

NETWORK CENTRIC WARFARE IMPLEMENTATION AND ASSESSMENT

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ABSTRACT

NETWORK-CENTRIC WARFARE IMPLEMENTATION AND ASSESSMENT, by
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This study examines three primary questions: (1) What is the definition of network-centric warfare? (2) Are the military services implementing the network-centric warfare concept? and (3) Is the network-centric warfare concept a new theory of warfare or rather a modification or extension of previous theories?

To answer these questions various publications on network-centric warfare and the various military service transformation plans were reviewed. The definition of network-centric warfare developed is the linkage of people, systems, and platforms to form a self-synchronization networked force that creates shared battlespace awareness for information superiority and speed of command. A review of the services transformation plans showed that the services may not be using the same terms, but they are implementing the concepts of network-centric warfare. The study concludes that network-centric warfare is not a new theory of warfare, but a concept that supports maneuver theory of warfare similar to the concept of blitzkrieg developed by Germany prior to World War II. To emphasize the concept of network-centric warfare supports maneuver theory the term network-enabled warfare is suggested as a more appropriate term to be used, instead of network-centric warfare.

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ACRONYMS

AEF	Air Force and Space Expeditionary Force
CSG	Carrier Strike Group
C2	Command and Control
C4I	Command, Control, Communications, Computers, and Intelligence
C4ISR	Command, Control, Computer, Communication, Intelligence, Surveillance and Reconnaissance
DoD	Department of Defense
ESF	Expeditionary Strike Force
ESG	Expeditionary Strike Group
FCS	Future Combat Systems
ISR	Intelligence Surveillance and Reconnaissance
JFCOM	United States Joint Forces Command
MCP	Mission Capability Package
NCW	Network-Centric Warfare
RMA	Revolution in Military Affairs
SBCT	Stryker Brigade Combat Team
UA	Unit of Action
UE _x	Unit of Employment X
UE _y	Unit of Employment Y

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CHAPTER 1

INTRODUCTION

Network-centric warfare (NCW) suggests a new and technology-focused concept for fighting future wars and conflicts. NCW focuses on battles with a preponderance of technology as opposed to the traditional personnel, tactics, and logistics.¹ The concept of NCW provides a force with access to new and previously unreachable types of information. The ability to operate with this new type of information provides the warfighter with an advantage broadly characterized by significantly improved capabilities for sharing and accessing information. NCW promises to arm warfighters with the ability to leverage this information advantage to dramatically increase combat power.²

The theory of NCW is the embodiment of an information age transformation of the Department of Defense (DoD). Its premise is that it involves a new way of thinking about how to accomplish missions, how to organize and interrelate, and how to acquire and field the systems that support warfare. This concept is one element that will help move the DoD to the next level of jointness as envisioned in *Joint Vision 2020*. This effort towards jointness will employ new technologies and involve new ways of operating and organizing to utilize these new technological advantages.³ However, one questions whether NCW is something really new requiring a new way to approach war.

Currently, NCW is a developing concept, not yet a fully formed and deployable warfighting capability. Transforming today's programs and platforms into a network-centric one will require developing and refining network-centric concepts of operation and evolving them with doctrine, organization, command approach systems, and the other

components needed to run the military.⁴ This study is an attempt to refine the network-centric concept.

Research Questions

This study examines three primary questions: (1) What is the definition of NCW? (2) Are the military services implementing the NCW concept? and (3) Is the NCW concept a new theory of warfare or rather a modification or extension of previous theories?

Assumptions

A major assumption in this research is that NCW can be broadly defined and refined into a few major themes. The use of themes is based on three assumptions. First, the presence of these themes suggests the concept of NCW is being implemented and there is no specific order or relationship that needs to take place. Second, the difference in how the themes are used indicates the path of understanding and definition of NCW. Third, the number of times a term is used indicates the importance of that theme. A final assumption is that the service transformation documents are appropriate sources to identify NCW implementation across the services. There may be other documents that are better suited to answer the question of how the services are implementing concepts and theories--more specifically the concept of NCW.

