REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY *(Leave blank)*	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	17 DECEMBER 1999	MONOGRAPH

4. TITLE AND SUBTITLE
Expanding Battlespace and the Integration of Air Ground Operations on the Tactical Battlefield

5. FUNDING NUMBERS

6. AUTHOR(S)
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7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
School of Advanced Military Studies
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8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)
US Army Command and General Staff College
Fort Leavenworth, K 66027

10. SPONSORING / MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION / AVAILABILITY STATEMENT

APPROVED FOR PUBLIC RELEASE.
DISTRIBUTION UNLIMITED.

12b. DISTRIBUTION CODE

A

13. ABSTRACT *(Maximum 200 words)*
SEE ATTACHED

14. SUBJECT TERMS	15. NUMBER OF PAGES 62
	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	UNLIMITED

EXPANDING BATTLESPACE AND THE INTEGRATION OF AIR GROUND OPERATIONS ON THE TACTICAL BATTLEFIELD

A MONOGRAPH
BY

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First Term AY 99-00

SCHOOL OF ADVANCED MILITARY STUDIES

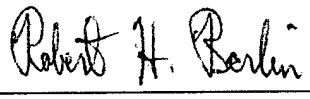
MONOGRAPH APPROVAL

Major James W. Danna III

Title of Monograph: *Expanding Battlespace and the Integration of Air Ground Operations on the Tactical Battlefield*

Approved by:

LTC Kim L. Summers, MA — Monograph Director



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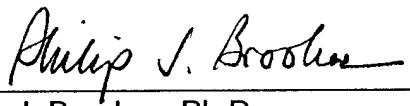

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Accepted this 17th Day of December 1999

ABSTRACT

EXPANDING BATTLESPACE AND THE INTEGRATION OF AIR GROUND OPERATIONS ON THE TACTICAL BATTLEFIELD by MAJ James W. Danna III, USA, 58 pages.

United States Army doctrinal developments of the last twenty years, initiated by Airland Battle concepts, along with technological developments have resulted in increased battlespace of the ground force commander. This increase in battlespace encompasses the dimensions of both time and space. Greatly increased detection and engagement ranges allow the commander to see farther and thus attack the enemy at a much greater distance in relation to the friendly maneuver forces. This increase in the dimension of space has been accompanied by a corresponding decrease in the dimension time. The ground commander can now acquire and target the enemy at a much faster rate than previously possible. The Theater Air Control System (TACS) was designed to synchronize air and ground operations into an integrated scheme of maneuver. Adjusting TACS procedures is required in order to respond to the current threat environment. This study analyzes the current structure of the TACS system and makes a recommendation to adjust the emphasis from mass to time. The emerging technologies of the information age combined with a non-hierarchical command and control system allow for a system designed to take advantage of the dimension of time, with the objective to create an operating tempo to which the enemy cannot react. The overall effect is to create a system (TACS) based on preemptive as opposed to concentration tactics. The significance of this is more than just semantic subtleties. Besides creating a system that allows for the maximization of advanced technologies, a TACS based on preemptive tactics focuses on a key tenant of warfare: the enemy gets a vote. The importance of this change is it takes into account the probable characteristics of future threats for the next twenty years as well as the direction current force structures are moving.

TABLE OF CONTENTS

Chapter 1

Introduction

> New weapons of warfare call for the total and radical reorganization of *methods* of warfare, and he who falls asleep during this process may never wake up. - Mikhail Tukhachevsky

United States Army doctrinal developments of the last twenty years, initiated by Airland Battle concepts, along with technological developments have resulted in increased battlespace of the ground force commander. This increase in battlespace encompasses both the dimensions of time and space. Greatly increased detection and engagement ranges allow the commander to see farther and thus attack the enemy at a much greater distance in relation to the friendly maneuver forces. This increase in the dimension of space has been accompanied by a corresponding decrease in the dimension time. The ground commander can now acquire and target the enemy at a much faster rate than previously possible.

The monograph posits a simple question: does the expansion of battlespace require a change in the current Air Ground Operations System? The objective of this monograph is to determine whether or not the dynamics created by expanded battlespace of a United States Army

corps commander require a change in the current Air Ground Operation System (AGOS). Mikhail Tukhachevsky, the early twentieth century Russian military theorist, in the passage emphasizes the need for reorganization of methods not the weapons of warfare. That is precisely the focus of this monograph.

The research methodology employed in this monograph is a historical comparison and contrast. The structure of the monograph is broken into four parts. The first section introduces the research question and establishes the historical settings of the problem. The purpose of this section is to frame the problem and establish the parameters of the argument. The second section examines the development of air power from its inception as a military arm of service in 1914 until the end of the Cold War in 1991. The purpose of this section is to establish a baseline understanding of current Air Ground Operations. Additionally, this section reviews the development of the Army's Airland Battle doctrine in order to explain the Army's viewpoint on the role and usage of air power in support of ground combat operations.

The third section analyzes the Air Ground Operations System (AGOS) in the realm of traditional and expanded battlespace. The purpose of this section is to determine

the effects the dynamics of expanded battlespace have on current air ground procedures. Finally, in the fourth and concluding section the implications of the research findings are discussed in relation to current concepts, doctrine, and procedures.

Definitions

One of the problems of Joint doctrine is the continuity of terms among the services. Terms that have different meanings confuse the effort of integration and harmony. For the purpose of clarity the following definitions have been established. The terms defined below are used consistently throughout this monograph:

Battlespace. The conceptual physical volume of space in which the commander seeks to dominate the enemy. It expands and contracts in relation to the commander's ability to acquire, and engage the enemy. It encompasses three dimensions and is influenced by the operational dimensions of time, depth, tempo, and synchronization. It is not assigned by higher headquarters nor is it constrained by assigned boundaries (United States Army Field Manual, 101-5-1).[1]

Traditional Battlespace. Defined by the parameters of a United States Army corps commander from the World War II until the early 1980s. The physical space is defined by

the maximum effective targeting and engagement systems organic to the corps: Approximately 20-30 kilometers in depth and width[2]. The dimension of time is defined by minimum information processing systems that are characterized by stove piped vertical communications systems with emphasis on analogue and human data processing. Information processing is characterized by days as a measure of time.

Expanded Battlespace. Defined by the parameters of a United States Army corps commander from the early 1980s until the present. The physical space is defined by the maximum effective targeting and engagement systems organic to the corps: Approximately 200-300 kilometers in depth and width[3]. The dimension of time is defined by maximum information processing systems that are characterized by horizontal communications systems with emphasis on digital and distributed data processing. Information processing is characterized by hours as a measure of time.

Theater Air Control System (TACS). Air Force system designed to perform centralized planning and control that facilitates decentralized execution of all air component operations. The key function of TACS is to ensure that the aerospace and ground schemes of maneuver are properly integrated.

Air Ground Operation System (AGOS). Joint Air Force and Army system responsible to provide the ground commander with the means for receiving, processing, and forwarding requests of subordinate ground commanders for air support missions and for rapid dissemination of information and intelligence.

Air Tasking Order (ATO). Methods used to task and disseminate to components, subordinate units, and command and control agencies projected sortie/capabilities/forces to target and specific missions. Normally provides specific and general coordinating instructions and published on a 24-hour recurring basis.

Limitations and Delimitations

The dynamics of battlespace and its effects on military operations encompasses a broad topic area. This study focuses on the tactical level of war, with the ground force commander being defined as a United States Army Corps Commander. The monograph does not focus on the operational level of war and the potential dynamics between a Joint Task Force Commander (JTF) or Joint Forces Land Component Commander (JFLCC) and his Joint Air Forces Component Commander (JFACC) counterpart. This is not to suggest that the battlespace dynamics at the operational level are not an important aspect of this issue. On the contrary, it

represents an integral and logical component of the tactical argument being presented here. However, that argument can not be examined in the required depth and scope in the framework of this monograph.

Historical Setting

The expansion of battlespace due to new and emerging technologies is not unique to the late twentieth century. One of the most dramatic examples of this phenomenon is the 1940 battle of France. The emergence of Blitzkrieg in Western Europe ushered in a new style of warfare marked by increased tempo of operations. W. Gordon Welchman, writing for *Mitre Corporation*, a defense think-tank, described Blitzkrieg as one single dominating idea - speed of attack through speed of communications.[4] The Germans were able to conceptualize and organize the emerging technologies of armor, wireless radio communications, and airpower combined with the traditional military virtues of speed, surprise, and continuity of operations.[5] This resulted in a short, quick defeat of Allied forces (French, British, Belgian, and Dutch). The most important aspect of the German operations were its timing and tempo, both rapidly increased due to the new technologies.

