A NEW "COMPANY TEAM" ARMOR, MECHANIZED INFANTRY AND ATTACK AVIATION

A thesis presented to the Faculty of the U.S. Army Command and General Staff College in partial fulfillment of the requirements for the degree

MASTER OF MILITARY ART AND SCIENCE

by

VICTORIA A. CALHOUN, MAJOR, USA
B.A., Mary Baldwin College, Stanton, Virginia, 1983

Fort Leavenworth, Kansas
1997

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	7 June 1997	Master's Thesis 4 Aug 96-6 June 1997

4. TITLE AND SUBTITLE
A NEW "COMPANY TEAM"ARMOR, MECHANIZED INFANTRY, AND ATTACK AVIATION

5. FUNDING NUMBERS

6. AUTHOR(S)
Major Victoria A. Calhoun, U.S. Army

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
ATTN: ATZL-SWD-GD
Fort Leavenworth, Kansas 66027-1352

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)

10. SPONSORING / MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION / AVAILABILITY STATEMENT
Approved for Public release: distribution is unlimited

12b. DISTRIBUTION CODE
A

13. ABSTRACT *(Maximum 200 words)*

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Finally this study concludes that the Army needs to develop a flexible approach in its force structuring that is focused on capability based organizations capable of combined arms operations down to the company team level as required.

14. SUBJECT TERMS	15. NUMBER OF PAGES
future battlefield, aviation	65
	16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED

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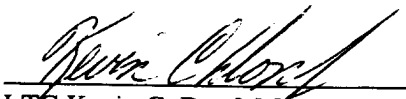
THESIS APPROVAL PAGE

Name of Candidate: Major Victoria A. Calhoun

Thesis Title: A New "Company Team" Armor, Mechanized Infantry, and Attack Aviation

Approved by:



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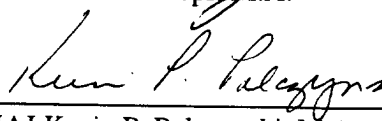

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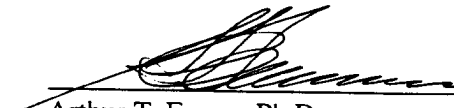

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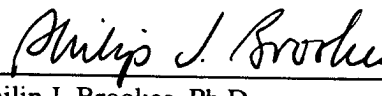

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ABSTRACT

A New "Company Team" Armor, Mechanized Infantry and Attack Aviation by MAJ Victoria A. Calhoun, USA, 64 pages.

The vision of the future battlefield is one of great uncertainty and complexity. Since the world is a dynamic and turbulent place, operations may cover the full spectrum of other than war to full war. The army will need an organizational strategy that maximizes flexibility, tailorability and capabilities. This study examines the feasibility of a new "Company Team" composed of Armor, Mechanized Infantry, and Attack Aviation. Current Army doctrine does not task organize aviation down to company team level. In this study an evaluation is made of this hypothetical organization using the measures of lethality, optempo and mobility.

Finally, this study concludes that the Army needs to develop a flexible approach in its force structuring that is focused on capability based organizations capable of combined arms operations down to the company team level as required.

ACKNOWLEDGMENTS

I want to thank the many people who helped me with this thesis. First of all, thanks goes to Lieutenant Colonel Kevin Dopf for his mentorship and support as the Committee Chairman. Without his wealth of knowledge and experience I would have stalled several times.

Thanks to Dr. Arthur T. Frame, for his courage in accepting the challenge to keep me on the right path and for supporting my academic pursuits.

Thanks to Major Kevin P. Polczynski, who provided me perspective on the issues and supported my efforts.

Thanks to Mr. Bob Ramsey and Mr. Larry Gavin who provided me with their expertise and support for the JANUS simulation experiment. Their professional support and tireless efforts made the computer simulation work go extremely smoothly and I am eternally grateful.

I especially want to thank Major Kevin McEnery for sharing with me his extraordinary talents for military thinking and teaching. Only through his tremendous perspective on military operations am I leaving here truly wiser not just smarter than when I arrived.

Finally I want to thank my family and friends for their support when I needed it.

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CHAPTER 1

INTRODUCTION

The Research Question

Would the incorporation of Attack Aviation as an integral part of a company team in the U.S. Army generate more lethality, mobility, and flexibility?

The Subordinate Questions

Does the organization enhance a company's ability to maneuver and engage enemy forces? How capable is the organization in engaging the enemy's forces? How capable is the organization of acquiring the enemy's forces? Does the organization support flexible force tailoring? Does the organization possess the capability for increased optempo, lethality, and mobility?

Background

The U.S. Army's current doctrine routinely integrates tanks and mechanized infantry into company task-force teams. "Thus the basic combined arms fighting element is the company task force."[1] This organizational concept reduces vulnerabilities and places assets in a complementary environment. Even though this organization meets the definition of a combined arms team its fighting capability is limited to the ground or confined within two dimensions. Therefore this company task force organization operates and maneuvers two dimensionally on a three-dimensional battlefield. The result is that terrain severely restricts and adversely impacts

this organization. It has been said that when task organizing "We should seek an optimum force indicated by the terrain and mission, trying always to assemble a force more powerful, more mobile and more versatile than his, which would also consist of a workable mix of the four elements of the combat arms plus adequate air support."[2] The company view of this battlefield is two-dimensional and possibly results in a degradation for the areas of lethality, optempo, and mobility.

Current Army doctrine describes attack helicopters as aerial maneuver assets. It states that they are not task organized below brigade but are "normally OPCON (operational control) to the brigade."[3] It goes further to say that attack helicopter battalions are an "aerial maneuver unit usually employed as a battalion."[4] This organizational concept supports independent aerial maneuver against large mobile threats but does not address Army Aviation's role in other operation along the continuum of conflict. Descriptions of future battlefields describe them as variable in nature ranging between linear and nonlinear. Enemy forces may range from terrorists or small organized units to state-funded national armies of various capabilities and threats. Therefore the current and popular concept of aviation deep operations may not match the requirements for some of the U.S. Army's potential future battlefields.

The physical dimensions of today's battlefield have grown. A company in World War II would occupy about a one-kilometer area, where a company in the Gulf War would occupy about ten kilometers. Today this area may be even bigger expanding to fifteen kilometers. It seems to follow that if this expansive area is to remain the responsibility a company commander then there is a growing need to visualize the battlefield in the third dimension and improve his ability to see his entire area of responsibility. The alternative it would seem is smaller company units with smaller more manageable areas of responsibility.

The vision of the future battlefield is one of great uncertainty and complexity. Since the world is a dynamic and turbulent place, operations may cover the full spectrum of operations other than war to full war. To meet operational requirements in this turbulent environment, the Army will need an organizational strategy that maximizes flexibility, tailorability, and capabilities. Since the company team is the cornerstone of the Army's organizational structure, it would be appropriate to relook its structure in light of the future threat, future battlefield conditions, and future capabilities to ensure it can continue to meet battlefield requirements into the next century.

Perhaps it is time for a new task-organized company structure for the future. A force structure strategy that is like tools in a tool box that come together to tackle a particular job. An organizational strategy that organizes in light of what is known about possible enemy capabilities and what is known about U.S. Army capabilities. The purpose of organizing like this is to incorporate flexibility and tailorability to overcome the unknowns. This new company team is structured for better control and influence over a smaller area of responsibility to accomplish future missions despite all the variables. This new organization is a hypothetical company team composed of armor, mechanized infantry, and aviation forces.

Current cavalry doctrine supports this idea of combined arms maneuver with armor, mechanized infantry, and aviation, but it organizes at the battalion level. "Division cavalry is unique as the only battalion level structure in the army with organic air and ground maneuver assets."[5] Today's Army needs flexibility and capabilities that can adapt to any situation. A balanced company team that incorporates armor, mechanized infantry and attack aviation might provide commanders with the right balance.

The company team is the cornerstone of Army warfighting. It builds to create higher echelons and supports the current divisional structure. To solve these dynamic challenges is that

a hypothetical organization is recommended (see figure 1) that combines the capabilities of armor, mechanized infantry, and attack aviation for the close battle. The organization builds using multiples of three for balance and symmetry and to facilitate force tailoring.

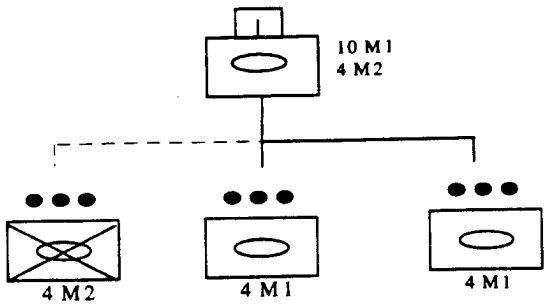
This company team is innovative and revolutionary in its organization and possibly its application. In the aggregate this organization might allow for a reduction in the number of assets in a brigade without reducing combat power and lethality while still providing commanders the flexibility to tailor forces to combat any potential threat. Companies can organize from within corps and divisional structures because they build using these modular companies.

Scope

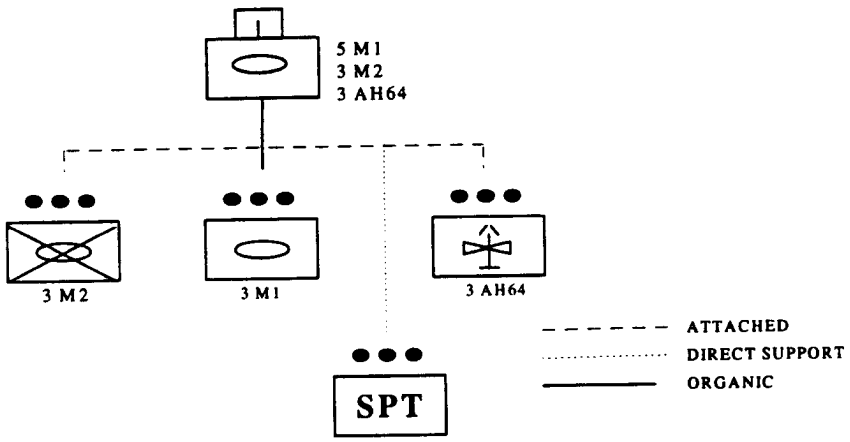
This study purposes a new company team for the Army. It possesses three key combat elements armor, mechanized infantry, and attack aviation. Each of these brings a unique contribution to the fight. The armored tank possesses lethality, speed, and protection. The mechanized infantry possesses speed, lethality, and ability to fight in restricted terrain. Attack aviation possesses speed, lethality, and freedom of movement. The three systems together in a company team represent a balanced package of assets that the commander can employ to defeat any enemy.

This could be a standing structure, but realistically, it is probably a task force that is put together considering the factors of mission, enemy, terrain, troops, and time available (METT-T). Task organizing may best support stationing considerations and training requirements that are not part of this research study. Task organizations also support missions in a world environment of unknown parameters by allowing commanders to arrange capabilities to meet requirements.

