately, past studies provide potential conclusions, which are still relevant today.”¹⁹ Karcher notes that during these types of transition periods scholars and military leaders have often resorted to costly studies in order to determine the next new innovative ideas for the future. More importantly, Karcher found that many of the past infantry studies are still applicable to today. Leveraging the historical conclusions and rationale of the past can help save time, money, and resources in determining the organizations of the future. Therefore, like Karcher’s study, this study will also analyze historical research to find relevant conclusions for determining the most

¹⁷ Benjamin M. Jensen, *Forging the Sword: Doctrinal Change in the U.S. Army* (Stanford, California: Stanford Security Studies, an imprint of Stanford University Press, 2016), 1–2.

¹⁸ Jensen, 35.

¹⁹ Timothy Karcher, “Enhancing Combat Effectiveness, The Evolution Of The United States Army Infantry Rifle Squad Since The End Of World War II” (Thesis, U.S. Army Command and General Staff College, 2002), 4.

combat-effective infantry squad organization that will operate in the near future. Karcher states that using this historical analysis methodology “allows for the observation of the evolution of the rifle squad from the end of World War II to the present, aiding the reader in determining the rationale for various changes.”²⁰ Therefore, in addition to finding valuable historical conclusions, using the historical analysis method helps one to gain a clear picture of the systematic factors that drive the infantry organization to change over time. With this information, one can apply the historical lessons learned to the development of a new infantry squad organization using the contemporary operating environment as the new foundation from which to base the new organizational design.

C. SIGNIFICANCE OF THE RESEARCH QUESTION

This research matters to the U.S. Army, given the vulnerabilities that exist in our current infantry formations. Today’s infantry rifle squad faces significant challenges for surviving on the future battlefield. Given the increasing importance of light dismounted ground units capable of securing urban environments and other restrictive terrain, the survivability of the light infantryman will be critical to the future of the U.S. In order for the future infantry rifle squad to succeed, it must evolve to the enemy and the operating environment it will confront.

My thesis will show that the current U.S. infantry rifle squad has multiple vulnerabilities, which, if exploited by a capable near-peer, could prove deadly. Current infantry organizations Command and Control (C2) systems are heavily reliant on the Electromagnetic Spectrum (EMS).²¹ The EMS links the vast multi-layered network that provides the infantry squad with critical external support. Denying these communications systems could significantly degrade the infantry squad’s ability to coordinate critical support functions such as supporting fires or logistical support missions.

Additionally, each infantry soldier wears multiple pieces of equipment that emit one (or in some cases multiple) electromagnetic signals. When active these signals are a

²⁰ Karcher, 14.

²¹ *Russian New Generation Warfare Handbook* (Fort Meade, MD: Asymmetric Warfare Group, 2016), 17.

vulnerability because they reveal friendly unit locations and make the emitting soldier a target to enemy kinetic attack. To the naked eye, a soldier may be invisible when wearing the proper camouflage and concealed behind vegetation. However, looking through the ‘eyes’ of the EMS, the same soldier can be easily found. Such vulnerabilities have not been an issue in the wars in Iraq and Afghanistan. However, in a future near-peer conflict environment these common vulnerabilities are significant.

In the book *Learning to Forget: U.S. Army Counterinsurgency Doctrine and Practice from Vietnam to Iraq*, David Fitzgerald argues that military leaders can draw on lessons from the past in order to serve the needs of the present.²² Fitzgerald states, “Major innovation and change can be driven from within military organizations but that such changes tend to be in reaction to major traumatic events.”²³ As the Army enters this new transition period, it either can address the vulnerabilities before the next conflict or be forced to address the issues after experiencing significant loss on the battlefield.

D. ORGANIZATION OF THE STUDY

Chapter II will begin with an analysis of past U.S. Army studies that have had a significant impact on the infantry squad’s organization. The historical studies examined will include the 1946 Infantry Conference, the 1956 Research Study of Infantry Rifle Squad TOE (ASIRS), the 1961 Optimum Composition of the Rifle Squad and Platoon (OCRSP) study, and the 1970s Infantry Rifle Unit Study (IRUS). This chapter will also compare and contrast the conclusions of other contemporary research papers that have used this same historical methodology. The purpose of this historical examination is to analyze the past methodologies utilized and to highlight any relevant conclusions that may be applicable to the future.

Chapter III will analyze the contemporary operating environment and determine how it will influence the creation of the future infantry squad organization. This chapter will focus on the key variables of the contemporary operating environment that will most

²² David Fitzgerald, *Learning to Forget: U.S. Army Counterinsurgency Doctrine and Practice from Vietnam to Iraq* (Stanford, California: Stanford University Press, 2013), 203–211.

²³ Fitzgerald, 206.

influence the future infantry squad organization. It will also discuss the implications of a battlefield proliferated with sensors and the growing use of the information domain to include the EMS. Next, the chapter will analyze the most likely contemporary threats that will be confronted in the near future and discuss the implications to the infantry rifle squad.

Chapter IV will conclude with key factors for future research to consider in the improvement of the infantry rifle squad. With clear developmental logic derived from past studies and a clearly defined future operating environment, this chapter will bring all this information together in order to provide insight into a more combat effective infantry rifle squad for the future. This chapter will highlight the key characteristics of the future operating environment and synthesize their effects on the factors of control, lethality, sustainability, and flexibility.

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II. HISTORICAL ANALYSIS

In this chapter, the study will analyze the methodologies and conclusions of five key historical infantry studies and five contemporary studies conducted between 1935 and the present day. The purpose of this historical examination is to highlight any relevant conclusions that may be applicable to today. This historical analysis will examine the logic and criteria that the Army used to maximize the squad's combat effectiveness. These findings will aid in the development of the future infantry squad organization. This chapter will also compare and contrast the conclusions of other contemporary studies that have recommended changes to the infantry squad organization.

A. DEFINING THE INFANTRY RIFLE SQUAD

We must first define the infantry rifle squad: According to the new Army Techniques Publication (ATP) 3-21.10 published in May 2018, an infantry rifle company consists of a company headquarters section, a mortar section, three rifle platoons, and a Raven unmanned system (UAS) team (see Figure 1). In an infantry company, the rifle platoons are the primary maneuver elements with the greatest amount of firepower. Each infantry rifle platoon within the rifle company consists of a platoon headquarters section, three infantry rifle squads, and one weapon squad. In an infantry platoon, the infantry rifle squads are the primary maneuver elements. The weapons squad is a supporting element that provides supporting fires to the maneuver squads. The weapons squad of an infantry platoon consists of two machine gun teams and two anti-tank teams. The three infantry rifle squads of an infantry platoon each contain two infantry fire teams. The infantry fire team is the smallest unit of organization within the Infantry rifle squad. Each fire team consists of a team leader armed with an M4 carbine, one automatic rifleman equipped with an M249 squad automatic weapon, one grenadier equipped with an M4 and M203 (or M320) grenade launcher, and a rifleman armed with an M4. Given their small size, limited

firepower, and other factors, the current fire team organizations are incapable of maneuvering independently.²⁴

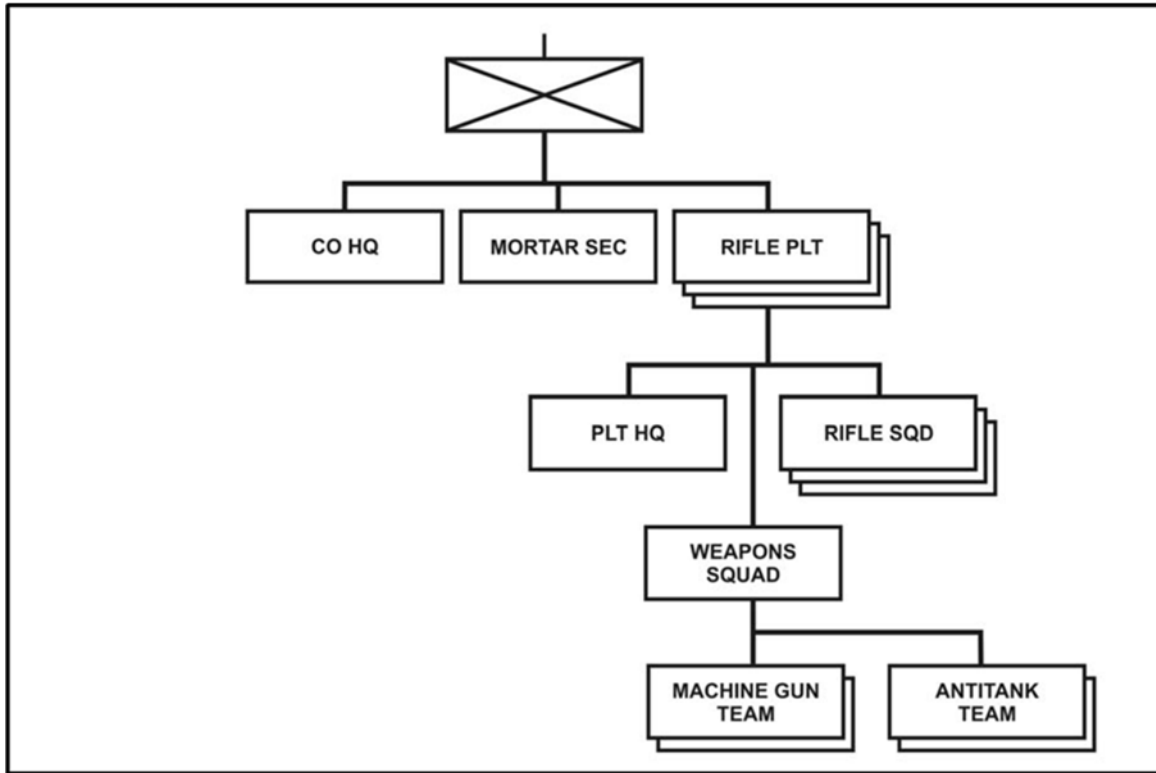


Figure 1. Infantry Rifle Company Organization.²⁵

B. THE BUILDING BLOCK OF THE STUDY

The infantry rifle squad is the basic build block of platoons, companies, and battalions. Karcher states in his study that, “One must determine what one wants this organization and its subordinate units to do, and its optimum organization. Starting at the bottom, and working the way to the top, the infantry rifle squad becomes the focus of this

²⁴ *Army Techniques*, Publication No. 3–21.10 (Washington, DC: Department of the Army, 2018), 1–14.

²⁵ Source: *The Infantry Rifle Company*, FM 3–21.10 (Washington, DC: Department of the Army, 2006), 1–11.

study.”²⁶ As similar studies, this analysis will focus on the infantry rifle squad organization. Although the fire team is a smaller element in the squad organization, because of its small size and inability to maneuver, this study will not begin at the infantry fire team level.

The infantry rifle company’s mission statement is the guiding framework from which to base the new organizational design. Any conclusion or recommendation that falls outside of the doctrinal mission statement is not suitable option. Additionally, if the mission statement regularly changes it will make any new recommendation less valuable given the uncertainty of the future. ATP 3-21.10 states (emphasis added):

The mission of the infantry rifle company is to close with the Enemy using fire and movement to destroy or capture enemy forces or to repel enemy attacks by fire, close combat, and counter-attacks to control land areas, including populations and resources. The infantry rifle company Commander exercises Mission command, directs the operation of the company, and attaches units while conducting decisive action throughout the depth of the company’s area of operations. Company missions, although non-inclusive, may include reducing fortified areas, infiltrating and seizing objectives in the enemy’s rear, eliminating enemy forces remnants in restricted terrain, securing key facilities and activities, and conducting operations in support of stability tasks in the wake of maneuvering forces. Reconnaissance and surveillance tasks and security operations remain a core competency of the infantry rifle company, platoon, and squad.²⁷

ATP 3-21.10 states that the infantry rifle company’s mission is to close with the enemy in close combat and destroy him using fire and maneuver. One unique capability mentioned in this mission statement is the capability to operate in restricted terrain. This movement capability is unique to the infantry given the inability of other mounted units to traverse dense foliage, rough mountains, or destroyed cities. Therefore, retaining this capability along with others that differentiate the infantry from other maneuver units is critical in developing future organizational designs.

²⁶ Karcher, “Enhancing Combat Effectiveness, The Evolution Of The United States Army Infantry Rifle Squad Since The End Of World War II,” 4.

²⁷ ATP 3-21.10, 1-13.

By comparing the 2018 mission statement with an old 1962 infantry company mission statement we can assess how much the infantry company's mission has changed over time. The old 1962 Infantry Field Manual (FM 7-10) states that "the mission of the rifle company is to close with the enemy by means of fire and maneuver in order to destroy or capture him or to repel his assault by fire, close combat, and counterattack."²⁸ By comparing the 2018 mission statement with the 1962 version we see that the infantry company and infantry squad's mission has remained nearly identical over the last fifty years. With this knowledge, we can infer that the infantry squad's mission statement will continue to remain constant in the near future and thus provide a better foundation in developing a future design.

C. SCOPE AND ASSUMPTIONS

Although this research may also be relevant to other infantry models, this analysis will solely focus on the organization of the U.S. Army infantry rifle squad (light) assigned to an Infantry Brigade Combat Team (IBCT). Mechanized infantry organizations such as the Stryker infantry or the heavy Bradley Fighting Vehicle infantry organizations are beyond the scope of this study. This same limitation includes specialized infantry squads such as those that operate in the elite Ranger Battalions.

