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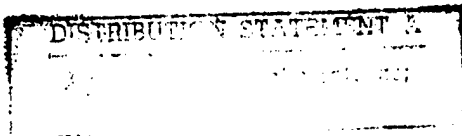
**GENERAL LOGISTICS PARADIGM:
A STUDY OF THE LOGISTICS OF
ALEXANDER, NAPOLEON, AND SHERMAN**

THESIS

R. Alan Hardemon, Captain, USAF

AFIT/GAL/LAL/98S-4

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**DEPARTMENT OF THE AIR FORCE
AIR UNIVERSITY
AIR FORCE INSTITUTE OF TECHNOLOGY**

Wright-Patterson Air Force Base, Ohio

AFIT/GAL/LAL/98S-4

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AFIT/GAL/LAL/98S-4

GENERAL LOGISTICS PARADIGM: A STUDY OF THE LOGISTICS OF
ALEXANDER, NAPOLEON, AND SHERMAN

THESIS

Presented to the Faculty of the Graduate School of Logistics
and Acquisition Management of the Air Force Institute of Technology

Air University

Air Education and Training Command

In Partial Fulfillment of the Requirements for the
Degree of Master of Science in Logistics Management

R. Alan Hardemon, BS

Captain, USAF

September 1998

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Acknowledgements

The purpose of this research is to first and foremost contribute to the existing research on the topic of military logistics. The first fact I became aware of in performing my research for this thesis was the relative lack of substantive work in the field of military logistics. It is my sincere hope that my thesis can in some way contribute to the further study of military logistics or at least inspire others to contribute their efforts in this area of study.

The second major goal I had was to produce some useful bit of knowledge as a result of my efforts. I have always despised *to do* lists and feel that they not only limit creativity but give the dangerous impression that if all the items on the *to do* list are accomplished, success is guaranteed. Anyone who has had the pleasure of living in the real world realizes that the only *to do* list that ensures success is the list whose first item is *be successful*. Obviously such a list is incredibly reliable and equally useless. By suggesting a way of thinking and approaching problems, I feel my logistics paradigm is specific enough to be useful yet broad enough to be applied to a variety of situations.

It would be impossible to individually thank all those without whose help I could have never completed this thesis. However, there are those who I feel must be mentioned and thanked for their constant support and help in making this thesis a reality.

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completion of Chapter II and Chapter III. He'll never know how much his love for long naps was appreciated.

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Alan Hardemon

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Abstract

This study examines the campaigns of Alexander the Great, Napoleon Bonaparte and William T. Sherman. By analyzing the influences of the logistics policies and practices employed during these campaigns common underlying logistics principles are identified. The resultant logistics principles are then codified into a logistics paradigm to be used when developing and managing operational level logistics.

Using an analysis schema that employs inductive reasoning, principles of historical analysis and critical thinking, each of the three campaigns is analyzed to identify events of interest. The events of interest are specific occurrences during the campaign when what occurred was directly influenced by logistics or logistics policies and practices were influenced by what occurred. Using a modified version of the Threads of Continuity approach to the study of history, four key logistics principles are identified: centralized control/decentralized execution, flexibility, the proper application of technology, and understand the environment.

The four principles are then codified into a general logistics paradigm. The viability and the application of the paradigm are discussed. Additionally, previous logistics principles from different authors are described and compared to the paradigm offered in this thesis.

GENERAL LOGISTICS PARADIGM: A STUDY OF THE LOGISTICS OF ALEXANDER, NAPOLEON, AND SHERMAN

I. Introduction

Any professional military leader or student of history will agree that providing the raw materials necessary for the conduct war, the function of logistics, is fundamental to victory. Without adequate supplies and arms the most capable fighting force is of little use. Remarkably, given the obvious importance logistics plays in the conduct of war, there is still precious little material on the topic of logistics and its role in armed conflict. Despite the voluminous amount of research and published works on armed conflict, very little of the existing literature focuses specifically on logistics. This thesis examines three military campaigns and the logistics involved in executing them and derives a paradigm which serves as a guide for operational commanders when developing their own logistics policies and practices.

Background

This thesis examines the logistics practices of three famous military leaders: Alexander the Great, Napoleon and William T. Sherman. Each of these three campaigns represents significantly different time periods and levels of technological advancement. However, the fundamental requirement is the same, to ensure the troops and their weapons of war are adequately provided for. There are numerous similarities among

each general's logistics policies and practices as well as pronounced differences. The key common thread among each of the subject generals is that he led a large military force across a great distance and had to develop logistics systems that could support such a force under diverse circumstances.

This thesis first examines Alexander's campaign against Darius of Persia. Though Alexander continued his campaign for several years after his defeat of Darius at the Battle of Arbela, the entire campaign of Alexander represented an unnecessarily broad span of time to cover in this thesis. Secondly, a good understanding of Alexander's logistics policies and practices can be gained by simply analyzing his campaign up until his defeat of Darius.

Napoleon's invasion and failed campaign to conquer Russia is the second campaign examined. Unlike the campaigns of Alexander and Sherman, Napoleon's campaign was a resounding failure. Though Napoleon's forces outnumbered the Russian army with a better than two to one advantage in troops and possessed the most technologically advanced fighting force of the time, he still was defeated. The main reason for Napoleon's defeat can be attributed to the inability of his logistics system to adequately supply his army with the raw materials necessary for the conduct war.

General William T. Sherman's march on Atlanta is the final campaign examined in this thesis. Sherman's campaign into the South is often considered a single campaign from the time he began in Chattanooga through his sweep to the sea and subsequent march on Savannah. However, there are two discernible phases to Sherman's campaign, the campaign leading up to and the ultimate capture of Atlanta and his subsequent campaign seaward. This thesis focuses on the first part of Sherman's campaign into the

deep South, his march on Atlanta, which in its own right can be considered a single campaign.

In each of these three campaigns leadership at the senior level was consistent and therefore the logistics policies and practices employed during each of these campaigns remained consistent. All of the campaigns covered relatively large distances and lasted a significant amount of time, with Alexander's campaign being the largest in both regards. Careful analysis of the policies and practices employed by each of these generals enables the codification of their tried and true methods into a general logistics paradigm. Unlike previous research, the result of this thesis is not a listing of *to dos*, it is a tool intended to facilitate thought and have broad applicability.

Problem Statement

Existing research and published works on the topic of logistics in armed conflict have two major shortfalls. First, the historical nature of the works results in the bulk of the literature focusing on the feats of great leaders or their strategy even when the work is supposed to focus on logistics. Secondly, when focused on logistics, the result of the author's analysis is some *laundry list* of activities to accomplish which will ensure adequate logistics support. Lists of that nature rarely are applicable except to the military actions which served as the source for deriving the list. Any list that has applicability to a large number of contingencies would be so broad as to provide little if any actual, useful guidance. This thesis solves those two shortcomings by not developing a list of *to dos*. Instead this thesis develops a paradigm for developing logistics policies and practices, which is broadly applicable yet provides substantive guidance.

Investigative Questions

To analyze the logistics policies and practices of Alexander, Napoleon and Sherman in order to develop a viable and broadly applicable logistics paradigm, five investigative categories are established. These categories are the definition of how each of the campaigns will be analyzed, the identification of the events of interest, the commonalities among the events of interest from each of the three campaigns, the resultant logistics paradigm, and the assessment of the applicability of the resultant paradigm.

Definition of How the Campaigns Will Be Analyzed.

This thesis establishes a framework for analyzing the logistics policies and practices of the three diverse campaigns.

Identification of Events of Interest.

This thesis identifies the specific events of each campaign that were influenced by or influenced logistics policies or practices.

Commonalties Between the Events of Interest.

This thesis identifies the strengths and weaknesses that were similar among each of the three campaign's logistics policies and practices.

Explanation of the Resultant Logistics Paradigm.

This thesis develops a general logistics paradigm, or system of thinking, which will capitalize on the proven strengths of the logistics policies and practices of Alexander, Napoleon and Sherman.

Assessment of the Resultant Paradigm's Applicability.

This thesis assesses the viability of the logistics paradigm as a practical management tool and assess how its application is different from existing theory.

Importance of Research

Major General Julian Thompson, Royal Marines, said it best when describing the role of logistics in the military, "I have no reason to believe that logistics will ever have much military sex-appeal, except to serious soldiers, but this book [Thompson's The Lifeblood of War] is written in the hope that I am wrong" (1991: xvi). It is difficult to explain why such an important factor in military success like logistics is so under-publicized and under-researched. Granted the exploits of great war heroes and the ingenious strategy of famed military leaders make for more interesting reading, but in the final analysis poor logistics will spell defeat. Why logistics is under-researched is not nearly as important as the fact that it is under-investigated. The key contribution this thesis makes is that it adds to the investigative thought on a woefully neglected but terribly important topic, military logistics.

The second major contribution of this thesis is that it provides a tool with a broad range of applicability. Instead of deriving some list of actions that only apply to a few,

very specific scenarios, this thesis offers a way of thinking and approaching logistics issues that will allow commanders to develop and modify their logistics policies and practices to the particular situation they are facing. This is of paramount importance given the operational tempo within the United States military. The military is not only being pressed to do more with less but to deploy to locations more distant and more diverse than ever before. It is reasonable for a unit to be expected to be able to conduct operations in theaters as diverse as the deserts of southeast Asia and the extreme cold of northern Japan and coastal Korea. It is clear that the logistics requirements for operating in these varying climates demand well thought out and planned logistics policies and practices. The additional challenge is that with the increases in theaters of operation, units face shrinking numbers of qualified personnel and money. Logisticians are under constant pressure to support the rising operational tempo with less and less experienced people and with dramatically reduced funding. This thesis attempts to provide a practical and viable tool to assist logisticians in their ever increasingly daunting task of providing the raw materials necessary for the conduct war.

Summary

Chapter II describes how each of the three campaigns is analyzed. It describes the Threads of Continuity approach to analyzing history and how it is modified for the analysis in this thesis. Chapter II also describes the thought process for bolstering analytical rigor within this thesis. Chapter II describes the research design and research method employed in this thesis.

Chapter III identifies the events of interest within each of the three campaigns. It does not attempt to capture every detail of each of the three campaigns but highlights

those events within each of the campaigns which are of particular interest due to their influence upon or being influenced by logistics. Chapter III does, however, retain the convention of describing the campaigns and the events of interest within them in chronological order, which is typical of most historical narrative works.

Chapter IV identifies and analyzes the commonalities among the events of interest. The bulk of positive observations result from Alexander's and Sherman's campaigns where the bulk of the *lessons learned*, in terms of logistics, result from Napoleon's campaign. As would be expected, both Alexander's and Sherman's campaigns are considered successes, whereas Napoleon's campaign against Russia is considered a complete failure.

Chapter V codifies the commonalties between events of interest into four logistics principles: Centralized Control/Decentralized Execution, Flexibility, Proper Application of Technology, and Understand the Environment. These principles then form the logistics paradigm. Chapter V not only develops and explains the logistics paradigm, it demonstrates its application and discusses the more traditional logistics *to do* lists to demonstrate the viability and applicability of the paradigm.