FIGURE 1
CURRENT COMPANY TEAM



HYPOTHETICAL COMPANY TEAM



This company team organization could allow commanders to maneuver their forces with greater speed, firepower, and mass. This organization could allow the tactical commander greater freedom of tactical maneuver than ever before and the opportunity to gain success across a wide

and dispersed battlefield. This team could revolutionize land warfare for the twenty-first century.

This organizational structure has tremendous capabilities across the possible spectrum of conflicts. It provides for dispersion across great distances and facilitates great volumes of fires through shared targeting data from long-bow, radar systems. With the introduction of top-down munitions fired from masked and concealed positions, this company team has tremendous capabilities for the commander to exploit on the modern battlefield.

Importance

It is essential that the Army organize to maximize flexibility and capability in operations. Today's units have limitations that capabilities-based organizations can overcome. These combined assets may produce synergistic battlefield effects on the enemy, and they should be considered. Should this structure prove to be feasible, suitable, and acceptable, it might provide an organizational strategy that supports future division force-structure requirements. The question is; Can the Army make a small fundamental change that allows it to accomplish its missions without abandoning everything it has learned and proven in combat over the years?

This hypothetical organization might be the required change. It is a simple and fundamental change that incorporates "combined arms" operations, exploits the targeting technology of Apache longbow for synergistic effects and generates optempo and battlefield visualization by raising the commanders view of the fight above the ground terrain. The possible aggregate result of this fundamental change could be a smaller combined arms combat force capable of producing decisive effects on the enemy.

Assumptions

The following assumptions are made to establish the required assets for the organizational research:

1. Current and modernized equipment is available
2. Availability on all systems is 100 percent.
3. Unit personnel 100 percent trained.

Key Terms

To establish a common understanding for this research the following key terms are provided. Although they may be familiar to many readers they are intended to convey specific meaning for the research.

Air Maneuver Forces. Combat aviation units that operate in the ground environment are air maneuver forces. They engage targets by fire from covered and concealed positions. Their operations are similar to ground combat operations in that they tailor their movement to the terrain and use suppressive fires.

Battlefield. A field or area where a battle is fought.

Battlespace. The components are determined by the maximum capabilities of a unit to acquire and dominate the enemy; includes areas beyond the area of operations; it varies over time according to how the commander positions his assets.

Bound. A single movement, usually from one covered and concealed position to another by dismounted troops or combat vehicles. The distance covered in one movement by a unit which is advancing by bounds.

Close Air Support (CAS). Air action against hostile targets that are in close proximity to friendly forces and that requires detailed integration of each air mission with fire and movement of those forces.

Close Operations. An elastic concept relating to forces in immediate contact with the enemy, in the offense or defense.

Combat Power. The conversion of the potential of forces, resources, and opportunities into actual capability through violent, coordinated action at the decisive time and place.

Combined Arms Team. Two or more arms mutually supporting one another. A team usually consists of tanks, infantry, cavalry, aviation, field artillery, air defense artillery, and engineers.

Company Team. A temporary grouping by attachment of platoons in exchange for, or in addition to organic platoons, under one company commander done for a specific operation or mission.

Dispersion. The spreading or separating of a force and its installations to reduce vulnerability to enemy action.

Firepower. The amount of fire that may be delivered by a position, unit, or weapon system. Firepower may be direct or indirect.

Flexibility. The ability to be responsive to change; adaptable. Capable of variation or modification.

Integration. The act or process of bringing all parts together; unify.

Lethality. The capability to cause death.

Maneuver. The employment of forces through offensive or defensive operations to achieve relative positional advantage over an enemy force to achieve tactical, operational, or strategic objectives.

Mobility. The freedom of movement maneuver by units.

Optempo. The rate of speed of military operation. Tempo can be fast or slow, while speed is preferred.

Organizational Structure. The definite structure of a military element prescribed by a component authority such as a table of organization.

Protection. The conservation of the fighting potential of a force.

Tactics. The art and science of employing available means to win battles and engagements. Tactics is the battlefield problem-solving-usually rapid and dynamic in nature.

Tailorability. The quality of being able to make, alter, or adapt for a particular end.

Targeting. A process based on friendly scheme of maneuver and tactical plan and an assessment of the terrain and threat which identifies those enemy functions, formations, equipment, facilities, and terrain which must be attacked to ensure success.

Task Organize. A temporary grouping of forces designed to accomplish a particular mission. Task organization involves the distribution of available assets to subordinate control headquarters by attachment or by placing assets in direct support (DS) or under the operational control of the subordinate.

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[1]William E. Depuy, Selected Papers of General William E. Depuy (Ft Leavenworth, KS: Combat Studies Institute, 1994), 147.

[2]Ibid., 148.

[3]U. S. Army Field Manual 1-100, Army Aviation in Combat Operations (Washington, DC: Government Printing Office, 28 February, 1989), 2-2.

[4]Ibid.

[5]Field Manual 17-95, Cavalry Operations (Washington, DC: Government Printing Office, 19 September 1991), 2-49.

CHAPTER 2

LITERATURE REVIEW

Current doctrinal literature on operations and maneuver clearly separates air maneuver from ground maneuver through rigid guidance and tactics for the employment of the various units. Combined operations in the army today are still not routine. The visions of airland battle doctrine as well as the organizational concepts coming from the 1973 Arab-Israeli war today are still topics of debate. Requirements for command and control, tactical maneuver, sustainment, and training all come together as forces working against combined arms operations on the modern battlefield. The Marine Corps has tried to overcome some of these challenges and in the process developed creative approaches to combined arms operations using aviation assets. These types of solutions attempt to address current and future requirements using a capability-based combat strategy. Many believe future combat will be very different, and envisioning it certainly is very challenging. Today's literature articulates a new and different world and environment for combat. The challenge is to build flexibility into the organization to meet all future requirements this nation may have.

Airland battle 2000 shaped current US Army doctrine by defining air maneuver forces to strike deep at Soviet second echelon divisions. This strategy, based on the large Soviet military structure, develops a capability to take away the initiative of an attacking army to deny them the ability to exploit success and forcing them to culminate. The US derived this air maneuver doctrine primarily from the 1973 Arab-Israeli war. During the 1973 Arab-Israeli war, combat failures were attributed to the lack of aerial maneuver assets and the inability to quickly shift

forces from one area to another.[1] The Israeli leadership determined air maneuver was key for future combat operations and incorporated it into their organizational strategy. Regardless of the problems the Israelis had during the war, the attack helicopter had shown it was a major force to reckon with on the modern battlefield. These lessons did not go unnoticed by the US Army. The Arab-Israeli war had demonstrated in combat that all arms on the current battlefield were vulnerable to having their individual weaknesses exploited. It was apparent that mutually supporting systems were now a requirement to survive and win on the battlefield. Combined arms operations now were a requirement to negate the threat to individual systems.

The US Army Cavalry today is an example of "combined arms." This combined arms structure overcomes the lessons learned in the Arab-Israeli war by organizing the unit to exploit capabilities and minimize the limitations of each weapons system. By organizing this way each unit experienced synergistic effects to its overall combat power. The Cavalry organized to build combined arms at the battalion level by integrating attack aviation, mechanized infantry and armor forces. This organizational approach ensures operational flexibility in the conduct of the cavalry missions of reconnaissance and security. Since the cavalry often faces many of the unknowns on the battlefield, cavalry tactics, techniques, and procedures must emphasize flexibility and tailorability for missions. The weapons systems employ mutually supporting fires and roles to achieve swift movement and positional advantages on the terrain. This organizational structure allows the cavalry to rapidly develop the situation and concentrate combat power on the enemy.

All brigade-level doctrine for the armor, mechanized infantry, and aviation brigade headquarters is confusing and inconsistent in providing guidance on task organization. As a command and control headquarters, armor, mechanized infantry, and aviation brigades should be

equally capable of receiving and employing units based on mission analysis and higher commanders' orders.

Current doctrine does not articulate it this way. The aviation brigade headquarters unlike the armored and mechanized infantry brigade headquarters consists of what doctrine identifies as "similar" structures and takes on implied responsibilities for aviation operations across the depth of the battlefield. Deep, close, and rear operations may be done simultaneously by the aviation brigade headquarters. This concept has the potential to divert the attention of the commander and staff considerably by challenging him with multiple tasks and purposes. Perhaps it is this that sets the impression that the aviation brigade commander might be too busy to be a combined arms task force commander. Conversely, armored and mechanized infantry brigades have only the headquarters company by doctrine, and all other units are task organized based on the commander's scheme of maneuver. Unit's task organize for specific operations, and the commander receives specific operational maneuver missions. This doctrinal concept provides for flexible force tailoring among armor and mechanized brigades. Inconsistency among all the doctrine leads to confusion and impressions that some brigades are more suitable for maneuver combat operations than others. Other limitations in doctrine consist of such things as "Division is the lowest level at which all of the combined arms are normally integrated."[2] It is not clear exactly what "all the combined arms" consists of and what's "integrated" is, but an opinion is clear, that combined operations below the brigade is not normal as articulated by doctrine.

Tactical maneuver of aviation forces is very clear in current doctrine. For deep operations the Aviation Brigade will attack deep to strike second echelon forces along an air corridor that is closely coordinated to ensure the suppression of enemy air defense (SEAD), the integration with Air Force operations, and the maximum combat power at the decisive point. For close combat operations, attack aviation units can provide two types of combat missions:

"Close-in fire support which is a form of close air support provided by rotary-wing aircraft or "support by fire positions which is the establishment of an overwatch position to fix the target so another force may maneuver."[3] Attack aviation units can also conduct raids, or reconnaissance, and security missions to support the commander's scheme of maneuver. All of these operations by doctrine are planned and conducted by the aviation battalion with coordination done with the other combat arms for synchronization. Because of this doctrinal concept many mechanisms are in place to ensure airspace coordination, fratricide prevention, fire support coordination measures, and, in general, command and control. This process as defined in the doctrine builds autonomous units of capability and not combined arms operations.

The doctrine for the tactical maneuver of armor and mechanized forces provides the opportunity for commanders to task organize units down to company level. Units plan operations to provide mutually supporting fires to create battlefield effects and maneuver during the battle at the direction of the company commander. At this level time and space relationships are at the most critical and may directly result in success or failure. The frictions of war are at the most basic level, the individual soldiers. Seeing the battlefield is the most important action for the company commander, specifically understanding the terrain with its impact on combat operations and the enemy. This ability to see is made more difficult by terrain, position, and combat. Eyes on tracking and communications are the keys to success. Training, standard procedures, and radio communications all enable the company commander to quickly maneuver the unit to achieve its objective. Company level doctrine states that: "Controlling and coordinating fires is just as vital to success of the operation as controlling and coordinating movement. Direct fire in the right amounts at the right times to achieve the desired results."[4] These maneuver and fire control processes are vital to the success of the overall operation. Fires and movement or position are key. Fires neutralize, suppress, and destroy enemy forces.