The battlespace of the German commander's had expanded dramatically, particularly the dimension of time, which had

a compression effect. This dynamism of expanding battlespace effected the employment of air power in two different ways. First, the rapid movement of large German mechanized forces through the restricted Ardennes Forrest created a space problem on the battlefield. Simply put, not everything could be brought to bear at the decisive points (Muese River crossings at Sedan and Dinant) at the critical times. The traffic congestion on the narrow roads of the Ardennes Forest combined with the effects of restricted terrain prevented German artillery from moving into positions to support the crossings. The Germans overcame this time/space problem by employing their Air Force (Luftwaffe) as "flying artillery" to support the river crossings[6]. The Luftwaffe was able to transcend the traditional operating limits imposed on surface forces by the terrain and apply the effects of firepower at the critical place and time[7].

The second effect of airpower employment use was in Allied planning factors. The Allies failed to account for the speed and tempo mechanized forces could achieve. Thus their developed plans that proceeded at a much slower, traditional pace.[8] Again, this is particularly highlighted in the assault crossings of the Meuse River. Allied commanders estimated it would take the Germans four to six

days to move from their initial positions inside Germany to reach the Meuse River and begin assault crossings. The plans called for airpower to destroy the Germans as they conducted the river crossings. The increased tempo of the battle shattered these plans. Lead units of the German armored forces, elements of Panzer Group Kliest, reached the Meuse in only 2 days, and had established and consolidated the crossings[9]. By the time the Allied planes arrived over the Meuse, (on day four) the Germans were prepared and waiting for them. Allied air losses were high, and the river crossings continued unimpeded. A German officer on the scene chastised a downed Royal Air Force (RAF) pilot. His comments are insightful to the nature of the Allied problem: "You British are mad! We capture the bridge early Friday morning. You give us all Friday and Saturday to get our Flak guns up in circles all around the bridge, and then on Sunday, when all is ready, you come along and try to blow the thing up."[10]

This historical example illustrates two points, the flexible nature of air power and the penalty of its untimely employment[11]. In what ways can the United States today adjust AGOS procedures in order to safeguard against failures such as the 1940 Muese River crossings? Specifically, what effects does advancements in automated

data processing (ADP) systems have on the current air ground operations system (AGOS)? And do these effects require a change in current AGOS procedures?

Future Joint Operations

The strategic security situation of the post cold war world offers many diverse challenges to the American armed forces. The roles and missions of each service is being closely examined in order to develop the right force structure in order to best meet these security needs. Airpower, with its responsiveness, flexibility, range, speed, and versatility represents one of the most flexible and versatile components of American combat forces. Airpower is capable of transcending many of the normal operating limits imposed on surface forces. Airpower is a key factor when attempting to overcome the compressed dimension of time in today's expanded battlespace.

The current principle for the employment of airpower in support of ground operations has its roots in the Second World War: summed up as centralized planning and decentralized execution. Examination of the validity of this principle represents the crux of the research question.

The increase in battlespace has changed the traditional geometry of the battlefield. The increase in

battlespace has created a dynamic, yet potentially disrupting effect between the ground and air component commanders. By its nature, battlespace imposes geometry on the battlefield.[12] Historically, this imposed geometry caused little friction on the battlefield. Traditionally, shallow ranges of detection and engagement systems combined with minimum information systems resulted in the ground force commander waging battle at limited ranges from the forward edge of the battle area (FEBA).[13] Ground commanders had little ability to influence enemy activity beyond the forward line of own troops (FLOT) in order to create conditions that shaped the close fight. This resulted in deep battle planning responsibility shifting primarily to the Air Force.[14]

Two developments are altering this traditional battlefield geometry: information system technologies and non-hierarchical command and control systems. First, the development of information systems has given the commander the ability to process data at exponentially faster rates. This dynamic is speeding up the commander's decision making cycle. Second, non-hierarchical command and control structures are having a "power down" effect on operations. Specifically, information from national and theater level intelligence systems are now available directly to the

tactical commanders. This increases the "reach" a tactical commander has on the battlefield.[15] The tradition of the Air Force with primacy on deep operations is being challenged. These two developments are having a dynamic effect on the air ground operations system (AGOS). The dynamics created by these developments warrant a close examination of the air ground operations system.

Chapter 2

History of Air Power Development

World War I

In order to examine the role of the Air Ground Operation System (AGOS) in an expanded battlespace environment, a brief review the history of air power development and the events that led to the establishment of the current system is required. The purpose behind this historical review is simple: in order to conduct an analysis of the current system one must understand the background and reasons how it was developed. The current system was not developed haphazardly or overnight. It is the result of over 70 years of combat experience and technological developments. This review provides the necessary information that allows for synthesis and articulation of the argument in finding the answer to the research question.

The history of air power in military operations dates back to 1914 and the outbreak of World War I. The dominant theme in this period among all military powers (to include the United States) was simple: employment of air power as an extension of the land battle.[16] The airplane was viewed as another arm of service (in the same manner as infantry,

cavalry, artillery, engineers, etc.) and was employed as such. Reconnaissance was the primary mission acting as the eyes of the battlefield commanders, much like the balloonist in the American Civil War. As the battles in Western Europe unfolded in the years between 1914-1918 the role of the airplane developed into two additional roles, the bomber and the fighter.

The success of the airplane as a reconnaissance platform led to the role of the fighter aircraft. Aircraft were employed specifically to attack and destroy enemy reconnaissance aircraft in a counter reconnaissance role. Additionally, aircraft dropping ordnance proved to be very effective, thus increasing the range of the commander's fire support. Thus the role of the bomber, or flying artillery was developed. The success of the airplane in these roles was the genesis of modern air power theories of today: that air power could make a significant contribution to the war effort independent of ground operations.[17]

Interwar Years

The inter war years (1919-1939) saw the debate on the independent air power idea intensify. Men such as Italian theorist Giulio Douhet and American General Billy Mitchell put forth concepts that shifted the emphasis of air power away from the tactical battlefield to targets throughout

the enemy's depth. To support this new role for air power, it was argued that all assets should be placed under centralized command and control.[18] The idea of centralized command and control of air forces took on great importance in the backdrop of the command structure debates going on between the Army and the Navy in the late 1930s early 1940s.

Command Structure Debates 1940-1942

Simultaneous to the arguments concerning the roles and missions of airpower during the interwar years was the command structure debates between the Army and the Navy. The doctrine of command structure centered on the different positions put forth by each service (Army and Navy): mutual cooperation or unity of command.[19] Mutual cooperation stated that no single commander would be in charge of Army and Navy forces, and that the services were expected to cooperate in any Joint effort.[20] This was the official command structure of the War Department at the outbreak of World War II. This doctrine soon proved inadequate to the task of combat operations in all Major Theaters of Operations during the war. The doctrine of unity of command was adopted. Unity of command organized all forces in a Theater of War under a single commander. The unity of command doctrine stated:

> The [single] commander has the authority to direct the operations of the Army and Navy elements of his command by assigning them missions and giving them objectives. During operations, he could exercise command and control as would insure success of the common mission. He could also organize task forces. He could not issue instructions to the other services on tactics, nor could he control its administration or discipline, nor issue any instructions beyond those necessary for effective coordination.[21]

The Army Air Corps (AAC) used the Army-Navy command structure debates as a vehicle to further enhance the position of an independent air force. It is important to remember that the Army Air Corps was still a subordinate organization of the Army during this period. The Army Air Corps wanted a separate role in any command structure, but the War Department was initially opposed to any reorganization of the Army Command structure. General George C. Marshall, Chief of Staff of the United States Army realized the immense requirements of organizing and managing the war efforts for a global conflict, recognizing the need to examine the role of the Army Air Corps in the command structure debates.[22] At the insistence of General Henry H. (Hap) Arnold, Chief of the Army Air Corps, General Marshall organized a commission to study the problem. The result was the creation of three separate commands within the Army: Army Ground Forces Command, Army Air Forces Command, and Army Service Forces Command. The Army Air

Corps now had expanded the issue of independent employment of air power significantly.