Limitations

This study uses public information that is available through the Combined Arms Research Library, U.S. Army Command and General Staff College, Fort Leavenworth,

Kansas, electronic databases, and the Internet. The research performed is textual based. The analysis is limited to the selected material.

Background and Significance of Study

Several authors suggest that NCW is more than just technology integration into today's military. Indeed, the introduction of technology is nothing new to warfare. The developments of the tank, submarine, and torpedo technology are just a few examples. Rather, the important question is not what technology is introduced, rather how it is integrated. The U.S. has made great advances in computer information processing, networking, satellites, radio communications, and other technologies. However, the question remains, Has modern technology changed the military so much that it requires a new way of thinking--an NCW way of thinking?

Some argue that NCW is based upon the experiences of organizations that have successfully adapted to the changing nature of their competitive spaces in the information age. Organizations that do not change the way they do business cannot fully leverage the power of information. NCW utilizes information as a potential source of power. This potential is realized when new relationships among individuals, organizations, and processes are developed. These new relationships create new behaviors and new modes of operations that create increased combat power.⁵ These relations allow for the networking of forces. NCW derives its power from the strong networking of a well-informed but geographically dispersed force.⁶

NCW provides a new foundation with which to examine and consider changes in military missions, operations, and organizations in the information age. Information technology advances are reshaping the conduct of warfare in the twenty-first century.

Most notable are advances in the areas of command and control (C2); intelligence, surveillance, and reconnaissance (ISR); and precision weapons delivery. These advances create the possibility for a networked warfighting force. This networked capability allows a commander increased speed to develop situational awareness and understanding, to rapidly communicate critical information to friendly combat forces, and to organize the appropriate capabilities to exert massed effects against an adversary.⁷

Recent military operations seem to support the NCW concept. These recent operations seem to have shown that when forces are truly joint, with comprehensively integrated capabilities and operating according to the concept of NCW, they can fully exploit the nature of information age warfare. Some of the reported military advantages of NCW operations include the following:

1. Networked forces can be formed with smaller-sized units that travel lighter and faster, meaning fewer troops with fewer platforms and carrying fewer supplies, can perform a mission effectively at a lower cost.⁸

2. Networked forces can fight using new tactics. During Operation Iraqi Freedom, U.S. Army forces utilized movement that was described by some as “swarm tactics.” Because networking allows soldiers to keep track of each other when they are out of each other’s sight, forces could move forward in Iraq spread out in smaller independent units, avoiding the need to maintain a tight formation. If one unit gets into trouble, other units nearby can quickly come to its aid, “swarming” to attack the enemy from all directions at once.⁹

3. The way individual soldiers think and act on the battlefield is also changing. When a unit encounters a difficult problem in the field it can utilize on-line chat rooms to

aid in resolving the problem. If the unit cannot type the problem in itself, it can radio the tactical operations center which types the problem into an on-line chat room.¹⁰

4. The sensor-to-shooter time is reduced. Using NCW systems, soldiers in the field have the capability to conduct an “on-site analysis” of raw intelligence from sensor displays, rather than waiting for return analysis reports to arrive back from other supporting units.¹¹

The recent operations have shown advantages of the use of technology in military operations. However, has the U.S. military placed too much emphasis on technology, and has information itself become overrated as a useful military asset? Is the development of NCW an embodiment of placing too much emphasis on information technology? The negative view of NCW is that networking for information exchange is not a sufficient substitute for combat maneuver and that information superiority and situational awareness are not the most significant components of combat power. More critical than information superiority and situational awareness is the correct analysis of an anticipated enemy movement and tactics.¹²

To provide a better understanding of what NCW is and how, if any, the services are implementing its concept, the next chapter will explore the history of the development of term NCW. Chapter 4 will develop themes of NCW. The themes will be used to create a working definition of NCW and to explore the service transformational documents to determine to what extent the services are implementing the NCW concept. This is followed by an analysis to determine if NCW is a new theory of warfare or rather modification or extension of previous theories.