II. Methodology

The method of this thesis is inductive and is based upon the qualitative analysis of three major military campaigns. The analysis schema is based upon the survey of military doctrine, historical and inductive reasoning texts and represents the synthesis of critical thinking principles, inductive reasoning and historical analysis techniques. By examining the logistics support practices of Alexander the Great, Napoleon, and William T. Sherman a general logistics support paradigm is developed. This thesis defines general logistics support as the policies and activities employed to ensure the adequate supply of the raw materials of war (food, water, and weaponry).

The level of analysis for this thesis is based upon the levels of logistics described in Marine Corps Pamphlet MCDP 4. "Levels of logistics correspond directly to the strategic, operational and tactical levels of war" (MCDP 4, 1998:48). The focus of this thesis is on the operational level of logistics which "involves those support activities required to sustain campaigns and major operations" (MCDP 4, 1998:48). Throughout this thesis the term strategy is used and should not be confused with the strategic level of war. The term strategy describes the overarching philosophy of Alexander, Napoleon and Sherman as it applies to their planning and conduct of their campaigns. The term strategy is not intended to imply a strategic level of analysis.

The three campaigns: Alexander's campaign against the Persians, Napoleon's 1812 campaign into Russia and Sherman's campaign into the deep South, all provide excellent opportunities to analyze the "classical" method of general logistics support. In each instance the leadership remained consistent, the campaign lasted over a significant

period of time and covered a significant distance. The latter two factors particularly make the analysis of their logistics support practices noteworthy given the challenge both distance and time present to logistics support. The consistency of leadership, at least at the highest levels, supports the assumption of consistent policy towards general logistics support.

The analysis of these campaigns produces several common underlying principles employed in each instance that, when codified into a set of practices, provides modern military leaders with a useful paradigm from which to draw upon when establishing their own general logistics support policies and practices. Since the level of analysis is the operational level of war, the resultant paradigm is best suited for application at the operational level of war. It must be emphasized that this paradigm is intended as a starting point from which military leaders can develop their own general logistics support policies. The principles, and the resultant paradigm, set forth in this thesis are not all inclusive nor should they be viewed as binding. However, this thesis illustrates that the application of these principles proved sound for noted military leaders in antiquity and has merit for the military leaders of today.

Accuracy and relevance are the two major concerns that must be addressed when applying *lessons learned from the past* in the form of general logistics principles.

Napoleon himself referred to history as “a set of lies agreed upon” (Webster’s 21st Century Book of Quotations, 1992:123). The study of history implies a lack of first hand knowledge. Despite the use of first hand accounts, a historian must take someone else’s word on what occurred. Both personal accounts and the previous work of other historians are then necessarily subject to the limitation of the individual making the

observation either first hand or second hand. These observations are in some degree influenced by the person's own prejudices, affiliations and physical limitations. To guard against the influence of personal limitations exaggerating the events of the campaigns, numerous accounts of each campaign are consulted. The descriptions of the campaigns contained within this thesis do not represent a single account of the events surrounding the campaign but represent a consensus of numerous sources on the events of each campaign.

Liddell-Hart's Sherman and Sherman's own memoirs proved rich sources of information regarding the campaign into the deep South during the Civil War. Chandler's Napoleon and Clausewitz's The Campaign of 1812 in Russia were relied upon heavily as reliable sources of information regarding Napoleon's campaign into Russia. Chandler's Napoleon is often considered a definitive work on the Emperor and Clausewitz's account of the campaign of 1812 is presented from his unique perspective as an adviser to the Russian Army during the campaign. Lastly, the work of Engels, Dodge and Fuller were insightful and represented a wealth of information, presented from varying perspectives, regarding Alexander's campaign through Asia-minor and Egypt. The above listing is not all inclusive of the sources consulted. However, it is representative of the broad range of sources and perspectives that were consulted during the development of this thesis. The goal was to obtain reliable and diverse accounts of the events surrounding Alexander's, Napoleon's and Sherman's campaigns in an attempt to ensure this thesis represents a true account of the three campaigns. When asking the rhetorical question "What is the object of history," B. H. Liddell-Hart commented "quite simply, 'Truth'" (Jessup et al., 1982:50). Consensus on the events surrounding each

campaign supports the acceptance that the description of events is *true* and not simply a set of widely accepted lies.

Many factors bring into question the relevance of a general logistic paradigm based upon military campaigns conducted in the distant past. Technological advances have made the use of pack animals obsolete. Advances in weaponry have increased the lethality of the individual 1000 fold. The specter of global, campaign-like, conflict has been all but replaced with the conduct of regional conflict, wars of limited scope, police actions and the like. Although the advance of time has brought significant change to the conduct of war, the core requirements are still the same. The pack animal may be no more but supplies still must have some type of conveyance to reach the personnel at the front. Although weaponry is constantly increasing in lethality, a weapon must be in the *hands* of a soldier trained and willing to employ it to be effective. Despite the varied scope of war, there will always be a definable theater of operations and therefore a need for operational logistics. Any reasonable commander must have a process by which he can re-supply both his personnel and implements of war. Although the tools and scope of the conduct of war have significantly evolved, those charged with the implementation and management of the tools of war can benefit from the lessons of past military leaders regardless of their era. Frank Craven made this point eloquently in a speech to the cadets at the United States Air Force Academy in 1959:

Let it be admitted that the modern technological revolution has confronted us with military problems of unprecedented complexity, problems made all the more difficult because of the social and political turbulence of the age in which we live. But precisely because of these revolutionary developments, let me suggest that you had better study military history, indeed all history, as no other generation of military men have studied it before. (1959)

The methodology of this thesis represents the synthesis of historical analysis and critical thinking techniques. The main focus for the survey and application of critical analysis techniques is to provide the qualitative analysis of historical campaigns with analytical rigor. The lack of a primary observational capability accompanied by a lack of empirical analysis tends to weaken the substantiation of analytical rigor. To address this concern, this thesis employs a rigorous qualitative analysis design.

Research Design

The basis for the analysis of each campaign was an adaptation of Jessup and Coakly's threads of continuity approach to the study of history. The threads of continuity approach reflects the Clausewitzian Principles of War but analyzes war not only in its theoretical and doctrinal context but also considers external factors ranging from social to technological factors. This represents a departure from the *classical analysis* technique of analyzing war strictly in terms of Clausewitz's principles of war and expands the analysis to the environment the war is fought in along with its guiding doctrine, strategy and tactics. In essence the threads of continuity approach looks not only at the *how* of war, it also addresses the *where, when* and *why*. Using the threads of continuity approach each campaign is analyzed in terms of its "1) Military theory and doctrine 2) Military professionalism 3) Generalism 4) Strategy 5) Tactics 6) Logistics and Administration 7) Technology 8) Political Factors 9) Social Factors 10) Economic Factors" (1982:48). This thesis, however, modifies the threads of continuity by analyzing how logistics

influenced or was influenced by the other threads of continuity. In essence, each campaign is analyzed in terms of how logistics policies and practices influenced or were influenced by military theory and doctrine, military professionalism, Generalism, strategy, tactics, administration, technology, political factors, social factors and economic factors.

By applying this historical analysis technique to each of the three campaigns commonalties are identified among the three campaigns which led to either success or failure. The resultant paradigm, based upon the above mentioned analysis, is necessarily broad to ensure applicability across all the threads of continuity. By addressing both military and non-military factors, the general logistics paradigm offered by this thesis has applicability across time given that the factors of technological and socio/political change are interwoven into the threads of continuity.

The technique for integrating the commonalties among the threads of continuity into a logistics paradigm is based upon numerous critical thinking and logic texts that were surveyed and integrated into the analysis process. Fischer's Historian's Fallacies provided critical insight into the common, and often humorous, fallacious arguments offered by notable historians. Fischer makes strong the point that history is subject to interpretation and exaggeration and that fact and truth are often difficult to clearly delineate. Although consensus on the occurrence of the events under study somewhat guards against the effect of personal influence and exaggeration, the issue of truth in terms of reality versus *agreed upon lies* must also be addressed. Although commonality among the threads of continuity across the three campaigns studied lends itself to codification in some encompassing general logistics paradigm, the construct of the

logistics paradigm must in itself have rigor beyond a simple recanting of practices that worked in antiquity. To bolster analytical rigor, the development of the logistics paradigm relies heavily on the effective use of demonstration as discussed by Cohen and Nagel. The authors in relating the story of Archimedes give insight into the effective use of demonstration:

According to an age old tale, Hiero, the tyrant of Syracuse, commanded a votive crown of pure gold be placed in a temple of the immortal gods. But gossip concerning the goldsmith led him to suspect that silver had been mixed in its construction, and he recommended Archimedes to determine, without injuring the crown, whether or not this was the case. While taking a bath, Archimedes noticed that his limbs were unusually light when in the water, and that in proportion as his body was immersed in the tub, water ran out of it. A method of resolving the problem forthwith became evident to him, and leaping out of the tub in great joy, he returned home naked, shouting as he ran, "Eureka! Eureka!" (1934:407)

The attractive aspect of the use of demonstration is that it provides support for arguments which cannot be actually proven and the comparisons upon which these arguments are based cannot be actually compared along side one another due to significant differences in scale or in this instance time. The authors point out that the proof that Archimedes offered and his methodology in proving it provide excellent insight into the correct use of demonstration. Archimedes' theory on the behavior of fluids and solids is based upon first developing a key postulate describing the "nature or definition of fluids" and then several postulates regarding "the nature of the behavior of solids within them" (Cohen and Nagel, 1934:408). Similarly, this thesis first qualifies the environment of the campaigns through the threads of continuity, defining their nature. After defining the nature of the campaigns, the events of each campaign are then

compared, comparison being the next step in the use of demonstration. Lastly, this thesis describes how the observed actions, events of interest, within these campaigns relate to the overall evolution and conclusion of the campaign--the resultant general logistics principles. These principles then form the basis for the logistics paradigm offered by this thesis (Cohen and Nagel, 1934:408).

Another key point that Cohen and Nagel make is the difficulty of applying propositions, the logistics paradigm in this instance, to all possible cases. Key to this is the assumptions which form the framework in which the application of the paradigm applies, as per the demonstration. Therefore, "the proposition [paradigm] will and must be true if the postulate [assumption] is assumed" (1934:408). This is key in understanding and applying the logistics paradigm. By expressing defined and well constructed assumptions this thesis sets the range for the applicability of the paradigm in addition to lending credence to its applicability across time.

Another strength to the use of demonstration in developing the paradigm is that it does not need to be materially proven, which again lends itself to comparison between time frames. The task is not unlike attempting to compare Super Bowl champion teams, one from the 50s and one from the 90s. They cannot simply suit up and settle it on the gridiron. However, an effective comparison can be made using demonstration "if it reveals a necessary connection between the defining properties of the objects being compared. The demonstration uncovers relations of implication between propositions" (1934:408).

The modified threads of continuity provide the schema for the analysis of the campaigns while the technique of proof through demonstration provides substance and

rigor to the logistics paradigm. Additionally, the technique of proof through demonstration supports validity across time. The effective development of a frame work of clearly defined assumptions aids in the current and future applicability of the logistics paradigm while fostering analytical rigor.