World War II Experience

The first practical application of the new command structure was tested in the North African Campaign in November 1942. Operation Torch, the invasion of North Africa, November 1942 represented the first test of the doctrine of unified command in World War II. While the overall operation was a success, Army Air Corps support doctrine had not yet matured and what doctrine did exist was often improperly employed.[23] General Dwight D. Eisenhower, commander of all Allied Forces during Operation Torch was not happy with the poor performance of air support during the operation. The air support system called for dividing air support assets among the various ground units resulting in a decentralized, often uncoordinated, piecemeal effort.[24]

As the war progressed the command structure of Army Air Forces changed. The dissatisfaction of the role of air power in the North African Campaign led to the creation of a new doctrine and organization by mid 1943.[25] The new doctrine was codified and expressed in Field Manual 100-20, *Command and Employment of Air Power*. The thesis underlining Field Manual 100-20 is that air and land power

are equal and interdependent forces. Additionally, it outlines three principle missions of air power: air superiority, air interdiction, and air support. FM 100-20 established two baseline principles: centralized command and control and the separation of tactical and strategic air forces. The premise of centralized command and control is summed up as follows:

> ... inherent flexibility of air power is its greatest asset [and this] flexibility makes it possible to employ the whole weight of available air power against selected areas in turn. Control of available air power must be centralized and command must be exercised through the air force commander.[26]

North Africa represents the experiences of only one Theater of Operation during World War II. The lessons learned from North Africa effected the use of air power for the remainder of the war. The dissatisfaction with decentralized control and parceling out of air power in the North African Campaign played a large role in the development of an independent Air Force and it represents the foundation of current Air Force doctrinal principles.[27]

Post World War II Developments

The National Security Reorganization Act of 1947 officially established the independence of the Air Force from the Army. The three major points of the legislation

are the established frameworks for three service command structures (Army, Navy, and Air Force), it formalized the unity of command doctrine developed during the war, and it established the Air Force as a separate service.[28] In addition to the reorganization of the armed forces, the security environment of the United States took on a vastly different aspect in the post World War II era. The cold war confrontation with the Soviet Union on a global scale accelerated the roles and missions of the newly independent Air Force.[29]

Technology developments, particularly nuclear weapons, long-range jet powered aircraft and guided missiles led the Air Force to focus on the mission of strategic attack. The primary threat to the United States during this period was a strategic nuclear attack by the Soviet Union (using long-range bombers and missiles). Based on the nature of the threat the Air Force was designated the service to best respond. Strategic Attack became the top priority for the Air Force. Integration of airpower with ground operations took a second priority within the Air Force.

The Korean War (1950-1953) gave the first combat test to the unified command structure codified under the National Security Reorganization Act of 1947. Of importance is the resurfacing of some of the same issues

from World War II concerning air support of a land campaign. Specifically, centralized command and control of air power in a theater of war. The first months of the Korean War were marked by non-unity of effort among the Services. This is particularly true in the Theater command structure. Primarily Army personnel staffed General Headquarters, Far East Command. The Headquarters lacked a Joint representation and thus concerned itself with primarily land operations.[30] Both the Air Force and the Navy, with little coordination and integration between the two, executed air operations in the Korean Theater. The results were a disunity of effort. Historian Robert F. Futrell summed up the issues as follows:

> Belatedly, at the end of July [1950] improved procedures brought some order to the fantastically confused command situation in the Far East...Certainly, at the outset of the Korean War, the defective theater command system prevented the fullest employment of airpower...[31]

While the Korean War again highlighted the issue of centralized command and control of air power it also led to the development of specific procedures of integrating air support to the land campaign.[32] This is the beginning of the current Air Ground Operations System (AGOS) in use today. This system, originally used in World War II called

for pre planned sorties, backed up by "on-call" alert aircraft, all in close coordination with ground forces.[33] This system was maintained and used during the Vietnam War (1965-1975).

During the Post World War II period the Army also begins development of rotary wing aviation as a possible replacement for air support to ground operations.[34] This development is spurned on by two issues: the Army's experience of the Cold War (i.e. prioritization of the strategic attack mission by the Air Force) and the experiences of the Korean and Vietnam Wars.[35] The issue of rotary wing aircraft development remained at the forefront of an ongoing Army-Air Force battle of air support to land operations. The debate is highlighted by a series of agreements between the Army and the Air Force beginning in 1949 through the early 1990s.[36]

Airland Battle Developments

The experiences of Korea and Vietnam can be defined as limited war. These wars did not require the United States to expand its full military power in order to achieve success on the tactical battlefields. War with the Soviet Union, on the other hand, was a different story. The years following the Vietnam War saw the Army refocus its efforts on confronting the Soviet Union in Western Europe. In

order to offset the quantitative superiority of the Soviets and adhere to political realities a new doctrine was developed: Airland battle.[37] Airland battle doctrine called for the integration of ground and airpower into a synergistic effort in order to defeat the Soviet threat. Primarily offensive in nature, airland battle doctrine envisioned attacking the enemy throughout the depths of his formations. Airland battle doctrine divided the battlefield into a deep, close, and rear framework. While the close battle still represented the decisive operation in the overall situation, the key to success was the integration of operations in depth (deep fight).[38] As airland battle doctrine was being implemented in the early 1980s, the Army did not have the systems, both detection and engagement, to execute the deep fight on its own.[39] Thus the primacy of the deep battle went to the Air Force. This has become the crucial issue that shapes the relationship between the two services. The Army viewed the support of the Air Force vital to its ability to execute its mission of defeating the Soviet Union in Western Europe. The Air Force, however, had a different view. Although happy with both the offensive spirit of airland battle doctrine and the premium it placed on airpower, it still tied the Air Force to supporting of the Army.

As the Soviet threat in Western Europe receded with the end of the cold war in 1991, the relationship between the Army and the Air Force took a new turn. The nature of the threat, no longer the quantitative superior Soviet forces, had changed dramatically. The threat now was a series of much less capable opponents. The integration of airpower in ground operations was not as important.[40] Along with the decline in the Soviet land power in Western Europe came the reduced threat of Soviet strategic nuclear attack. The Air Force now had flexibility in its missions. With strategic nuclear attack and tactical battlefield support to the Army being reduced by the decline of the Soviet threat, the Air Force began to push the idea of an independent Air campaign.

Post cold war experiences

The Air campaign concept stated that the independent application of airpower could achieve strategic objectives. This concept was not new. The debate is as old as airpower employment itself. The Italian theorist, Giulio Douhet in his inter-war book, *Command of the Air,* put forth the concept of airpower attacking independently (i.e. not in support of ground or naval forces). Douhet called for directly attacking the enemy's sources of power (population, national command authority, food supplies,

industries, etc.) as a method of achieving a strategic objective.[41] Similar arguments were occurring in the United States, Germany, England, and France during this period.[42]

During the cold war, strategic attack had always been associated with nuclear weapons. Now that the struggle between the United States and Soviet Union was at an end, the idea of a non-nuclear strategic attack came to the forefront.

Nuclear weapons had placed the concept of a conventional air campaign into hibernation for a period of almost 50 years. As the cold war was winding down, airpower theorist began to resurrect this argument. Colonel John Warden in his book, *The Air Campaign: Planning For Combat* called for creation of a campaign plan in which airpower would play the dominant role. Warden argued, that airpower, if applied in mass and concentration could achieve decisive results independent of ground and naval forces.[43]

The Persian Gulf War (1990-1991) saw the first post-cold war application of Warden's air campaign theory.[44] Although, not applied in a purist sense, the United States Central Command (USCENTCOM) air campaign from January 17 through 24 February 1991 applied airpower as the primary means to meet the strategic objective of removing the Iraqi

Army from Kuwait. The debates that followed between the Army and the Air Force centered on the concept of an independent air campaign. Both services took away different lessons from the Persian Gulf War; the Army looking to subordinate the air campaign to its operations, while the Air Force saw the opportunity for an increased role for airpower employment.[45]

Summary

The development of aerospace doctrine is influenced by the experiences from World War II to the present. The experiences of each Service during this period (Army and Air Force) shape their views of the today's battlefield. The Army sees the battlefield from a tactical perspective. The Corps Commander is the primary warfighter, and all operations, to include sister services, are designed to support the Corps.[46] The Air Force sees the battlefield from a Theater or operational perspective.[47] The Theater or Joint Forces Commander is the primary warfighter, all operations are designed to support him. Additionally, with the end of the cold war, strategic nuclear attack is no longer the primary mission of the Air Force. These conditions have allowed the Air Force to develop and promote the concept of an air campaign that is designed to

achieve decisive results in support of strategic or operational objectives.