Movement to a position or positioning allows the fires to come to bear on the enemy. In the company team organization, "combined arms assets are complementary, reducing friendly vulnerability while making the enemy more vulnerable. As the enemy avoids the effects of one type of weapon, he exposes himself to attack by another."[5]

Sustainment operations are critical to all combat operations. Within army doctrine there are many methods to support combat operations depending on the type of unit supported. The concept of support is echeloned to produce economies of scale across expansive battlefields. Today's structures to support this concept consist of Forward Support Battalions (FSB), Aviation Support Battalions (ASB), Main Support Battalions (MSB) and elements of the Corps Support Command (COSCOM). These are the organizational units that provide the support, but because they lack flexibility and mobility, sustainment teams appear in the task organizations. Today, frequently elements move forward to provide support, such as maintenance support teams (MST) or forward logistics elements (FLE). This movement of personnel and equipment makes it difficult to control and economize any support. This process of sustaining does not address the issues of limited tools and limited technical personnel to support multiple teams. These ad hoc, flexible, support packages support and sustain certain units for certain operations. This type of support concept if further institutionalized could support combined operations at lower levels.

Armor and mechanized infantry forces have their organic support in the company trains. While at the brigade level the FSB is providing direct support to the brigade units. This support battalion is a dedicated one to that brigade that also has an area responsibility mission for all units in the area. The support battalion may have augmentation from corps, usually the mobile support teams for maintenance operations. Aviation forces have recently organized and fielded the ASB. Similar in concept to the forward-support battalion the aviation support battalion provides dedicated support to the aviation brigade. It provides intermediate-level maintenance

for division aviation brigade aircraft as well as supply and ground maintenance. The modular design of these units supports mobility and flexibility requirements for future sustainment operations.

Sustainment doctrine for the armored cavalry regiment states that the regiment is logistically self-contained and normally receives support from the corps support command. Maintenance support teams for ground systems may be provided to the regiment and normally are also providing support for aircraft systems. The distance between the regiment and the corps will provide a strain on the lines of communications and highlights the need for modular sustainment packages of maneuver units.

Within the Army many task-organized or standing units provide sustainment for combat operations. For example, the current doctrine for armor and mechanized infantry companies cross-attaches support assets between the battalions. Contrary to the apparent ease, the shifting of assets is not an easy task. These units as currently organized are not modules or units designed by the army, but are arranged by unit standard operating procedures within the battalions. They also experience equipment and personnel shortages as they attempt to put these teams together. Aviation units also establish contact teams to go with the aircraft for short duration operations away from the parent units. These task-organized groups suffer from equipment and personnel shortages as they take on missions the authorization documents do not recognize and do not fully resource.

Currently the demands and organizations of sustainment support can be a deterrent to task organizing, especially for aviation assets. Modularity and flexible force design are requirements today because they facilitate sustainment, combat, and force projection operations now and into the future.

The Marine Corps Gazette recently shows one way the Marine Corps is able to accomplish their military operations in new and creative ways. The Marine Corps has exercised the various capabilities of ground and air combat forces in new and different methods to achieve success on the battlefield. Their operations recently have begun to exploit the flexibility and speed that attack helicopters can provide to the ground battle. They have used attack helicopters to support dismounted infantry operations on objectives by "interdicting avenues of approach and destroying enemy units before they can engage the infantry."[6] They have sought to use attack aircraft as close air support to the ground fight because the speed of the aircraft can coincide with the ground forces they are operating with. During Desert Storm, "Marine Supercobra pilots developed their own version of aerial refueling. Landing alongside and taking fuel from trucks used to refuel turbine powered M-1 tanks, they seldom had to leave the battle."[7] The Marine Corps is evolving their employment of attack aviation to meet the requirements on the future battlefield.

Literature on the future battlefield describes a varied threats with great potential to own the most advanced weapon systems that money can buy. The threat could range from security operations for operations other than war, to rogue militia groups, all the way up to all-out war as thought of today. Some today theorize that "smaller units are able to create decisive effects in three ways: the first physical, more rounds more accuracy fewer soldiers; the second, mixing arms within a formation; the third, is maneuver; the third step will take place when land combat is waged by formations consisting of combined arms, air/ground-based units."[8] The emerging theory is that smaller units equipped with the technology and well trained may be very effective. "The implications of these moves toward compressing greater firepower in smaller unit packages will require significant adjustments in doctrine, leadership, organization and command and control."[9]

Current US Army doctrine does not fully facilitate flexibility in force tailoring or exploit the benefits of modular capabilities. In fact doctrinal short falls are believed by some to be the result of a focus on prescriptive and conceptual doctrine. "The real problem is that American doctrine has never realized that 'prescriptions' can arise not from particular threats and regional scenarios, but simply from the constant objectives of the state and the nature of war at a given time."[10] For doctrine to remain relevant for today's forces it must support flexibility and exploit capabilities. Doctrine must allow for continual evolution through its applicability to each unique situation and facilitate the creation of offensive opportunities and defensive successes. Doctrine must support the ability to always exploit the capabilities of systems and minimize the weaknesses.

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[1]Roger J. Spiller, Combined Arms in Battle Since 1939, (Ft Leavenworth, KS: US Army Command and General Staff College), 40.

[2]U. S. Army Field Manual 1-100, Army Aviation in Combat Operations (Washington, DC: Government Printing Office, 28 February 1989), 1-15.

[3]Ibid., 2-8.

[4]U. S. Army Field Manual 71-1, Tank and Mechanized Infantry Company Team (Washington, DC: Government Printing Office, 22 November 1988), 2-34.

[5]Ibid., 1-6.

[6]CPT Russell E. Stinger, "Employ Attack Helicopters as an Independent Maneuver Element," Marine Corps Gazette, October 1993, 46.

[7]LTC Barry M. Ford, "The Future is Attack Helicopters," Proceedings, September 1994, 54.

[8]General Gordon R. Sullivan, and Lieutenant Colonel James M. Dubik, "Land Warfare in the 21st Century" (Carlisle Barracks, PA: US Army War College, February 1993), 19-21.

[9]Ibid., 22.

[10]Frederick Kagan, "Army Doctrine and Modern War: Notes Toward a New Edition of FM 100-5," Parameters, Spring 1997, 136.

CHAPTER 3

RESEARCH DESIGN

The research method used for this study was a combat simulation experiment using the Janus model, version 6, and personal interviews with senior combat arms officers. The simulation experiment consisted of four phases: Phase I--evaluation of synergistic effects and scenario refinement; Phase II--establishment of baseline; Phase III--evaluation of the hypothetical company team; and Phase IV--personal interviews. The purpose of the first three phases was to determine capabilities and limitations of the hypothetical organization measured against an established standard baseline. This would provide the analytical data for a comparison to determine capabilities and limitations of the new organization. The purpose of all four phases was the development of data and an evaluation of the new organization for the overall research into the combat effectiveness of the hypothetical company team.

The focus of this study is on the combat capability of the proposed organization using the analytical measures of lethality, survivability, sustainability, dectectability and subjective measures of personal opinion. The current and hypothetical organizations will be evaluated with regard to these factors and how they improve or reduce combat effectiveness of the unit. The analytical analysis is focused on the combat capabilities of the hypothetical company team and if these capabilities will change the battlefield dynamics. The subjective analysis is focused on the personal opinions of senior leaders.

Model

The Janus combat simulation model is a six-sided, closed, stochastic model. Stochastic refers to the way the model determines the outcome of certain events. In a stochastic model the outcome of an event is determined from drawing random numbers against a probability of an event's occurrence, or simply by applying the laws of probability or chance. The model requires at least two graphic monitors for a Red force and a Blue force. Red and Blue forces will appear on opposite screens only when detected by the opposing force. The model can be run in two modes interactive and systemic mode. In the interactive mode, players can react to and redirect certain actions for the combat forces. The systemic mode player routes are input in the initialization phase, and there is no human interaction. This experiment was conducted in the interactive mode using preprogrammed movements.

Terrain

The geographic terrain for this scenario is Kansas and Missouri. This specific battle is conducted northwest of Leavenworth Kansas. The terrain in this area favors mobile warfare by heavy forces, but the region is heavily cross-compartmented with low hills and numerous streams. There are few major terrain features in the area which permits generally good long-range observation. The heavy cross-compartmentalization in some areas can restrict observation. Concealment in the area is good and creek or stream valleys provided excellent cover throughout the area. Weather is not a factor.

Scenario Specifics

Start time: 0500

Visibility: unlimited

Ceiling: clear

winds: calm

Scenario

For the experiment a "Centralia" scenario was used because it presented generally rolling terrain and because there was a wealth of available information to build the scenario. The fictitious nation of Centralia consists of the geographic area of Kansas. The country of Nebraska has pursed a military buildup and appears likely to go on the offensive for a limited time. The purpose of their operation is to destroy Kansas City, the Centrailian capital, and eliminate enemy forces in an attempt to restore old borders that are favorable to them. Therefore the enemy forces are attacking from north to south toward Kansas City and through the Leavenworth, Kansas avenue of advance.

Forces

Red Forces

The Red Forces consist of a motorized rifle battalion (BMP) reinforced with a tank company. The Red Forces possess the T80 tank and the BMP2. The motorized rifle battalion is attacking from north to south to defeat enemy forces in the vicinity of Leavenworth, Kansas. Listed below are the major items of equipment for the:

Motorized Rifle Battalion (+)

Equipment/Item	Quantity
T80	10
BMP 2	42
2S6	1
SA13	4

Blue Forces

Engineer Effort

The scenario is a defense. Therefore engineer assets and effort were incorporated into the scenario and used. These assets and their execution were constant throughout the experiment. Listed below are the Engineer items and effort allocated:

Equipment/Item	Quantity
Wire Obstacle	5
Road craters	4
Minefields	8
Fighting Positions	all

Current Company Team

The current Blue force company team consists of armor and mechanized forces. They possess the M1A2 tank and the M2 Bradley infantry fighting vehicle. The company team will be defending in the south to defeat the attacking enemy forces in engagement area TIGER. Listed below are the major items of equipment:

Equipment/Item	Quantity
M1A2	10
M2 BIFV	4
BSFV	2
Stinger tm	2
FIST	1
Smk gen	3
COLT	1
GSR	1

Hypothetical Company Team

The hypothetical Blue force company team consists of armor, mechanized, and aviation forces. They possess the M1A2 tank, M2 Bradley infantry fighting vehicle, and the AH64 Apache. The company team will be defending in the South to defeat the attacking enemy forces in engagement area TIGER. Listed below are the major items of equipment:

Equipment/Item	Quantity
M1A2	5
M2 BIFV	3
AH64	3
BSFV	2
Stinger tm	2
FIST	1
Smk gen	3
COLT	1
GSR	1

Analytical Phases

Phase I is an evaluation of the synergistic effects of artillery, smoke, and hold fires and the development of the standard scenario. This phase supported the tactical planning and established the combat conditions, fighting positions, and engineer operations to minimize the variables that could insert bias to the data. Results from this phase will provide a limited assessment of capabilities and limitations of the hypothetical company team in a multivariable combat environment. It also will establish the baseline scenario to objectively evaluate the combat potential of the organization.