Additionally, given the uncertainty of the far-future operating environment (beyond 20 years), this study will focus on the near-term operating environment (within 20 years) to avoid being bogged down in speculation of the ambiguous future. By using these time parameters, we assume that the near future technology will not change significantly and that the infantry rifle squad will use similar weapon systems that produce the equivalent amount of firepower as the systems of today. Using these assumptions will allow us to develop useful recommendations for the future. Additionally, this study will assume that there will be no substantial troop drawdown requirements within the next 15 years. Such drawdowns would limit the Army's willingness to grow an infantry organization and therefore limit our range of recommended options.

²⁸ *Rifle Company, Infantry, Airborne Infantry, and Mechanized Infantry, FM 7-10* (Washington, DC: Department of the Army, 1962), 4.

D. DEFINING COMBAT EFFECTIVENESS

Next, one must define what it means to be combat effective. To assess combat effectiveness, there must be defined criteria from which to assess the strengths and weaknesses of an organization. This study will utilize four commonly used criteria from previous studies in order to assess the combat effectiveness of different infantry squad organizations. These four criteria are control, lethality, sustainability, and flexibility.

This study defines ‘control’ as the ease of a leader to manage his or her organization. Thus, the more people under a leader’s supervision the less the leader is able to effectively control that organizational unit. This aspect of control plays a critical part in balancing the organization’s leadership structure and its leader-to-led ratio (or the ratio of a leader to direct subordinate soldiers).

Next, this study defines ‘sustainability’ as the ability of a unit to be inflicted with casualties (attrition) and loss of equipment and still be capable of accomplishing its core tasks (maneuver, attack, & defend). Dupree and Homesly define sustainability as “the ability of the squad or team to function as a fighting unit despite normal attrition.”²⁹ The more soldiers a squad has, the more attrition the squad is able to sustain and still be capable of closing with and destroying an enemy through fire and maneuver.

‘Flexibility’ is the ability of a unit to conduct multiple tasks or the “ability to perform a variety of missions.”³⁰ As noted previously, an infantry squad has a wide range of missions that include attack, defense, reconnaissance, and other operations in support of stability tasks. A flexible organizational structure would allow the infantry squad to not only conduct its primary core tasks of fire and maneuver, but also all the other tasks that fall within its mission statement.

Finally, the study defines ‘lethality’ as a squad’s ability to inflict damage on an enemy with the use of firepower. The infantry squad’s organic weapons and other enabling

²⁹ Robert Dupree and Horace Homesly, *A History of United States Army Squads and Platoons 1935–1967* (Fort Benning, GA: United States Army Combat Developments Command, 1967), 92.

³⁰ Karcher, “Enhancing Combat Effectiveness, The Evolution Of The United States Army Infantry Rifle Squad Since The End Of World War II,” 11.

equipment generate squad firepower. As the number of weapon systems increase within a unit, the unit's overall firepower simultaneously increases. Similarly, an increase in the rate of fire (or destructive power) of an individual weapon system will simultaneously increase the lethality of the unit as a whole.

Now the framework of the study is established, this paper will analyze the methodologies and conclusions of historical infantry studies conducted between 1935 and the present day to highlight any relevant conclusions that may be applicable to today. Using these four variables, this historical analysis will examine the logic and criteria that the Army used to maximize the squad's combat effectiveness, then compare and contrast their conclusions to aid in the development of the future infantry squad organization.

E. 1946 INFANTRY CONFERENCE

After WWII the U.S. Army conducted the 1946 Infantry Conference held at Fort Benning, GA to improve the infantry's organizational structure used during the war (see Figure 2). The conference captured the combat experience of veteran soldiers from both the European and the Asian theaters of operation. Using their valuable insights, the Infantry Conference's attendees analyzed the strengths and weaknesses in the infantry organizational structure and made new innovative changes using a committee voting process. Although the conference had many areas of focus, one key area of study was the combat effectiveness and organization of the infantry rifle squad. The question posed to the committee was if the infantry squad organization was satisfactory or not, and if not, then what changes would make the organization better.³¹

³¹ The Infantry Conference, "Report of Committee 'B' on Tactics and Technique" (Fort Benning, GA: The United States Army Infantry School, 1946), T-18, 3.

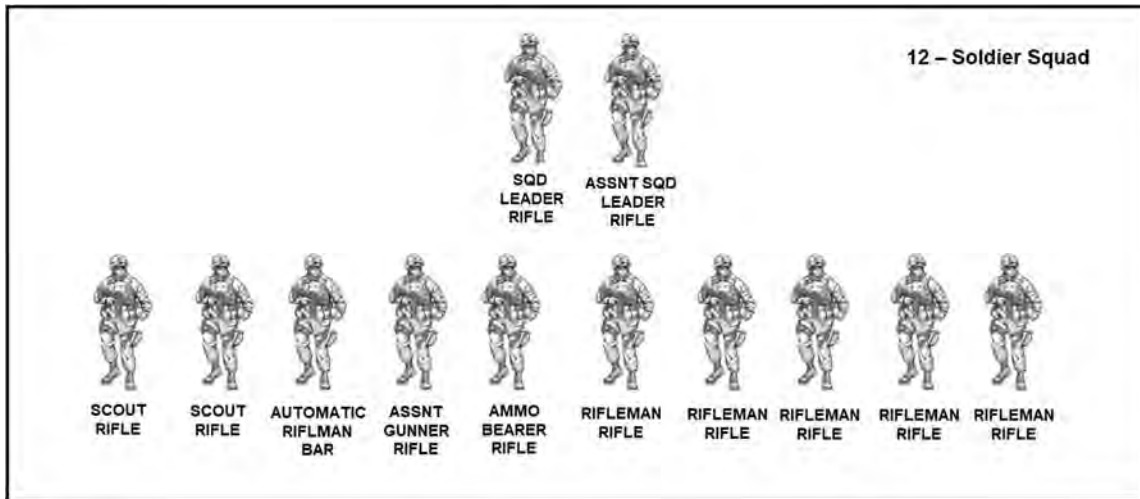


Figure 2. WWII Infantry Rifle Squad.³²

During WWII, the infantry rifle squad organization consisted of 12 soldiers: a squad leader, assistance squad leader, two scouts, one automatic rifleman (equipped with a BAR), one assistant gunner, one ammo bearer, and five riflemen.³³ Unlike today, the WWII infantry squad organization did not fire and maneuver independently as per its design. During this time, the infantry platoon was the lowest echelon capable of fire and maneuver. The infantry squad would move as a single entity and suppress the enemy while another squad maneuvered or assaulted the enemy while being covered by another squad in the platoon. In theory, the squad leader would travel forward with the scout element to find the enemy. Upon finding the enemy, the squad leader would direct the suppression of the enemy with the squad automatic rifleman, which would enable another squad to assault the enemy position.³⁴ However, the committee found that this was often not the case and that

³² Adapted from Karcher, "Enhancing Combat Effectiveness, The Evolution Of The United States Army Infantry Rifle Squad Since The End Of World War II," 23; Soldier image taken from *Infantry Platoon and Squad*, ATP 3-21.8 (Washington, DC: Headquarters, Department of the Army, 2016), 1-13.

³³ *Infantry Field Manual: Rifle Company, Rifle Regiment*, FM 7-10 (Washington, DC: War Department, 1942), 130.

³⁴ *Infantry Field Manual: Rifle Company, Rifle Regiment*, FM 7-10, 131.

the squad leader often became pinned down in front of his squad where he could not effectively control the other soldiers.³⁵

After an extensive review, the committee came to three key conclusions: First, the committee found that the 12-soldier infantry squad was too large for one soldier to control (even with an assistant squad leader). During this time, the primary methods of control at the squad level revolved around the use of voice commands and hand and arm signals. Each of these control methods is limited in reach making it difficult to control eleven other dispersed soldiers even in favorable conditions. Another part of the problem of control was the inexperience of the squad leaders. General Omar Bradley stated in his testimonial, “I am sure that the squad is too large. With rapid promotion due to casualties you sometimes find yourself with people commanding squads who are having a pretty hard job commanding that large a squad.”³⁶ General Bradley’s comments highlight that a part of the issue of control was the inexperience of the conscripted junior leadership who often led squads due to the high level of attrition. Therefore, the conference determined that “one man can normally control no more than eight others by voice and hand signals in the field.”³⁷

Second, the committee concluded that the infantry squad should anticipate operating at 25 percent below the authorized unit strength.³⁸ The conference found that attrition was common in warfare and that squads often had to operate well below their authorized strength. Although the committee did not determine the minimum number of soldiers needed to operate effectively, it was determined that the squad should not be larger than nine soldiers.³⁹ According to the committee’s findings, a nine-man squad would be able to sustain a small number of casualties (one or two soldiers) and still be able to suppress or assault the enemy but not maneuver independently.

³⁵ Dupree and Homesly, *A History of United States Army Squads and Platoons 1935–1967*, 31.

³⁶ The Infantry Conference, “Report of Committee ‘B’ on Tactics and Technique,” Tab A, 8.

³⁷ Dupree and Homesly, *A History of United States Army Squads and Platoons 1935–1967*, 36.

³⁸ Dupree and Homesly, 36.

³⁹ Dupree and Homesly, 37.

Third, the committee found that the WWII squad did not possess sufficient firepower in comparison to their German counterpart. The analysis found that the German Light Machine Gun (LMG), and the SG44 assault rifle provided the German formations superior firepower.⁴⁰ The committee's key organizational recommendation was that the future squad organization be equipped with an American version of the German LMG.⁴¹ However, it would take over a decade for this recommendation to happen. Given the committee's findings, the Infantry Conference recommended the nine-soldier infantry squad as shown in Figure 3.

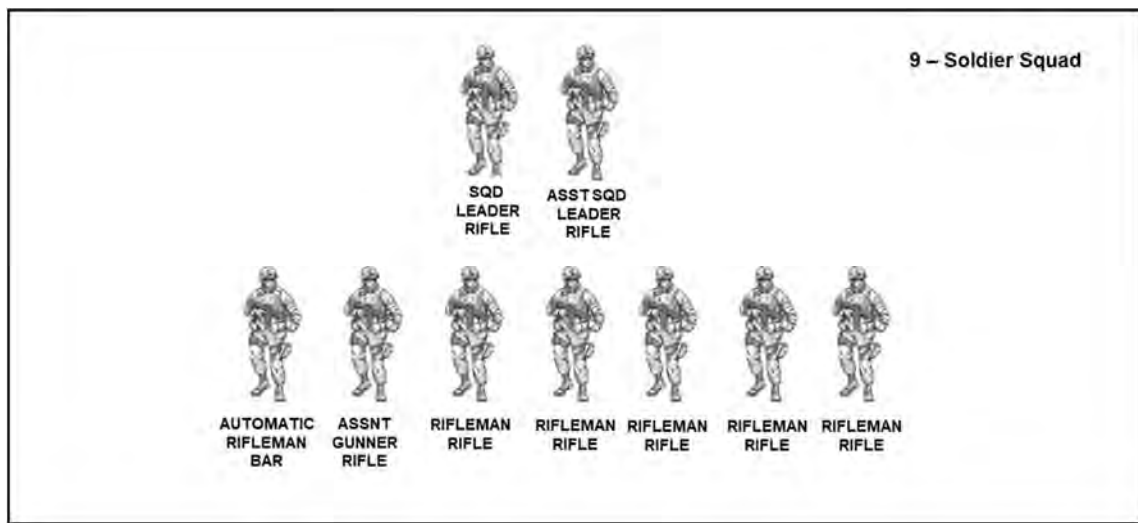


Figure 3. 1946 Infantry Conference Recommended Squad Organization.⁴²

Four years later, the nine-soldier squad organization developed by the 1946 Infantry Conference was put to the test in Korea. It was determined through combat experience that the nine-soldier squad was not optimal in the severely restricted mountainous terrain of Korea. This led General S.L.A. Marshall to modify the nine-soldier squad to a more combat

⁴⁰ Dupree and Homesly, 31–33.

⁴¹ The Infantry Conference, "Report of Committee 'B' on Tactics and Technique," T-17, T-18, T-19.

⁴² Adapted from Karcher, "Enhancing Combat Effectiveness, The Evolution Of The United States Army Infantry Rifle Squad Since The End Of World War II," 26; Soldier image taken from *Infantry Platoon and Squad*, ATP 3–21.8 (Washington, DC: Headquarters, Department of the Army, 2016), 1–13.

effective unit that fit the rugged terrain of Korea. General Marshall found that “a squad with two wings, each working under its own leader, but both working toward the same object, is demonstrably capable of stronger action and closer direction than eight men operating under one man.”⁴³ General Marshall’s 11-soldier infantry squad would bring about the first two-fire team concept within the squad organization. General Marshall found that balancing each fire team with its own team leader and machinegun not only gave the squad more firepower but also more flexibility by enabling the squad to fire and maneuver.⁴⁴

F. 1956 RESEARCH STUDY OF INFANTRY RIFLE SQUAD TOE (ASIRS)

Three years after the Korean War the Continental Army Command (CONARC) directed the Combat Operations Research Group (CORG) to conduct a study titled “Research Study of Infantry Rifle Squad TOE (ASIRS)” to determine the most combat-effective squad organization.⁴⁵ Unlike the 1946 Infantry Conference, which relied heavily on the previous combat experience of WWII veterans, this study instead conducted multiple field tests using a variety of different squad organizational structures and weapon load-outs. The purpose was to maximize the squad’s combat effectiveness by assessing a squad’s size, weapons load-out, and command structure. The ASIRS study analyzed the performance of eight different squad configurations during daylight attack and defense mission scenarios. The study tested each squad under the same conditions (i.e., terrain, mission, time, and standards) in order to help the researchers identify correlating factors.