¹LTC Edmund Blash, USAR, “Network-Centric Warfare Requires a Closer Look,” *Signal Magazine*, May 2003, 56.

²Department of Defense, *Network Centric Warfare Report to Congress* (Washington, DC: 27 July 2001), iv.

³*Ibid.*, i.

⁴*Ibid.*

⁵Davis S. Alberts, John J. Garstka, and Frederick P. Stein, *Network Centric Warfare: Developing and Leveraging Information Superiority*, 2d ed. (Washington, DC: CCRP, 1999), 87.

⁶Vice Admiral Arthur K. Cebrowski, U.S. Navy, and John J. Garstka, “Network-Centric Warfare: Its Origin and Future,” *Proceedings*, January 1998, 35.

⁷Department of Defense, Office of Force Transformation, *The Implementation of Network-Centric Warfare* (Washington, DC: Government Printing Office, 2005), 18.

⁸Congressional Research Service, Report to Congress Order Code RL32411, *Network Centric Warfare: Background and Oversight Issues for Congress* (Washington, DC: Government Printing Office, 2004), 7.

⁹*Ibid.*

¹⁰*Ibid.*

¹¹*Ibid.*

¹²Blash, 56.

CHAPTER 2

LITERATURE REVIEW

The literary review forms the foundation for this study. The purpose of the literary review is to obtain a sense of understanding of the concept of NCW and to determine its essential themes.

Definitions

Concept refers to the general idea of what NCW is all about. Theme refers to the unifying ideas that are recurring in the NCW literature.

Introduction

The themes identified in the literary review are used in subsequent chapters to answer the research questions: (1) What is the definition of NCW? (2) Are the military services implementing the NCW concept? and (3) Is the NCW concept a new theory of warfare or rather a modification or extension of previous theories?

The primary source of review for this study of NCW focuses on four publications. First is the address by Admiral Jay Johnson as Chief of Naval Operations during the U.S. Naval Institute Annapolis Seminar and 123d Annual Meeting, Annapolis, Maryland, 23 April 1997. Second is the 1998 article “Network Centric Warfare: Its Origins and Future,” in *Proceedings* of the Naval Institute by Vice Admiral Arthur K. Cebrowski, U.S. Navy, and John J. Garstka. Third is the 1999 book about network-centric warfare: *Network Centric Warfare: Developing and Leveraging Information Superiority*, David Alberts, John Garstka, and Frederick Stein. The last publication for review is the January

2005 Office of Force Transformation booklet: *Implementation of Network Centric Warfare*.

Myths

To begin the study of NCW, a review of some of the myths that surround the topic is performed. This review sets the stage for the further literary analysis by dispelling some of the common misconceptions of NCW. After the false notions of NCW are addressed, a more focused look at what NCW is about can be performed. David S. Alberts, John J. Garstka, and Frederick P. Stein discuss in their book *Network Centric Warfare: Developing and Leveraging Information Superiority* eleven myths about network-centric warfare.¹

Myth 1: There are experts with all the answers to NCW. There are no experts on NCW. The concept of NCW is about a state of mind, not a concrete reality. Translating the NCW concept into a real operational capability requires more than just an information infrastructure. Rather it requires new concepts of operations, C2 approaches, organizational forms, doctrine, force structure, and support services all working together to leverage the available information.²

Myth 2: NCW is all about the network. NCW is more about networking than networks. It is about effective linking or networking of knowledgeable entities that are geographically or hierarchically dispersed. It is about the increased combat power that can be generated by a network-centric force. The networking of knowledgeable entities enables them to share information and collaborate to develop shared awareness and also to collaborate with one another to achieve a degree of self-synchronization. The net result is increased combat power.³

Myth 3: NCW will change the nature of warfare. NCW suggest the need to address the principles of mass and maneuver. Mass and maneuver need to be looked at in the context of massing effects, not the physical massing of forces. The other principles of warfare remain as meaningful as ever. NCW offers an opportunity to improve the ability to achieve these principles by reducing the tensions among them. The application of NCW concepts can help the principles related to the offense, economy of force, surprise, unity of command, and simplicity.