Phase II is to establish the baseline. The purpose of this phase is to establish the baseline performance standard for the current company team using the Janus combat simulation model. This phase consisted of fighting the current company team within the established Janus scenario

and obtaining the measures of performance in regard to lethality, survivability, sustainability, and detectability. These results will then be used as the baseline to compare the results of phase III.

Phase III is to evaluate the hypothetical company. The purpose of phase III is to obtain results on the performance of the hypothetical company team using the Janus combat simulation model. This phase will consist of fighting the hypothetical company team within the established scenario and obtaining the measures of performance in regard to lethality, survivability, sustainability, and detectability. These results will then be compared to the results of phase II to determine within 95 percent confidence if the organization is as effective as the current company team.

Phase IV consists of seven interviews with senior combat command veterans who average twenty-six years of experience across three combat arms branches. The interviews focused on the military judgments of these officers as the hypothetical company team's "potential" to provide improved combat performance over the current company team. The results of the interviews will be used to address issues that analytics alone may not and to further elaborate on the organization's ability to enhance the art of war.

Data Collection Plan

Definitions of Measure

Detectability. Blue Forces were analyzed for detectabiltiy using primary and secondary sensor detection's of enemy forces. Detectability was defined as follows:

Detectability = Blue sensor detection's of Red forces

Lethality. Blue forces were analyzed for lethality against major enemy weapons systems. Lethality was defined as follows:

Lethality = Red Losses

Range. Blue and Red forces were analyzed for weapons system engagement range. Range was defined as follows:

Range = Engagement range

Survivability. Blue forces were analyzed for survivability against enemy weapons systems. Survivability was defined as follows:

Survivability = Blue Losses

Data Analysis Plan

Lethality, survivability, sustainability, and detectability were analyzed by finding the sample means and the sample standard deviations from phases II and III and completing statistical analysis to enable the drawing of relevant conclusions. The complete set of data is presented in tabular form as part of the analysis in chapter 4.

The actual statistical analysis done used the small-sample t-test were the variances are unknown and not equal. The equations for that analysis are:

$$\text{d.f.} = \frac{(s_1^2/n_1 + s_2^2/n_2)^2}{(s_1^2/n_1)^2/(n_1-1) + (s_2^2/n_2)^2/(n_2-1)}$$

$$\text{C.I. for } \mu_1-\mu_2 = (\overline{X}_1 - \overline{X}_2) \pm t' \sqrt{s_1^2 / n_1 + s_2^2 / n_2}$$

The analysis is conducted at the 95 percent confidence interval. Therefore the following two hypotheses were tested with the significance level of a=.05:

1. h_0: $\mu_1 = \mu_2$, There is no significant difference between the groups.

2. h_2: $\mu_1 \neq \mu_2$, There is a significant difference between the groups.

Assumptions and Limitations

The following assumptions were made concerning the data collection methodology.

1. The Janus combat simulation model is a reasonably valid simulation of combat.

2. Sample data from the Janus model produces "Normal" sample data following the laws of probability and chance.

3. The variance of the current company team and the hypothetical company team may not be equal ($\mu_1 \neq \mu_2$).

This study will conclude with findings and an assessment to address how this change in the company team impacts combat capabilities. It will attempt to address the impact of compressing greater firepower and maneuver into smaller combined arms units and if the change produces positive effects on the battlefield. The analysis of this fundamental change is done to experiment with battlefield requirements and organizational capabilities to determine if this change could be the foundation to support the Army of the Twenty-First Century and beyond.

CHAPTER 4

ANALYSIS

This chapter records and discusses the results of the research done for this project. It analyzes the significance of these results as they pertain to the basic research question.

Phase I

Evaluation of Synergistic Effects/Scenario Refinement

The modeling evaluation of this organization is first preceded by reviewing and examining the documentation of missions, capabilities, and limitations of both the hypothetical and current company teams. The work in this phase had two purposes: to support the technical aspects of the modeling and to support the initial research of the organizations. The two mission statements are as follows:

Mission Statement for Hypothetical Company Team. The company team is a flexible multipurpose force that is task organized for a specific mission capable of maneuvering to achieve a position of advantage and to concentrate superior combat power to destroy, capture or repel the enemy.

Mission Statement Current Company Team. The company team is task organized for a specific mission to close with the enemy by fire and maneuver in order to destroy or capture him, or repel his assault by fire.[1]

The hypothetical unit's mission statement attempts to incorporate more flexibility in the capability to task organize as well as flexibility in the actual combat maneuvering and agility

against the enemy. The current company team's mission statement incorporates flexibility by the processes of task organizing, but following that a rigidity is set by the limits on agility and flexibility within the capabilities of the assets. The current team statement reads as if the unit is a concrete block laying a foundation but in itself is not flexible. The hypothetical company team's mission reads like the unit is a powerpoint object that in itself is fixed but the attributes can be enhanced and adjusted to fine-tune the picture.

Another valuable part of the research evaluated the capabilities and limitation. They reveal a great deal about the organizations and the changes that occur. Table 1 lists the capabilities and limitations of both company teams for comparison. By comparing the

Table 1. Capabilities and Limitations

Capabilities

Current	Hypothetical
High degree of firepower	High degree of firepower
Shock effect	Shock effect
Destroy enemy armor	Destroy enemy armor
Seize terrain	Seize terrain
Destroy mounted/Dismounted Infantry	Destroy mounted/Dismounted Infantry
Cross country mobility	Cross country mobility
Conduct continuous operations	Operate on a three dimensional battlefield

Limitations

Current	Hypothetical
Obstacles	Endurance
sustainment	sustainment
Operations in builtup areas	Weather
	Limited Visibility

two organizations' capabilities and limitations, clearly the hypothetical company team further expand the application of combined arms operations with aviation to company level. It portrays the application of the principles of minimizing vulnerabilities and of exploiting capabilities. The question remains, What are the adverse costs with doing this? Most notable within the comparison is the possible tradeoff between agility and the capability to operate in adverse weather. Agility is a very valuable commodity on the modern battlefield but so is assurance in capability. The issue of agility is itself complex and dynamic. A commander can gain agility in three possible ways: anticipating the enemy's actions, movement of assets, and ability to react.[2] The new structure provides the commander with improved agility in the speed of the AH64 and improved situational awareness with a new three-dimensional view of his battlespace. The hypothetical company team also provides the commander the ability to achieve the effects of maneuver while stationary or in a defensive scenario. The capability of the helicopter within the company team integrates movement and positioning of fires simultaneously throughout the operation. The maneuverability and agility of the aircraft could generate a constantly changing problem for an enemy. The problems of variety and tempo may cause the enemy to select an inappropriate or ineffective response. This variable asymetical problem eventually could cause the enemy to fail or be defeated. All organizational structures and task organizing should allow the commander to achieve a positional advantage in time and space in order to put the enemy at a disadvantage. This disadvantage is built into the plan or could be generated directly from the battlefield fog of war which is an unpredictable element. This unpredictable opportunity if generated from the new organization could generate an improved effectiveness or a requirement for the company team to have the flexibility and agility to seize opportunities as they present themselves.

Comparing the dimensions of the two units' battlespace provides tremendous evidence of the changes that take place. The comparison is listed in table 2.

Table 2. Battlespace Comparison

Current	Hypothetical
14 weapons systems	11 weapons systems
24 Dismounts	18 Dismounts
900 meter front	700 meter front
900 meter depth	1,000-5000 meter depth
48 kmph max speed	74 kmph max speed
2 dimensional	3 dimensional

This comparison shows the real changes that take place in the battlespace of the company. This comparison only considers the deployment of the weapons systems at standard doctrinal dispersion distances and does not include other company assets. The difference in depth is very significant and could be more. This increase in battlespace is as much as five times for the hypothetical company team. Another remarkable difference is the change in the maximum speed for the fastest weapons platform from 48 kilometers per hour to 74 kilometers per hour. This could present the company commander with a significant capability to flex assets as the battle continues. These are all tremendous changes in capability but the expansion in the of company battlespace to three dimensions is tremendous. Today, although the company commander is responsible for and commands the battlespace above, his limited assets and capability to exploit the area make it an untapped resource at the company level. Army aviation assets today infrequently are asked to participate in the close fight and do little to enhance the company commander's ability to find and track the enemy. This initial numerical comparison again reflects the tremendous potential of expanding combined operations further at the company level.

A comparison of combat power documents the potential firepower of the company teams verses the enemy's. Listed in table 3 is the combat power analysis of the three organizations.

Table 3. Combat Power Analysis

MRB (+)		Current Company Team		Hypothetical Company Team	
MRB (BMP2)	.70	10 M1	.20517	5 M1	.10259
Tank Co (T80)	.26	4 M2	.06896	3 M2	.05172
				3 AH64	.35125
Total	.86		.27413		.50556

In this comparison is a portrayal of the increased firepower of the hypothetical company team verses the current company team. It also provides a representation of the enemy's potential firepower for this modeling. The results here show the hypothetical company possesses improved firepower by .2314. This mathematical comparison demonstrates the potential firepower harnessed by expanding combined operations at the company level.

Firepower and protection enable effective maneuver. The comparison shows the hypothetical company team possesses considerable firepower and therefore significant destructive capabilities along with an ability to maneuver. The variety of available firepower provides the commander the ability to direct a variety of fires to mass their effects to achieve certain results. The integration of leap-ahead technologies and the concept of shared firing data creates the opportunity to achieve even more synergistic effects from these fires. The two organizations' capabilities and limitations clearly show the potential for expansion by the continued expansion of the combined arm's philosophy to the company level with aviation.

Sustainment requirements are also a primary consideration for any organization. Therefore a comparison of sustainment requirements was done to determine the difference in the

sustainment requirements for the two organizations. Table 4 lists a sustainment comparison for a one-day defensive operation and one hour of fuel consumption.