The significance of this historical review is simple: in order to conduct an analysis of the current system one must understand the background and reasons how it was developed. The current system was not developed haphazardly or overnight. It is the result of over seventy years of combat experience and technological developments. This review provides the necessary information that allows for synthesis and articulation of the argument in finding the answer to the research question.

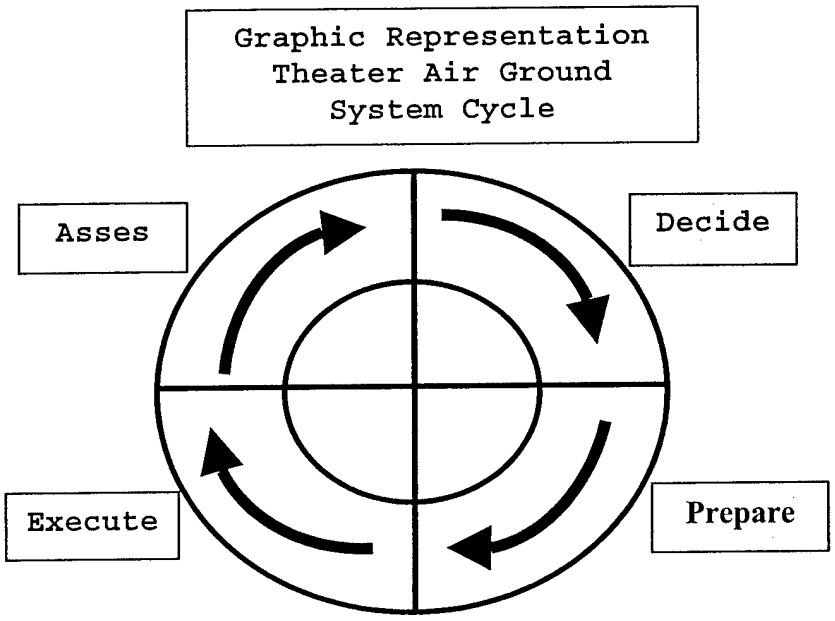
Chapter 3

Analysis of Theater Air Control System

The Theater Air Control System (TACS) was designed as a result of 50 years experience of applying airpower in support of ground combat operations. TACs is a subset of the Air Ground Operations System (AGOS). The key function of TACS is to perform centralized planning and control and facilitates decentralized execution of all air component operations.[48] This System (TACS) represents a scientific approach to controlling airpower by accounting for the "physics" of the problem. TACS is designed to arrange assets in time and space in accordance with the stated purpose in order to achieve specified tasks. Simply stated, it puts the right aircraft, with the right munitions, supported by the right support assets over the right target.

The Theater Air Control System (TACS) is divided into four phases: decide, prepare, execute and assess. This is a dynamic process that is in continuous operation on the battlefield. Figure 1 illustrates the relationship in time of the four phases.

Figure 1



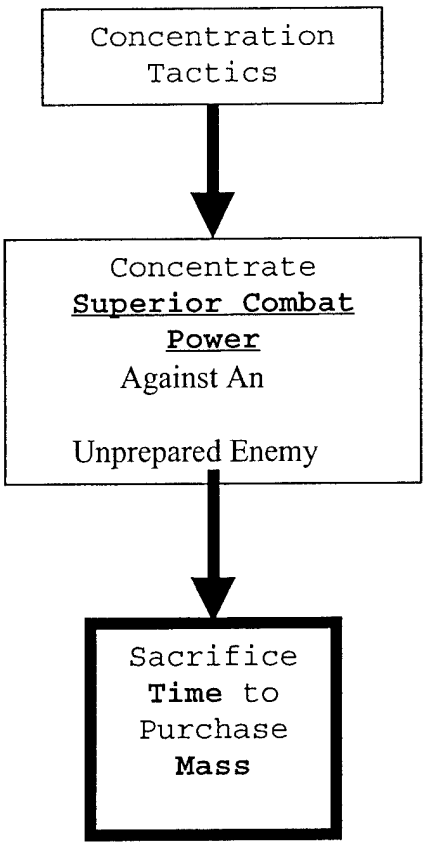
In the first phase (decide), the questions of what, where, and why, and how to attack a particular target are discussed and decided upon. Additionally, the desired effects on that target are stated. Once these questions have been answered the second phase, prepare begins. This phase arranges all the assets (airplanes, overhead imagery support, ground maintenance, weaponeering, command and control, etc.) to support the missions and their desired effects on the target.[49] This phase includes not only physically preparing and arranging the equipment but also briefing the pilots and support personnel on the upcoming

missions. The next two phases, execute and asses occur either simultaneous or near simultaneous. The execute phase represents the attacking of the targets by aircraft and missile systems while the assess phase determines the effectiveness of these attacks. The results of the assessment phase start the cycle over again. If the desired effects have been achieved the other targets in the air campaign plan are addressed. If not then the target is re-attacked.[50]

The underlying tenants of TACS are centralized control and mass. Mass superior combat power against an enemy in order to achieve the desired effects. Centralized control of airpower is the enabling operation that permits mass. The term concentration tactics best describes the theory behind centralized control and mass in the application of airpower in a theater of operation. Robert R. Leonhard in his book, *Fighting By Minutes: Time and the Art of War* defines concentration tactics as, " a form of warfare in which the commander gathers and synchronizes his combat power to attack or defend with maximum strength against the enemy."[51] The focus of concentration tactics is to gather your combat power, synchronize it and mass against the enemy. Time is sacrificed for the effects of mass, which

is created by combined arms synergism.[52] Figure 2 illustrates the concept of concentration tactics.

Figure 2



In concentration tactics the emphasis is on friendly capabilities rather than enemy reaction. Time is sacrificed in order to purchase mass. Nathan Bedford

Forrest, Confederate cavalryman of the American Civil War is credited with advice to his commanders to, "get there first with the most."[53] Forest was advocating the concept of closing rapidly and decisively with the enemy with overwhelming combat power. This concept, which worked remarkably well for Forest during the American Civil War, today remains a tenant of modern American military doctrine, particularly the employment of airpower.

The principal problem with Forest's advice is that there is no military professional alive or dead who would disagree with it.[54] It is intrinsically simple and appears to have no flaw in its logic. A closer inspection, however, reveals an inherent contradiction. Forest's dictum offers a tactical paradox concerning the application of combat power. Arriving *first* with the *most* is a difficult operation to execute simultaneously. Getting there first, an aspect of time, and with the most, an aspect of mass represents opposite goals. Commanders usually must chose between a rapid advance on the enemy or a more deliberate build up of combat power. These events can occur sequentially, but rarely if ever, simultaneous.

Centralized employment of airpower, champions Forest edict of "getting there first with the most" with the emphasis on most. By employing the mass and shock, the

inherent qualities of airpower enable the commander to overcome the enemy's ability to react to it. The principal of mass outweighs time. The Theater Air Control System (TACS) provides a scientific method for applying concentration tactics (emphasizing mass) in respect to airpower.