Research Method

The process for conducting the research for this thesis involved reading as much as possible about each of the three campaigns and the three principal players: Alexander, Napoleon and Sherman. Since the threads of continuity approach considers both military and non-military factors, the research was necessarily broad in focus. The challenge was that the bulk of the literature on the three campaigns and the three principals focuses heavily on their military conquests and personal biographies and provides little on their specific logistics policies and practices. With the exception of Engels' Alexander, Daniel's For Want of a Nail and Thompson's The Lifeblood of War: Logistics in Armed Conflict, the vast majority of the existing literature on Alexander, Napoleon and Sherman does not focus on the logistics of their campaigns. As a result, numerous pages of text had to be examined for precious few lines regarding logistics practices, policies or their results.

Other than Sherman's memoirs and Clausewitz's account of the campaign of 1812, the sources are secondary sources. This thesis, however, does not focus on providing an all-encompassing account of the events of each of the three subject campaigns. Events are selected from each campaign which illustrate effective or ineffective logistics practices and policies. The selected events then serve as

representative examples from which the logistics paradigm is developed by use of the threads of continuity approach to historical analysis and the technique of demonstration.

III. Discussion

Alexander the Great

Alexander the Great is rumored to have wept upon the conclusion of his conquests because there no longer were any nations to conquer. To a large degree it is true that at his height of power, Alexander was the ruler of the known world. His tales of conquest take on a mythical grandeur in which he is located somewhere between a man and a god. "Alexander was in fact, a living myth, and unless we accept him as such we cannot begin to understand his history" (Fuller, 1940:5).

Generalism and Military Professionalism.

The almost superhuman view of Alexander is not a modern contrivance. In fact, throughout most of his life Alexander was treated with godlike reverence. "Led by a god they [the Macedonian Army] faced all dangers, and it was their faith in him as a supernatural world-hero, as much as his inborn genius for war, which made him not only the greatest of all the Great Captains, but which distinguishes him from all and each one of them" (Fuller, 1940:5). This unparalleled allegiance to Alexander coupled with his genius for integrating logistics concerns into every facet of his military theory, doctrine, strategy, tactics, and administration enabled the support of a world-conquering army.

Alexander did not rise through the ranks, but inherited his position from his father Philip. Likewise he inherited a formidable fighting force without equal in the ancient world. Alexander's *professional education* was enviable to say the least. He received superior instruction in strategy and tactics from his father and was privately tutored by

Aristotle. The negative legacy of Philip and Aristotle's tutelage was their incredible hatred of the Persians, referred to by both Philip and Aristotle as the barbarians. However, Alexander seemed to rise above the hatred of his father and mentor and developed an attitude towards conquered peoples, even Persians, that was key in ensuring logistical support across the vast conquered nations under his control. Alexander's political philosophy regarding conquered peoples and its direct impact upon logistics support is discussed at length in a subsequent section.

Military Theory and Doctrine, Strategy, Tactics.

B.H. Liddell-Hart characterized Alexander's logistics strategy as "direct and devoid of subtlety" (1945:39). Moreover, to a large degree logistics concerns shaped Alexander's strategy and tactics. From the time of his initial defeat of Darius at Issus through his Campaign into Egypt and his final defeat of Darius at Gaugamela, also known as the battle of Arbela, Alexander displayed an acute awareness of the logistics requirements of his army. Alexander considered the logistics implications of every aspect of the campaign, from the route that he took to the allies he courted, in successfully moving the mighty Macedonian army across the relatively barren deserts of Asia-minor. Alexander began his move east from Macedonia intent upon engaging the Persians at the Gracicus River. Engels estimated Alexander to have ten days worth of provisions for his army at Hellespont (1978:28). Ten days' provisions were ample given Alexander's close proximity to ports along the Aegean Sea and the relative friendliness of the people of that region. Upon defeating the Persians at the Gracicus River, Alexander then marched on Sardis. It was on his march to Sardis that Alexander

encountered his first great logistics challenge. The direct route to Sardis was across mountainous terrain. Alexander elected a more circuitous route moving back towards the coastline rather than southward to Sardis. Alexander's route is indicative of his exceptional grasp of logistics requirements and their direct influence upon the fighting capability of his army. Had he chosen the more direct route, not only would the terrain have slowed his advance, but the increased strain of covering mountainous terrain would have increased the consumption of supplies by both his men and horses. In all likelihood, his supplies would have been exhausted prior to reaching Sardis and his army would have been located in the mountainous region vice the coastal area with its ready access to supply ships. Alexander repeated this strategy of attacking the enemy, then quickly returning to the coastal region for re-supply throughout his campaign against the Persians. The two exceptions to this strategy were his move on Ancrya (modern day Ankara) and his expedition into Egypt.

Alexander achieved two major logistics objectives in his capture of Sardis. Sardis was the political and economic hub of the entire region and by bringing it under his control, and raiding its treasury, Alexander further increased the resources he could draw upon. Secondly, the defeat of Sardis cleared his path southward along the coast of the Aegean. Alexander then *liberated* Ephesus, Caria, Lycia and Pamphylia. Alexander limited the Persian fleet's ability to move and took away their access to these ports by bringing these coastal cities under his control. A secondary effect of controlling these cities was that Alexander deprived the enemy fleet of a valued manpower resource. The Persians had been recruiting heavily from this area (Liddell-Hart, 1948:40). Alexander continued his coastal movement through Lycia and Pamphylia. While passing through

this fertile region Alexander again illustrated his incredible ability to integrate logistics requirements with the gamut of additional concerns facing the leader of a large force. Although the region was fertile and presented an excellent source of re-supply for his army, Alexander was well aware the effect mountainous terrain had on supplies consumption. Additionally, it was now winter. Alexander chose to grant leave to newly-wed members of his army. This act of altruism was in fact a brilliant means of reducing the army's consumption of stores in addition to significantly improving morale. Though it seems unusual to grant leave in the midst of a campaign, Alexander was sensitive to the limits to which this region could support his army and he did not intend to march on until the end of winter (Engels 1978:37).

Throughout his campaign Alexander left garrisons of forces at key locations along his route. This practice had three major purposes: it ensured the allegiance of the city was secure, it served as a depot for the storage of supplies, and it protected his lines of communication. In some instances Alexander was able to send a small force ahead to secure a city's allegiance and support. His emissaries were able to secure logistics support and supplies, simply from the fact that the city desired to be in favor with Alexander.

Alexander's army remained throughout the winter and spring in the region around Pamphylia. Alexander did not make his march to Ancyra until well into summer. The reason for the delay was purely logistical. Alexander would be departing the coastline and heading inland. Given Alexander's doctrine of traveling light, his army would quickly exhaust its supplies and be forced to forage. Knowing that, Alexander began his march in the late summer to ensure crops within the region between Pamphylia and

Ancyra had an opportunity to both mature and be harvested, the latter being performed by the residents of the region thus sparing his army the arduous task (Dodge, 1996:53).

En route to Ancyra the Macedonian army crossed a region best described as an utter wasteland. Given the lack of potable water in this region, Alexander made frequent use of advance depots. He established the depots forward of the main army with supplies from the rear augmented with whatever else that could be secured at the advanced location.

Upon securing Ancyra, Alexander successfully secured his position in Asia-minor. Alexander then marched to Issus. Alexander again was forced to rely heavily upon the advance garrisons he had established in addition to securing supplies from the local population en route. To his advantage was the fact that the majority of the cities between Ancyra and Issus were quite unhappy with their subjugation under Persian rule and viewed Alexander's cause favorably. Issus was a coastal city which enabled Alexander to move forces garrisoned in the rear on the Aegean Sea forward. The army which Alexander had partitioned prior to his march on Ancyra was now back in full force at Issus. Alexander's partitioning and regrouping of his army is an excellent example that his philosophy of carrying only what was needed and could be supported applied to not only his supplies but to his troops as well.

Upon his defeat of Darius at Issus Alexander departed from the direct conquest of Persia. Alexander turned southward through Phoenicia and eastward into Egypt. Though Phoenicia and Egypt were under Persian control, Alexander did not face serious opposition until his return to Asia-minor. Additionally, his logistics philosophy was consistent with his earlier actions along the coast of the Aegean Sea. His route in Egypt

followed the coast of the Mediterranean Sea. The majority of the cities, especially those in Egypt, viewed Alexander as a liberator and not a conqueror and therefore were generous in their support of his army.

Upon his return to Asia-minor Alexander again remained near the coast and its valuable seaports. The cities that he passed en route from Egypt were now directly under his control and represented an asset rather than a possible threat. Alexander's departure from the coast and march on Arbela was made through the fertile Tigris-Euphrates valley. Though meeting the logistics needs of an army is no small task regardless of location, Alexander's march through the Tigris-Euphrates valley was not marked by any significant logistics challenges.

Alexander's defeat of Darius at the battle of Arbela marked the end of the Persian Empire and Darius as their King. Key to Alexander's defeat of Darius was his approach to Darius' main body at an angle and the rapid encirclement of Darius' forces by Alexander's left flank. Alexander's successful use of maneuver is directly attributable his overarching philosophy of flexibility and mobility, a philosophy integrated into and facilitated by his logistic practices.

Administration and Technology.

One of Alexander's logistics strengths, and one he cannot wholly take credit for, was the organization of his army. "Alexander had as a legacy...a model instrument--the army which Philip developed" (Liddell-Hart, 1945:39). Key to Alexander's combat superiority and logistic prowess was his staff. In addition to the traditional second in command, called the Secretariat, Alexander had Keepers of the Diary, Keepers of the

King's Plans, Surveyors and Official Historians. In addition to the more traditional staff functions, Alexander also kept a large number of specialists and scientists on his staff. This wealth of military genius, both operational and logistical, Alexander kept close at hand and without reservation solicited their counsel. Alexander's use of his staff of experts made his army formidable not only in terms of its ability to execute combat operations but also in terms of its ability to plan and support combat operations.

Under Philip's direction the Macedonian army also underwent a significant change in the manner in which troops and provisions were transported. Philip outlawed the use of wagons in the Macedonian army. The elimination of wagons resulted in the Macedonian army far exceeding any of its contemporaries in terms of speed and flexibility. Philip's philosophy was further carried on by Alexander, who limited the number of followers, civilians who tracked behind an army providing a gamut of services. Alexander only used horses, camels and mules due to their greater speed and endurance over traditional pack animals such as oxen and donkeys (Engels 1978:23). The speed and flexibility of the Macedonian army proved in many occasions to be its greatest asset.

Social, Political and Economic Factors.

Philip, through his victory at Chaeronea, had secured his control over Thebes and Athens. He then founded the Corinthian league and through it unified Greece. His next and ultimate goal was to destroy the barbarians, the Persians. His plans, however, were cut short due to his assassination. Alexander was then left with the goal of conquering the Persians and in doing so laying claim to the known world. Despite his father's

outright hatred of the Persians and the unbridled hatred of the Persians by Aristotle, his mentor, Alexander took a decidedly different view of his enemy. Alexander, too, saw the necessity of engaging and conquering the Persians. However, his purpose was well apart from the destruction of the barbarians. Under Philip, Greece had been unified “and though he might have avenged Greece upon Persia, he [Philip] was not the man to carry the idea of *homonía* (unity in concord) into the world empire of his day...this supremely greater task was destined for his son” (Fuller 1940:4). Alexander’s philosophy was not one of revenge and destructive conquest but one of control and ownership. When brought under Alexander’s control, either through defeat or in many cases by self capitulation, a conquered city was left with a measurable level of autonomy. “His method throughout his reign was always the same: he separated civil administration from military control. The first he handed over to the representative of the conquered people the second he placed in the hands of one of his chosen Macedonians” (Fuller, 1940:9). Alexander’s goal was not for *homonía* among Greeks but among all men, including Persians. In addition to the obvious political benefits this policy held, it provided substantial military logistics benefits. Although not completely free to choose whether or not to lend support to Alexander, conquered peoples on the whole favored life under Alexander’s rule to that under some other conqueror and were generally supportive. On the off chance the *carrot* of semi-autonomous rule did not persuade the conquered people, Alexander still had the *stick* of garrisoned troops left behind to oversee military affairs.