Table 4. Sustainment

Current		Hypothetical	
120mm	100 rds	120mm	50 rds
Tow	36 rds	Tow	27 rds
25 mm	320 rds	25 mm	240 rds
Fuel	552 gal	Hellfire	60 rds
		Fuel	661 gal

In this comparison the most notable conclusion derived from the data is the lack of any substantial difference in the overall quantity of sustainment required. What this shows is a sustainment requirement that is about the same. It is also intuitively obvious that the locations for these operations maybe different with the addition of the aircraft and forward-arming and refueling requirements. This analysis revealed the fact that for this company-level operation the aircraft sustainment requirements should not exceed the onboard capabilities of the weapons systems reguardless of type due to the expected duration of the operation. A sustainment issue that must be addressed is aircraft maintenance. Aircraft maintenance operations is a major issue to consider due to the fact that aircraft, especially rotary-wing aircraft, are maintenance intensive. These aircraft receive support for the operation through a maintenance contact team. Any aircraft requiring more maintenance capability than a maintenance contact team can provide receives maintenance back with the Aviation brigade and under the command and control of the parent unit. A replacement aircraft would be assigned to the mission. For this experiment all aircraft were available and were operationally ready. The force structure required to provide three operationally ready aircraft is beyond the scope of this study and will require further

research. Another expanding sustainment factor to evaluate in later studies is the cost associated with the differing round types used and possible economies in command selected delivery of munitions. This issue might provide operational cost savings as well as combat benefits. Overall, the analysis shows that the sustainment requirement is not significantly different from current requirements and should be within the capabilities of the unit.

This initial analysis facilitated the development of the operations order, positioning of the weapons systems, sustainment requirements, and combat potential of the new organization. It also provided a substantial opportunity to assess basic capabilities and limitations of the organization. Results to this point seem to provide support already for the portrayal of a hypothetical company team that could be more lethal, mobile, and sustainable in this combat operation than the current company team organization.

Phase I operations of refining the scenario and variables for the Janus database supported the technical aspects of the simulation experiment and the capabilities research. To reduce the number of variables and consider their effects Janus, runs of four varying operational conditions were done on both the current organization and the hypothetical organization. The limited operational conditions for the runs consisted of: no holdfire; holdfire; smoke and holdfire; and artillery, smoke, and holdfire. Table 5 displays the data for these phase I runs.
The results of this phase were most insightful. The most striking difference consistent in both organizations was the impact of holding fires. In both organizations the battle was lost when the unit was allowed to engage at will. Since the effects were catastrophic and both units lost the fight with very little enemy losses, a weapons' hold condition was incorporated into the scenario.

The next result was the lack of significant effects from indirect fires at the company level. This result is at least intuitively due to modeling limitations and the inherent inability to model human response. Due to its lack of significant effects in this battle, it was determined that

injecting artillery fires as a variable in this battle inserted unnecessary bias. Therefore the artillery and its effects were not included as part of the modeling.

Table 5. Phase I Results

	Current	Hypothetical
No Holdfire		
Duration	52 min	56 min
Friendly losses	14	11
Enemy losses	10	6
Holdfire		
Duration	49 min	56 min
Friendly losses	1	4
Enemy losses	69	68
Smoke and Holdfire		
Duration	45 min	59 min
Friendly losses	5	0
Enemy losses	69	68
Artillery, Smoke and Holdfire		
Duration	49 min	55 min
Friendly losses	4	6
Enemy losses	69	69

Another significant result was the impact of smoke on aviation operations. The smoke as portrayed in the model reduced the effectiveness of the aircraft to zero. Although it can be reasoned that smoke would impact the ability to see, the capability of the pilot to maneuver and effectively use other targeting equipment within the model was cause for bias. Therefore, the effects of smoke were not included as part of the modeling.

This Janus modeling in phase one provided great insight into the capabilities and limitations of both organizations as well as facilitating the establishment of unbiased scenario conditions. With the model conditions established, the analytical runs of phase II were begun.

Phase II

Establishment of Baseline

The results of the phase II analysis primarily established the baseline for comparing the hypothetical company team. It consisted of ten Janus model runs for the current company team organization fighting a defensive fight against a reinforced motorized rifle battalion and the statistical analysis of the data obtained. Table 6 contains the data from this phase.

The data itself revealed capabilities and possible limitations of the current organization. The results show the current company team obtains a better ratio in rounds per kill as well as a better round per minute ratio than the Red enemy forces. The results also show enemy forces have a significant advantage in their ability to detect with sensors the US Force. These measures will provide a noticeable contrast to compare the hypothetical company team. The next result is that the data shows a significant lack in capability at the company level to find and track the enemy. With both primary and secondary sensors the enemy's capability in this terrain to find and track Blue forces significantly exceed the Blue force's capability. The dispersion of this detection data is also significant to note.

The current company team has a significant advantage over the enemy in rounds per kill and rounds fired per minute. Friendly forces achieve one enemy kill for every 2.7 rounds fired. In contrast the enemy obtains one kill for every 26.3 rounds fired. This shows the tremendous advantage held by the current company team, but also reveals there is not a great deal of room for improvement. In the measure of rounds per minute the current company team fired at an average rate of 8.98 rounds per minute against an enemy who was firing at an average rate of 5.17 rounds per minute. This comparison shows that the current company team has a significant advantage over the enemy in rounds per kill and rounds fired per minute.

Table 6. Current Company Team

Current	Dura-tion	Blue Hits	Red Hits	Blue Rds Fired	Red Rds Fires	Red Killed	Blue Killed	Friend Primary Detec-tions	Enemy Primary Detec-tions	Field Secondary Detections	Det Enemy Second	Ave Range Friend	Ave Range Enemy
	23	202	93	201	141	58	7	0	6	121	267	2.52	2.61
	18	141	93	144	103	69	2	0	8	138	217	3.16	2.49
	21	169	81	172	95	69	2	2	6	128	255	3.14	2.63
	22	185	66	189	145	69	0	5	10	99	233	2.85	2.64
	21	183	68	187	94	69	6	3	6	114	252	2.46	2.63
	19	180	53	185	81	69	3	1	7	7	226	2.63	2.65
	18	150	57	151	68	69	6	0	7	117	227	2.72	2.69
	23	188	72	212	129	69	2	1	3	136	242	2.60	2.61
	20	166	66	169	82	69	5	0	7	122	238	2.69	2.66
	19	206	88	222	117	69	7	2	7	125	278	2.67	2.61
TOTAL	204	1770	737	1832	1055	679	40	14	67	1107	2435	27.44	26.22
Mean m	20.40	177.00	73.70	183.20	105.50	67.90	4.00	1.40	6.70	110.70	243.50	2.744	2.622
S2 s_1^2	3.600	434.000	207.122	622.622	701.389	12.100	6.222	2.711	3.122	1451.567	374.500	0.057	0.003
S s_1	1.897	20.833	14.392	24.952	26.484	3.479	2.494	1.647	1.767	38.099	19.352	0.239	0.053
CV	9.301	11.770	19.527	13.620	25.103	5.123	62.361	117.610	26.373	34.417	7.947	8.715	2.017
MEDIAN	20.500	181.500	70.000	186.000	99.000	69.000	4.000	1.000	7.000	121.500	240.000	2.680	2.630
MODE	23	#N/A	93	#N/A	#N/A	69	2	0	7	#N/A	#N/A	#N/A	2.61

The analysis of the data also reveals a significant capability limitation of the current company team to obtain a sensor detection advantage over the enemy. Primary sensor detections by the company team was a meager average of 1.4, while enemy forces possessed a 6.7 average number of detections by primary sensors. The limitation does not change considerably with secondary sensors. Data for the secondary sensors show the enemy still holds a 2.2-to-1 advantage. Overall, the enemy possesses a 2.23-to-1 advantage in number of detections that is mitigated somewhat by the fact enemy red forces have more weapons platforms in this fight. This fact does not change the disadvantage the current company team faces. The data reveals the current company team has a significant capability limitation in obtaining a sensor detection advantage over the enemy.

Results of this analysis also markedly show there is a tremendous lack of variance in the measures of both friendly and enemy acquisition range. This result could be a product of modeling, but could also be a product of an acquisition system that pursues range advantages to the possible compromise of other measures. In this analysis Blue force has a .122 average range advantage over the enemy force.

Phase II provided two primary aspects to this analysis. First and primarily it established the baseline data to support the phase III comparison. Second it provided insight and data to document the capabilities and limitations of the current company team with this scenario. The measures established in this phase provide the baseline to compare and statistically analyze the hypothetical company team against in phase III.

Phase III

Evaluation of Hypothetical Company

This analysis establishes the capabilities and limitations of the hypothetical company team and documents the comparison between the current company team baseline data and the hypothetical company team data. The final outcome of the simulation experiment of the hypothetical company team was a "battlefield victory." Table 7 details the data from the ten Janus runs. The data shows a significant advantage over the enemy in rounds per kill and rounds fired per minute. The hypothetical company achieves one enemy kill for every 2.7 friendly rounds fired. Enemy red forces in contrast achieve one kill for every thirty rounds fired. This is a significant advantage over the enemy force. The hypothetical company also achieves an advantage over the enemy in the measure of average rounds per minute of 8.43 against an enemy who achieves a 5.72 average round per minute rate. This comparison shows that the hypothetical company team possesses a significant advantage over the enemy force in this defensive scenario.

Further review reveals that the hypothetical company team also possesses a slight advantage over the enemy force in capability to detect enemy forces with primary sensors. The organization specifically achieves a 1.5-to 1.0 advantage in sensor detections by primary sensors; however, this quickly fades as the enemy obtains a 2 to 1 advantage with secondary sensors. Overall, the enemy obtains a 1.71 to 1 advantage over the hypothetical company team when both primary and secondary sensor detections are totaled. This comparison shows that this organization possesses a slight advantage with primary sensors over the enemy that might contribute to the success they achieve in the engagements.

The results of the detailed statistical analysis are derived from the Janus data. The data includes fight duration, Blue hits, Red hits, Blue ammo consumption, Red ammo consumption, Blue killed, Red killed, Blue Secondary sensor detections, Red secondary sensor detections and,