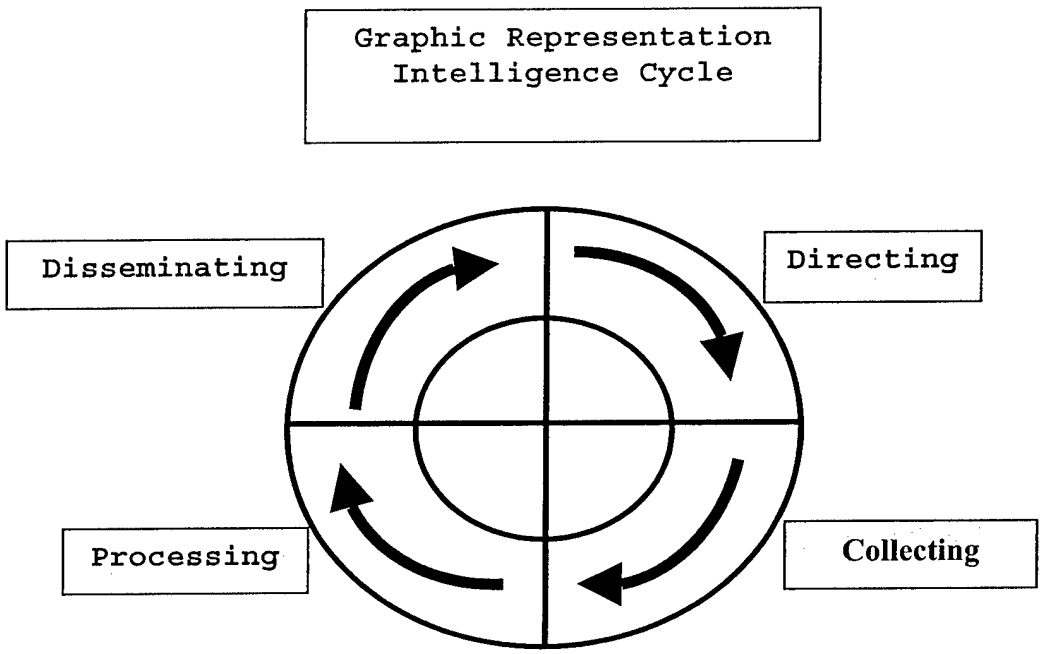
The dynamics of traditional battlespace allowed concentration tactics to dominate the battlefield for the past 50 years. Technology defined the limits of battlespace as the capabilities of battlefield commanders were limited by what he could physically see and engage the enemy with. The limits of technology led to the emphasis on mass as opposed to time in developing tactics.

The Theater Air Control System (TACS) was developed as a methodology to incorporate mass within this traditional battlespace framework. The four phases of TACS represents roughly a 72-hour cycle of time. This process fit nicely with the technologies available as far as detection, engagement, and information processing systems.[55]

Technology also has an effect on the intelligence cycle. The intelligence cycle is the process by which information is converted into intelligence.[56] This process has four phases: directing, collecting, processing, and disseminating. Directing determines what intelligence is

required and who should collect it. Collecting obtains the information required to support the intelligence requirements. Processing converts the information into intelligence through analysis. Finally dissemination passes the intelligence to the users who direct combat actions against them. See Figure 3 for a graphic illustration of this process.

Figure 3



The intelligence cycle has a direct link to the Theater Air Control System (TACS). The commander drives the intelligence cycle by determining his information requirements that support his concept of the operation. The intelligence systems are then tailored, focused, and

employed to support these requirements. The information produced by the intelligence process drives operations. It provides the commander with answers to questions concerning development of future plans and execution of current operations. The TACS process is dependent on the products produced by the intelligence cycle.

The dynamics of expanded battlespace however, create conditions were the effects of concentration tactics are being questioned. The emerging technologies in target acquisition, engagement, and information processing are responsible for creating these conditions. Commanders are able to see the enemy at greater ranges and combined with more accurate engagement systems and faster information processing capability, able to engage more efficiently.

There are three critical factors that are the driving force behind expanded battlespace: a rapid increase in the capabilities of automated data processing (ADP) systems, an increase in the capabilities in weapons (detection and engagement) systems, and finally the emergence of distributed information systems as a preference in command and control doctrine.

The proliferation of automated data processing systems has increased the speed at which information flows on the battlefield. This phenomenon effects all phases of

the intelligence cycle and the targeting process. They create conditions in which information is moved rapidly from one point to another efficiently and rapidly. The overall effect is to provide the commander information concerning the enemy faster. This effect speeds up the commander's decision cycle, which creates the potential of a faster application of combat power against the enemy. This has had the effect of compressing the dimension of time in the battlespace equation.

It is also important to distinguish that automated data processing (ADP) does not equate to artificial intelligence (AI) systems. Although these systems are used to assist in the process function of the of the intelligence cycle, a human interface is still the heart and soul of the analysis process.

An increased weapons capability is the next factor that influences battlespace expansion. The range and accuracy of weapons systems available to the tactical commander has increased dramatically in the past twenty years. This includes both detection and engagement systems. This increase in capability has expanded the physical volume portion of the battlespace equation. Commanders now can detect and engage the enemy at greatly increased ranges.

Lethality is another component weapons capability that effects battlespace dynamics. The increase in lethality of weapon systems redefines the principle of mass and its application of effects on the battlefield. Fewer numbers of systems are now required to achieve similar effects. An example of this is the use of precision guided munitions (PGM) technology. The accuracy of PGM delivered munitions allows for fewer aircraft to be dedicated to a target in order to achieve the desired effects. Air Force Doctrine Document 1 best describes this effect:

> Today's air and space forces have altered the concept of massed forces. In the past, hundreds of airplanes attacked one or two major targets per day. Massed bomber raids revisited targets, often intending their attacks to gradually attain cumulative operational or strategic level effects over time. Today, a single precision weapon that is targeted using superior battlespace awareness can often cause the destructive effects that in the past took hundreds of bombs.[57]

Lethality effects not only the principle of mass but also the dimension of time. Since it takes fewer systems and less sorties to achieve similar effects the overall time required is naturally decreased. Additionally, the fewer number of systems employed the less planning and preparation is required, again reducing the factor of time.

The final factor effecting battlespace expansion is the concept of non-hierarchical command and control structures. Under traditional battlespace framework the commanders operated under a hierarchical command and control structure. This structure is designed to handle the chaos of the battlefield. Specifically, multiple headquarters, each staffed to a certain level of competencies, manages different functions of the battlefield. This system allowed for the best synergy and unity of effort in applying combat power.

The theory behind hierarchical command and control is the management of complexity in order to apply the effects of combat power in time, space, and for a common purpose. Information is passed through a series of echelon headquarters in order to manage and better manage this complexity. Simply put, in order not to overwhelm a commander at any one level, multiple levels of command are structured and designed to assist in this process.

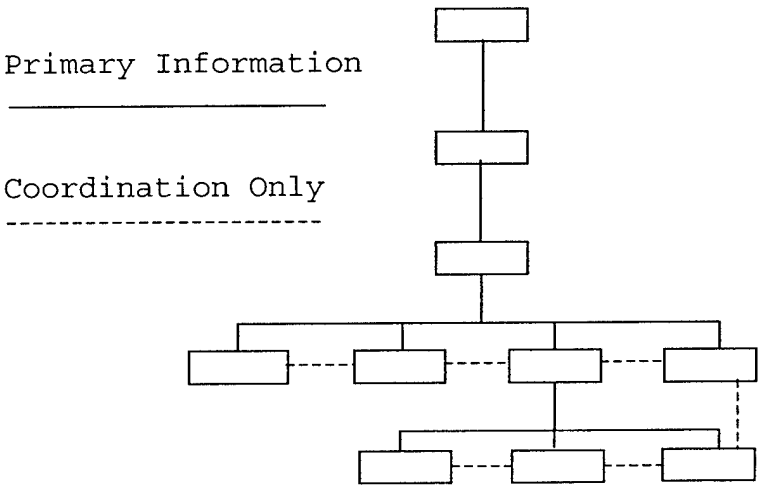
Inherent to the concept of hierarchical command and control is the flow of information. Information flows in a "stoved pipe"

method, higher to lower (See Figure 4) Although, information is gathered at multiple levels in this system, it is processed, analyzed, before being sent on to the next level. This allows for the management of dynamic events and the limited control of chaos on the battlefield. All of this is designed with the purpose of assisting the commander to apply the effects of combat power in time, space, and purpose.

The management of chaos and control of information comes with a price. Time is the critical factor involved here. The hierarchical command and control structure sacrifices time (i.e. takes more time) in order to gain clarity and manageability[58].