Additionally, the ASIRS study built on the data provided by three smaller studies previously conducted by the 18th Airborne Corp and the Third Infantry Division named Operation Falcon, Operation Follow Me, and Operation Sagebrush. Operation Falcon found that the 11-soldier squad could be controlled by one soldier and sustaining minimal

⁴³ S.L.A. Marshall, *Commentary on Infantry Operations and Weapons Usage in Korea: Winter of 1950–51* (London: Green Hill Books, 1988), 54.

⁴⁴ Marshall, 53–56.

⁴⁵ Dean Havron, “A Research Study of the Infantry Rifle Squad TOE” (Fort Monroe, VA: Headquarters, Continental Army Command, 1956), 1.

casualties and still be capable of fighting.⁴⁶ Operation Follow Me contributed to ASIRS by evaluating the effects of attrition on varying squad sizes and concluded that seven soldier squads were completely inadequate (due to attrition) and that the 10 soldier squad was optimal.⁴⁷ Operation Sagebrush countered the 1946 Infantry Conference findings and concluded that the nine soldier squad was still too large for one soldier to control and too small to split in two. Instead, Sagebrush recommended a 12-soldier squad that included two balanced maneuver teams, two fire team leaders, and an assistant squad leader.⁴⁸

With these previous findings and additional field tests, the ASIRS study had three key conclusions. First, that the best leader-to-led ratio was actually between one-and-five and that the 11-soldier squad organization was optimal over the nine-man squad given the inclusion of two team leaders.⁴⁹ Secondly, with the addition of two subordinate leaders, the squad leader was effectively able to distribute the burden of fire control down to the team level.⁵⁰ Third, ASIRs found that by giving more than 1/3 of the squad a machine gun the effectiveness of the squad would actually begin to decrease due to excess weight and the lack of rifleman to assault the enemy.⁵¹ Therefore, like the Korean War configuration, ASIRS recommended the 11-soldier squad organization with two five-soldier fire teams, each possessing a light machine gun and led by a team leader (see Figure 4).

⁴⁶ Dupree and Homesly, *A History of United States Army Squads and Platoons 1935–1967*, 63–64.

⁴⁷ Dupree and Homesly, 64.

⁴⁸ Dupree and Homesly, 65.

⁴⁹ Havron, “A Research Study of the Infantry Rifle Squad TOE,” 12–14.

⁵⁰ Havron, 12–14.

⁵¹ Havron, 12–14.

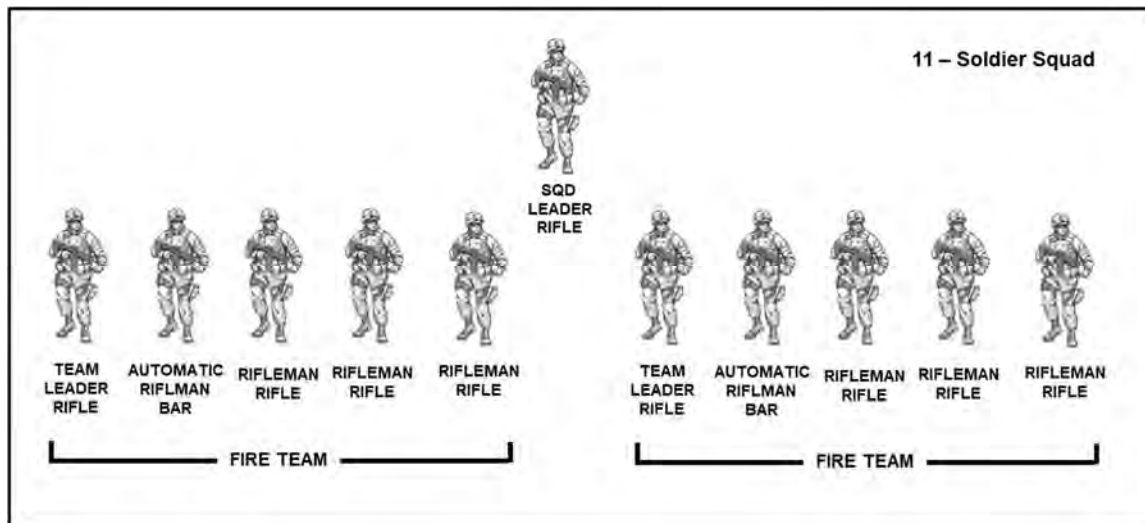


Figure 4. 1956 ASIRS Recommended Squad Organization.⁵²

G. 1961 THE OPTIMUM COMPOSITION OF THE RIFLE SQUAD AND PLATOON

Five years after the ASIRS study CONARC again initiated a study to analyze the composition of the infantry squad to maximize its combat effectiveness using the equipment available between 1965–1970.⁵³ In this study, the Army wanted to analyze the implications of new weapons technology introduced to the military at the time (i.e., the new M60 machine gun) and how they affected the squad organization. However, unlike the previous two studies “The Optimum Composition of the Rifle Squad and Platoon” (OCRSP) study used a more objective analysis approach that attempted to minimize biases and other subjective interpretations. To achieve this, the competing squad organizations were modified only in ways that needed to be analyzed using a two-sided field tactical exercise.⁵⁴ Twenty-three officers and non-commissioned officers were then used as evaluators to conduct the field experiment and to ensure adherence to the designed

⁵² Adapted from Karcher, “Enhancing Combat Effectiveness, The Evolution Of The United States Army Infantry Rifle Squad Since The End Of World War II,” 39; Soldier image taken from *Infantry Platoon and Squad*, ATP 3–21.8 (Washington, DC: Headquarters, Department of the Army, 2016), 1–13.

⁵³ Combat Development Experimentation Center, “The Optimum Composition of the Rifle Squad and Platoon” (Fort Ord, CA: Headquarters United States Army, 1961), 1.

⁵⁴ Combat Development Experimentation Center, 2–4.

scenario. Each varying squad organization that was tested was subjected to the same obstacles. These obstacles included a pre-determined number of enemy combatants and casualty assessments in each iteration. One of the challenges in the study was identifying how to equip the squads with equipment believed to be used between 1965 -1970. To overcome this obstacle, the testers equipped the squads with equipment expected to be used in the future or items of approximately the same configuration.⁵⁵

Although this study used a slightly different framework, the results of the OCRSP study did not differ significantly from the 1956 ASIRS study. Similar to the ASIRS study, the OCRSP study also recommended the 11-soldier infantry squad organization stating that there was not a noticeable difference in the level of control between the 11-soldier squad and the nine-soldier squad.⁵⁶ This study also validated the fire team concept as the best organization for control and flexibility in that it allowed the squad leader more options regarding which team would establish the base of fire or become the assault element. Regarding sustainability, the studies also produced similar findings noting that small squads cannot sustain casualties and retain the ability to fire and maneuver.⁵⁷ Assessing the squad's lethality, one unique change made in the squad's composition was the replacement of the BAR with an organic M60 machine gunner and the replacement of one rifleman as an assistant gunner within each fire team organization (see Figure 5).

⁵⁵ Combat Development Experimentation Center, 9,53.

⁵⁶ Combat Development Experimentation Center, 16.

⁵⁷ Combat Development Experimentation Center, 16.

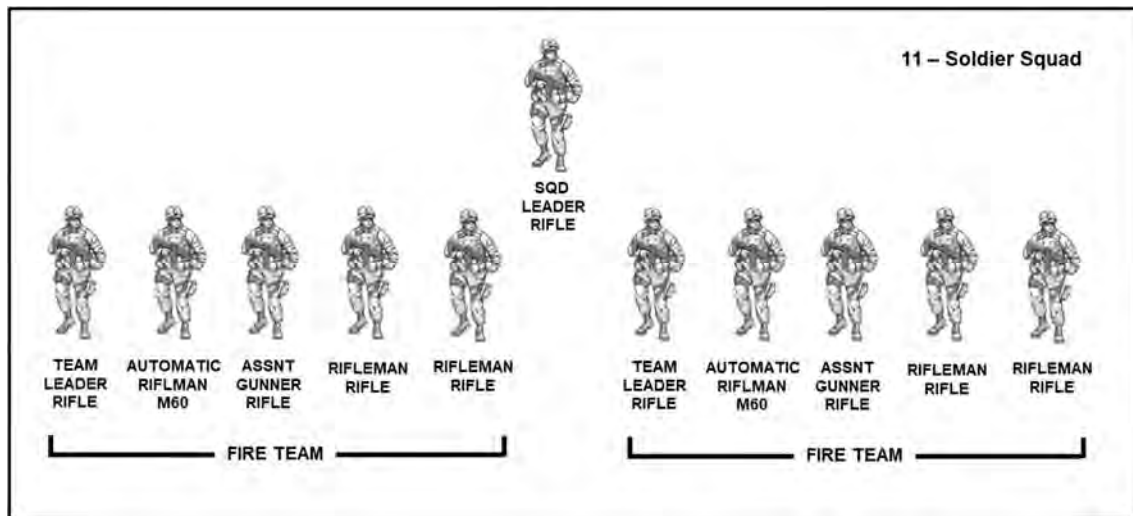


Figure 5. 1961 OCRSP Recommended Squad Organization.⁵⁸

H. 1970S INFANTRY RIFLE UNIT STUDY (IRUS)

From 1961–1964 the army began to transition to the new Reorganization Objective Army Division (ROAD). In this transition, the Army reduced the size of the infantry rifle squad from 11 to 10 soldiers. This reduction was not the result of scientific research but instead was the Army’s way of trying to fill up its newly authorized infantry divisions under the ROAD transition program. It was also the result of the introduction of new weapon systems such as the M14 and M16 rifles (which many believed would mitigate the loss of a soldier from the squad given the increased rate of fire).⁵⁹

From 1966 to 1975, the Army conducted its most extensive field test to date titled “The Infantry Rifle Unit Study” (IRUS). The purpose of this study was once again to objectively determine the most effective infantry rifle squad organization. The IRUS study measured combat effectiveness using the following criteria: controllability, maneuverability, survivability, sustainability, intelligence and counterintelligence, and fire

⁵⁸ Adapted from Karcher, “Enhancing Combat Effectiveness, The Evolution Of The United States Army Infantry Rifle Squad Since The End Of World War II,” 50; Soldier image taken from *Infantry Platoon and Squad*, ATP 3–21.8 (Washington, DC: Headquarters, Department of the Army, 2016), 1–13.

⁵⁹ Virgil Ney, *Organization and Equipment of the Infantry Rifle Squad: From Valley Forge to R.O.A.D.* (Ft. Belvoir, VA: United States Army Combat Developments Command, 1965), 66.

effectiveness.⁶⁰ To evaluate varying squad organizations objectively under these criteria, the testers once again developed a simulated force on force field environment that minimized variables by mirroring standards, missions, etc. However, unlike previous studies, the IRUS study leveraged new electronic sensor technology to help measure the effects of weapon systems and to help isolate key firepower variables being analyzed.⁶¹

The multi-phased IRUS study arrived at two key conclusions: First, the study found that the 11-soldier infantry squad was the smallest squad configuration that could sustain normal attrition and continue to operate as a squad. Thus, the study recommended the 11-soldier squad over the other configurations.⁶² Secondly, the IRUS study determined that squads composed of 15-soldiers or above were too large to control and became less combat effective.⁶³ Consequently, after the conclusion of the IRUS study, the Army once again changed from a 10-soldier configuration to an 11-soldier configuration (see Figure 6). This 11-soldier squad organization was nearly identical to the one recommended by the 1961 OCRSP study.

⁶⁰ “Infantry Rifle Unit Study, IRUS-75, Phase II, Volume 1” (Ft. Benning, GA: United States Army Combat Developments Command, 1969), 7.

⁶¹ “Infantry Rifle Unit Study, IRUS-75, Phase II, Volume 1,” 1–7.

⁶² “Infantry Rifle Unit Study, IRUS-75, Phase II, Volume 1,” 53–54.

⁶³ “Infantry Rifle Unit Study, IRUS-75, Phase II, Volume 1,” 19,31.