Napoleon Bonaparte

Napoleon is widely regarded as one of the premier Generals of all time. Napoleon brought about numerous reforms in the way in which wars are fought and the very structure and composition of the fighting forces engaged in combat. Napoleon embodied the idea of the professional military leader, not gaining his position through political or familial connections but earning it by distinguishing himself in combat. Although the focus of this thesis is on the logistics aspect of Napoleon's 1812 march upon Moscow, it first seems appropriate to recognize Napoleon for what he was, one of the greatest military leaders of all time.

Generalism and Military Professionalism.

The drawback to Napoleon's superior generalship and professionalism during the planning of the campaign into Russia was that he had the overpowering need to be involved in every aspect. An even greater problem than Napoleon's desire to be micro-involved was his tendency to make decisions without consulting with his key leaders. There is a consensus among the accounts regarding Napoleon's preparation for the Russian campaign that he made severe oversights with regards to the logistic requirements of his army.

Although the planning for the Russian campaign was performed over the span of two years, and showed some aspects of logistics consideration, it is clear Napoleon did not fully understand the logistical challenges he would face (Chandler 1966:753). Napoleon's misunderstanding coupled with his reluctance to share information had an obvious impact upon the soundness of his plan in terms of logistics. Napoleon's

reluctance to seek the council of others was as much a function of “delusion and irrationality clouding his powerful mind” as the lack of any competent advisors. Just prior to the invasion of Russia, “there were few men left in the imperial entourage with sufficient integrity to speak their true minds” and “for the main part Napoleon was now surrounded by claquers and sycophants” (Chandler, 1966:747). Whether acting out of ego or necessity, Napoleon planned the Russian campaign, to a large extent, entirely on his own. Operating in a vacuum led to numerous logistics problems in terms of military theory and doctrine, strategy, tactics, administration and technology.

Military Theory and Doctrine, Strategy, Tactics.

Throughout the planning and execution of the campaign into Russia, Napoleon committed numerous errors in terms of strategic focus and tactics which directly impacted the ability of his logistics system to support sustained operations. One of the greatest oversights by Napoleon, however, was his doctrinal belief that he could conduct a war on two fronts. When he began the invasion of Russia in 1812, Napoleon’s forces were still actively engaged in a peninsular war with the Spanish. Though it is unclear as to his exact reasoning, Napoleon chose not to regard his commitment to the war in Spain. It seems he preferred to have the British involved on the side of the enemy in Spain rather than being involved in some other less convenient sector of the Europe. Regardless of Napoleon’s exact reasoning, the net negative effect of the Spanish War was the loss of 50,000 French soldiers per year and the consumption of an untold amount of the materials of war which could have been used in the Russian campaign (Chandler 1966:748)

Though Napoleon did show some consideration for logistics, his problem was that though he developed his strategy with logistics concerns in mind, he viewed his logistics requirements in a static sense. He failed to factor in the possibility that the support he anticipated would not be available nor did he consider the possibility that the enemy he wanted to destroy would not engage him.

From the onset of the campaign Napoleon's strategy showed consideration for the material challenges to be faced by any force marching on Moscow. The date for the start of the invasion, the 23rd of June, was largely chosen for logistics reasons (Scott, 1998). Napoleon thought that the crops in Russia would be sufficiently developed and provide adequate forage for the thousands of horses upon which he relied upon for transportation and weapons of war. He also had the horses bear a larger than traditional load in an attempt to ensure an adequate supply of food for both man and beast. Unfortunately, the addition of the extra of food increased the horses' consumption of food, in essence negating or worsening the effect of the additional provisions. In very short order after crossing the Niemen River, Napoleon would see the his fleet of horses cut down by a third due to an outbreak of colic, the relative lack of edible forage (which he was counting on) and incredibly hot weather. The loss of these horses had a cascading effect. Men who were mounted were now forced to advance on foot and horses were diverted from other details to fill vacancies in horse-drawn artillery teams. The net effect was to distribute the transportation and logistics burden over an ever-decreasing population of beasts of burden. The burden increased with the onset of heavy rains which turned the Russian roads into impassable bogs. Throughout the campaign the ever-dwindling

supply of horses and the ever-worsening weather assisted in the complete destruction of Napoleon's ability to provide for his forces (Daniel, 1948:113-114).

The greatest strain on Napoleon's logistics system proved to be the Russian unwillingness to engage in battle. From the start of the campaign, the Russian forces were quite content in withdrawing and forcing Napoleon to pursue them. The Russians also would burn their own cities prior to abandoning them. The farther Napoleon marched into Russia, the farther he marched into a virtual wasteland. The Russians rarely left behind anything of use. Upon reaching his strategic goal of Moscow, Napoleon found it deserted and generally devoid of any useful supplies. The Russians after fighting a pitched battle on the outskirts of the city and seeing that the city would fall, simply deserted it during the night. The net effect of Napoleon's march on Moscow was that his army, that was 250,000 strong when it crossed the Niemen, was now down to 130,000 due primarily to the lack of supplies, disease and Russian hit and run attacks on Napoleon's rear. The Russian army, which was outnumbered two to one when Napoleon crossed the Niemen, now was approximately equal in size to Napoleon's army. The Russian army in spite of all its retreats had stubbornly hung on to its artillery and enjoyed a slight advantage over Napoleon's heavy guns. Upon reaching the strategic goal of Moscow, Napoleon was no closer to defeating the Russians than when he began and he was now in the midst of a vast wasteland, several hundreds of miles from his stores of supplies in Warsaw.

In search of both victory and supplies to sustain his army, Napoleon next marched on to Kaluga. It is en route to Kaluga that Napoleon got what he so desperately wanted, an army to army battle with the Russians. The Russian General Kutuzov made his stand

at Maloyaroslavetz, a village on the road from Moscow to Kaluga. Although Napoleon was able to remove Kutzov's forces from Maloyaroslavetz it came at the cost of 4,000 French troops. Worse yet was that Kutzov's forces still controlled the road to Kaluga. It was at this point that Napoleon began his retreat from Russia. Without losing a battle, he had lost the war.

It was now October and 200 miles lay between Napoleon and his nearest supply depot, Smolensk. The depot at Smolensk was established on the march across Russia from Poland. Napoleon had charged the garrison commander to secure stores while the main body of Napoleon's army pressed onward to Moscow. Napoleon anticipated that upon the conclusion of the grueling two-week march from Maloyaroslavetz to Smolensk he would be able to halt there and regroup. There were, however, three tragic flaws with this plan. The Russians now were attacking Napoleon's rear with great vigor. The garrison commander at Smolensk had precious few supplies at the onset of establishing the depot at Smolensk and being surrounded by a virtual wasteland had failed to secure any stores of adequate quantity. The weather was steadily deteriorating:

The strain on the weakened transport system was growing. All along the way the men were discarding the bulkier and less valuable items among their loot. Rations were limited. Horseflesh began once more to be cooked at the evening campfires. Snow began to fall. And on the night of November 5, the cold came.

No longer were the retreating troops faced with merely the pleasant chill of frost. This was a cold that could not be held off by the upturned collars of their greatcoats-could not be pushed aside by stamping in the snow or by holding cupped hands against ears and cheeks. This was cold so terrible that frozen feet, followed by frozen death, came upon men who had done no more than momentarily to step into the ankle-deep water of some frozen roadside puddle on which a heavy artillery wheel, a moment before, had broken the ice. (Daniel 1948:141-142)

Upon his arrival at Smolensk, Napoleon realized his folly. There were no adequate stores at Smolensk and he must keep moving or his army would be lost. Throughout the retreat, the Russian army dogged Napoleon's heels, at times separating his rear guard from his main body and inflicting even heavier casualties. When Napoleon finally returned from the Moscow campaign his army, once numbering 250,000 reported 8,800 men fit for duty.

Administration and Technology.

The administrative weakness of Napoleon's army was directly attributable to Napoleon's desire to be *micro-involved*. Although Napoleon's *micro-involvement* had garnered great success in the past, Napoleon made the tragic flaw of assuming what worked in previous situations would work again despite the dramatic difference the Moscow campaign represented from his previous conquests. Most importantly, Napoleon's army was larger than it had ever been and the campaign was spread over the vast expanse of the Russian country side. "The problems of time and distance were to prove too great for the capacity of a single mortal, even when that man was Napoleon...Napoleon's whole idea of warfare was based upon personal supervision of all parts of his army" (Chandler 1966:763). Napoleon's philosophy of direct supervision had proven difficult for him to execute over armies of smaller size which operated over a far more confined area. This philosophy proved impossible during the Russian campaign. Napoleon's inability to oversee his subordinates' preparation and execution of his planning led to significant shortfalls in readiness and synchronization of effort. The

army's reliance upon guidance from the highest levels led to poor preparation and logistics support.

Technologically, Napoleon's army was the model of modern arms for the time. However, technological superiority in this case did not ensure battlefield superiority. Specifically, Napoleon's heavy guns required multiple horse teams to move. The horses in turn required provisions of their own. The only means of replenishing a lost horse was to obtain it from another function within the army. The net result, as mentioned earlier, was the logistics burden continually being spread over a decreasing number of pack animals. Furthermore, Napoleon's wagons were well suited for the relatively passable roads of western Europe, but were woefully inadequate in the boggy mire of the Russian countryside. The combined net effect was a technologically advanced force incapable of getting to the battle in force and forced to consume itself in order to keep pursuing an enemy not committed to full engagement.

Social, Political and Economic Factors.

Leading up to Napoleon's invasion of Russia, Tsar Alexander was able to make peace with Turkey, sign a treaty of alliance with Great Britain and court the favor of Crown Prince Bernadotte of Sweden. The collective affect of this diplomatic maneuvering was that Russia "was able to clear her hands of all outstanding commitments and proved notably successful in her search for new allies" (Chandler 1966:749). Although Napoleon made similar political attempts to garner support, the vast majority of his support was obtained by force. The Russians were fighting on their own soil which provided many logistics advantages. Their supplies had shorter distances

to travel and their personnel were well equipped to handle the severe weather. Tsar Alexander eerily predicted the results of the Moscow campaign in a conversation with Armand de Caulaincourt, then Ambassador to St. Petersburg in 1811:

If the Emperor Napoleon decides to make war , it is possible, even probable, that we shall be defeated, assuming that we fight. But that will not mean that he can dictate peace. The Spaniards have frequently been defeated; and they are not beaten, nor have they surrendered. Moreover, they are not so far away from Paris as we are, and have neither our climate nor our resources to help them. We shall take no risks. We have plenty of space; and our standing army is well organized....Your Frenchman is brave, but long sufferings and a hard climate wear down his resistance. Our climate, our winter, will fight on our side. (Chandler 1966:746)

Logistics problems played the pivotal role in Napoleon's failed campaign into Russia. Inadequate transportation systems, reliance upon single sources of replenishment, and improper provisioning for extremes in climate reduced the greatest army of the time, some 250,000 men strong, to a feeble force of 8,800 survivors. Until his retreat Napoleon had not lost a battle, but he did lose the war.