Figure 4

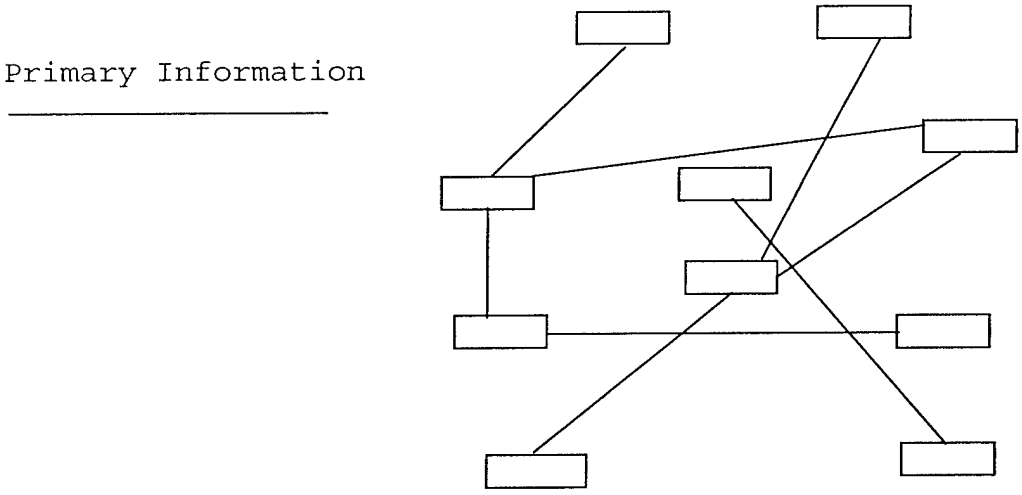
Hierarchical Command and Control Structure



The non-hierarchical command and control structure represents the opposite side of the argument. Time is valued more than the manageability and clarity of information. Information flow is based on a "seamless web" concept. Information flows directly from the source to the user or receiver without passing through multiple layers (See Figure 5).

Figure 5

Non Hierarchical Command and Control Structure



The best analogy to illustrate this concept is that of the Internet. The Internet is an information system designed to provide access to vast amounts of information on a point to point basis without going through a hierarchical structure. Different nodes (called servers) receive, process, store, and offer access

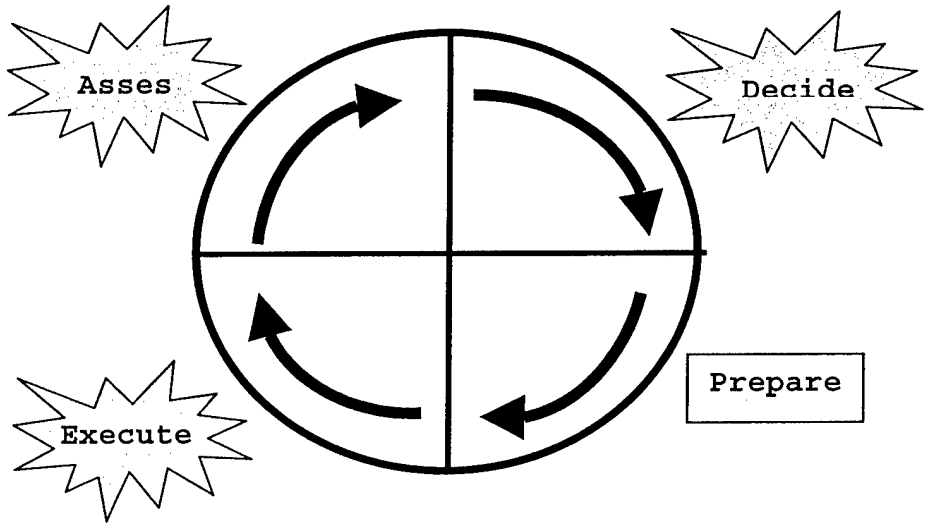
to this information. Users "pull" information that they require in order to execute their daily business. A shopper, who wants to purchase an item directly from the manufacturer, can look up the information concerning the product on the manufacturers web site. They can make the purchase directly from the manufacturer using their credit card on line. The item is then shipped directly from the manufacturer to the customer by surface or air deliver systems. This example shows how the hierarchy of shopping is eliminated. The customer no longer needs to go to a retailer (store) to get information concerning the product desired. The retailer no longer has to go through the wholesaler or distributor for the product. The customer gets the information required directly and makes the purchase. The time saved using this type of system is rather obvious, no drive to the store (or multiple stores) comparing variety and or prices of the products. This analogy illustrates the Internet as a fast conduit to a large amount of information in a real time or near real time manner without requiring a large overhead structure to manage the process.[59]

The dynamics created by increased battlespace offer the opportunity to execute a tactical theory that focuses on attacking the enemy in the dimension of time: preemptive tactics. Preemptive tactics are defined as attacking with an overmatching *velocity* against an enemy who cannot react in time.[60] The aim is turning

the "time flank" of the enemy.[61] The dynamics of time have always been a key factor in warfare: simply put attack the enemy in a manner so that he cannot react. Again we use Forest's famous quote to illustrate the point. "Concentrate superior combat power *against an unprepared enemy", or " to get there first* with the most" (emphasis added). Preemptive tactics focus on attacking the enemy quickly before he has time to react to the situation.

Figure 5

Effects of Technology on TACS Functions



The three factors that define modern battlespace, automated data processing systems, increased weapons capability, and non-hierarchical command and control structures set the conditions for successful application of preemptive tactics. Preemptive tactics

allows the commander to take advantage of the increased situational awareness that is created by information dominance. The current targeting process that is incorporated into the Theater Air Control System (TACS) is based on concentration tactics, thus not fully taking advantage of the capabilities created by advances in technology.

Figure 5 shows the effects the three factors that define modern battlespace have on the TACS process. The technology combined with non-hierarchical command and control structure serve to compress the time required executing three of the four functions of TACS. The conditions are now set to employ preemptive tactics in the TACS process.

First, the increased detection capability allows for the commander to see farther and to greater detail in the physical volume of battlespace. This has its greatest effects in the decide and asses phase of TACS. Second, automated data processing systems (ADP) speed the flow of information between the phases. Although, as previously stated, this is not intended to be an artificial intelligence function. Human analysis is still an integral part of the decision making process. ADP systems are focused on information processing and dissemination. Finally, increased lethality of weapon systems (aircraft and missiles) allows for fewer platforms to be employed in order to achieve the same effects. This has the effect of fewer systems to prepare

(fuel, arm, brief, etc.) and overall speeds up the execution phase.

The overall effect is to create a system (TACS) based on preemptive as opposed to concentration tactics.[62] The significance of this is more than just semantic subtleties. Besides creating a system that allows for the maximization of advanced technologies, a TACS based on preemptive tactics focuses on a key tenant of warfare: the enemy gets a vote. It is important we look at the probable characteristics of future threats for the next twenty years as well as the direction our own force structure is moving in.

First, the current force structure and equipment is based on industrial age technologies, tempered with the beginnings with new information age systems. This force is clearly the dominant military power as the twentieth century comes to a close. The most recent combat operations (conducted during the last ten years) in the Persian Gulf and the Balkans clearly shows the dominance of American technology and procedures for warfighting: particularly in the employment of airpower. We can rest assured that our potential future threats have given close scrutiny to these operations.[63] We can fully expect them to take actions to avoid our strengths and attack weaknesses.

The most likely action a potential future threat will take is to attack asymmetrically using limited information age

technologies to achieve a limited political aim and neutralize our firepower superiority. A lesson learned from the Persian Gulf war is to use tactical mobility and limited electronic emissions to avoid destruction by long range firepower. This point is highlighted by the failure to find and destroy Iraqi mobile SCUD launchers.[64] A second point coming from the Kosovo Air Campaign (1999) is the concept of neutralizing anti-radiation guided missile systems by limiting the use of radar on anti-aircraft artillery systems.[65]

Both of these examples illustrate techniques that can be employed to offset the superior long-range firepower advantages of American airpower.[66] Both of these techniques work against the current concentration tactics of airpower employment. Preemptive airpower employment can offset these techniques. Hit the enemy before he is ready or unable to react by sacrificing mass for speed.

The second point to consider is future capabilities of American ground forces. The October 1999 proposal by the Chief of Staff of the Army to form "Prototype Brigades" can be viewed as a harbinger of future force structures. The concept is to develop a force that is lighter in armament and posses less firepower but has strategic deployablity. As the ground forces get "lighter" and have less organic armor protection and firepower capabilities, airpower, in the close air support will play a much larger role.[67]

Chapter 4

Conclusion

The current Tactical Air Control System (TACS) has been developed as a result of over 50 years experience in airpower employment. The question is not whether the current TACS system has been an effective tool for employment of airpower on the tactical battlefield. The record of successful airpower employment during post World War II conflicts is impressive. The question is rather, how effective will the system (TACS) be in face of future threats?