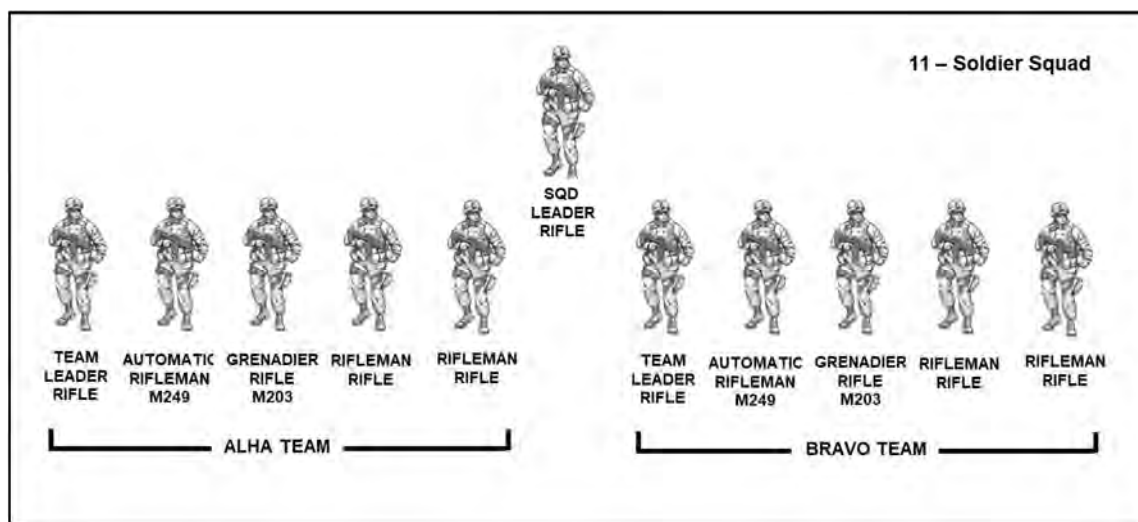


Figure 6. 1967 IRUS Recommended Squad Organization.⁶⁴

I. 1984 ARMY OF EXCELLENCE

In 1982, the U.S. Army Training and Doctrine Command (TRADOC) conducted an Army-wide study named “Army 86” to determine how to reshape the Army’s tactical and support organizations to the AirLand Battle doctrine and new weapons systems.⁶⁵ The Army 86 study was significantly less objective than the IRUS study conducted a decade before. Unlike previous Army studies which used data from field tests and combat experience, the Army 86 study was driven primarily by two main top-down factors: First, the Army was reorganizing to become a rapidly deployable and light mobile force. In order to achieve this objective, the Army began to standardize unit formations across the force to better accommodate new equipment being fielded (i.e., the Bradley Fighting Vehicle) and also to become better logistically transportable via C-141Bs.⁶⁶ Second, to create lighter divisions the Army generated personnel constraints by task which forced infantry

⁶⁴ Adapted from Karcher, “Enhancing Combat Effectiveness, The Evolution Of The United States Army Infantry Rifle Squad Since The End Of World War II,” 60; Soldier image taken from *Infantry Platoon and Squad*, ATP 3–21.8 (Washington, DC: Headquarters, Department of the Army, 2016), 1–13.

⁶⁵ John L. Romjue, *A History of Army 86*, 2nd ed., vol. 1 (Ft. Monroe, VA: United States Army Training and Doctrine Command, 1982), 2.

⁶⁶ John L. Romjue, *The Army of Excellence: The Development of the 1980s Army*, 2 (Fort Monroe, VA: United States Army Training and Doctrine Command, 1997), 25.

organizations to cut their size.⁶⁷ These constraints ultimately resulted in the decrease of the infantry squad organization from the traditional 11 soldiers back down to nine soldiers.⁶⁸ Then in 1983 at the Summer Army Commanders Conference, various Army leaders voiced their concern over the “hollowness” of the force, which had an imbalance in the combat-to-support structure.⁶⁹ TRADOC addressed these concerns through the Army of Excellence (AoE) reorganization effort. However, like the Army 86, the AoE effort lacked objective analysis and was driven by personnel and budgetary constraints. Consequently, General William R. Richardson, the TRADOC Commander, affirmed the Army 86 nine-man infantry rifle squad, which is still in use to this day (see Figure 7).⁷⁰

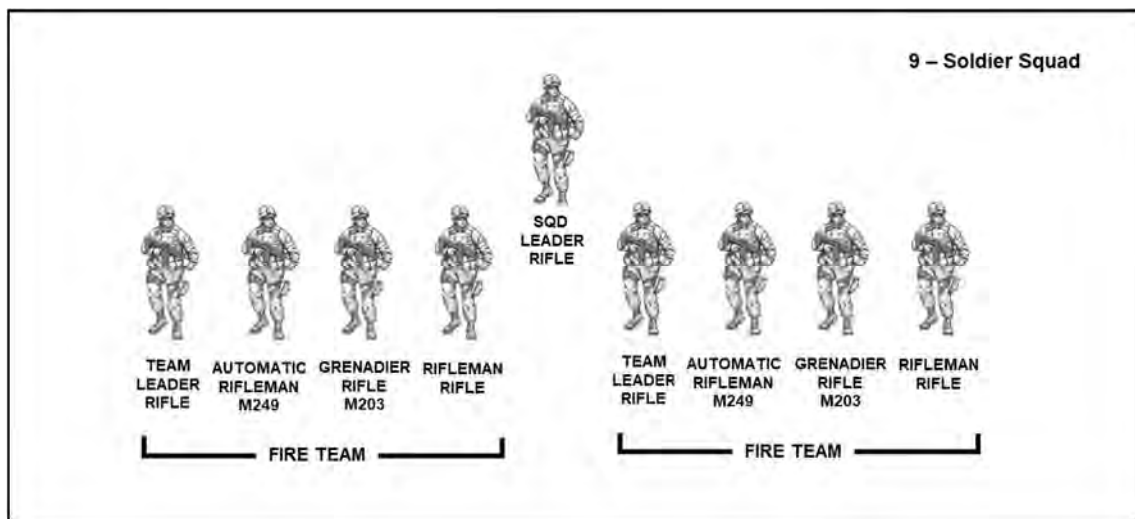


Figure 7. Current Light Infantry Squad Configuration (AoE Recommended).⁷¹

⁶⁷ Romjue, *A History of Army 86*, 1:37.

⁶⁸ Romjue, 1:41.

⁶⁹ Romjue, *The Army of Excellence: The Development of the 1980s Army*, 31–32.

⁷⁰ Romjue, 41.

⁷¹ Adapted from *Infantry Platoon and Squad*, ATP 3–21.8, 1–13.

J. CONTEMPORARY STUDIES

1. 1990 MELODY

Following five years of operating under the nine-soldier AoE squad configuration, Major Paul E. Melody, a student at the United States Army Command and General Staff College (CGSC) conducted a study of the infantry squad organization titled, “The Infantry Rifle Squad: Size is Not the Only Problem.” Melody’s historical analysis found that the 1946 Infantry Conference conclusions were still the optimal solution to maximizing the combat effectiveness of the contemporary squad organization.⁷²

Acknowledging the nine-soldier squad’s vulnerability to attrition and also the unlikelihood of the Army returning to the 11-soldier squad (due to downsizing), Melody concluded that the best solution to the problem would be to return the squad to a modified version of the 1946 Infantry Conference squad configuration (see Figure 8).⁷³ To do this, Melody determined that the squad would need to do two things: First, eliminate one M249 squad automatic weapon and one grenade launcher. Doing this would free up more riflemen in the squad. Second, Melody believed that the two fire team structure within the squad should be eliminated and instead be reassigned an assistant squad leader to help with control. One key point in Melody’s conclusion is that the squad would not be capable of fire and maneuver, but instead only fire or maneuver.⁷⁴ Thus, once again the infantry platoon would be the lowest echelon capable of fire and maneuver.

⁷² Paul Melody, “The Infantry Rifle Squad: Size Is Not the Only Problem” (United States Army Command and General Staff College, 1990), 39.

⁷³ Melody, 45.

⁷⁴ Melody, 45.

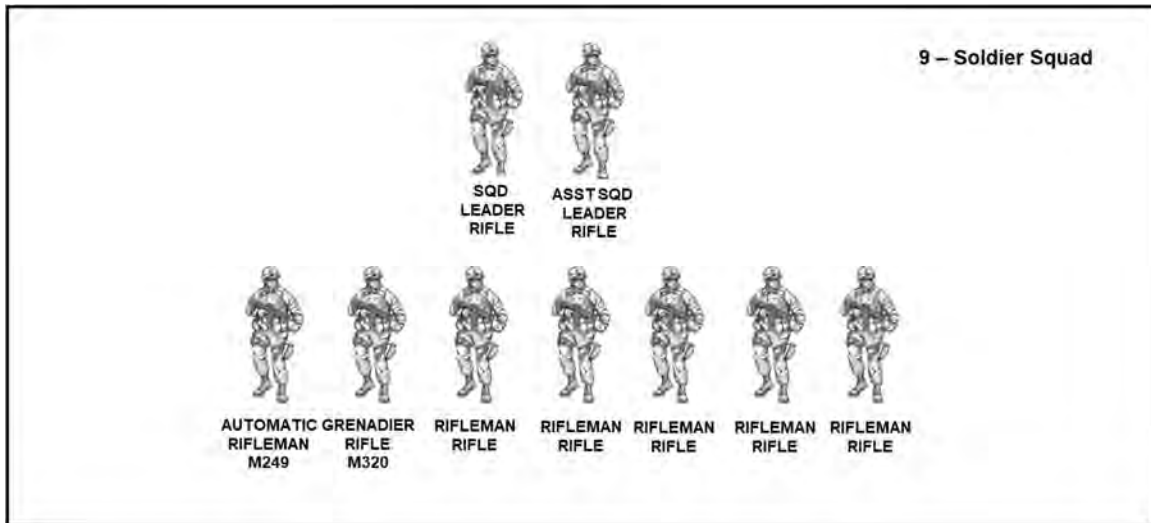


Figure 8. 1990 Major Paul E. Melody Recommended Squad Organization.⁷⁵

2. 1994 HUGHES

Three years after the 1991 Gulf War, Major Stephen E. Hughes conducted a study in his work titled, “The Evolution of the U.S. Army Infantry Squad: Where Do We Go From Here? Determining the Optimal Infantry Squad Organization for the Future” to again analyze the most combat-effective infantry squad organization. In his study, Hughes conducted a comparative analysis between a three-team 10-soldier squad versus a two-team nine-soldier squad configuration. Hughes’ combat effectiveness criteria included firepower, maneuver, leadership, protection, and resiliency.⁷⁶ However, in his research, Hughes found another key variable to consider in designing the future squad organization. Hughes found that morale was also a significant variable that correlated to the infantry unit’s size. Hughes states, “Soldiers fight best when they are grouped with other soldiers they know and trust.”⁷⁷ Hughes concludes that making an infantry unit too small will

⁷⁵ Adapted from Melody, 44–46; Soldier image taken from *Infantry Platoon and Squad*, ATP 3–21.8 (Washington, DC: Headquarters, Department of the Army, 2016), 1–13.

⁷⁶ Stephen Hughes, “The Evolution Of The U.S. Army Infantry Squad: Where Do We Go From Here? Determining The Optimum Infantry Squad Organization For The Future.” (School of Advanced Military Studies, 1994), 35.

⁷⁷ Hughes, 39.

create a negative impact on the combat effectiveness of the unit. This is the result of soldiers feeling alone, isolated, and afraid. These negative emotions degrade a unit's ability to accomplish its mission. Therefore, Hughes concludes that the 10-soldier three-team squad organization is superior to the nine-soldier squad in the majority of the assessment criteria (see Figure 9).⁷⁸

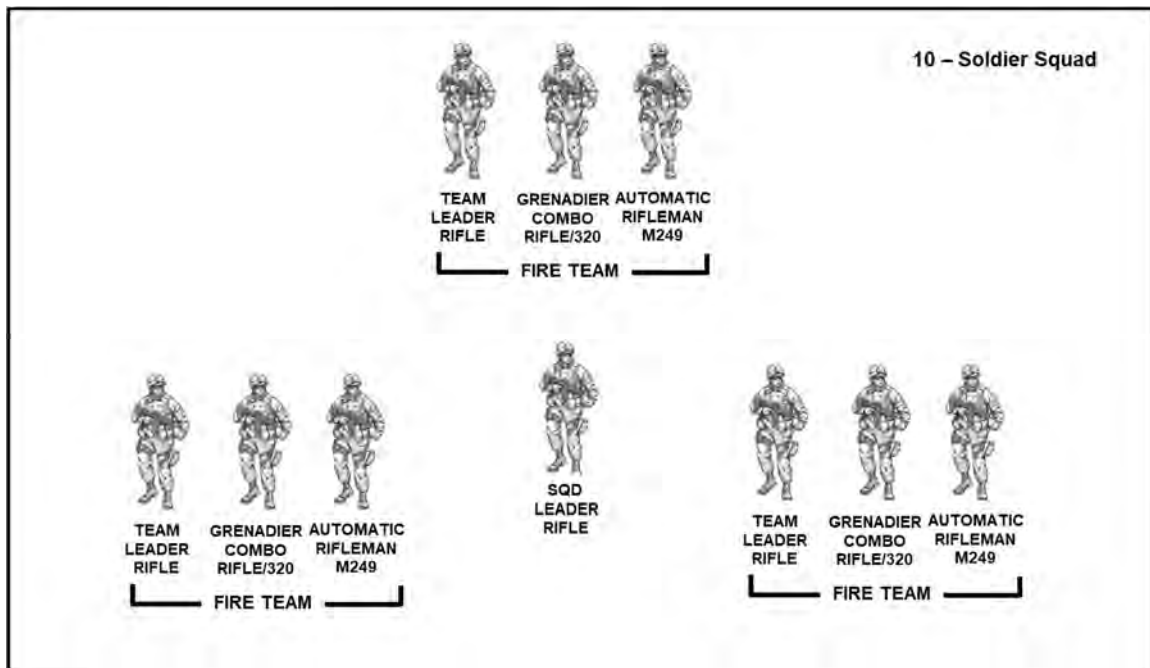


Figure 9. 1994 Major Stephen E. Hughes Squad Organization.⁷⁹

3. 1998 RAINEY

Building upon Hughes' 1994 study, Major James E. Rainey conducted a study titled, "Sharpening the Tip of the Spear: Is the Light Infantry Squad the Right Size for the Future Battlefield?" in order to determine the inherent characteristics of a combat effective

⁷⁸ Hughes, 38.