Myth 4: NCW applies only to large-scale conflict with a peer competitor. Early experiments of NCW were focused on tactical sensor-to-shooter capabilities. This experimentation was focused on peer competitors. However, NCW can be applied broadly across the mission spectrum. NCW is about battlespace awareness, speed of command, and responsiveness that can be applied to all conflicts, not just those with peer competitors.⁴

Myth 5: NCW makes the military more vulnerable to asymmetric attacks. Currently no one can say NCW will make military less vulnerable. This is because it depends on how NCW is translated into concepts of operation, doctrine, force structure, and each of the other elements that comprise to support military missions.⁵

Myth 6: NCW is well on the road to development. To fully leverage information superiority and apply NCW to the full range of tasks, the DoD requires two things: first, a suitable infostructure and second, the co-evolvment of the concept of operations, command approach, organization, systems, and people with a prescribed level of expertise. The DoD is working to improvements in these areas, but it remains to be seen

if these changes are applications of NCW or just an extension of current concepts and practices.⁶

Myth 7: The commercial world has shown the way and all that is needed is to follow. Alberts, Garstka, and Stein state that, “network-centric concepts do not automatically translate into effective organizations. This is true whether or not one is trying to apply this concept in the commercial sector or to DoD.”⁷ They continue by emphasizing that what is good for business is good for the DoD, which is a dangerous oversimplification. The important factor is to learn from the experiences of others and apply these lessons where appropriate.⁸

Myth 8: NCW will provide the power to dominate adversaries. No one item alone is the answer to warfare. NCW has the potential to improve current performance of people and assets. The improvements in collaboration, speed of command, and other attributes of C2 that NCW provides will not make up for weapons that are incorrectly applied. The ability of NCW to provide better awareness depends upon not only sharing what is known, but also upon the collection and analysis of the information shared.⁹

Myth 9: NCW will not survive first contact with the real fog, friction, and complexity of war. Warfare will always be characterized by fog, friction, and complexity. NCW can provide improved battlespace awareness and access to geographically separated assets. The ability to have a better near real-time picture of what is going on helps reduce uncertainty. Better battlespace awareness through this near-real time picture provides the ability to advantageously shape the battlespace.¹⁰

Myth 10: NCW is an attempt to automate war that can only fail. NCW is not about executing battles through computer networks or about relying on automation to

make decisions. It is about creating combat power by combining information and warfighting assets together in the most efficient and effective way possible.¹¹

Myth 11: NCW will result in the chasing of information rather than responding to battlespace events. This myth refers to the NCW ability to create increased speed of command. The worry is that the increased speed of command will result in friendly forces responding to their own inputs rather than the inputs of the adversary on the battlefield. Such a scenario is possible, but the scenario where speed of command is used effectively to the friendly forces advantage is also possible. The point is that NCW provides the opportunity to use increase speed of command when appropriate, it does not force the use of speed of command when not appropriate.¹²

The myths have provided an overview of the issues that surround the concept of NCW. These myths have set the stage for further literary analysis. The literary analysis consists of four key publications on NCW that are used to identify its essential themes.

Concept Themes

Chief of Naval Operations Admiral Jay Johnson

One of the first senior military leaders to use the term network-centric warfare was Admiral Jay L. Johnson, Chief of Naval Operations from August 1996 to July 2000. He discussed the topic of information superiority and network-centric warfare during the U.S. Naval Institute Annapolis Seminar and 123d Annual Meeting, Annapolis, Maryland, 23 April 1997. To gain a true understanding of Admiral Johnson's view of NCW, it is important to see the context in which he used the term. Here is an excerpt of his address:

The United States Navy of the 21st century will be increasingly focused on projecting power landward. But there is nothing really new about this. What is new is the concept of offensive distributed firepower, using complementary air, surface

and subsurface platforms bound together with the landward force component command in a network-centric architecture. Our Navy of tomorrow will provide the force commander, wherever assigned with a staggering range of options and an incredible deterrent punch.¹³

The address continues by discussing naval technology advances. Amidst all the technological advancements, there is another area that is becoming more important as the Navy progresses into the twenty-first century. That area is information superiority, a shift from a concept called platform-centric warfare to something called network-centric warfare. Admiral Johnson further states:

Information superiority, combined with netted, dispersed, offensive firepower that we talked about, will yield a well-conceived and precisely placed early effort to produce extremely high rates of change. This in turn, locks out enemy options and locks in success for us. This is what we call “speed of command.” This is what we call “network-centric warfare.”

Speed of command flattens the hierarchy, puts decision-makers in parallel with shooters in ways that we were unable to do before, and transforms warfare from a step function to a continuous process.¹⁴

Advances in technology, Admiral Johnson suggests, will fundamentally change the way naval warfare is conducted. Distributed sensors and fire capabilities coupled with communication networks will enlarge the C2 capabilities available to a commander. National, theater, and local assets will all be connected (networked). He believes the explosion of technology is the single most fundamental change over the past twenty years. The naval warriors of the future must be able to understand and effectively use the new technology. He concludes by discussing that mastery of the personal computer will be fundamental in all naval activity in the next century.

This address by Admiral Johnson reveals several concepts of NCW. One, is a fundamental shift from platform-centric warfare to the term NCW. He discusses using complementary air, surface and subsurface platforms bound together in a network-centric

architecture. He also addresses information superiority combined with netted, dispersed, offensive firepower. This is argued as providing the capability to eliminate an enemy's options and enabling friendly forces the opportunity for success through speed of command. Next, Admiral Johnson suggests speed of command flattens the hierarchy and transforms warfare from a step function to a continuous process.

From these concepts a few themes begin to emerge: offensive distributed firepower, forces bound together in a network-centric architecture, shift in focus from the platform to the network, speed of command, information superiority, and warfare transformed from a step function to a continuous process.

Network Centric Warfare: Its Origins and Future

The term NCW was first introduced to a wide audience in January 1998 in the article "Network Centric Warfare: Its Origins and Future," by Vice Admiral Arthur K. Cebrowski, U.S. Navy, and John J. Garstka. The article approaches NCW as arising from the fundamental changes in economics and technologies of American society and business. The authors argue that insight can be gained through the general observation that nations make war the same way they make wealth. If society and business have changed, how can the military not also change? These changes are having a drastic effect on the military that is actually a revolution in military affairs. The article addresses the revolution in military affairs in the following manner:

We are in the midst of a revolution in military affairs (RMA) unlike any seen since the Napoleonic Age, when France transformed warfare with the concept of *levée en masse*. Chief of Naval Operations Admiral Jay Johnson has called it "a fundamental shift from what we call platform-centric warfare to something we call network-centric warfare," and it will prove to be the most important RMA in the past 200 years.¹⁵

The authors suggest society and business will enable the military to increasingly capitalize on the advances and advantages of information technology. They describe three basic themes pertaining to these changes: (1) the shift in focus from the platform to the network; (2) the shift from independent actors to the view of a continuous adapting environment; and (3) importance of strategic choices in an adapting environment.¹⁶

Cebrowski and Garstka assert the fundamental changes in economics can be traced to the dynamics of growth and competition that have emerged in the modern economy. As more companies now produce similar products and services, competition increases. This competition has increased the emphasis on returns on investment and competition based on time. Companies have turned to information technology for a competitive edge.¹⁷