The future threats to the United States will look to offset firepower advantages through a series of mobile and asymmetrical operations. There is no peer competitor right now willing to stand face to face with American airpower in a symmetrical fight. Yet the current TACS system is designed to fight such a symmetrical operation with its emphasis on sortie generation rates and attrition through mass.

Adjusting TACS procedures is required in order to respond to the current threat environment. The current structure of the TACS system is fine, however, the recommendation is to adjust the emphasis from mass to time. The emerging technologies of the information age combined with a non-hierarchical command and control system allow for a system designed to take advantage of the dimension of time. The objective is to create a TACS system

with the ability to create an operating tempo to which the enemy cannot react.[68] The adjustment described creates a system that recognizes the radical changes in the weapons of warfare (information age technologies) and ensures that in keeping with Tuchkchevsky's dictum, we do not fall asleep during this process and run the risk of never waking up.

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[1] Department of the Army, Field Manual 101-5-1, *Operational Terms, Symbols, and Graphics*. (Washington: Government Printing Office, June 1997), 1-19.

[2] This before the fielding of the big five weapon systems of the early 1980s: M1A1 Main Battle Tank, M2/M3 Infantry/Cavalry Fighting Vehicle, AH-64 Attack Helicopter, Multiple Launch Rocket System (MLRS), and the Patriot High to Medium Air Defense Missile (HIMAD). Additionally, limited automated data processing information systems and no direct links to echelon above corps and national collection assets.

[3] This includes AH-64 Attack Helicopters, MLRS to include the extended range systems, and Army Tactical Missile System (ATACMS). Additionally, C4SRI automated data processing systems designed to process and disseminate information rapidly as well as direct links to echelon above corps and national collection assets.

[4] Cushman, John H., *HandBook for Joint Commanders,* (Annapolis, Maryland: U.S. Naval Institute Press, April 1993). "Thoughts For Joint Commanders", privately printed by the author is a revision of the above title. (Unpublished Manuscript, Annapolis, Maryland, August 1993), 41.

[5] Rothrock, John, E. *Theater War in the Information Age: The Rapid Application of Airpower (RAAP) Concept*. (Fairfax, Virginia: Armed Forces Communication and Electronics Association (AFCEA), 1989), 70.

[6] Corum, James S., *The Luftwaffe: Creating the Operational Air War 1918-1940*. (Lawrence, Kansas: University of Kansas Press, 1998), 277.

[7] Crevald, Martin van, Canby, Steven, L., and Brower, Kenneth, S., *Air Power and Maneuver Warfare* (Maxwell Air Force Base, Alabama: Air University Press, 1994), 50-51.

[8] Traditional or slower pace in this sense is defined as the marching speed of the infantry. The infantry, marching on foot, represented the maneuver striking power of the Allied armies at this time. Armored forces were organized in small units to support infantry attacks. All timings depended on the speed of these foot-mobile formations.

[9] Hart, B.H., *The History of the Second World War.* (New York: Perigee Books, 1982), 70-73. The majority of German armored forces were assigned to Army Group A, and further tasked organized into 5 Panzer Corps. The main effort of the German armored units was a temporary or battle formation known as "Panzer Group Kliest" under the command of General Ewald von Kliest, consisting of the XLI and XIX Panzer Corps. The XV, XVI, and XXXIX Panzer Corps attacking to the north supported Panzer Group Kliest. Panzer Group Kliest's XIX Panzer Corps established the assault crossings at Sedan while the XV Panzer Corps, in a supporting attack role to the north, established the assault crossings at Dinant.

[10] Rothrock, 71.

[11] Hart, 39. One could argue that the Allied plan, which called for an economy of force mission in the Ardennes Forrest area, was flawed and therefore had a direct cause and effect with the German success in crossing the Meuse river. Flawed for two reasons: first, because it placed the weakest part of the Allied defense against the main effort of the German attack even after the Allies gathered intelligence concerning the German troop concentrations and assembly areas west of the Rhein River. Second, because the plan had its foundation on one main assumption, the Germans would attack through the low Countries (Belgium and Holland) in a repeat of the Schlifen Plan of 1914. If the main attack did not happen in the North, the Allies could shift their main effort to meet the German attack wherever it came. However, the speed prevented this from happening.

[12] King, Douglas, M. "Fire Support Uncoordination Line". Fort Leavenworth, Kansas: United States Army Command and General Staff College, School of Advanced Military Studies, May 1997,20-12.

[13] King, 20-12.

[14] King, 23.

[15] Mcknight, Clarence E., ed., *Control of Joint Forces: A New Perspective* (Fairfax, Virginia: Armed Forces Communications and Electronics Association (AFCEA), 1989), 194.

[16] Cardwell, Thomas A., *Airland Combat: An Organization For Joint Warfare*. (Maxwell, Air Force Base, Alabama: Air University Press, 1992), 5.

[17] Crevald, Canby, and Brower, 193.

[18] Cardwell, 9.

[19] Cardwell, 9.

[20] Cardwell, 11.

[21] Cardwell, 12.

[22] Millet, John, D, *The Organization and Role of the Army Service Forces* (Washington: Office of the Chief of Military History, Department of the Army, 1954), 26.

[23] Cardwell, 13.

[24] Cardwell, 14. The Twelfth United States Air Force was created to support the North African Campaign. It was further sub divided into three commands: Bombardment Command (tactical and strategic strikes behind enemy lines), Air Defense Command (rear area protection), and Air Support Command (direct support of land troops). The Army further divided this situation by allocating each Corps its own portion of the three air commands. In particular, Air Support Command units were divided out among Army divisions on a semi-permanent basis. The result was division commanders holding on to "their" air in the same way they held on to other supporting arms assigned to their units. This led to piecemeal employment of air power and prevented concentration and mass.

[25] Cardwell, 14.

[26] Field Manual 100-20, *Command and Employment of Air Power*, July 1943, 16.

[27] Cardwell, 12.

[28] Brinkerhoff, John, "The American Strategy of Unpreparedness", *Strategic Review* (Winter 1994), 36.

[29] The cold war confrontation with the Soviet Union led to the development of new roles and missions for the Armed Forces. The United States took on a National Security Strategy of containment, which required a large peacetime military ready to combat the Soviets on a moment's notice. This strategy effected all the armed forces. The Army, was primarily forward deployed in various locations such as Western Europe, Northeast Asia (Korea) and Southeast Asia (Vietnam) in order to confront Soviet expansionist policies. The Air Force, deployed in the same locations in support of the Army, also had the mission of strategic attack, primarily from locations in the United States using both long range manned aircraft (bombers) and missiles to deliver nuclear weapons against targets within the Soviet Union.

[30] Cardwell, 19.

[31] Futrell, Robert F. *The United States Air Force in Korea, 1950-1953* (New York: Duell, Sloan, and Pearce, 1961), 38.

[32] Cardwell, 21.

[33] Cardwell, 30.

[34] Cardwell, 22.

[35] Cardwell, 23-24. The Army's experience during the Korean and Vietnam Wars with air support to ground operations is one of mixed emotions. Although the Air Force adequately supported ground operations with tactical air support, the priority of the service still was interdiction and strategic attack. Both of these wars were limited in nature, and did not require the Air Force to conduct strategic attack and limited interdiction missions. It was felt that in a war against the Soviet Union the Air Force would relegate support to ground operations (close air support) as a distant third priority. The Army looked to rotary wing aviation as a replacement to close air support.

[36] See Cardwell, 22-25. The Army-Air Force agreements represent a series of understandings between the two services concerning roles and missions. The underlining theme for all the agreements is the issue of air support to land operations. Additionally, a budgetary issue is tied to this problem. Whoever is assigned the mission of close air support (either by rotary or

fixed wing aircraft) gets the funding necessary to develop, organize, equip, and train those forces. The first agreement was signed between Chief of the Staff of the Army General Omar Bradley and Chief of Staff of the Air Force General Hoyt Vandenberg in 1949. The Bradley-Vandenberg agreement allowed the Army to develop rotary wing aircraft, but with a weight of fewer than 4000lbs and primarily for the role of reconnaissance, troop transport, and medical evacuation. This debate continued in the 1950s and is highlighted by the Pace-Finletter agreements (Secretary of the Army Frank Pace and Secretary of the Air Force Thomas K. Finletter) which further expanded the Army's role in rotary wing aviation development. This concept of agreements between the Army and Air Force continued up until this day. Although agreement is designed to cover a specific issue, the basic premise remains the same as 1949: roles and missions of each service and who get the budgetary support to execute those roles.