⁷⁹ Adapted from Hughes, 38–40; Soldier image taken from *Infantry Platoon and Squad*, ATP 3–21.8 (Washington, DC: Headquarters, Department of the Army, 2016), 1–13.

squad organization.”⁸⁰ To do this, Rainey first conducted a historical analysis of the evolution of the squad organization from the Revolutionary War to the 1984 AoE study. Rainey then conducted a comparative analysis of four different squad organizations that were most prevalent in past studies. The first configuration was the contemporary nine soldier, two-team squad. The second configuration was Hughes’ triple-team 10-soldier squad. The third configuration was the 11-soldier two-team squad and the final configuration was the 12-soldier squad that included two teams and an assistant squad leader. Rainey used four criteria to assess the combat effectiveness of each configuration: span of control, sustainability, flexibility, and leadership.⁸¹

Rainey’s conclusions validated that the nine-soldier squad organization did not have sufficient sustainability given that only a small amount of attrition would deny the squad the ability to fire and maneuver. Rainey’s comparison chart showed that the 12-soldier two-team squad was the most optimal configuration and that it provided the greatest sustainability and flexibility with a low leader-to-led ratio.⁸²

Rainey’s conclusions also echoed a common theme regarding the vulnerability of the current nine-soldier squad configuration in that it lacked the size to sustain casualties. Rainey concludes that “technology should be leveraged rather than used as a justification for a reduction in size”⁸³ Therefore, the idea of downsizing the soldiers of an organization just because of an increase in the lethality of modern weapons systems may be a poor developmental method, given that adversaries will likely progress in lethality as well. Thus, Rainey recommended the 12-soldier squad organization illustrated in Figure 10.

⁸⁰ James E. Rainey, “Sharpening the Tip of the Spear: Is the Light Infantry Squad the Right Size for the Future Battlefield?” (United States Army Command and General Staff College, 1998), 6.

⁸¹ Rainey, 2–3.

⁸² Rainey, 42–43.

⁸³ Rainey, 43.

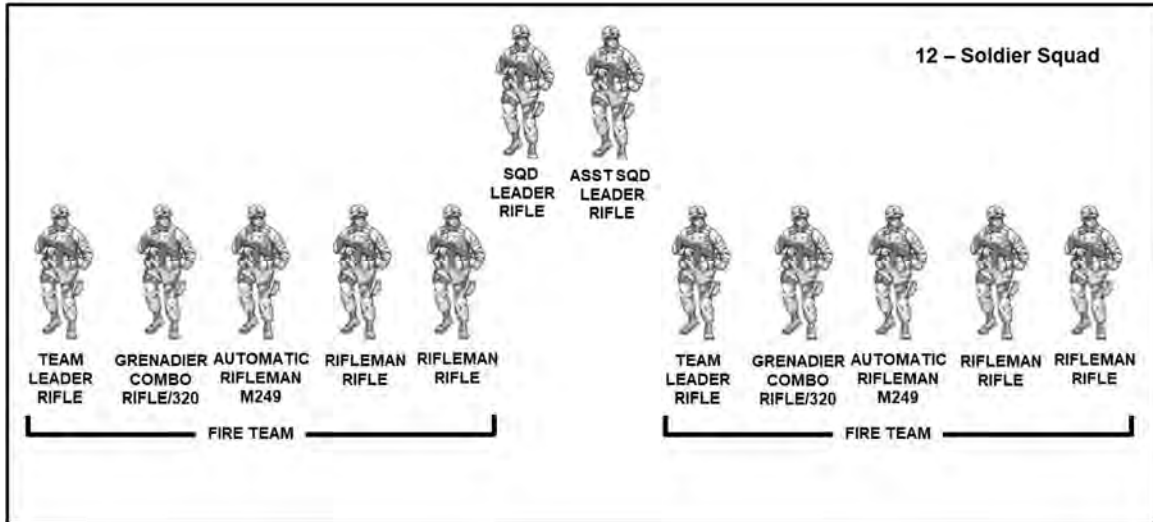


Figure 10. 1998 Major James E. Rainey Squad Organization.⁸⁴

4. 2002 KARCHER

In 1999 General Eric Shinseki, Chief of Staff of the United States Army began laying the groundwork for the new “Objective Force” which entailed the organization of small, agile, multi-functioning brigade combat teams. In 2002 Major Timothy M. Karcher conducted a study titled “Enhancing Combat Effectiveness, The Evolution Of The United States Army Infantry Rifle Squad Since The End Of World War II” in order to determine the optimum infantry squad size and composition of General Shinseki’s new Objective Force.⁸⁵ Karcher’s analysis used the IRUS-75 combat effectiveness criteria (control, lethality, sustainability, and flexibility) to compare the current nine-soldier squad organization to the 11-soldier squad organization.

Karcher analysis concluded four things. First, like many previous studies, Karcher found that the 11-soldier squad organization was far superior to the nine-soldier squad because it could “suffer 36 percent casualties prior to reorganizing into a single entity, as opposed to the nine-man squad that only required 22 percent casualties to require

⁸⁴ Adapted from Rainey, 38; Soldier image taken from *Infantry Platoon and Squad*, ATP 3–21.8 (Washington, DC: Headquarters, Department of the Army, 2016), 1–13.

⁸⁵ Karcher, “Enhancing Combat Effectiveness, The Evolution Of The United States Army Infantry Rifle Squad Since The End Of World War II,” 10.

reorganization.”⁸⁶ Therefore, the 11-soldier squad was significantly better in sustainability than the smaller nine-soldier squad. Second, Karcher found that although the nine-soldier squad was easier to control than the 11-soldier squad, the advantage was nullified as soon as the team command structure broke down. Karcher notes that as soon as the nine-soldier squad sustains casualties it is forced to reorganize into a single entity.⁸⁷ Third, regarding lethality and flexibility, Karcher found that the 11-soldier squad consistently outperformed the nine-soldier squad given the squad’s greater number of weapon systems and greater ability to fire and maneuver.⁸⁸

5. 2018 KAMARA

Major Hassan Kamara, a member of the Army’s Future Studies Group and the Army’s Modernization Task Force, wrote a journal article in the 2018 *Military Review* titled, “Rethinking the U.S. Army Infantry Rifle Squad” in which he argues that “changes in war, military affairs, and human society since the 1940s, as well as projections about future war, sufficiently invalidate many of the foundational arguments, facts, and assumptions that generated the legacy nine-person infantry squad, and justify institutional reevaluation and reform.”⁸⁹

Kamara uses Sir Michael Howard’s dimensions of war (operational, technological, logistical, and social) to highlight how changes in military affairs and society have changed since the 1940s.⁹⁰ Regarding the social dimension, Kamara argues that soldiers of today are significantly more familiar with warfare than the those conscripted during WWII due to the increase in the amount of simulated warfare experienced by civilians who participate in computer gaming, virtual reality, and paintball activities.⁹¹ Regarding the technological

⁸⁶ Karcher, 89.

⁸⁷ Karcher, 88–89.

⁸⁸ Karcher, 89.

⁸⁹ Hassan Kamara, “Rethinking the U.S. Army Infantry Rifle Squad,” *Military Review*, April 2018, <https://www.armyupress.army.mil/Journals/Military-Review/English-Edition-Archives/March-April-2018/Kamara-Infantry-Rifle-Squad/>.

⁹⁰ Kamara, 52.

⁹¹ Kamara, 56.

dimension, Kamara refuted the 1946 conference’s claim that the emergence of more lethal weapons would enable smaller squad organizations because similar technology is proliferated among the enemy.⁹² Thus, both Rainey and Kamara refute the idea of downsizing the squad organization due to advancement in technology without objective analysis.

Although Kamara does not provide exact organizational details, he recommends that the Army restore a modified version of the WWII infantry squad that includes a more robust scout reconnaissance team with an integrated drone, cyber, and electronic warfare capability. Kamara argues that this will improve the squad’s ability to survive “high attrition combat” and help it operate more dispersed in the contemporary battlefield.⁹³

K. CONCLUSION

Analyzing the U.S. Army’s historical studies conducted from 1946 to the present we find various consistencies in the assessment criteria used and the conclusions drawn. Regarding the assessment criteria, in four of the five major studies, there are three key criteria consistently used in developing new squad organizations: control, attrition, and firepower (see Figure 11). Given the AoE’s lack of objective research, it did not consider these criteria.

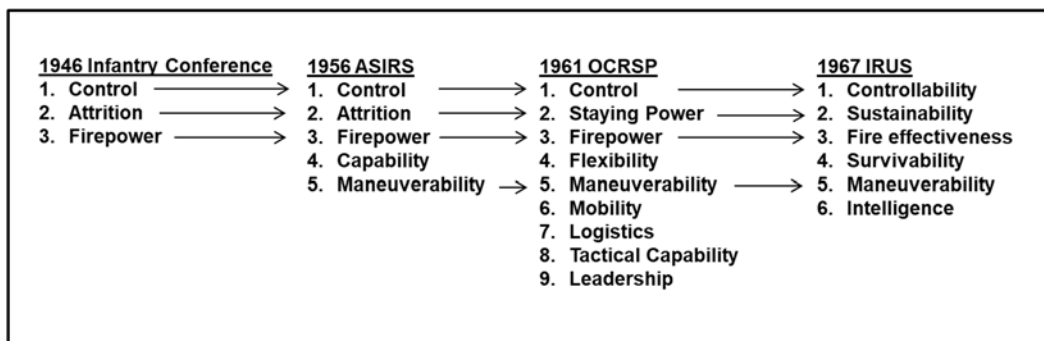


Figure 11. Historical Combat Effectiveness Assessment Criteria

⁹² Kamara, 58.

⁹³ Kamara, 69.

Three of the four key studies found ‘control’ to be a key factor in determining the optimum squad organization of the future. First, regarding control, historical studies show that the optimum size of the infantry fire team is between three to five soldiers. The 1946 Infantry Conference and the 1956 ASIRS studies both support this parameter. Under field conditions using voice and hand signals, any more than five soldiers will be difficult for one soldier to control. In contrast, any less than three soldiers in a team will begin to degrade the combat effectiveness of the team. Hughes’ 1994 study validates that not only will the team not be able to accomplish its task due to attrition but its combat effectiveness will also be degraded due to the negative effects of soldier’s morale. An individual soldier accompanied by others soldiers who can provide comfort and an assurance of survivability will help the soldier continue fighting.

Second, these historical case studies claim that the optimum size of the infantry squad is somewhere between 11–15 soldiers. As the 1970s IRUS study found, any more than 15 soldiers would begin to degrade the combat effectiveness of the unit because it would be harder to control. Additionally, historical research does not conclusively argue whether the two-fire team squad organization is better than the three-fire team squad organization. Therefore, future research may consider evaluating the combat effectiveness of these two squad variations.

Attrition (or sustainability or staying power) is another key assessment criterion used by four of the five key studies. These studies have proven that the ability to sustain casualties in combat (or through routine administrative actions) is critical for a squad’s survivability, lethality, and flexibility. With the exception to both the ROAD and AoE reorganizations that led to the decrease in the squad’s size, every other study recommended a more robust squad capable of sustaining up to a 25 percent loss in manpower. Although the 1946 Infantry Conference also recommended a decrease in the squad size from 12 to nine, at that time the squad was not doctrinally meant to fire and maneuver. Thus, as the lowest tactical unit, the 1946 squad could be considered a very large modern day fire team.

The last key variable used by every study is ‘firepower’ or fire effectiveness. Squads must possess comparable or greater firepower than their enemies in order to be combat effective. These studies have shown that a squad’s firepower is an essential quality

because it increases the squad's lethality or ability to suppress and destroy an enemy in close combat. This brief historical analysis has shown that a squad can possess many other characteristics but if the squad lacks lethality it cannot accomplish its core mission and thus becomes worthless.

Based on these findings we can conclude that any future study should include these three critical factors. Additionally, we can also conclude that future squad reorganization should not be determined by monetary or personnel constraints within the Army (as was the case with the ROAD and AoE reorganizations). Rainey wisely concluded, "Arbitrary decision based on personnel and budget concerns should not be allowed to take the place of detailed studies, field testing, and combat analysis."⁹⁴ Thus, objective scientific variables should hold more weight in determining the most combat-effective squad organization of the future.

These historical studies provide future research with key factors and developmental logic to consider in the creation of the new infantry squad organization. Following Jensen's ideational framework (Threat → Analysis → Concept → Doctrine), the next step in this study is to analyze the future threat. In the next chapter, this study will look to the future operating environment to determine key factors to consider in the development of the future squad organizational concepts.

⁹⁴ Rainey, "Sharpening the Tip of the Spear: Is the Light Infantry Squad the Right Size for the Future Battlefield?," 21.

III. CONTEMPORARY OPERATING ENVIRONMENT

The purpose of this chapter is to determine the characteristics of the future operating environment and its implications to the future infantry rifle squad organization. The chapter will first examine academic predictions of future warfare to understand the challenges associated with speculating too far into the future. Next, the chapter will analyze the contemporary operating environment by inspecting the significant capabilities of potential near-peer adversaries and then conclude by examining the terrain in which the future infantry rifle squads will most likely fight.