William T. Sherman

The concept of generalism, a person's ability to be a general, cannot be viewed simply in terms of his conduct and influence upon his surroundings. His surroundings must also be evaluated. The environment in which the general commands has a great deal to do with his success and in turn will clearly influence the overall perception of his generalship. An analysis of William T. Sherman's environment leading up to and during the march on Atlanta provides unique insight into his generalism and military professionalism and how these threads of continuity both influenced and were influenced by his logistics practices.

Generalism and Military Professionalism.

Ulysses S. Grant's appointment as Lieutenant General, Commanding the Armies of the United States in 1864, served to solidify not only unity in terms of command but also in sense of purpose. Grant was the field General under whose leadership Sherman led the armies of the West into the heart of the Confederacy. Sherman's success can in a large part be attributed to the autonomy with which he was allowed to operate.

Sherman's autonomy was brought about as much because of Grant's trust in him as because of his geographic separation from Grant. Grant in his written direction to Sherman illustrates his belief in outlining what needs to be done, not how to do it, "I do not propose to lay down for you a plan of campaign, but simply to lay down the work it is desirable to have done, and leave you free to execute it in your own way" (Liddell-Hart, 1993:232).

This concept of centralized control and decentralized command was especially useful given Sherman's nature as a man of action. His conduct during the preparation for and subsequent march on Atlanta is distinguished by quick and decisive action. His focus was first on the end goal then on achieving it. In terms of logistics support, Sherman clearly identified his logistics requirements then obtained the necessary means to accomplish them. Sherman, however, was not prone to micro-management. He simply expressed his requirements, established a completion date, and then ensured adequate motivation for completing the task he assigned. An excellent example of Sherman's leadership style as it specifically relates to logistics was the case in which a subordinate was not providing adequate transportation support. Sherman informed the officer that if he did not supply his army and keep it supplied that "we'll eat your mules

up.” Sherman was far more forgiving of tactical errors than errors regarding adequate logistics planning. He believed that tactical errors often “stem from the enemy’s resistance and counteractions which are the most incalculable factors in war,” but a failure to adequately prepare was intolerable. Sherman believed “that by due foresight, preparation and initiative, material obstacles can always be overcome” (Liddell-Hart, 1993:232-5).

Sherman enjoyed the benefit of the best military education available at the time. He was a Graduate of the United States Military Academy. Despite not holding any cadet positions of authority while at West Point, he graduated near the top of his class, number six in the class of 1840 (All About Sherman, 1998:1). The military education he received at West Point proved valuable because it provided a sound background upon which to build military command experience, and was the same background the majority of the military leaders of the time had. Grant, Lee, Jackson and numerous other Northern and Southern generals came from the same school of thought, the West Point school. The classical approach to education at West Point undoubtedly exposed Sherman to the histories of great generals and campaigns of the past. It is then not surprising that there are significant similarities between Sherman’s campaign into the heart of the South and Alexander’s campaign against Darius, a topic further discussed in Chapter IV.

Military Theory and Doctrine, Strategy, Tactics.

Sherman, in his memoirs, makes two points clear with regards to in his planning for the campaign on Atlanta: that adequate supplies and maneuverability were key to the success of the Atlanta campaign. “The great question of the campaign was one of

supplies” (Sherman, 1984:Vol II, 8). Sherman was well aware of the relative length and vulnerability of his supply chain and took many creative steps to ensure he was provided adequate support.

Sherman was adamant with regards to the preparation of his army prior to the Atlanta campaign in order to ensure the highest maneuverability while still maintaining adequate support. “I made the strictest possible orders in relation to wagons and all species of encumbrances and impedimenta whatever. Each officer and soldier was to required to carry on his horse or person food and clothing enough for five days” (Sherman 1984: Vol II, 15). Sherman gave strict orders regarding the number of wagons and ambulances each regiment was allowed in addition to banning the use of tents by his army. The ultimate goal of Sherman was to strike a balance between maneuver and support. Sherman required each soldier to carry sufficient supplies for five days, yet he relieved units of the burden of carrying *nonessential items* such as tents, excess wagons and ambulances. Sherman’s key focus during the planning of the Atlanta campaign was to make his “troops as mobile as possible” (Sherman 1984: Vol II, 15).

Sherman was well aware of the possibility of not receiving adequate support despite the many actions he had taken in preparation for the Atlanta campaign including the increased build up of supplies at the front, the commandeering of the railroads and the strict limitations he placed upon his army. Sherman bluntly informed General Grant of his anticipated course of action should his supply system fail to support him. “Georgia has a million of inhabitants. If they live, we should not starve. If the enemy interrupt our communications, I will be absolved from all obligations to subsist on our own resources, and will be perfectly justified in taking whatever and wherever we can find” (Sherman,

1984: Vol II, 28). Sherman's strategy and tactics in terms of logistics were then clear: a highly mobile force which would rely upon significant logistics support from the rear and whenever this support was *interrupted* whatever was required would be taken from the local inhabitants. The plan of taking what was required from the local population further supported Sherman's over-arching doctrine of bringing the horror of war to the people of the South (Janda, 1995:12).

From the onset of the campaign into Atlanta, Sherman's strategy emphasized maneuver and focused on logistics. Specifically, Sherman's desire was to feint an attack on the Confederate forces at Dalton while engaging in a rear action to bar the retreat of the Confederate forces further south to Resaca. If the Confederate forces were allowed to retreat south to Resaca, Sherman would not only face the burden of being farther from his main supply depot, but he would be driving the Confederates closer to theirs.

Unfortunately for Sherman, his plans for a rear action were not completely carried out. Due to a lack of initiative on the behalf of one of his subordinate commanders, Sherman's army failed to attack the rear decisively and Sherman's attempt to execute a rear action failed to reach complete fruition. However, Sherman's actions did have both a negative and positive result. The Confederate forces were drawn away from their fortified position in Dalton to a far less favorable position upon their retreat through Resaca across the Oostenaula River. "It was nevertheless a brilliant achievement to have maneuvered so renowned a master of defense [General Johnston, Confederate commander at Dalton] out of two strong positions against his will and his orders" (Liddell-Hart, 1993:252). The negative result of the confederate retreat was that Sherman had not only missed a golden opportunity to trap Johnston's army and attack it from the

rear but that “Sherman had a lengthening line of communication [and supply], Johnston a shortening and less exposed one” (Liddell-Hart, 1993:252).

Throughout the remainder of Sherman’s march to Atlanta, he was able to effectively employ maneuver to force Johnston backward while continually supplying his troops from the rear. Essential in the re-supply effort was a trailing echelon of 2000 troops under the command of Colonel Wright, a civil engineer, whose expertise in the repair of enemy-damaged railways enabled virtually uninterrupted re-supply to the forward lines beyond Resaca. “Time after time Sherman’s greater army outflanked Johnston’s lesser forces, compelling their withdraw” (Daniel, 1948:194). Sherman eventually won the Battle of Atlanta and captured the city.

Administration and Technology.

The Civil War arguably was the first modern war, especially when considering war in terms of the American experience. The North in particular was a highly industrialized region capable of producing a variety both durable and consumer goods. One key necessity of industrialization is the need for rapid, reliable transportation. In the late 1860s the railroad developed as an indispensable mode of transportation for both military and civil concerns. Sherman, well aware of its importance, made the acquisition and maintenance of rail transportation, while denying it to the enemy, a priority (Thompson, 1991,21).

Chattanooga, the starting point for Sherman’s advance on Atlanta, lay 151 miles from his supply depot at Nashville which was in turn 185 miles from his main source of supply in Louisville. Given the significant length of Sherman’s lines of supply, it was of

paramount importance that he secure adequate transportation for supplies and reserves. Sherman's first step in ensuring a reliable line of supply was to acquire supreme control of the railroads. Previously, the railroads had been controlled by "the departmental commanders, with consequent friction and uneven distribution of supplies" (Liddell-Hart, 1993:234). Sherman, much like Grant had done for the entire Union Army, unified his control over this critical resource. Sherman then decentralized execution while maintaining overall control. Sherman's philosophy of overarching control and decentralized execution railroad operations resulted in two largely beneficial effects. He was able to oversee the flow of supplies to the front without directly involving himself in the *ins and outs* of rail operation and he eliminated the bickering and supply imbalance between subordinate commands. A secondary effect of Sherman's control of the railroads was his ability to weigh in with the authority of his office should any problems arise.

Sherman further ensured the availability and proper use of railroads by banning civil traffic. Still not satisfied, despite the fact that his daily delivery of stores to the front had doubled, Sherman directed that cars and locomotives from other locations be diverted to the Chattanooga line. The decision to ban civil traffic and commandeer additional cars was not an attempt by Sherman to simply bring a valuable resource directly under his control. Sherman had a clear level of support in terms of rail shipments, 130 ten ton car loads per day, that he felt must be met and taking control of the railroads seemed the logical way to do it (Liddell-Hart, 1998:235).

Sherman also displayed his penchant for centralized control and decentralized execution in both his mode of operation and his army's organization. An excellent

illustration was the composition of his staff. His staff included functional experts in artillery, engineering, ordnance, logistics (actually called chief quartermaster and commissary), and medicine. In addition to the functional representatives, Sherman's staff had three inspectors general and three aides-de-camp. Conspicuously absent from Sherman's staff was the administrative function. Sherman advocated clerical work in the field be kept to a minimum and used permanent clerical offices in the rear for daily correspondence. The composition of Sherman's staff facilitated the scheme of centralized control by using the staff in a controlling capacity while still leaving the execution to the lower echelons.

Social, Political and Economic Factors.

The political motives behind Sherman's campaign were clear, to bring the war and all its horror to the heartland of the South. "Sherman was eager to teach the people of the South a lesson in the horrors of war, believing that a harsh war would ensure a lasting peace" (Janda, 1995:12). Sherman further believed he was justified in his laying claim to any and all stores before him shaking off the "old West Point notion that pillage was a capital crime"(12).

Sherman was convinced that the South was entirely to blame for starting and continuing the war. He believed that by inflicting as much hardship as possible upon the people of the South, the Southern armies as well as the Confederacy would crumble. Sherman's all-out attack upon the people and resources of the South was a perfect complement to his strategy of flexibility. Because his troops traveled light, in terms of supplies, they were in constant need of re-supply. The foraging of supplies served a two-

fold purpose for Sherman. First, it deprived the civilian population of already scarce resources. Secondly, it significantly decreased the burden for Sherman's own logisticians. The morality of Sherman's actions is not a topic of this thesis. However, it is questionable whether his willingness to meet logistics requirements by the use of the previously criminal practice of pillaging was rooted in military necessity or merely performed out of some sense of retribution. The former is consistent with accepted military custom and the latter is indicative of poor leadership and compromises military custom and chivalry.