Table 7. Hypothetical Team

Hypo 999	Dura-tion	Blue Hits	Red Hits	Blue Rds Fired	Red Rds Fired	Red Killed	Blue Killed	Friend Primary Detec-tions	Enemy Primary Detec-tions	Friend Seondary Detections	Det Enemy Second	Ave Range Friend	Ave Range Enemy
	21	169	81	182	112	69	4	32	32	152	197	2.75	2.74
	20	134	77	138	107	69	7	27	15	133	279	2.65	3.41
	23	146	76	164	154	65	5	32	11	117	300	2.40	3.55
	23	138	80	144	126	66	6	42	17	121	256	2.48	3.23
	22	176	59	280	107	64	3	38	32	115	200	2.76	2.49
	22	140	69	139	151	69	3	37	43	125	252	2.86	2.91
	21	135	73	141	137	69	3	43	14	110	300	2.63	2.80
	22	176	59	280	107	64	3	38	32	117	200	2.77	2.49
	21	160	77	188	148	66	5	40	31	107	233	2.71	2.65
	24	157	65	190	104	69	3	46	21	114	252	2.67	2.79
TOTAL	219	1531	716	1846	1253	670	42	375	248	1211	2469	26.68	29.06
Mean m	21.90	153.10	71.60	184.60	125.30	67.00	4.20	37.50	24.80	121.10	246.90	2.668	2.906
S2 s_2^2	1.433	278.544	67.378	2941.600	419.122	4.889	2.178	33.389	111.511	172.767	1542.989	0.019	0.138
S s_2	1.1972	16.6897	8.2084	54.237	20.472	2.211	1.476	5.778	10.560	13.144	39.281	0.139	0.371
CV	5.4668	10.9011	11.4642	29.381	16.339	3.300	35.136	15.409	42.580	10.854	15.910	5.199	12.761
MEDIAN	22	151.5	74.5	173	119	67.5	3.5	38	26	117	252	2.69	2.795
MODE	21	176	77	280	107	69	3	32	32	117	300	#N/A	2.49

average engagement ranges Blue and Red. The data from the two organizations is then compared to each other using the small-sample t-test using unknown and unequal variances. This t-test is used to compare the interval scale of the current company team data and the hypothetical company team data. The size of difference between the two data measurements is an important consideration to determine if the two organizations perform equally or with some degree of disparity. The size of the difference and if it provides improvement or loss of capability is critically significant to the analysis and conclusions. As the two hypotheses are tested for each data measure with a significance level of a =.05, zero must fall between the range indicated in the table 8, columns CI+ and CI-. If zero is not between this range, the null hypothesis is rejected, and there is a statistically significant difference between the current company team and the hypothetical company team. If zero is within the interval, the null hypothesis is not rejected and there is no statistically significant difference between the current company team and the hypothetical company team. Table 8 shows zero falls within the confidence interval ranges for all measures but four. They are Blue hits, Sensor detections Blue primary, Sensor detections Red primary and average engagement range of Red force. This analysis indicates that there is not a statistically significant difference between the two organization's performances in this experiment, except in four of the measures. The possible reason for this is the addition of attack helicopter capabilities to the company team. When it is considered that the hypothetical company team actually consists of three fewer weapons system platforms than the current company team, the results are even more significant.

The four data measures that are statistically different are Blue Hits, Friendly Primary Detections, Enemy Primary Detection and Average Range Enemy. The reasons for these differences must be further evaluated to determine whether it is a favorable difference or a negative difference to the organization.

Blue hits data measure has two possible reasons for the statistical difference. First, there are fewer weapons systems firing through the engagement. This could account for all if not some of the difference. But another obvious result contained in the data is a drop in the variance as indicated in the data table by smaller sample standard deviations and a smaller coefficient of variation. Perhaps the organization has improved its performance and that has caused a drop in the number of Blue hits.[3]

The measure of friendly primary detection's was also outside the statistical parameters established and the hypothesis was rejected. A closer evaluation of the data shows that the performance of the hypothetical unit has improved over the current organization in this measure. The hypothetical company team, despite its larger standard deviation exhibits in the measure of detections less deviation relative to its mean than does the measure of detections for the current company team relative to its mean. It can therefore be concluded that the hypothetical company team has more consistent and improved performance than the current company team organization.

Enemy primary detection's statistical analysis also rejects the null hypothesis. This indicates that this measure also has a statistically significant difference between the two organizations. The total Sensor detection's Red Primary against the hypothetical company increases to 24.8 from 6.70. It can therefore be concluded that the addition of the helicopters caused this increase. However even though the enemy receives beneficial effects the measure also experiences a larger standard deviation as well as an increase in the deviation relative to the mean. Therefore it could be concluded that the hypothetical company benefits more from the addition of the aircraft than the enemy derives from their addition. It could also be argued that the enemy is limited in its ability to effectively and consistently detect the targets with their primary sensors. The results are provided in table 8.

Table 8. T-Test Results

	df	t'	CI+	CI-	Is Zero within CI range	Reject m1= m2
Fight Duration	15.1860	2.1315	0.012	-3.012	YES	NO
Blue Hits	17.1822	2.1098	41.709	6.091	NO	YES
Red Hits	14.2951	2.1448	13.337	-9.137	YES	NO
Blue Rds Fired	12.6465	2.1788	38.840	-41.640	YES	NO
Red Rds Fired	16.9259	2.1199	2.762	-42.362	YES	NO
Red Killed	15.2521	2.1315	3.678	-1.878	YES	NO
Blue Killed	14.6125	2.1448	1.754	-2.154	YES	NO
Friendly Primary Detections	10.4520	2.2281	-32.050	-40.150	NO	YES
Enemy Primary Detections	9.5036	2.2622	-10.883	-25.317	NO	YES
Friendly Secondary Detections	11.1125	2.2010	16.765	-37.565	YES	NO
Detections Enemy Secondar	13.1258	2.1604	26.115	-32.915	YES	NO
Ave Range Friend	14.4405	2.1448	0.262	-0.110	YES	NO
Ave Range Enemy	9.3658	2.2622	-0.032	-0.536	NO	YES

Average range enemy statistical analysis revealed a rejection of the null hypothesis. This indicates another statistical difference between the two organizations for this measure. Further analysis indicates that the enemies average engagement range increases from 2.62 to 2.906 or .286. This is a result of the increase in dispersion and standoff range of the aircraft or some of the targets. Obviously increased enemy engagement range is a possible benefit as well as a detriment because probability of hits can decrease with range. This fact is solidified somewhat

by the Blue loss data remaining almost unchanged. Further analysis shows another gain for the hypothetical company team that of an increase in standard deviation. The enemy engagement range measure experiences an increase in deviation relative to its mean. It therefore can be concluded that the enemy is engaging at a longer range and must do so across a more varied target distance. This dispersion is a benefit to the hypothetical company team and leads to a conclusion that the rejection of the null hypothesis for this measure is because the organization is experiencing a significant gain in capability.

Phase IV

Personal Interviews

There are certain things simulation and analytics cannot truly measure. Therefore the purpose of the phase IV research is to bring into consideration the subjective opinions of seven senior commanders with an average of twenty-six years of experience. The participants in this phase consisted of one Lieutenant General, five Colonels and one Lieutenant Colonel. Their names are listed in the bibliography. Their experience spans three combat arms branches with three in the armor branch, two in the infantry branch and two in the aviation branch. Five of the participants have cavalry experience. All the participants have held command at the battalion level and five have held command of a brigade. One participant commanded a division. Three of the participants have commanded in combat. The comments generally fell into several overarching categories: command and control; training; leadership; organizational capabilities and personal willingness to organize and fight a unit like this. These opinions bring out the subjective art of war and how these experienced combat leaders feel this hypothetical company team can enhance and stress the commander's tactical operation.

Command and control is the first survey category and encompasses the control functions of: airspace management, maneuver control, and fire control. The majority of these leaders

believe that the combat effects of this hypothetical company team would be significant. To achieve these effects considerable staff planning and coordination requirements are placed on the command and control processes. The respondents go on to highlight the requirements for detailed planning and coordination that must be done by a battalion or brigade staff on behalf of any company organization due to the lack of a staff planning capability within a company. Airspace coordination issues alone are cited by these officers as frequent reasons why today the Army does not further task organize attack helicopters lower than battalion. The aircraft can travel distances and speeds that requires maneuver airspace to support the operation and that airspace can not be solely defined by company ground maneuver graphics. These issues of airspace management, maneuver control measures and fire control measures for this hypothetical company team are all melding together in the geographic areas that today is company, battalion and brigade battlespace. This melding is exactly what makes the coordination so demanding for the leaders and what makes the organization so effective against the enemy.

The second overarching category in the survey results involves training. These former combat commanders highlighted that training is critical to this organization because of the two fundamental principles the organization builds upon, combined arms and task organization. Combined arms operations, these officers point out, requires swift coordinated actions and full knowledge and understanding of all the weapons systems. This understanding they say is a product of training. They go on to say today's army does not effectively train organizations for combined arms operations. Further they believe the training requirements for this type of task-organized force requires a consistent frequency and support with resources that then produces the desired coordinated battlefield effects. They emphasized their concerns that close battle using varying weapons systems and capabilities requires combined arms training as a unit. Today, they say, we are frequently unable to maintain any consistent habitual relationships among diverse

units as operational mission requirements require new task organizations to meet specific needs. The flexibility to task organize forces and the unit's ability to produce the desired combat effects is a direct product of the training they receive. It is the training foundation that allows multifunctional capabilities of weapons platforms to be task-organized, maneuvered and eventually exploited to achieve decisive effects on the enemy. These leaders believe that this hypothetical company team must conduct this combined arms training together in order to support the development of the skills, knowledge, and proficiency to achieve success.

The third overarching category in the survey results involves leadership. The leaders of this organization, these former commanders believe, must be extremely knowledgeable on the capabilities and have experience with the leadership considerations for employment all assets assigned to them. Today, a few note, there is a great reluctance in the Army to let captains and lieutenants make decisions. This point gains more clarity as most of these officers said they feel currently captains and lieutenants would have difficulty if not be incapable of managing this type of combined arms organization. They highlighted the diverse complexities of fighting combined arms organizations and synchronizing fires, sustainment, maintenance, and maneuver to support the case that the company commander may need more experience and possibly rank. To bring out some of the divergent responsibilities for the leadership they describe the current mechanized infantry platoon leader. Here leadership responsibilities serve to cause the platoon leader to maneuver the Bradley weapons platform and a squad of solders dismounted simultaneously. This seam in responsibility makes it difficult to operate effectively within this organization both today and in the future. This issue shows the complexities of leadership within the company team organization and requires further study. Trained and experienced leaders are essential whatever the grade, on this point they were very strong. The element of the third dimension allows the company commander better ability to see and acquire targets but these leaders felt a

company commander should not have a "deep battle." The focus for them was a company that has one mission and one purpose to support the overall operation. Many of these leaders had lead small combined arms units as captains. They described the difficulties and the issues of diversified weapons systems but most agreed it gave them the capability to respond and cover their areas of responsibility fully. The issue with young leaders is training and experience. Both are, they feel, a requirement in greater measure to effectively operate a combined arms organization on the modern battlefield.

Organizational capability was the fourth overarching category in the survey. The results of the survey outlined the opinion that this hypothetical company team organizational strategy had merit. Most felt it added flexibility and dramatically improved the ability to acquire enemy forces. The majority of respondents agreed that it did enhance the company's ability to maneuver and supported the concept of force tailoring. The consensus was that the hypothetical company team had about the same lethality, flexibility, and mobility as the current company team because of the tradeoffs among the three measures. It was also the combined opinion that technology could greatly enhance the ability of this unit to perform. Weather and sustained operations for the aircraft in combat developed as a common point among the respondents for current and future organizations. Short operations that go as planned present no problems, but issues of weather, crew endurance, and day/night operations always are factored into operational analysis and mission planning. The ability to sustain longer duration operations within this organization surfaced as a common concern regarding organizational capabilities. These leaders agreed that sustainment requirements for this organization presented new and complex challenges to the logistics system. This type of organization would need tailored support at the right time and focused to the unit's operations on the whole.