A. THE FUTURE CONFLICT

Many professional military thinkers and renowned academic writers have speculated what the future near-peer conflict will look like. Researchers have analyzed historical scenarios in which nations evolved to meet new threats. In 1986, Frank Barnaby published the book titled *The Automated Battlefield*, in which he conceptualizes a future battlefield almost entirely automated.⁹⁵ Barnaby states, “The battle takes place with no human involvement. The soldiers used are robots. If there is human involvement, it is remote. Humans keep well away from the battlefield.”⁹⁶

In contrast to Barnaby, Jeremy Black argues in his book *War and Technology*, that technology is a key factor in affecting the results of conflict but that it is only one variable of many that determine the success or failure in combat.⁹⁷ Black uses a qualitative methodology to examine military innovation in a historical context in order to forecast possible future battlefield environments. Black concludes that the effectiveness of technological innovations greatly depends on the actions of one’s opponents. Black’s research provides a good illustration of how challenging it is to forecast the future operating environment.

⁹⁵ Frank Barnaby, *The Automated Battlefield* (London: Sidgwick & Jackson, 1986), 2.

⁹⁶ Barnaby, 2.

⁹⁷ Jeremy Black, *War and Technology* (Bloomington and Indianapolis: Indiana University Press, 2013), 265.

Similarly, Lawrence Freedman argues in his book *The Future of War: A History*, that most concepts and ideas developed by futurists in the past were wrong. In his analysis, Freedman uses a qualitative approach using case studies beginning after the middle of the 19th century to determine historical perspectives on what the future of warfare would look like. He then analyzes the difference between what actually happened and what was predicted to happen. Freedman notes that many previous concepts of future warfare were vastly over-exaggerated in lethality or effect.⁹⁸ Thus, although future concepts are very influential, they are often wrong. Both Jeremy Black's and Lawrence Freedman's arguments support the claim that predicting the future operating environment can be challenging and quite often wrong. Given this logic, one can rationally argue that the best method for preparing the infantry squad for the next conflict is to focus less on the uncertain technologies of the far future and instead focus more on contemporary technology and tactics confronted today or in the near future.

B. ENEMY

Designing an infantry squad organization that can exploit the strengths and weaknesses of an adversary will significantly improve its survivability and lethality in future warfare. Therefore, this section will analyze America's near-peer adversaries and highlight their modern capabilities. Field Manual (FM) 3-0 defines a peer threat as "an adversary or enemy with capabilities and capacity to oppose U.S. forces across multiple domains worldwide or in a specific region where they enjoy a position of relative advantage."⁹⁹ The two potential adversaries that meet these criteria are Russia and China. Therefore, this chapter will focus on the Russian and Chinese contemporary military capabilities that will most likely be encountered on the future battlefield.

⁹⁸ Lawrence Freedman, *The Future of War: A History*, First edition (New York: Public Affairs, 2017), 1.

⁹⁹ *Operations*, Field Manual (FM) 3-0 (Washington, DC: Headquarters, Department of the Army, 2017), 1-9.

1. Russia

The Russian military is a formidable force capable of creating multiple complex dilemmas for its adversary. A U.S. infantry squad confronting a Russian force is likely to encounter tanks, ground attack aircraft, drones (attack and reconnaissance), electronic attack assets, non-uniformed militias, information warfare effects, and most importantly long-range artillery. Given that many of these Russian threats are traditional systems (i.e., tanks, planes) the U.S. Army already has systems and capabilities to counter them. Although not organic, the Javelin and Stinger missile systems provide the infantry squad with a sufficient layer of protection when placed along the enemy's most likely avenue of approach. Unlike the Ukrainians, which suffered from a lack of anti-tank-guided-missiles during their 2014 conflict with Russia, the U.S. military has the capability to confront these conventional Russian threats and thus will most likely not require significant reorganization in this area.¹⁰⁰

However, like many historical conflicts, artillery proved to be the most lethal weapon on the battlefield in Ukraine. In his personal account, Phillip A. Karber of the Potomac Foundation found that artillery accounted for over 85 percent of all losses in both the Russian and the Ukrainian militaries.¹⁰¹ Karber found that “the dramatic effect of these new munitions on the lethality of Russian indirect fire cannot be overemphasized. The combination of DPICM, scatterable mines, top-attack munitions and thermobaric warheads -- when used in pre-planned massed fire-strikes -- can have catastrophic consequences for targeted units.”¹⁰² Thus, according to Karber, Russian munitions proved very effective against light armor and infantry formations.¹⁰³ Therefore, the greatest threat to the infantry rifle squad on the future battlefield is the enemy's ability to find the infantry units through drone observation, snipers, scouts and electronic surveillance, and then engage these targets with artillery assets. In 2014 at a battle east of Mariupol, it only took the Russians

¹⁰⁰ Phillip A. Karber, “‘Lessons Learned’ from the Russo-Ukrainian War, Personal Observations” (The Potomac Foundation, July 8, 2015), 23.

¹⁰¹ Karber, 17.

¹⁰² Karber, 17–18.

¹⁰³ “Combat Vehicle Modernization Strategy,” 15.

15 minutes after a drone flyover to attack a Ukrainian position resulting in the almost total destruction of two full infantry battalions.¹⁰⁴ Like the Ukrainians, the current U.S. infantry squad does not have the means to effectively counter this type of drone-artillery combination attack. Thus, the future infantry squad must have the capability to counter these Russian tactics by either improved electronic concealment or by providing the infantry squad with its own electronic capabilities. These electronic capabilities must be capable of attacking or jamming enemy drones in order to deny them the ability to locate friendly positions or deny them the ability to communicate back to artillery support units.

Over the last decade, the Russian military has made significant advances in its military capability. Since the invasion of Georgia in 2008, Russia has invested heavily in modernizing its Soviet-era equipment.¹⁰⁵ One of Russia's major areas of emphasis has been to improve its electronic warfare capability. Throughout the 1980s and 1990s, the U.S. 'owned the night' by investing heavily in night vision optics and night tactical training. This unique capability enabled the U.S. forces to achieve great battlefield success in Iraq and around the world. Similarly, it appears that Russia has made it their objective to 'own the electromagnetic spectrum' by investing heavily in new electronic jammers, radars, and other sensors. While the U.S. also possesses a robust electromagnetic capability, many analysts are concerned that the U.S. is lagging behind both Russia and China.¹⁰⁶ In contrast, Russian air and ground forces continue to introduce new jammers and signals intelligence vehicles. The 2011 Global Security report notes that the Russians have integrated all their electronic warfare capabilities into a single system that combines signals intelligence, direction finding, intensive jamming, deception, and destructive fires systems.¹⁰⁷ This capability enables Russia to destroy or disrupt their adversaries command and control network, weapon navigation, and timing systems. Russia also recognizes its

¹⁰⁴ Karber, "'Lessons Learned' from the Russo-Ukrainian War, Personal Observations," 13.

¹⁰⁵ Grau and Bartles, *The Russian Way of War: Force Structure, Tactics, and Modernization of the Russian Ground Forces*.

¹⁰⁶ Freedberg, "Army Cyber Accelerates; Electronic Warfare Lags."

¹⁰⁷ "Global Security" (Global Security, 2011), <https://www.globalsecurity.org/military/world/russia/aircraft-ecm.htm>.

own vulnerable communication networks and continues to invest heavily in the protection of its own communication systems. At the 2017 International Defense Exhibition & Conference Russia revealed a new portable multimode radio in which they claim to be impervious to jamming or direction finding.¹⁰⁸ Regardless of the validity of the Russian's claims, it is important to recognize that the Russians are determined to dominate the electromagnetic spectrum by denying it to its adversary while protecting its own.

The implications of the Russian electronic attack capability to the contemporary infantry rifle squad are significant. The current light infantry rifle squad does not possess the capability to counter this Russian electronic threat. In many cases, the lowest U.S. Army electronic warfare support teams reside at the brigade level or higher. Our near-peer adversaries can exploit this gap in capability. The U.S. military has become accustomed to a robust communications network that connects multiple enabling systems. According to the 2016 SITREP quarterly review "The single most important thing to note is that Russian electronic warfare forces have the capability to degrade or defeat U.S. Ground Force C4 capabilities, including GPS/Position-Navigation and Timing (PNT) capabilities, and air defense and fires radars – all U.S. Army spectrum using emitters from fires control systems to SATCOM radios to cell phones are targeted and can be affected."¹⁰⁹ With a disrupted communications network, the current infantry squad will not be able to request medical support or fire support assistance in a safe and timely manner. Removing the infantry squad from these supporting enablers significantly decreases its survivability and lethality on the battlefield.

Another vulnerability of the infantry squad is its electromagnetic signature. The average infantry soldier emits one or more electronic signals making themselves vulnerable to Russian observation and attack. These vulnerabilities include radios, GPS systems, watches, and even cell phones. On the battlefield of the future camouflage and face-paint will not be enough to conceal infantry squads from the enemy. These vulnerabilities will

¹⁰⁸ "Russian Armed Forces Deploy a New Radio System," *OE Watch* 7, no. 3 (April 2017): 50.

¹⁰⁹ Laurie M. Buckhout, "Modern Russian Electronic Warfare," *SITREP, Quarterly Review of C4ISR Technology Advancements*, 2016, http://www.leonardodrs.com/sitrep/q1-2016-the-invisible-fight/modern-russian-electronic-warfare/#_ftnref1.

force infantry soldiers to power off electronic devices and use them only when the benefits outweigh the risks. The dispersion of infantry squads will become more important but simultaneously more difficult assuming the degraded communications on future battlefields. These conditions will force squads to place more emphasis on understanding the commander's intent.

2. China

Similar to Russia, China significantly reduced the size of its armed forces beginning in the 90's in order to create a smaller, more technologically advanced and lethal force. A U.S. infantry squad confronting a Chinese enemy today would face many of the same threats as if it faced the Russian military. The battlefield would be proliferated with tanks, planes, helicopters, drones, and electronic warfare platforms. The infantry squad would confront the enemy in multiple domains. Like Russia, China also considers electronic warfare capabilities to be vital in future conflicts. According to the 2017 Department of Defense Annual Report to Congress, The Chinese military strategy focuses on attacking its enemy's radio, radar, optical, infrared, computer and information systems.¹¹⁰ Like Russia, the Chinese military also has the capability to deny, degrade, and disrupt the infantry squad's communication and navigation systems. The implications to the U.S. infantry squad are nearly identical to the Russian threat.

One unique difference between the Russian and Chinese threats is the Chinese level of combat experience. Some have labeled the Chinese Army's lack of combat readiness as a "peace disease."¹¹¹ Some argue that many Chinese units lack the proper level of competence given their lack of combat over the last few decades. In contrast, the Russian units have garnered experience from the conflicts in Georgia, Ukraine, and Syria. Therefore, although both the Russians and the Chinese possess similar capabilities, the

¹¹⁰ "Military and Security Developments Involving the People's Republic of China" (Department of Defense, 2017), 58–59.

¹¹¹ Minnie Chan, "Anti-Corruption Inspections to Root out Falsifying of Military Training Data Take on Added Importance in Drive to Boost Forces' Combat-Readiness," *South China Morning Post*, July 3, 2018, <https://www.scmp.com/news/china/diplomacy-defence/article/2153579/chinas-army-infiltrated-peace-disease-after-years>.

Russians will more likely employ their systems more effectively given their combat experience.

Another unique difference between the Russian and Chinese threats is China's cyber capabilities. Given that China produces 90 percent of the world's printed circuit boards, China is in a unique position to exploit the infantry soldier through the cyber domain.¹¹² China, as a global supplier of electronic components, is a more significant supply-chain cyber threat than Russia. In a 2018 report to the U.S. Armed Services Committee, The U.S. Government Accountability Office found that "until recently, DoD did not prioritize cybersecurity in weapon systems acquisitions. In part because DoD historically focused on the cybersecurity of its networks but not weapon systems themselves, DoD is in the early stage of trying to understand how to apply cybersecurity to weapon systems."¹¹³ Although the infantryman does not possess the same magnitude of computer components as a jetfighter, the use of modern radios and tracking systems with adversary made components, still poses an exploitable risk.

C. TERRAIN

Terrain is a significant factor to consider when designing the next infantry squad organization. In 490 BC the densely packed Greek phalanx decimated the lighter more mobile Persian army while fighting at the battle of Marathon where the Greek organization and tactics proved much more effective in restricted terrain.¹¹⁴ Similarly, in 54 BC the more mobile mounted Parthian archers easily destroyed the densely packed Roman legions on the open plains of Mesopotamia.¹¹⁵ History has shown that successful militaries, which effectively leverage the terrain to their advantage (both tactical and organizational), can gain an upper hand over their adversaries. Therefore, in this new transition period, the U.S.

¹¹² Michael Peck, "The U.S. Military's Greatest Weakness? China 'Builds' a Huge Chunk of It: What Could Possibly Go Wrong?," *The National Interest*, May 26, 2018, <https://nationalinterest.org/blog/the-buzz/the-us-militarys-greatest-weakness-china-builds-huge-chunk-25966>.

¹¹³ "Weapon Systems Cybersecurity: DoD Just Beginning to Grapple with Scale of Vulnerabilities" (Washington, DC: United States Government Accountability Office, October 9, 2018), 11.

¹¹⁴ John Keegan, *A History of Warfare*, 1. ed (New York: Vintage books, 1994), 253.