IV. Analysis

Though it can be maintained that the two largely successful campaigns of Alexander and Sherman had many similarities among policies and practices, it cannot further be assumed that there then exists some exacting set of rules or practices shared by the two that if employed will always guarantee success. This thesis does not attempt to develop a listing of the key logistics principles that will guarantee success, but rather establishes a logistics paradigm intended to be a guide or a starting point from which current and future military leaders can develop their own policies and practices. By analyzing the commonalities among successful campaigns and integrating those with the lessons learned from not-so-successful campaigns, a logistics paradigm is developed which is based upon practices proven to be valid in antiquity and which forms a starting point from which leaders can tailor their own practices to fit their specific situation. In this thesis the campaigns of Alexander and Sherman illustrate the good logistics practices while Napoleon's campaign into Russia provides the lessons learned. The framework for analyzing the commonalities and lessons learned is based upon the threads of continuity approach.

Generalism and Military Professionalism

In terms of formal military education and background, the backgrounds of Alexander and Sherman are dramatically different than that of Napoleon. The former represent the aristocratic general while the latter represent the journeyman soldier. In no way does that mean Napoleon was a lesser general. In fact he is arguably the greatest

general of all time. What is meant by the distinction between aristocratic and journeyman is that both Alexander and Sherman were taught to be generals and leaders of men, while Napoleon was first taught to be a soldier and through aptitude and hard work rose to his position as general. Both Sherman and Alexander received superior education and military training compared to that of their contemporaries. Alexander's private tutor was Aristotle and he was taught from an early age how to be a general by his father Philip. Sherman attended the United States Military Academy and, though commissioned as a Second Lieutenant, the focus of the United States Military Academy is to teach men to be leaders and ultimately generals. Napoleon, though a graduate of *l'Ecole Militaire*, did not have the formal military education of Sherman. *L'Ecole Militaire* during Napoleon's time was not "particularly distinguished for the attention it paid to the proper preparation of its young aspirants for commissions" (Chandler 1966:8). Similarly, given Napoleon's middle class up-bringing, he was not afforded the tutelage of a great thinker nor was his father a great general.

Though no direct correlation can be made between the military education received by Alexander, Napoleon and Sherman and their general logistics practices during the campaigns under study, their backgrounds provide insight into the disposition and character of these generals. It can clearly be seen that by working his way up from his middle class beginning through the ranks as a junior artillery officer, Napoleon developed a significant sense of self-reliance and, as was the case during the planning for the invasion of Russia, a need to be involved in every aspect of the operation down to the minutiae. Conversely, both Sherman and Alexander consistently maintained supervisory

oversight of their armies while leaving the precise execution of daily operations to their functional experts.

Military Theory and Doctrine, Strategy, Tactics

Military theory and doctrine, strategy and tactics for the purpose of this analysis are focused at the operational level and can be viewed in general terms as how each general conducted the campaign. Each of the three campaigns represents dramatic differences in how the conduct of war influences or is influenced by logistics. Alexander's conduct of his campaign was greatly influenced by logistics concerns. Napoleon's logistics practices were greatly influenced by how he intended to conduct his campaign. Unfortunately for Napoleon, how he thought he was going to conduct the campaign was not how he ended up conducting it and his logistics system proved horribly inadequate. Sherman's conduct of his campaign was both influenced by logistics concerns and influenced his logistics practices.

Alexander's foremost concern was the adequate provisioning of his army as is evident in his route through Asia-minor. Though the defeat of the Persians was the ultimate military goal of his conquest up to the battle of Arbela, clearly that could not be accomplished without first addressing the logistics needs of his army. Throughout his campaign, Alexander employed three main techniques to ensure adequate provisioning. First, he stayed as close to the coast as possible. His proximity to the coast facilitated easy access to his fleet of supply ships while denying port access to his enemy. Secondly, Alexander modified the size of his army, flexible sizing, to suit the environment he was facing. An excellent example of his flexible sizing was when

Alexander, faced with the onset of winter after passing through the region around Pamphylia, granted leave for all newly-wed members of his army. The granting of leave greatly decreased the number of troops he had to supply and undoubtedly had the additional benefit of increasing morale. When Alexander marched inland, he took great pains to ensure advance logistics support. Alexander sent military envoys ahead with the charter to inform local officials of Alexander's approach. The message was clear; surrender yourselves and your property or be destroyed. As was often the case, support was granted without the use of force.

Napoleon's *hubris* was that he failed to fully understand the environment in which he was to conduct war and therefore developed a logistics system that was woefully mismatched for that environment. The most popular example was the inadequacy of Napoleon's wagons to effectively negotiate the rough Russian countryside. However, a closer examination indicates the problem was just as much about what he carried and how he carried it as what it was carried in.

Though Napoleon had planned the start of the invasion to coincide with the harvest within western Russia, the availability of crops proved inadequate to support the thousands of horses he relied upon for transportation and as weapons of war. The lack of fodder, combined with an outbreak of colic, decimated Napoleon's fleet of horses and had the cascading effect of spreading the burden over an ever-decreasing number of horses which in turn increased their consumption of supplies. Worse yet is that as the number of horses decreased, horses had to be shifted from pack detail to pulling Napoleon's artillery. The shortage of pack horses meant more was being carried by men, increasing their consumption and reducing their mobility.

Napoleon's greatest misunderstanding was how the Russians would respond to his advance. The Russian willingness to trade land for time proved to be Napoleon's undoing. As Napoleon pressed further and further into Russia, he traveled farther and farther away from his main supply reserves in Poland and further into a vast wasteland. The Russians laid waste to anything of logistical value prior to retreating, leaving Napoleon with little to draw upon from the local population. The Russian *scorched earth* tactic accompanied by constant attacks on Napoleon's lines of supply deprived Napoleon of even the slightest relief. By the time Napoleon was able to engage the enemy face to face his two to one superiority in numbers had vanished. With the onset of winter, Napoleon realized the war was lost and in his desperate march back to Poland he lost the bulk of his remaining troops.

Napoleon began the campaign with the anticipation of relying upon the available crops within the area to augment the provisions his army carried with them. Additionally, he intended to bring his superior numbers and fire power to bear against an enemy in an army to army confrontation for the control of the capital. Unfortunately, what he encountered was something far different. Had events gone as Napoleon expected, it could be argued that he well may have won in Russia. However, Napoleon's logistics plan and his logistics practices proved woefully inadequate in the end.

Sherman's logistics policies and practices both influenced and were influenced by how he conducted his campaign. Sherman was well aware of the logistics strain and the vulnerability of his lines of supply as he advanced further towards Atlanta. Sherman took unusual measures to bolster his lines of supply. From the planning stages through the execution of the campaign, Sherman maintained control of the railways. He diverted

locomotives from other locations and aggressively repaired battle damaged rail lines. His route southward followed the main rail line from Chattanooga to Atlanta. Clearly in this instance Sherman's conduct of war was influenced by logistics.

Sherman is noted for the destruction that he brought into the heart of the South. The destruction Sherman inflicted was not solely the result of pillaging for supplies nor was it the result of pure malice and wanton destruction but a combination of both. Sherman was clear from the onset of the campaign that one of his motives was to bring the war to the people of the South. He also considered himself completely justified in obtaining whatever he required from the local population. Sherman believed that if the Confederate forces impeded the flow of supplies to the front, he was then perfectly justified in acquiring the supplies he needed from the local population. Whether it be the case that the Confederate forces significantly affected Sherman's supply lines or in fact that Sherman simply needed more supplies than he could provide for himself, Sherman before the onset of the campaign clearly established his intention to take what was needed from the local population. Sherman allowed his desire to bring the horror of the war to the people of the South, a key element in how he was to conduct this campaign, to influence his logistics practices.

Sherman and Alexander shared one key factor in their conduct of war: the logistics requirements they placed upon individuals during the planning stages of their respective campaigns. Both gave specific instructions aimed at lightening the load of individuals and individual units under their commands. Interestingly, both Alexander and Sherman prohibited the use of tents. Alexander built upon Philip's requirements to minimize followers and Sherman limited the number of wagons available to individual

units. The ultimate end goal was to increase individual and unit mobility by limiting what was carried to the bare essentials. This is not to say that Napoleon did not take measures to increase mobility and in turn increase the army's ability to maneuver, but in the case of Alexander and Sherman, maneuver proved to be the deciding factor in the defeat of their enemy. Sherman was able to outflank Johnston's forces and Alexander was able to attack Darius' forces at an angle and encircle them. Both victories resulted from the successful use of maneuver which was directly attributable to their armies' ability to move quickly, a concept integrated into and facilitated by their logistics policies.

Administration and Technology

A key attribute shared by both Alexander's and Sherman's success and which proved to be a contributing factor to Napoleon's failure was the use of their staffs. Both Alexander and Sherman had experienced and trusted military advisors to advise them on a multitude of functional areas. Though Napoleon also had a staff, his to a large degree was made up of "claqueurs and sycophants" (Chandler, 1966:747). It is unclear if the lack of sound advisors resulted in Napoleon's tendency to micro-manage or if his management style made a staff position an overly unattractive billet for anyone except a sycophant. Regardless of the cause for his less than competent staff, its lack of competence left Napoleon with little choice but to rely upon his personal involvement in all aspects of the operation of his army.

As discussed earlier, both Sherman and Alexander to a large degree dictated what was to be done and not how to do it. Such a philosophy is an excellent indicator of a high

level of trust and respect for one's subordinates and indicates a capable and competent staff.

Each of the three armies represented the most technologically advanced fighting forces of their time. They differ, however, in how they adapted their technology to fit the situation at hand. Napoleon had state of the art weaponry, especially artillery, yet he was unable to effectively use it because he could not transport it effectively. The wagons carrying his artillery were well suited for the well-maintained roads of Western Europe but were woefully inadequate in the impassable bogs of the Russian countryside. Alexander, on the other hand, purposefully did not use traditional pack animals such as oxen and donkey but opted for animals with better endurance and speed like horses and camels. Alexander adapted his transportation technology to suit the situation. Sherman took complete control of the railways and ensured he had a viable repair activity prior to the start of the Atlanta campaign. He exploited available technology to his advantage while denying the enemy access to it. Similarly, Alexander made great use of naval re-supply and in doing so denied the enemy similar access since he controlled the ports. Alexander's and Sherman's ability to adapt and apply logistics technology, specifically transportation technology, proved valuable in the success of their campaigns, not their absolute technological superiority, as was the case for Napoleon.

Social, Political and Economic Factors

To analyze the effect of social, political and economic factors, this thesis examines the interaction between the campaign forces and the indigenous peoples and the local environment. Although each of the three campaigning forces interacted differently

with local inhabitants there is one common aspect which defined the interaction. In the case of the successful campaigns, the commander understood the environment he was to operate in, to include not only the tangible factors such as terrain but the intangible factors such as the resolve and attitude of the people he intended to conquer.

As discussed previously, Napoleon's failure to comprehend Russian resolve and willingness to sacrifice land for time was key in his defeat. In his statement to Armand de Caulaincourt, Tsar Alexander was quite clear about the Russian willingness to use the vastness of their frontier and the severity of their climate as key aspects in their defense. Apparently Napoleon failed to regard these comments or simply thought that even if the Russians did employ these tactics they would be of little impact. Napoleon also was willing to begin his offensive against Russia while still engaged in a war with Spain. He neglected to realize that a fundamental building block to alliances is a common enemy. Unfortunately for Napoleon, the fact that France was engaged in two wars made France far less attractive to any new prospective allies than Russia who had settled all her other disputes. The net result was that Russia was able to form alliances with Great Britain and Sweden and make peace with Turkey. Napoleon not only failed to comprehend the impact of the physical environment upon his logistics plan, he failed to recognize the political environment's effect upon his logistics plan. Russia had gained new allies and made peace with former enemies which resulted in focusing their entire military logistics capability towards a single foe. Unlike his Russian enemy, Napoleon was now actively engaged in fighting a war on two fronts with the bulk of his allies being former conquered peoples whose support was tenuous at best.