[37] The political realities of NATO were the retention of terrain. Specifically, in Germany, the host nation and front line border state of NATO forces. The German position was simple: do not give up any terrain to the Soviets in a war. NATO was forced to deal with a real time constraint when it comes to trading space for time against a numerically superior opponent. Airland battle, an aggressive offensive oriented war-fighting doctrine, combined with a qualitative advantage in personnel and equipment would offset this restraint.

[38] Airland battle called for the simultaneous (or near simultaneous) attack of the enemy throughout the depths of his formations. The Soviet Union, which employed a doctrine of an echelon employment of forces was vulnerable to this concept. The close battle was still viewed as the decisive fight, however, the deep battle set the conditions in order to allow the Army to win the close fight. Without the effects in the deep battle, it was doubtful the Army could overcome the quantitative superiority of the Soviet forces in Central Europe.

[39] The Army was developing systems to execute these functions but it would take years until they were fielded. Primarily the AH-64 Attack Helicopter, Multiple Launched Rocket System (MLRS), Army Tactical Missile System (ATACMS), Unmanned Aerial Vehicles (UAVs), Joint Surveillance and Targeting Radar System (JSTARS). Additionally, the Army acquired access to National Surveillance systems (primarily satellites) to assist in this process. It would take until the mid 1990s until these systems all came on line.

[40] With the quantitative superiority of the threat no longer the primary issue, the Army was less reliant on airpower in order to succeed in its mission. Although airpower still played an important role in ground operations, the Army was not dependent on it in order to win.

[41] Douhet, Giulio, *The Command of the Air*. (Washington: Coward-McCann, 1942), viii.

[42] See Development of Airpower for a more detailed discussion concerning this subject.

[43] Warden, John A. III, *The Air Campaign: Planning For Combat* (Washington DC: National Defense University, 1988). See this document for a more detailed discussion of the air campaign concept.

[44] Colonel John Warden, working at Checkmate, The Air Forces strategic planning and assessment cell in the Pentagon, put together the outline of an air campaign plan during the Persian Gulf War. His plan, named INSTANT THUNDER was controversial from the start. CENTCOM Commander, General H. Norman Schwartzkopf asked the Air Staff to provide assistance in developing a list of options for airpower employment against Iraq. General Schwartzkopf knew it would take months to build up his ground combat power in order to evict Iraq from Kuwait. The airpower options were designed as an offensive option if the President wanted to attack Iraq before the ground force was fully assembled. Warden took the tasking a step further. He developed a plan that was designed to persuade the Iraqi's to pull their Army out of Kuwait without a ground war, and if that did not happen, create conditions for the overthrow of the Iraqi government. Schwartzkopf saw the air campaign as a supporting plan to the ground campaign, which would be the only way to achieve decisive results. Warden saw INSTANT THUNDER as the decisive campaign with the ability to achieve strategic objectives.

[45] Gordon, Michael R., Trainor, Bernard E., *The General's War* (Boston: Little, Brown and Company, 1995), 474.

[46] Swain, Richard M., *"Lucky War": Third Army in Desert Storm*. (Fort Leavenworth, Kansas: United States Army Command and General Staff College Press, 1997), 342-343. Reinforcing the theater vs battlefield viewpoint between the Army and the Air Force, Swain argues on page 227, "Air assets are allocated according to primary categories, and the air component commander decides what will be flown according to his priorities as a theater commander. Because

Air Force officers are not particularly knowledgeable about the conduct of ground operations, they are not inclined to allocate air assets to support ground maneuvers".

[47] Cardwell, 52.

[48] Department of the Air Force, Air Force Doctrine Document 2-1.3, *Counterland*. (Washington: Government Printing Office, 23 June 1999), 43.

[49] Weaponeering is a term used to describe the function of assigning weapons and planning sorties. See Whiteman, Philip S., "Improving Single Strike Effectiveness for Network Interdiction", *Military Operational Research,* Volume 4, Number 4 (1999): 15-16.

[50] Battle Damage Assessment (BDA) is the most difficult task in this process. Technology has advanced to the point that physically observing the target once it has been attacked is no longer the issue (using a combination of overhead systems - satellites- unmanned aerial vehicles, reconnaissance aircraft, and ground based reconnaissance systems). Determining what BDA (both physical and psychological) the attack has had and does the BDA match the desired effects is extremely difficult and analytical process.

[51] Leonhard, Robert R. *Fighting By Minutes: Time and the Art of War*. (Westport, Connecticut: Praeger, 1994), 155.

[52] Leonhard, 162.

[53] Leonhard, 152.

[54] Leonhard, 152.

[55] A point of further explanation is required here to explain the relationship between the 72-hour TACS cycle and the technologies available that shaped traditional battlespace. Without getting into technical specifics of particular systems, the tactical (Corps) commander only had the ability to see as far as his organic ground and air based systems would allow. This consisted of SIGINT, ELINT, and HUMINT assets that ranged out no greater than 70 - 100 KMS. The dimension of time is measured in days as information had to be transmitted in a stove piped vertical command and control network using primarily analogue and human data interfaces.

[56] Department of the Army, *Field Manual 34-8: Combat Commander's Handbook on Intelligence* (Washington: Government Printing Office, 1992), 2-1.

[57] Department of the Air Force, Air Force Doctrine Document 1, *Air Force Basic Doctrine*. (Washington: Government Printing Office, September 1997), 16.

[58] Clarity and manageability based on the concept of span of control theory. The theory, roughly put, states that a headquarters is only capable of controlling a finite amount of resources (i.e. personnel, information, ect.). The hierarchical command structure seeks to keep this finite number in check by establishing redundant levels of command to assist in this management process. One of the prices you pay for this manageability is time. The more command and control structure architecture is in place, the more time is required to process and disseminate information.

[59] The example used concerning the Internet is considered common knowledge and not gathered from a particular source.

[60] Leonhard, 154.

[61] Leonhard, 153.

[62] Rothrock, 72. Rothrock argues that the current TACS system has evolved into a "procedural approach to air warfare; one that emphasizes sortie generation rates and attrition management as basic measures of effectiveness for assessing air combat success. This approach has the effect of reducing the potency of modern airpower to a reactive, target servicing posture that allows the enemy to gain the initiative".

[63] Funk, David E. *Tactical Dislocation: Force XXI Doctrine or Just Another Pretty Theory?* (Fort Leavenworth, Kansas: School of Advanced Military Studies Monograph, First Term, AY 1997-1998), 38.

[64] Friedman, Norman, *Desert Victory: The War for Kuwait* (Annapolis, Maryland: Naval Institute Press, 1991), 253.

[65] Although this technique did not prove to be very effective (only one NATO aircraft was credited as being destroyed by hostile fire) it did alter the tactics of the air campaign. Since air defense systems could not be verified as being suppressed, aircraft flew missions at higher altitudes (to avoid the effective

range of these systems). This hindered the accuracy and effectiveness of many of the missions. This simple procedure illustrates a technique to offset the firepower superiority of American airpower.

[66] Wass de Czege, Hubba, "Optimizing Future Battle Command Technology", *Military Review* (March-April 1998), 17. Wass de Czege warns against the risks of centralization in operations. "Centralization risks belated action because new and unexpected information is not understood in time. A competent enemy ensures the relevant half-life of information about him is short. Belated decisions lead to ineffective marching and counter-marching or to insubstantial commitment of precious long range fires". He comments were a part of the after action review for the Army's Advanced Warfighting Experiments (AWE).

[67] The role of Close Air Support (CAS) and ground combat operations has its roots in World War II. Overall, the Wehrmacht in almost all aspects of ground combat systems (tanks, tank destroyers, and artillery outgunned the United States Army. The Wehrmact systems had greater firepower, range, and protection. CAS was used to make up the difference. During the Cold War, the Soviets possessed both a quantitative and in some areas a qualitative advantage in ground combat systems. Again, CAS was designed as the system to help offset these advantages. It was not until the development of the M1A1 MBT that the United States Army gained a firepower and protection advantage over any potential adversary. The importance of CAS to success in ground operations has diminished in this respect. A new, lighter weight force, however, will restore the importance of CAS to this equation.

[68] Wass de Czege, 72.

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