¹¹⁵ Adrian Keith Goldsworthy and John Keegan, *Roman Warfare*, Smithsonian History of Warfare (New York, NY: Smithsonian Books, Collins, 2005), 139–43.

Army has an opportunity to optimize the current infantry squad organization to the battlefield of the future by leveraging the effects of terrain to its advantage. Thus, understanding the characteristics of the terrain of the future battlefield is critical to achieving this success.

According to the 2018 United Nations (UN) World Urbanization Prospects, 55 percent of the world's population lives in an urban environment.¹¹⁶ This number continues to grow as the world population increases over time. The UN report projects that the number of megacities (cities with over 10 million inhabitants) will increase by 23 percent by 2050.¹¹⁷ Given this data, there is a very high probability that the future infantry squad organization will have to operate in this complex urban environment. General Milley states, "If war is politics by other means, and politics is all about people and power, then future wars are almost certainly going to be fought mostly in cities, which has significant implications for the military."¹¹⁸ Therefore, to maximize combat effectiveness, the future infantry squad organization should consider these urban characteristics.

Military doctrine characterizes urban combat as an attrition-style combat, which inflicts a large toll on manpower and resources. Analyzing the 2013 U.S. Joint Urban Operations 3–06 we find two key characteristics of urban combat impactful to the infantry squad: First, urban operations are more manpower intensive.¹¹⁹ Urban environments favor larger squads over smaller squads given that larger squads can share a greater workload, sustain more casualties, and provide a greater level of mental security. Snipers, booby-traps, and other threats have a significant impact on the psychological and physical makeup of the infantry squad.¹²⁰ The urban terrain offers an adversary more angles of attack resulting in an increased friendly casualty rate over other types of terrain. Given these

¹¹⁶ "World Urbanization Prospects: The 2018 Revision, Online Edition" (United Nations, Department of Economic and Social Affairs, Population Division, 2018), <https://esa.un.org/unpd/wup/Publications/Files/WUP2018-KeyFacts.pdf>.

¹¹⁷ "World Urbanization Prospects: The 2018 Revision, Online Edition."

¹¹⁸ Mark A. Milley, "General Mark A. Milley AUSA Eisenhower Luncheon Speech" (October 4, 2016), 12.

¹¹⁹ *Joint Urban Operations 3–06* (Washington, DC: U.S. Department of Defense, 2013), 38.

¹²⁰ *Joint Urban Operations 3–06*, 37.

conditions, small squad organizations are often unable to observe every possible angle of enemy attack within their platoon assigned sector. Urban terrain is also manpower intensive because medical and logistical support assets (air and ground) are often unable to get to the infantry squads deep inside the city due to tall structures or building rubble. This terrain forces infantry soldiers to carry casualties and supplies to viable extraction points further than in other types of terrain. Therefore, an infantry squad organization operating in an urban battlefield will have a greater need for soldiers than in any other terrain.

Second, urban environments inhibit the use of the electromagnetic spectrum. Joint Publication 3–06 states, “Terrain in urban environments can impede a land force’s ability to send and receive data directly to satellites. This can impact global positioning system receivers and inhibit their ability to provide accurate data.”¹²¹ Massive skyscrapers and the thousands of civilian electromagnetic emissions throughout a city will negatively affect the infantry squad’s communication architecture and global positioning navigation systems. These systems are vital for command and control and munition accuracy. In cities, the effects of the thick re-enforced buildings and restrictive rules of engagement tend to blunt the effects of fire support systems.¹²² The degraded ability to communicate via radio frequency will force squads to return to the traditional visual and voice commands for squad control. This will degrade a squad’s ability to effectively disperse and mass when needed. The urban structures will also degrade the ability of satellite-guided munitions to hit their intended targets potentially resulting in increased collateral damage. An infantry squad’s ability to communicate with supporting armor, artillery, and air support assets are vital to its lethality and survivability on the battlefield. The infantry squad organization must evolve technologically and organizationally to better confront these future urban threats. A 2017 RAND study highlighted the opportunity that exists to exploit the electromagnetic spectrum in an urban environment:

The Battle of Sadr City shows that there are also significant opportunities to exploit electromagnetic operations to find and kill or capture adversaries. Nevertheless, U.S. forces have not operated in an urban environment where

¹²¹ *Joint Urban Operations 3–06*, 2.

¹²² *Joint Urban Operations 3–06*, 5.

the adversary can exploit or disrupt communications since World War II. This may not be the case in the future, even against non-state adversaries.¹²³

Therefore, not only will the future infantry squad be challenged by near-peer electromagnetic warfare equipment but the terrain itself will pose a significant challenge to a squad's use of the electromagnetic spectrum. Future squad organization should thus incorporate the capability to leverage the electromagnetic spectrum to its favor in order to improve its lethality and survivability in future combat.

D. CONCLUSION

Given the uncertainties of the mid-term and long-term future, the contemporary operating environment provides a greater prediction for the near-future battlefield. In the future near-peer conflict the infantry rifle squad is likely to be confronted by conventional threats it has not encountered in over four decades. The Russian-Ukrainian conflict has proven that the era of tank warfare has not ended. Infantry squads supported by Javelin teams and Stinger teams must be capable of destroying modern enemy tanks, planes, and helicopters. On the future battlefield, long-range artillery will continue to be the "king of battle" through its devastating effects on light units. Trenches and foxholes will again be vital to protecting infantry soldiers from the dangers of long-range artillery fire. More importantly, it will be critical for the infantry rifle squad to possess the capability to deny the enemy sensors (aerial drone or ground sensor) the ability to communicate targets to the supporting enemy artillery systems. The current infantry squad organization is blind to the electromagnetic spectrum. The current dismounted infantry rifle squad does not possess the electronic support capability to map out the electromagnetic environment for greater situational awareness on the battlefield. The future infantry squad organization must include the ability to observe and affect the electromagnetic spectrum in order to leverage it to its advantage. Thus, providing electronic warfare capacities down to the squad level in the future operating environment will significantly improve the infantry squad's lethality and survivability on the battlefield.

¹²³ Gian P. Gentile, *Reimagining the Character of Urban Operations for the U.S. Army: How the Past Can Inform the Present and Future*, Research Report, RR-1602-A (Santa Monica, Calif: RAND Corporation, 2017), 155.

IV. CONCLUSION

Future U.S. Army research should re-analyze the current infantry rifle squad organization to maximize its combat effectiveness to the future operating environment. Synthesizing the U.S. Army studies from 1946 to the present we can extrapolate two key factors for future research to consider: First, future research should optimize the infantry squad organization using primarily objective analysis from controlled field tests or combat experience as the main drivers of organizational change. Second, top-down constraints such as personnel-manning, vehicle design capacity, or other limiting variables should not be the driving factors for determining future squad modifications. The Army-86 and AoE infantry studies were subject to these top down constraints and resulted in less effective infantry squad organizations that proved to be vulnerable to the effects of attrition.¹²⁴

A. SUSTAINABILITY

This historical analysis has shown that size is a key factor in optimizing the combat effectiveness of an infantry rifle squad organization. An infantry squad's size directly correlates to the variables of control and sustainability. As the size of an infantry squad grows it becomes more capable of mitigating the negative effects of attrition; however, the squad simultaneously becoming more and more difficult to control. Inversely, the smaller the squad organization becomes, the easier it is to control, but the less it is able to effectively fire and maneuver.

Given the high probability of the infantry rifle squad operating in dense urban environments, which require more manpower and result in a greater amount of casualties, it is imperative that the U.S. Army avoids the next near-peer conflict with the current nine soldier organization. Historical research has shown that the current nine-soldier infantry rifle squad is vulnerable to the effects of attrition.¹²⁵ Therefore, future research should study how to grow the organization to better mitigate these vulnerabilities.

¹²⁴ Romjue, *The Army of Excellence: The Development of the 1980s Army*, 21.

¹²⁵ Dupree and Homesly, *A History of United States Army Squads and Platoons 1935–1967*, 64.

B. LETHALITY

Historical studies have shown lethality to be a key factor in determining the combat effectiveness of infantry squad organizations. Infantry rifle squads must possess equal or greater firepower (rate of fire + destructive power) than the near-peer adversary to achieve suppression effects. The current organic weapons load-out of the infantry rifle squad, which includes the squad automatic weapon (M249) and multi-use weapon (M320), provide the squad with sufficient firepower to both suppress and maneuver against a lightly armed near-peer adversary. However, in the future near-peer operating environment with modern tanks and planes it will be imperative that company Javelin and Stinger missile systems provide integrated support to the infantry rifle squad to effectively counter the near-peer air and armor threats. Without these integrated weapon systems, the infantry squad organization would be vulnerable and fall into the same dilemma in which the Ukrainians found themselves against the Russians in 2014.

Next, future research needs to study how to improve the infantry rifle squad's lethality by giving it a more robust electromagnetic capability that is organic to the squad. Given the robust electromagnetic and drone capabilities of the current near-peer adversaries, the current infantry rifle squad organization is lacking in its potential lethality and survivability. Equipping the current infantry rifle squad with lightweight man-portable electronic warfare systems significantly increases its lethality and survivability against a near-peer adversary. These electromagnetic systems would allow the dismounted infantry squad the capability to jam enemy radio frequencies, disrupt enemy drone navigation and communication systems, geo-locate enemy signals, electronic deception, and map out the electromagnetic spectrum for better situational awareness and actionable intelligence. One method may be to integrate electronic receivers and transmitters already existing on the typical infantry soldiers (i.e., squad radio and GPS) into a single system.

Although the U.S. Army is currently researching how best to organize and equip the future force with greater electromagnetic capabilities using new prototype systems,

there is currently no long term solution at the lower tactical levels.¹²⁶ Adding this capability at the tactical infantry squad level will likely require adding one or more trained electronic warfare specialists given the complexity of the electromagnetic spectrum and the extra weight of the equipment. Thus, although the technology needed to equip the dismounted infantry squad with this capability already exists (i.e. DRS Phoenix system) more research must be conducted to determine the optimal organizational structure that includes these types of manned systems.¹²⁷

Both armed and unarmed enemy drones will pose a significant threat in the near-future operating environment.¹²⁸ Whether drones are used as an observation platform to call in an artillery strike or as an attacking swarm, electromagnetic disruptive technologies provide the infantry rifle squad a greater level of defense on the future battlefield.¹²⁹ Thus, future Army studies should research how to feasibly re-organize the infantry rifle squad to include these critical drone defense capabilities in order to increase its lethality and survivability.

C. CONTROL

In the future operating environment, the infantry squad leader's ability to control the squad will be disrupted not only by enemy electronic attack but also by the environmental factors relating to the urban environment. Large heavy building structures, enemy jamming systems, GPS spoofing capabilities, and an environment proliferated with competing civilian radio frequencies will disrupt the squad's ability communicate and navigate on the future battlefield. These factors will significantly degrade the squad's

¹²⁶ Nancy Jones-Bonbrest, "Electronic Warfare Prototypes Improve Operational Understanding Against Near-Peer Threats," *Army Rapid Capabilities Office*, May 10, 2018, <http://rapidcapabilitiesoffice.army.mil/news/Electronic-warfare-prototypes-improve-operational-understanding/>.

¹²⁷ "Modern Ground Electronic Warfare," *Leonardo DRS*, 2016, <https://www.leonardodrs.com/sitrep/q1-2016-the-invisible-fight/modern-ground-electronic-warfare/>.

¹²⁸ Karber, "'Lessons Learned' from the Russo-Ukrainian War, Personal Observations," 12.

¹²⁹ Mark Pomerleau, "Electronic Warfare Emerging in Army Arsenal," *C4ISRNET*, May 18, 2017, <https://www.c4isrnet.com/c2-comms/2017/05/18/electronic-warfare-emerging-in-army-arsenal/>.

ability of control. ASIRs 1-to-5 leader-to-led ratio is a key parameter that future infantry squad designs should continue to consider.

In the future environment, the infantry squad cannot solely rely on modern command and control systems. In this communication contested environment, the time proven techniques of hand-and-arm signals, voice communication, signal flares, markers, and other non-electronic movement control measures will prove invaluable to the infantryman's ability to control. Until a radio system is designed that can provide safe and secure communications in this type of operating environment infantry squads will often have to rely on these older time-proven techniques. However, although these time-proven techniques are impervious to electronic attack they are limited in range. Future squad organizations must consider these limiting factors. As the enemy will not be capable of jamming all communications everywhere at once, they will likely prioritize the use of their electronic attack assets along key avenues of attack or the defense of key terrain. Therefore, infantry organizations must be capable of operating effectively in both contested and non-contested electronic environments. Infantry concepts, which dictate small-dispersed squads over wide areas, must consider the challenges of controlling such a formation when communications are being jammed or disrupted on a routine basis.

D. FLEXIBILITY

Regarding flexibility, future infantry rifle squad organization designs should consider the following factors: First, as confirmed by the 1961 OCRSP study, infantry rifle squads should include balanced fire teams in which each team includes the same organizational equipment. Balanced fire teams provide the squad leader with greater tactical flexibility. If one fire team becomes pinned down, the squad leader can use the free fire team (or teams, depending on the squad configuration) to maneuver or suppress the enemy as is best in the given situation. The balanced fire team organization also allows the squad leader to better balance squad security tasks (such as taking point during tactical movements, etc.).