Sherman understood well the environment he was to encounter during his campaign. One of his specific goals was to change the environment of the enemy citizens he encountered. Atlanta and the surrounding region represented a wealthy and pristine area of the South, particularly in terms of its exposure to the destruction of the Civil War. Sherman conducted his campaign "aimed at defeating the South psychologically as well as militarily" (Janda 1995: 8). He was dramatically successful in both aspects. Sherman not only successfully completed his campaign to capture Atlanta, he also left a lasting mark on the consciousness of the enemy population he encountered. Sherman clearly understood his environment and made affecting that environment a key factor in his campaign.

Alexander, too, was well aware of the environment he was to encounter. He, however, took a decidedly different approach than Sherman to the people he encountered and conquered. Alexander allowed the conquered people to retain some measure of autonomy with regards to their own civil affairs. Additionally, the people he encountered often surrendered to Alexander without a fight and in some instances viewed him as a liberator from the oppressive rule of the Persians. Conquered peoples' view of Alexander is in stark contrast to how Napoleon and Sherman were viewed during their respective campaigns. Alexander's goal, too, was different from that of Napoleon or Sherman. Where Sherman explicitly wanted to make war on the people of the South and Napoleon wanted to conquer the people of Russia, Alexander to a large extent wanted to unify, under his rule, the people he conquered. This distinction between conquering and unification on the surface may seem subtle, but examination of how conquered people were treated by the two generals illustrates the dramatic difference between the two

concepts. Alexander retained military control but to a large extent left the civilian population to continue their lives as they had done before. Napoleon in contrast retained control through the establishment of some puppet civil and military leadership. The net result was those under Alexander's rule to a large extent were unaffected by the shift in power, whereas former enemies under Napoleon's control were much the worse for the shift in power. Clearly, Alexander realized that if he was to accomplish his goal of *Homonía* he would have to ensure the eventual and lasting support of the people. *Homonía* could not effectively be accomplished at the point of a spear. By understanding and integrating the political and social environment of the people he conquered, Alexander obtained their support, a factor that played a major role in his logistics practices during the campaign to defeat Darius.

V. Conclusions

The conclusions set forth in this thesis result from first an examination of the events surrounding the campaigns under study and then an analysis of the commonalities among successful campaigns and the lessons learned from the not-so-successful one. The logistics paradigm resulting from this analysis has four key principles. Each principle of logistics put forth by the analysis relies upon the use of demonstration by "revealing a necessary connection between the defining properties of the object being compared" (Cohen et al, 1934:408). Key to the validity of the logistics principles, and in turn the entire paradigm, put forth in this thesis is the underlying assumptions specifically outlined with the explanation of the principles. As Cohen and Nagel point out, the assumptions form the framework in which the application of the principles apply as per the demonstration (1934: 408).

It can easily be seen that the four principles of logistics offered by this thesis are not entirely new to anyone familiar with the study of war. In fact, in some form or another, each of these principles appears in several prominent historians' statements of principles of war and or logistics. However, the method with which these principles can be applied distinguishes them previous theory. The difference between the principles put forth in this thesis and other theories will be discussed, but the principles themselves must first be described.

Centralized Control, Decentralized Execution

As described earlier, both Alexander and Sherman made extensive use of staffs of functional experts. Conversely, Napoleon, though possessing a staff of his own, tended to be involved down to the lowest operational levels. As Chandler points out, the logistics challenges Napoleon faced would prove too great for any one man to handle, even if that man was Napoleon (1966:763). Sherman and Alexander allowed their functional experts to manage the daily operations of their specific area of responsibility and both generals weighed in with the authority of their office only when needed. Their management philosophies allowed them to focus upon the overall management of their armies while still staying close to the daily operations managed by their staffs.

Although these campaigns involved large armies and the necessity for centralized command and decentralized execution seems well founded, there is just as much applicability of this concept for smaller sized, more modern military units. Given the assumption that logistics concerns are a function of the complexity of the operation at hand which is in turn a function of the people, equipment, and supplies being used, then the challenge of meeting basic logistics requirements has increased in proportion to the complexity of the fighting force being provided for. Though the size of the army or military unit may be quite different from that of Alexander, Napoleon or Sherman, in modern times it is still quite complex. Complexity then implies the need for exacting expertise in numerous, specific fields integrated to support an overarching end goal or mission. In much the same manner that even a general as brilliant as Napoleon could not manage the wide gamut of logistics and non-logistics issues he faced during the campaign into Russia, neither can a modern military leader expect to have adequate

knowledge in the gamut of functional areas of responsibility. Though an extensive staff may neither be practical or attainable, a leader should be willing and endeavor to consult the functional experts. Similarly, one person can only be expected to know and do it all if he or she is not just one person but the only person.

Key to the validity of centralized control, decentralized execution and its implied reliance upon functional experts is that such experts exist and are available. This assumption seems negligible but as mentioned earlier the availability of a competent staff or group of advisors is quite rare in small military units. Of even greater concern is the lack of true functional experts. Though career broadening and the blurring of the lines between logistics specialties in the modern military does provide an increased pool of *trained* personnel from which to draw upon to fill logistics billets, it necessarily results in the reduction of true functional experts who have spent the bulk of their career learning their specialty and honing their skills to a superior level. The greatest challenge to the concept of centralized control and decentralized execution is the loss of true functional experts, given the current trend in United States Air Force logistics.

Flexibility

The need for flexibility seems to be an item of consensus among students of military history. Flexibility is analyzed in this thesis as the degree to which forces can adapt to their environment, specifically, how logistics policies and practices enable forces to quickly adapt to their environment. Both Alexander and Sherman made advance orders to their armies specifically outlining what they could and could not bring with them, the ultimate goal being the most mobile force they could possibly have. Alexander

and Sherman used maneuver as a key tactic in the defeat of their enemies. What is not so well documented but equally as important is how their ability to move rapidly between battles further enhanced the capability of their armies. Napoleon, on the other hand, was unable to maneuver with any success and was forced to plod along the Russian countryside enabling the enemy before him to retreat and lay waste to anything of value prior to his arrival. The flexibility to move and maneuver was clearly key in the success of Alexander and Sherman and was integrated into all aspects of their armies to include their logistics planning and practices.

Additionally, this thesis examines flexibility in terms of not only an army's ability to respond to the physical aspects of the environment but to the more intangible aspects of the environment. Napoleon very well may have been able to overcome the hardships he faced crossing the Russian countryside if he had had an enemy to fight directly in battle. Ironically it was the lack of an enemy which led to his eventual defeat. In taking Moscow, Napoleon fully expected the war to be won. When Napoleon marched into the capital largely unopposed, he was no closer to defeating the Russians than when he began his campaign. The Russians simply abandoned Moscow and after Napoleon's arrival set parts of the city ablaze. The intangible factor of Russian willingness to trade land for time proved to be the downfall of Napoleon's logistics plan. Though it cannot be said if his logistics plan would have adequately supported his troops had he been able to conduct the war as he had planned, it can be said that his logistics plan based upon the invasion of Russia and the ultimate capture of Moscow was not capable of sustaining his army in the protracted conflict into which he was lured.

Flexibility is key to the success of any organized unit, military or otherwise. If an organization cannot adapt to changes in the physical and intangible factors which encompass its environment, then the laws of nature maintain it will become extinct. The challenge in developing, obtaining, or maintaining flexibility is that it in some sense presumes clairvoyance. Clearly it is easy to identify factors that at present must be adapted to or overcome. It is an entirely different matter to plan for factors, or contingencies, before they manifest themselves, the mark of true flexibility. The measure to which a unit can respond to unforeseen contingencies is the true measure of the unit's flexibility. Therefore, the principle of flexibility implies the assumption that measurable flexibility is the result of planning for immeasurable and unforeseeable contingencies. Additionally, every contingency that is planned for and not encountered is needlessly planned for. The paradox is that there is no way to know with any surety which contingencies will arise and which will not. The lack of a spare tire is only problematic when a flat tire is encountered. Otherwise the omission of a spare tire represents additional cargo space and possibly better gas mileage. Flexibility then is more an aspect of the art of logistics than the science of logistics. It is both logistically and economically not feasible to plan for every possible contingency, but to the largest degree possible logistics plans should be adaptable to the gamut of most likely contingencies that may be faced. Quality advance planning and experienced logistics leadership can go a long way in the development of viable contingency plans. The major factor in assuring flexibility, however, is not to attempt to analyze every possible contingency and then plan for it. In fact this will result in excessive waste and as pointed out earlier, those contingencies not encountered are needlessly planned for. The key is to develop a logistics plan that at its

core is highly adaptive, meaning it requires the minimum possible support from external agencies. By having a highly adaptive logistics plan the unit's reliance upon its environment is minimized allowing it to function unencumbered in a wide variety of environments thus enhancing flexibility.

Proper Application of Technology

Both Alexander and Sherman not only properly applied the technology available to them, they integrated this technology into their logistics support practices. Alexander made use of non-traditional pack animals because they better fit the environment in which his army was operating. Additionally, Alexander made use of sea lift whenever available. The capture of enemy ports and the coastal route Alexander followed illustrate how he integrated transportation technology into his overall strategy. His route and the ports he captured enabled him to exploit available shipping while preventing his enemy from doing the same. Similarly, the use of shipping enabled better and more rapid re-supply further enhancing his capability to execute his strategy. Sherman, prior to the march on Atlanta, was well aware of the critical role railroads would play in his preparation and execution of the campaign. He took the unprecedented step of bringing this critical asset under his control to ensure its proper use and application in support of his efforts. Furthermore, Sherman had the foresight to form and utilize a rail repair force comprised of some 2000 troops. The rail repair force enabled the quick repair of any damaged rail lines and resulted in the preservation of this valuable transportation technology.

It cannot be said, however, that technologic superiority necessarily equates to victory. Napoleon's force at the onset of the Moscow campaign represented the most technologically advanced force of its time. Additionally, it enjoyed numeric superiority over the Russian forces by whom it was ultimately defeated. The key in Napoleon's case was that he was unable to exploit his technological advantage or, in other words, he failed to properly apply the technology available to him. There are numerous instances throughout recent history in which a technologically superior force was defeated by a technologically inferior enemy but those conflicts are not the focus of this thesis. In a broad sense technology can be seen as a single tool. No matter how advanced the tool, if it is used improperly or if its the wrong tool it simply will not work.

For modern military leaders the challenge to the proper use of technology is that in most instances leaders do not have the leeway to determine the technology they employ. This is most true in terms of the actual weapons a unit employs. The critical assumption then to the proper application of technology is that there is some choice regarding the technology that can be used. The greatest leeway in terms of technologic choice is in how the weapons of war, to include troops, are provided for. It is true in this case that the most technologically advanced method may not always be the best method. Though airlift in its own right might be the fastest mode of shipment, attempting to airlift an entire support package may result in a bottleneck and lengthy delays awaiting available air transport. The ultimate result may be that the support package, had sea lift been used, would have arrived earlier than by air due to sea lift's ability to handle a larger capacity of freight. Similarly, the best way to provide potable water is to employ portable water purification units. However, this application of advanced technology is

only of use if some source of water exists. This may not always be the case in extremely arid regions. The examples are numerous and further illustrate that superior technology is only of use if it is applied properly or can even be applied at all.