Personal preference was the fifth overarching category. All of these former combat commanders were asked if they would consider organizing and fighting a unit like the hypothetical company team and all but two said they would. The responses focused on capabilities-based organizational strategy and mission requirements. Most felt that this organization clearly possessed some unique capabilities that would be advantageous in certain combat operations. The organizational requirements and capabilities should always be a consideration in tactical operations and are the main reason task organization of forces and combined arms operations developed. The majority of these leaders and combat veterans believe this organization's capability to bring enhanced combined arms capability into future combat operations reshapes the art of warfare at the company team level.

This analysis has captured the personal feelings of some of the Army's senior combat leaders with regard to capabilities, limitations, and the intangibles of combat operations. The results cover a wide range of issues and specific concerns, but in total, none eliminate the organization as a possible organizational solution to a specific tactical problem.

This analytical comparison between a current company team and a hypothetical company team indicates that the hypothetical company team experiences a reduction in the coefficient of variation in all measures. This indicates that for all the measures the new organization has less deviation relative to their means. That is the performance of the organization is more consistent. Consistent performance is perhaps surprising to consider in a combat organization. The analysis supports the conclusions that for all measures the hypothetical company team's performance is equal to or better than the current company team organization in a defense.

The analysis work established capabilities and limitations, documented the results of the Janus computer simulation experiment, and developed survey data. The final outcome of the simulation was a "battlefield victory" or a statistical victory. The final outcome of the survey

was favorable majority support from several combat command veterans. The analytical comparison shows the hypothetical company team possesses a fighting strength at least equal to or better than the current company team organization. The results of the personal interviews shows that the majority of respondents felt it was better than the current company team. The research shows that a hypothetical company team that incorporates armor, mechanized infantry, and aviation generates more lethality, mobility, and flexibility.

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[1]U.S. Army Field Manual 71-2, The Tank and Mechanized Infantry Battalion Task Force (Washington, DC: Government Printing Office, 27 Sep 1988), 1-3.

[2]U.S. Army Field Manual 71-1, Tank and Mechanized Infantry Company Team (Washington, DC: Government Printing Office, 22 Nov 1988), 1-8.

[3]Stephen Gould, Full House: The Spread Of Excellence From Plato To Darwin (New York: Harmony Books, 1996), 119.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

The objective of this study was to determine if a task-organized hypothetical company team consisting of Armor, Mechanized Infantry, and Aviation would generate more lethality, mobility, and flexibility for combat operations. The methodology to answer this question was a combat simulation experiment using the Janus model and personal interviews. The research methodology provided the answers to the research questions and supported the experimental analysis extremely well. The results of the research show the hypothetical company team consisting of Armor, Mechanized Infantry, and Aviation performed equal to or better than the current company team in both the simulation experiment and the personal interviews with senior combat command veterans. The research shows that the hypothetical company team organization could generate more lethality, mobility, and flexibility for combat operations and was more consistent with its performance than the current company team organization.

The organizational changes within the hypothetical company team maintained the performance level of the organization or improved the performance for some measures as determined by this research. The results support the incorporation of attack aviation as an integral part of a company team based on the mission requirements. Although this organization is task organized for the situation, it does possess unique capabilities that provide the commander improved lethality, mobility, and flexibility to impose his will upon the enemy.

Does the organization enhance a company's ability to maneuver and engage enemy forces ?

The proposed organization, the research indicates, does enhance a company's ability to maneuver and engage enemy forces. The addition of the helicopter and its capabilities within the company team assembles varying and asymmetric threat. This type of asymmetric threat forces the enemy to attack an array of combat power deployed in depth across the battlefield. Maneuver warfare of this type causes a major problem for the enemy. It brings closer into balance the triad of firepower, protection and maneuver at the company level. It generates a positional advantage for the company team by generating a multidimensional threat to the enemy. This varying threat forces the enemy to make constant decisions and reactions to these variables. These dynamics all appear to have a positive influence on fire and maneuver for the company team that supports the overall objective of maneuver warfare. This new multidimensional threat generates a position of advantage in time and space that supports the destruction of the enemy. The result is an enhanced and consistent ability to maneuver and engage enemy forces with fewer weapons systems engaged in the operation. The challenge will be enhancement of the mobility of the organization using better command and control systems to support situational awareness and flexible control measures.

How capable is the organization in engaging enemy forces?

The hypothetical company team provides a unique capability to engage enemy forces in a three-dimensional and asymmetrical engagement. This lethal capability is comparable in combat power to the current company team organization but changes the characteristics of the engagement significantly. It achieves similar overall effects in lethality on the enemy as the current organization, with the analytical results indicating a more consistent performance during the various test engagements. This finding of consistency in lethality appears to be a unique

measure of effectiveness in this research. The research says the hypothetical company team is as lethal as the current company team but it does not experience as much variation in its lethal effects. Simply stated the hypothetical company team killed the same number of enemy forces as the current company team but did it more consistently. There is no statistical difference in the lethality of the two units other than consistency in performance. This consistency in performance therefore supports the theory that the hypothetical company team is more capable in engaging enemy forces. This consistency measure of effectiveness brings into light a possible new tool to look at combat performance and measure it. This measure of consistent effectiveness also changes the weight of "mass" as currently understood, to something analogous to a uranium round. The consistency result changes the characteristics of mass making the new organization very capable of acquiring enemy forces and more capable of achieving the expected results.

How capable is the organization of acquiring enemy forces?

The research shows that the organization is more capable of detecting enemy forces with sensors and human eyes than the current company team. The aircraft sensor and altitude capabilities reduce some of the effects of the terrain by creating a three-dimensional view of the battlefield for both the company commander and the pilot. This ability to see the battlefield provides the commander with important tactical information to support the effective engagement of the enemy. Each weapons platform provides an ability to see the enemy both electronically and with human eyes that support the creation of an accurate and three-dimensional battlefield view. This visibility sets the conditions to allow the commander to shift combat power and react to the dynamics of the battlefield. This improved visibility could also support improving the situational awareness of higher levels of command.

In this simulation experiment, the hypothetical company team achieves a significant improvement in its ability to electronically detect enemy forces over the current company team.

Red forces also benefit to achieve a significant improvement in detection capability but not a superior improvement over Blue forces. Overall, the study shows that the hypothetical company team possess a 12.7 detection advantage over the enemy. This fact creates a tremendous opportunity with precision targeting, shared firing data, and precision munitions. The synergistic effects could provide a revolutionary strategy for massing fires. This product is a direct result of the ability to electronically detect with sensors the enemy forces on the battlefield and then engage them. The human element clearly adds the acquisition of knowledge from the vision of the battlefield and supports the three-dimensional visualizations through the command from foxhole to theater commander. The hypothetical company team does possess a significant capability to detect enemy forces, as well as generating an improved enemy ability to detect the force.

Does the organization support flexible force tailoring?

The organization supports flexible force tailoring because it is task organized for the mission and comes from a divisional and brigade structure. The organizational structure is an asymmetrical foundation of three and uses a cellular concept to assemble a capability for a particular mission. The platoon of threes is a small organization that supports the building of combat power geometrically, which facilitates quick communications and future exchange of data transmissions within a unit. This structure is one module of a combat organization that supports tailorability based on the mission. The organizational capability for this research is based on resourcing at 100 percent and maintenance at 100 percent; further study is required to determine the authorization requirements to support this operational availability. The company is a self-contained organization that is task organized for a specific mission. It provides a nucleus of combat power within brigades and divisions to support flexible force tailoring and

further expansion of the force as the mission requires and time allows. It supports the unpredictable requirements of the twenty first century battlefield.

The key to flexible force tailoring is as the Germans called it the "Einhert" principle. That is standard units that are independent and self-sustaining. This concept supports the demands of moving and fluid situations to make quick adjustments. The future battlefield will present much the same challenges. Challenges that have various requirements. These varying requirements can and should be supported by a small, self-contained, capable, and flexible organizational cornerstone of an enhanced company team.

Certainly this organizational strategy supports flexible force tailoring, since it is a self-contained task-organized company unit with less major weapons systems and more self-deployment capability of the unit itself. It is part of a divisional structure that is beyond the scope of this experiment but was extrapolated to research the sustainment and command and control issues. A possible division structure is presented in table 9. Since it is brigades and divisions that have the capability to plan and sustain operations through their staffs, the company team still relies heavily on higher headquarter's planning and sustainment operations.

The availability of unit resources and unit readiness impact directly on the ability to tailor a force for combat operations. An organization today must be resourced to provide its intended capability, or it becomes a force projection burden. Defense planners at the highest levels must be able to select capability in a timely manner without scrambling to fix the individual shortfalls of resource corner cutting. Robbing capability from other units throughout the Army cannot continue to be a feasible option as the organization gets smaller due to fiscal constraints. This deployment resourcing also provides resources in an environment where time to train is limited or none. Timely force projection operations and the demands for the future battlefield support total resourcing of units or modules of capability. This organization provides

that type of modularity by building and training with smaller multifunctional units that can support flexible force tailoring.

Does the organization possess the capability for increased optempo, lethality, and mobility?

The organization possesses improved capability in the characteristics of increased optempo, lethality and mobility. Commanders always seek to control the pace of events to gain or maintain the initiative. Tempo, however, is not just speed; it is the pace of events. Tempo is controlling or operating in time to achieve your purpose as well as the ability to set or control the pace of operations. Results obtained for this experiment indicate that the tempo of this battle was statistically equal to the current organization. This battle is of limited duration and had a specific purpose. To support this organization for longer periods of time is going to require flexible logistics and maintenance operations that support maneuver and fix resources in the rear. What is also still unclear is the human impacts on optempo with this organization. Still at issue are the human responses and limits both friendly and enemy to the operations of this unit. The battle with the various systems generates a multidimensional warfare that requires quicker decision making and offers less security in and among the terrain. How will human beings react? This study does determine the organization possesses improved capability in the characteristics of increased optempo, lethality, and mobility in the conduct of combat operations.

Lethality between the two organizations is also statistically equal. Both organizations killed all the enemy forces over the same period of time. Significant for consideration is the measure of Blue hits and the fact that there is a statistical difference between the two organizations. The current company team obtains more hits than the hypothetical company team, but not statistically more kills or statistically less combat time. These additional hits do not contribute significantly to greater lethality for the current company team organization. This

seems to be a result of the impacts of terrain and contributes to the variance in performance across all measures of effectiveness for the organization. The data and research indicate the hypothetical organization is as lethal and more consistent in performance than the current company team.

The hypothetical company team possesses enhanced mobility over the current company team. This is first evident by the speed and agility of the aircraft and second by its ability to overcome terrain obstacles. The highest speed of the weapons platform in the hypothetical company team is 259 kilometers per hour. The highest speed of the current company team is 66 kilometers per hour. This is a significant improvement, but it does not stand alone. The company moves as a unit, but the speed of the aircraft, its firepower, and its agility can support an improved environment of security for the unit over terrain and distance. It thus could support improvement in the potential average rate of advance for the unit in total.