Given the limited amount of resources, the squad cannot possess every capability. However, future research should consider reviewing the rifle squad's organic

organizational equipment in order to design a more flexible infantry organization. The more an infantry rifle squad is able to operate independently, the better it will be on the future battlefield. This can be achieved by providing each fire team with electronic attack and support capabilities. An infantry squad that possesses the ability to jam enemy drones without having to request support from a brigade electronic warfare team is more lethal and survivable. Additionally, in a communication-degraded environment, infantry squads will be limited in their ability to coordinate for indirect fire, air defense, anti-tank, and other supporting enablers. Thus balancing each infantry squad's fire teams with critical enabling capabilities (i.e., electronic attack, defense, & support) will increase its overall flexibility but also its lethality and survivability on the future battlefield.

E. LARGER IMPLICATIONS

Following the conclusion of major combat operations in Afghanistan and Iraq, the U.S. military has entered a unique transition period. Once again, the U.S. military is looking forward to the future operating environment to better prepare itself for what is to come. To retain a lethal and survivable force the U.S. Army must evolve its organization and tactics as determined by threat and environmental factors. The infantry rifle squad, as the basic building block of platoons/companies/battalions, is the key area of focus from which future research should focus.

On the future battlefield with an opposing near-peer adversary, the infantry rifle squad will confront numerous threats across every domain. The infantry squad must be capable of defeating conventional threats it has not had to face in over four decades. However, unlike previous conflicts, the future near-peer enemy will significantly leverage new innovative tactics and technologies to include drones and electromagnetic platforms. General Raymond A. Thomas, the head of United States Special Operations Command stated, "Right now in Syria, we're in the most aggressive E.W. environment on the planet from our adversaries...they're testing us every day."¹³⁰ The current infantry squad does

¹³⁰ Thomas Gibbons-Neff, "How a 4-Hour Battle Between Russian Mercenaries and U.S. Commandos Unfolded in Syria," *New York Times*, May 24, 2018, <https://www.nytimes.com/2018/05/24/world/middleeast/american-commandos-russian-mercenaries-syria.html>.

not possess the capabilities needed to effectively operate in the electromagnetic spectrum. Given the lack of electromagnetic capabilities, the current infantry squad is vulnerable to enemy observation and attack. Therefore, future research should apply historical lessons learned and logic from previous Army studies as well as modern conflicts to determine the optimal infantry squad organization of the future.

Thus, as validated by Stephen Rosen and many others, militaries are not doomed to fight the next war as they did the last. By understanding the future operating environment and developing new innovative infantry rifle squad concepts that leverage this new environment, the U.S. military can once again gain an advantage. Although there is currently a wide range of future concepts regarding the future of warfare, almost every concept continues to emphasize the need of the infantryman. Regardless of the level of artificial intelligence and other technological advancements, the infantryman will continue to play a vital role in future combat. T.R. Fehrenbach wisely states, “You may fly over a land forever; you may bomb it, atomize it, pulverize it and wipe it clean of life—but if you desire to defend it, protect it and keep it for civilization, you must do this on the ground, the way the Roman legions did, by putting your young men in the mud.”¹³¹ Even in this atomic age, in which the push of a button could destroy civilization, Fehrenbach’s statement has proved true. Regardless of the technological level of innovation, the infantryman’s role in future conflict will be important. The survival of our great nation depends upon our ability to train, equip, and prepare our future infantrymen to confront our forthcoming near-peer enemies.

¹³¹ T. R. Fehrenbach, *This Kind of War: The Classic Korean War History*, 1st Brassey’s pbk. ed (Washington, DC: Brassey’s, 1998), 427.

LIST OF REFERENCES

- Barnaby, Frank. *The Automated Battlefield*. London: Sidgwick & Jackson, 1986.
- Benjamin M. Jensen, *Forging the Sword: Doctrinal Change in the U.S. Army*. Stanford, California: Stanford Security Studies, an imprint of Stanford University Press, 2016.
- Black, Jeremy. *War and Technology*. Bloomington and Indianapolis: Indiana University Press, 2013.
- Buckhout, Laurie M. “Modern Russian Electronic Warfare.” *SITREP, Quarterly Review of C4ISR Technology Advancements*, 2016. http://www.leonardodrs.com/sitrep/q1-2016-the-invisible-fight/modern-russian-electronic-warfare/#_ftnref1.
- Chan, Minnie. “Anti-Corruption Inspections to Root out Falsifying of Military Training Data Take on Added Importance in Drive to Boost Forces’ Combat-Readiness.” *South China Morning Post*, July 3, 2018. <https://www.scmp.com/news/china/diplomacy-defence/article/2153579/chinas-army-infiltrated-peace-disease-after-years>.
- Clark, J. P. *Preparing for War: The Emergence of the Modern U.S. Army, 1815–1917*. Cambridge, Massachusetts: Harvard University Press, 2017.
- Combat Vehicle Modernization Strategy*. Fort Eustis, VA: Army Capabilities Integration Center, September 15, 2015.
- Cordesman, Anthony, and Joseph Kendall. *Chinese Strategy and Military Modernization in 2016: A Comparative Analysis*. Washington, DC: Center for Strategic and International Studies, 2016. https://csis-prod.s3.amazonaws.com/s3fs-public/publication/161208_Chinese_Strategy_Military_Modernization_2016.pdf.
- Dupree, Robert, and Horace Homesly. *A History of United States Army Squads and Platoons 1935–1967*. Fort Benning, GA: United States Army Combat Developments Command, 1967.
- Fehrenbach, T. R. *This Kind of War: The Classic Korean War History*. 1st Brassey’s pbk. ed. Washington, DC: Brassey’s, 1998.
- Fitzgerald, David. *Learning to Forget: U.S. Army Counterinsurgency Doctrine and Practice from Vietnam to Iraq*. Stanford, California: Stanford University Press, 2013.
- Freedberg, Sydney J. “Army Cyber Accelerates; Electronic Warfare Lags.” *Breaking Defense*, February 10, 2017. <https://breakingdefense.com/2017/02/army-cyber-accelerates-electronic-warfare-lags/>.

- Freedman, Lawrence. *The Future of War: A History*. First edition. New York: Public Affairs, 2017.
- Gentile, Gian P. *Reimagining the Character of Urban Operations for the U.S. Army: How the Past Can Inform the Present and Future*. Research Report, RR-1602-A. Santa Monica, Calif: RAND Corporation, 2017.
- Gibbons-Neff, Thomas. “How a 4-Hour Battle Between Russian Mercenaries and U.S. Commandos Unfolded in Syria.” *New York Times*, May 24, 2018. <https://www.nytimes.com/2018/05/24/world/middleeast/american-commandos-russian-mercenaries-syria.html>.
- “Global Security.” *Global Security*, 2011. <https://www.globalsecurity.org/military/world/russia/aircraft-ecm.htm>.
- Goldsworthy, Adrian Keith, and John Keegan. *Roman Warfare*. Smithsonian History of Warfare. New York, NY: Smithsonian Books, Collins, 2005.
- Grau, Lester W., and Charles K. Bartles. *The Russian Way of War: Force Structure, Tactics, and Modernization of the Russian Ground Forces*. Fort Leavenworth Kansas: Foreign Military Studies Office, 2016.
- Havron, Dean. “A Research Study of the Infantry Rifle Squad TOE.” Fort Monroe, VA: Headquarters, Continental Army Command, 1956.
- Hughes, Stephen. “The Evolution Of The U.S. Army Infantry Squad: Where Do We Go From Here? Determining The Optimum Infantry Squad Organization For The Future.” School of Advanced Military Studies, 1994.
- The Infantry Conference. “Report of Committee ‘B’ on Tactics and Technique.” Fort Benning, GA: The United States Army Infantry School, 1946.
- Infantry Field Manual, Rifle Company, Rifle Regiment*. Field Manual 7–10. Washington, DC: War Department, June 1942.
- Infantry Platoon and Squad*. Army Techniques Publication 3–21.8. Washington, DC: Headquarters, Department of the Army, 2016.
- The Infantry Rifle Company*. Field Manual 3–21.10. Washington, DC: Department of the Army, 2006.
- Infantry Rifle Company*. Army Techniques Publication No. 3–21.10. Washington, DC: Department of the Army, May 2018.
- “Infantry Rifle Unit Study, IRUS-75, Phase II, Volume 1.” Ft. Benning, GA: United States Army Combat Developments Command, 1969.

- Jensen, Benjamin M. *Forging the Sword: Doctrinal Change in the U.S. Army*. Stanford, California: Stanford Security Studies, an imprint of Stanford University Press, 2016.
- Johnson, David E. “The Challenges of the ‘Now’ and Their Implications for the U.S. Army.” *RAND Corporation*, 2016. <https://www.rand.org/pubs/perspectives/PE184.html>.
- Joint Urban Operations*. Joint Manual 3–06. Washington, DC: U.S. Department of Defense, 2013.
- Jones-Bonbrest, Nancy. *Electronic Warfare Prototypes Improve Operational Understanding Against Near-Peer Threats*. Army Rapid Capabilities Office, May 10, 2018. <http://rapidcapabilitiesoffice.army.mil/news/Electronic-warfare-prototypes-improve-operational-understanding/>.
- Kamara, Hassan. “Rethinking the U.S. Army Infantry Rifle Squad.” *Military Review*, April 2018. <https://www.armyupress.army.mil/Journals/Military-Review/English-Edition-Archives/March-April-2018/Kamara-Infantry-Rifle-Squad/>.
- Karber, Phillip A. “‘Lessons Learned’ from the Russo-Ukrainian War, Personal Observations.” The Potomac Foundation, July 8, 2015.
- Karcher, Timothy. “Enhancing Combat Effectiveness, The Evolution Of The United States Army Infantry Rifle Squad Since The End Of World War II.” Thesis Paper, U.S. Army Command and General Staff College, 2002.
- Keegan, John. *A History of Warfare*. 1. ed. New York: Vintage books, 1994.
- Marshall, S.L.A. *Commentary on Infantry Operations and Weapons Usage in Korea: Winter of 1950–51*. London: Green Hill Books, 1988.
- Melody, Paul. “The Infantry Rifle Squad: Size Is Not the Only Problem.” United States Army Command and General Staff College, 1990.
- “Military and Security Developments Involving the People’s Republic of China.” Washington, DC: U.S. Department of Defense, 2017.
- Milley, Mark A. “General Mark A. Milley AUSA Eisenhower Luncheon Speech.” Washington, DC, October 4, 2016.
- “Modern Ground Electronic Warfare.” *Leonardo DRS*, 2016. <https://www.leonardodrs.com/sitrep/q1-2016-the-invisible-fight/modern-ground-electronic-warfare/>.
- Murray, Williamson, and Allan R. Millett, eds. *Military Innovation in the Interwar Period*. Cambridge: Cambridge Univ. Pr, 1996.

- Ney, Virgil. *Organization and Equipment of the Infantry Rifle Squad: From Valley Forge to R.O.A.D.* Ft. Belvoir, VA: United States Army Combat Developments Command, 1965.
- Operations*. Field Manual 3–0. Washington, DC: Headquarters, Department of the Army, 2017.
- The Optimum Composition of the Rifle Squad and Platoon*. Combat Development Experimentation Center. Fort Ord, CA: Headquarters United States Army, 1961.
- Peck, Michael. “The U.S. Military’s Greatest Weakness? China ‘Builds’ a Huge Chunk of It: What Could Possibly Go Wrong?” *The National Interest*, May 26, 2018. <https://nationalinterest.org/blog/the-buzz/the-us-militarys-greatest-weakness-china-builds-huge-chunk-25966>.
- Pomerleau, Mark. “Electronic Warfare Emerging in Army Arsenal.” *C4ISRNET*, May 18, 2017. <https://www.c4isrnet.com/c2-comms/2017/05/18/electronic-warfare-emerging-in-army-arsenal/>.
- Rainey, James E. “Sharpening the Tip of the Spear: Is the Light Infantry Squad the Right Size for the Future Battlefield?” United States Army Command and General Staff College, 1998.
- Rifle Company, Infantry, Airborne Infantry, and Mechanized Infantry*. Field Manual 7–10. Washington, DC: Department of the Army, 1962.
- Romjue, John L. *A History of Army 86*. 2nd ed. Vol. 1. Ft. Monroe, VA: United States Army Training and Doctrine Command, 1982.
- . *The Army of Excellence: The Development of the 1980s Army*. 2. Fort Monroe, VA: United States Army Training and Doctrine Command, 1997.
- Rosen, Stephen Peter. *Winning the next War: Innovation and the Modern Military*. Cornell Studies in Security Affairs. Ithaca, NY London: Cornell University Press, 1994.
- “Russian Armed Forces Deploy a New Radio System.” *OE Watch* 7, no. 3 (April 2017).
- Russian New Generation Warfare Handbook*. Fort Meade, MD: Asymmetric Warfare Group, 2016.
- Trump, Donald. “National Security Strategy of the United States of America.” The White House, December 2017.
- “Weapon Systems Cybersecurity: DoD Just Beginning to Grapple with Scale of Vulnerabilities.” Washington, DC: United States Government Accountability Office, October 9, 2018.

“World Urbanization Prospects: The 2018 Revision, Online Edition.” United Nations,
Department of Economic and Social Affairs, Population Division, 2018.
<https://esa.un.org/unpd/wup/Publications/Files/WUP2018-KeyFacts.pdf>.

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