Understand the Environment

A major function of logistics is the neutralization of the effects of the environment. Clearly it follows that to neutralize the effects of the environment the environment must be understood first. The paradox is that the ability to completely understand the environment is beyond the capacity of any individual or group of individuals. This problem is further compounded by the fact that the environment can be defined in varied terms or at varied levels of precision. For example, the United States can be defined as the 50 states and all territories. An equally valid description is that the United States consists of all those individuals that consider themselves American. Furthermore, the United States can be defined in terms of longitude and latitude. The course of action offered by this thesis is that given the environment is at best vaguely defined, the key to understanding the environment is to define as much as can be defined and then integrate control, flexibility and technology in such a manner as to minimize the effect of any unforeseen factors in the environment. Therefore, the fourth logistics principle offered in this thesis is as much the integration of the previous three as it is an individual concept in its own right.

The environment, though definable in multiple terms, does have basic characteristics of interest to military leaders. Though the physical aspects of the environment, terrain, size of the enemy force and supply requirements to name a few,

tend to garner the bulk of a military leader's attention and accordingly are addressed by his strategy, tactics and logistics plans the intangible aspects of the environment are just as important. Napoleon had a fairly good grasp of the tangible environmental factors that he would encounter during his invasion into Russia. What Napoleon failed to consider was the intangible factors which dramatically altered the effect of the physical factors of the environment. The Russian willingness to trade land for time resulted in Napoleon's advancing farther into the interior of Russia without garnering a victory. The Russian willingness to surrender their capital without a major conflict resulted in Napoleon's having to press even farther into Russia in search of an enemy to defeat. These two intangible factors resulted in Napoleon's having to completely change his concept of how he was going to defeat the enemy. Furthermore, Napoleon's logistics plan was not developed to support a seek and destroy mission across the vastness of the barren Russian countryside. Had Napoleon understood Russian resolve, that is to say, understood the intangible aspects of the environment of a war with Russia, and integrated proper control, flexibility and technology into his logistics plans the outcome of the Moscow campaign could have been dramatically different.

Alexander was attuned to the environment he encountered during his campaign against Darius. His goal of *homonía* for all people had no hope of being achieved unless he could bring the conquered peoples under his control. Alexander knew that he would not maintain lasting control if he relied upon military force alone to keep his newly acquired territories in line. He therefore allowed them a large measure of autonomy with regards to their own civil affairs. Interestingly, Alexander was viewed as a liberator in some of the areas which he conquered since life under Alexander was viewed as better

than life under the rule of Darius. Alexander was able to exploit his understanding of the environment to gain support from the local population. He successfully integrated his control policies, flexibility and technology into a plan that both exploited the support of the local environment but could adapt to any adverse factors which arose from the environment. Alexander would gladly accept support from the local population but should they choose not to support him he was more than capable to adapt and take whatever he needed by force.

Sherman too was well-attuned to the environment and in fact one of his overarching goals was to affect the environment of the people he encountered. Sherman from the planning stages of the Atlanta campaign was clear in expressing his willingness to acquire whatever was needed from the local population if the need should arise. This would serve the two-fold purpose of meeting his logistics requirements while further supporting his goal of bringing the war to the people of the South. Sherman, by understanding his environment, was able to integrate control policies, flexibility and technology into his logistics plan which not only limited the effect of adverse environmental factors, it further promoted one of his ultimate goals.

Modern military leaders face an environment which is extremely complex and consistently changing. Major political events in recent history have significantly changed the political, social and economic landscape of the world. The potential theaters of operations are now more than any other time in history more diverse and geographically separated. Given that, it is impossible to understand every possible environmental factor, both tangible and intangible, that may present a logistics challenge. However, by knowing as much as possible about the people, geography and culture of as many areas as

possible and developing logistics plans and practices which integrate proper control, flexibility and technology the effect of unforeseen and adverse environmental factors can be minimized.

Other Views on Logistics Principles

The four logistics principles put forth by this thesis, Centralized Control/Decentralized Execution, Flexibility, Proper Application of Technology and Understanding the Environment, can be found in some form or another in other research. However, it is how this thesis applies these principles that is quite different from previous research. These principles are not simply a listing of specific *dos* and *don't s*, they are intended to form a paradigm or framework of thought from which military leaders can draw upon to develop their own policies and practices. The biggest failing of a list of *dos* and *don't s* is that it cannot hope to fit every possible situation and in fact may be the worst possible course of action for a given environment or situation. The paradigm consisting of the four principles of logistics is intended to guide thought, and not specify actions. It facilitates creativity while offering a bounded framework for the development of executable logistics plans. A comparison of Huston's and Thompson's principles of logistics with the four principles of logistics outlined in this thesis serves to further illustrate the applicability and adaptability of these principles.

In his book, The Sinews of War: Army Logistics 1775-1953, Huston outlines 14 principles of logistics: "First with the Most, Equivalence, Materiel Precedence, Economy, Dispersion, Flexibility, Feasibility, Civilian Responsibility, Continuity, Timing, Unity of Command, Forward Impetus, Information, Relativity" (1997:564). It is clear that

Huston's principles are intended to be a list of things to do vice a description of how to approach logistics challenges, the latter being the focus of this thesis's principles.

Similarly, Thompson makes use of the *British Principles of Administration* as a reference for general logistics principles in his book The Lifeblood of War: Logistics in Armed Conflict. Thompson's principles, "Foresight, Economy, Flexibility, Simplicity, Cooperation" are fewer and broader in scope than Huston's but still to a large extent focus on what to do rather than how to think (1991:7). If viewed on a continuum with the right being the pragmatic *how to* and the left being the thought-provoking paradigm, Huston's principles would be on the far right, Thompson's somewhere between the middle and the right, and this thesis's principles would be past the middle and more towards the far left. There is no particular spot on the continuum that is particularly better than the other. However, as one moves from the right to the left the focus becomes more broad but the principles' applicability also increase to a larger number of situations. Admittedly, moving to the extreme left of the continuum is of little use because the principles would be so broad that, although they would surely apply to any situation, they would be of little use. The resultant guidance would be broad and useless principles like: employ sound logistics principles at all times and ensure your logistics requirements are met. Generally an extreme point on a continuum is of little use, the principles put forth in this thesis, though less pragmatic than the traditional listing of *dos* and *don'ts*, are still specific enough to provide guidance while enhancing applicability by focusing on outlining a way to think instead of listing specific actions to complete.

Application of the Logistics Paradigm

Operational level commanders should at the onset endeavor to understand as much about their theater of operations as possible. Studying history combined with genuine intellectual curiosity will go a long way in gaining an understanding of a diverse and often multi-cultural theater of operations. As the perception of the operational environment becomes more clear, commanders, with the aid of their functional experts, can begin to modify their existing command structure, protocols and organization to facilitate the proper balance between centralized control and decentralized execution. Certain tangible and intangible environmental factors will lend themselves to either a more centralized control structure or a more decentralized one. For example, a geographically vast theater of operations with diverse climates and terrain lends itself to a decentralized control structure. Therefore, the logistics policies and practices within that theater of operations should support a high level of autonomy between distinct, geographically separate units.

Much in the same manner that the logistics command and control structure should be tailored to the specific theater of operations, so should the application of technology. Advanced technology should not be forced into use in an environment in which it is not well suited. Advanced technology should not be the square peg forced into an inappropriate situation's round hole. Commanders should use the most advanced technology available that is suited for the theater of operations. For example, no matter how advanced the available motorized transportation is, if the only means of transport through a mountainous area of operations is by donkey, then donkeys should be used. It

would be of greater benefit to ensure the best donkeys and donkey drivers are used than to force the use of motorized vehicles in an unsuitable environment.

The fine tuning of control practices and technology to best mesh with the environment within the theater of operations is an iterative process. As more information is obtained about both the tangible and intangible factors of the environment adaptations to existing policies and practices will need to be made. As stated earlier, a major role of logistics is the neutralization of adverse environmental factors and the exploitation of favorable ones. As a better understanding of the environment is gained, policies and practices must be modified to best take advantage of new opportunities or defend against previously unknown adverse conditions. The discovery of a previously unknown water source could result in a change of logistics policy by allowing the practice of drinking locally acquired fresh water. Similarly, the discovery that a local water source is no longer potable may result in changing logistics policy and the banning of the use of any water found in the local area.

An excellent measure of the soundness of existing logistics policies or practices is the speed with which they can be adapted to meet changes in the environment. The speed of change is a direct function of the flexibility of the existing logistics system. It is therefore of paramount concern that flexibility be a core characteristic of any logistics plan, policy or practice. Reliance upon single sources of supply, the belief that there is only one way to do something or resistance to new ideas are key indicators of a lack of flexibility. Without flexibility, the ability to adapt slows which in turn can result in an excellent logistics plan evolving into a dated, useless way of doing things. The highest degree of flexibility should be maintained in all aspects of an operation. By maintaining

the highest level of flexibility, the unit's logistics policies and practices will be able to rapidly adapt to a constantly changing environment.

The previous description of how the logistics paradigm should be applied illustrates the pronounced difference between its application and the use of more traditional, list-type logistics principles. Fundamental to the logistics paradigm is its iterative and adaptive nature. It is meant to guide thought instead of specifying specific actions to take. The shortfall of any list of *to dos* is that there will always be some instance where they do not fit, are inadequate or are the complete wrong thing to do. The logistics paradigm focuses on integrating logistics policies and practices with the environment in order to ensure adequate support, exploitation of opportunities, protection against threats and the ability to adapt to change, all key abilities demonstrated during Alexander's and Sherman's campaigns and woefully lacking in Napoleon's.

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Vita

Captain R. Alan Hardemon was born on [REDACTED]. He accepted an appointment to the United States Air Force Academy in 1987 upon graduation from F.W. Springstead High School in Springhill, Florida. Upon graduation from the Air Force Academy on 29 May 1991, he received the degree of Bachelor of Science in Economics and his commission in the USAF. Prior to arriving at his first duty station, MacDill AFB, Florida, he attended the Aircraft Maintenance and Munitions Officer Course at Chanute AFB, Illinois. While assigned at MacDill from December 1991 until March of 1993, he held a gamut of positions within the 56 Maintenance Squadron culminating in his assignment as Accessory Flight Commander. He was then reassigned to Kunsan AB, Republic of Korea in April of 1993 where he was the Flight Commander Accessory and Fabrication Flights. In April 1994 he extended at Kunsan AB for an additional year and was made the Sortie Generation Flight Commander, 35th Fighter Squadron. Upon completing his tour of duty in Korea, he was assigned to Misawa AB, Japan where he was the Propulsion Flight Commander, and then the Sortie Generation Flight Commander in the 14th Fighter Squadron followed by his assignment as Sortie Generation Flight Commander in the 13th Fighter Squadron. He entered the Air Force Institute of Technology at Wright-Patterson AFB, Ohio in May 1997. His follow-on assignment is to the Air Force Logistics Management Agency, Gunter AFB, Alabama.

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