There is also a new aspect to the measure of mobility that is added to the operational ability of the unit with the addition of the aircraft. That is the factor of multidimensional warfare. The aircraft being highly mobile and unencumbered by the terrain poses a potential threat to the enemy from a variety of locations. This enhanced mobility and firepower provide the company team more accurate direct fire capability that is extremely effective against an attacking enemy. This enhanced mobility also has synergistic effects and enhances the measure of sensor detections. The effect seems to be reflected in the study data with the increased number of detections. This increase in detection's would improve the commanders ability to orient on the enemy. Since mobility is a product of such things as quick decisions, anticipation, movement, and agility, the hypothetical company team possesses tremendously enhanced mobility. This mobility is directly reflected in the organization's ability to visualize the battlefield, move more freely on it, and conduct operations with increased agility. The result is

the organization is more mobile than the current company team organization and benefits tremendously from it.

The study shows that the hypothetical company team possess the improved capabilities of increased optempo, lethality, and mobility over the current company team organization. The addition of the aircraft and the combined arms approach within the organization enhances the commander's ability to influence the pace of operations, by generating lethality, and move weapons systems on the battlefield to achieve success.

Command and control is a major factor in the operations of all combat organizations. The integration of aviation down to the company level has both advantages and disadvantages for the command and control system and process. During this operation the hypothetical company team would have possessed significant advantages in the areas of fratricide reduction, local airspace coordination, and situational awareness. The fratricide risk should be smaller by the fact that the aircraft would be operating on the company command net and at the direction of the company commander. For direct-fire weapons that support the control of fires in and around maneuvering forces and the ability to establish effective fire control measures. Currently when aircraft operate in and around friendly forces, the aircraft are operating under the command and control of the brigade or maybe the battalion and operate on those command radio nets. The majority of the aircraft are on preestablished internal frequencies that are often the aviation battalion or company frequencies. The aircraft arrives on station, must orient to the operation, and obtain situational awareness on the disposition of forces and the combat activities. They must also obtain awareness in relation to the operational plan that may or may not be working, based on combat conditions. This presents an increased risk for the operation which airspace command and control measures attempt to manage. The continuing challenge is that Army aviation assets are direct fire weapons platforms and can engage targets across unit boundaries

and are not doctrinally considered indirect fires although the pilot may have no more situational awareness of the disposition of friendly forces than a howitzer unit. An aircraft arriving on station in a combat operation around friendly forces with the freedom of direct fires is in a doctrinal gray area between command and control measures, fire control measures, and airspace command and control measures. This gap presents great risk to friendly forces and successful combat operations.

The speed and maneuverability of the aircraft were greatly restricted by company boundaries if the boundaries are used to restrictively control the movement of aerial maneuver and not the effects of its fires. This study showed that an aircraft can traverse a company area very quickly and may need to maneuver over two company areas in order to provide effective fires in the company's battlespace. This obviously changes the nature of command and control and could put new command and control burdens on the battalion and higher command and control nodes. This type of movement over units requires command and control that focus on fires and not the restriction of movement to control fires. These types of command and control processes may soon be available through the use of new digital technologies. Command and control technologies that support the free flow of the battle may serve to further support this type of hypothetical organization and may further serve to meld the elements of fire and maneuver facilitated by the echelons of command and control.

New digital communications offer tremendous opportunities to operate units of varying capabilities over the battlefield. Improved situational awareness and the ability to share firing data among weapons platforms are revolutionary in what they offer a unit organized for combined arms' operations and operating on a faster optempo. The integration of digital technologies and the concept of shared firing data create the opportunity to achieve even more synergistic effects from fires and systems. This variety of capabilities supports the technological

networking of shared firing data from systems, such as longbow radar and ground-based weapons platforms. These abilities to fire and maneuver within a communications architecture that shares firing data are indeed the beginning of a revolution in warfare. The potential to mass fires on the enemy from any weapons system from various locations is remarkable. This discussion is a next logical step from the integration of these assets, their capabilities, and new technologies.

This study has determined that a hypothetical company team consisting of Armor, Mechanized Infantry, and Aviation could generate more lethality, mobility, and flexibility for combat operations. It also supports a new concept to exploit digital technologies bringing fire and maneuver effects on the enemy while creating an environment of multidimensional warfare to create confusion and cause the destruction of enemy forces. The organizational changes provide equal or improved capabilities to the hypothetical company team organization and support the generation of improved lethality, mobility, and flexibility for combat operations.

Recommendations

This thesis has explored the possibility of a hypothetical combined arms company team and concluded that indeed it can generate many advantages to support combat operations. The organizational strategy that supports building units such as this is not new to the Army; it is merely task organization. This old concept needs expansion to encompass today's more complex threats and the formation of capabilities-based organizations to meet these threats. Today, all of the aspects of operational planning requirements, capability, and time require precise synchronization to meet the needs of the national security strategy in a global environment. The Army of the future must have the capability to quickly tailor forces to meet national needs.

What is clear from this research and others like it is that combined arms operations at the lowest level produce significant combat capability and is required to achieve success on the modern battlefield. New information age technology seems to provide solid technical support to

a more fluid movement of forces on the battlefield and the control of fires and their effects. The Army should explore the battlespace issues of controlling fires and supporting movement within the scope of the new technologies and maneuver as they are evolving today. This issue alone encompasses a revolution in warfare through the ability of weapons systems to share and exploit firing data. This technical process supports the "selection" of the weapons system to fire by the probability of success and it is the next logical step to this technical process. In this targeting process the whole process occurs in seconds through the power of the computer, and the results are an enemy who cannot know where his threat is coming from directly. The result is multidimensional warfare.

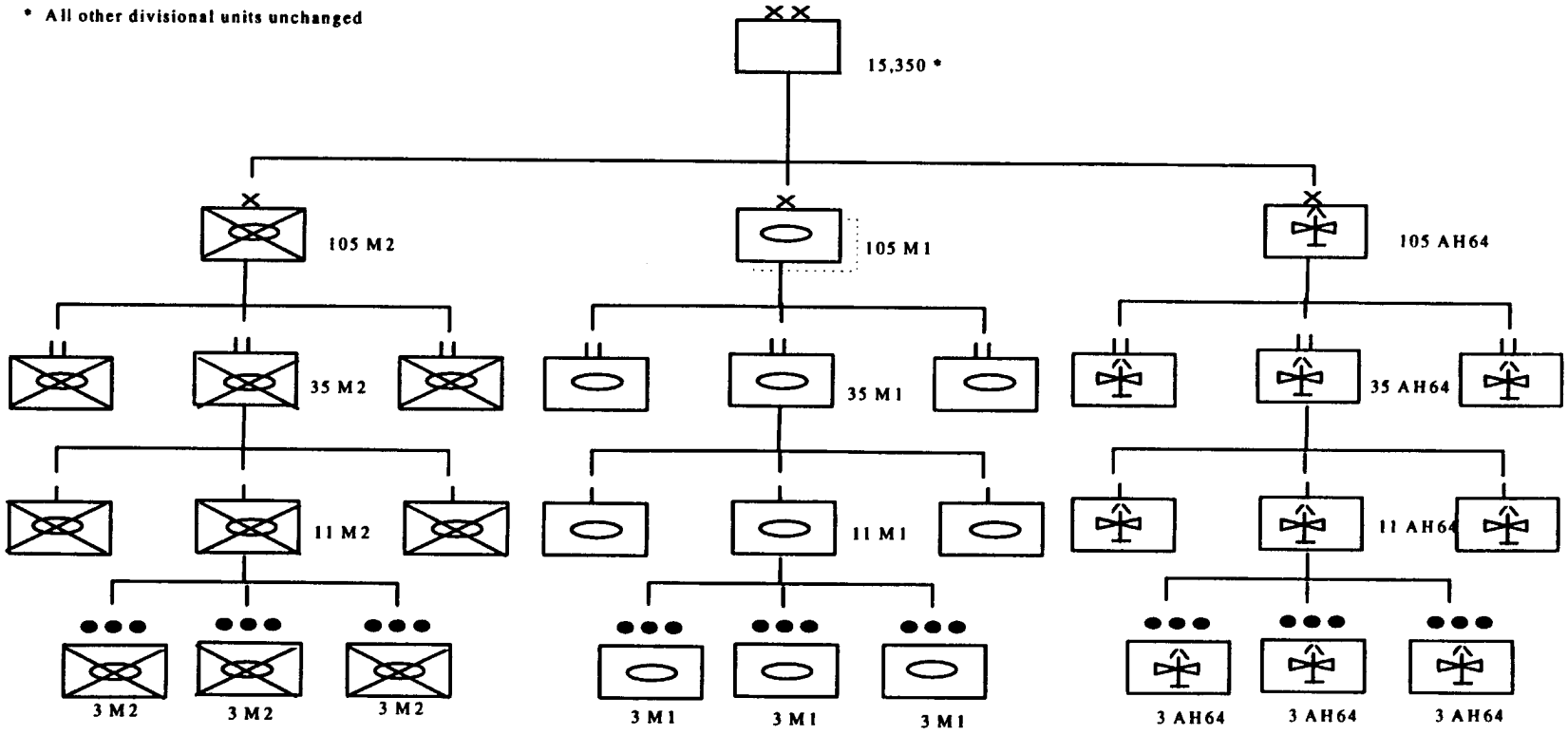
The Army should conduct a bottom-up review to revalidate all requirements and capabilities within the force structure, to ensure applicability into the future. This review would then solidly support the future division and corps structures. It should be all encompassing to ensure all dollars go to compatible and interoperable systems.

The strategy for the threat must be established in Army doctrine. The Army must accept that today's enemies are part of a spectrum of possible forces. With this the Army can adopt a design methodology that deals with today's enemies that are one standard deviation around a potential great armor threat and build modular capability into divisions that can support and enhance the Army's ability to defeat it.

It is essential in today's world that the Army organize to maximize flexibility and capability into all operations. The Army should embrace a doctrinal strategy of capabilities based organizations to meet mission requirements, and maximize combined arms operations at the lowest level possible. Commanders should consider task organizing attack aviation forces into the company team if it supports the operation and not exclude it because of doctrine. Perhaps it is time for a new task-organized company structure for the future. A force structure

strategy that is like tools in a tool box that come together to tackle a particular job. An organizational strategy that organizes in light of what is known about possible enemy capabilities and what is known about U.S. Army capabilities. This new organization is a hypothetical company team composed of armor, mechanized infantry, and aviation forces.

Table 9. Hypothetical Division Structure



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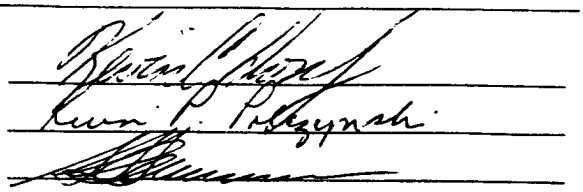

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