Clearly, the technologies of American society have also changed. The 1998 article describes information technology as the process of migrating from an emphasis on platform centric computing to network-centric computing. This shift is most obvious in the increased emphasis on the use of the Internet and sharing of information. Sharing of information can help organizations exploit information technology leading to superior results. The new technologies, combined with high-volume, high-speed data access, and technologies for high-speed data networking have led to the emergence of network-centric computing. Cebrowski and Garstka continue by stating that the developments of network-centric operational architectures that consist of a high-powered information backbone, a sensor grid, and a transaction grid have lead to an increased competitive space. Information now can be created, distributed, and easily exploited across the extremely heterogeneous global computing environment. The business logic to link

heterogeneous computing lines more effectively and provide increased value for customers is the same value proposition sought in warfare.¹⁸

The authors also assert the way American conducts business has also changed. The emergence of the dynamic and unstable economy changed the American way of business. First, firms have shifted their focus to the much larger, adaptive, and learning environment. Firms realized that an environment is composed of more than just competitors. Sharing information with friends can lead to superior results. Second, firms also realized that speed has increased in importance. Firms learned to use superior awareness to gain a competitive advantage and compress timelines linking suppliers and customers.¹⁹

Cebrowski and Garstka continue by stating that the leading U.S. firms have three main understandings of how to employ networks:

1. The shift from platforms to networks for a more flexible and more dynamic operational capability that increases profitability
2. The shift from viewing partners as independent to the view of partners as part of a continuously adapting environment that can result in increased profitability
3. The key to market dominance lies in making strategic choices appropriate to changing environment

The concept of NCW includes those benefits produced in American business sector can be delivered to the U.S. military.²⁰

The 1998 article suggests that changes in economics, society, and business are accompanied by changes at a structural level. This level requires an operational architecture with three critical elements: sensor grids and transaction grids supported by a

high-quality information backbone. These elements are supported by value-added C2 processes that are automated to get the required speed.²¹

The authors further describe NCW as enabling a shift from attrition-style warfare to a much faster warfighting style characterized by the speed of command and self-synchronization. NCW provides a very high and accelerating rate of change that impacts the outcome by locking-out alternative enemy strategies and locking-in success. NCW allows forces to develop speed of command and enables forces to organize from the bottom up (self-synchronize) to meet the commander's intent. This capability is provided through information superiority, the massing of effects versus the massing of forces, and the rapid foreclosure of enemy courses of action by the shock of closely coupled events.²²

Cebrowski's and Garstka's in their 1998 article reveal several concepts of NCW. One, NCW is a shift in focus from the platform to the network in a continuous adapting environment. Next, the idea that sharing of information can help organizations exploit information technology leading to superior results is also present. The article also discusses the need to develop an information backbone, sensor grid, and transaction grid for an increased competitive space. Finally is the assertion that NCW enables a shift from attrition-style warfare to a much faster warfighting style characterized by speed of command, information superiority, and massing of effects not forces.

From these concepts more themes of NCW are identified. Those themes include: information technology focus, shift in focus from the platform to the network, adapting environment, information backbone, a sensor grid, a transaction grid, speed of command, information superiority, and increased competitive space. Compared to the themes that Admiral Johnson previously highlighted, a few common themes begin to emerge. The

concept themes in common are networked platforms, speed of command, information superiority, and architecture backbone.

Network Centric Warfare: Developing and Leveraging Information Superiority

In May 1999 one of the first books about network-centric warfare: *Network Centric Warfare: Developing and Leveraging Information Superiority*, by David Alberts, John Garstka, and Frederick Stein was published. It suggests NCW is based upon experiences of organizations that have successfully adapted to the challenging nature of the competitive spaces in the information age. It is defined in terms of human and organizational behavior. As such, NCW represents a new way of thinking, a network-centric way of thinking, and applying this thought process to military operations. The concept focuses on combat power that can be generated from effective linking or networking of various warfighting elements. Some characteristics of NCW the authors suggest include the ability of geographically dispersed forces to create a high level of shared battlespace awareness that can be exploited via self-synchronization and other network-centric operations to achieve the commanders' intent. Again, as in previous articles, the authors see NCW supporting speed of command and the conversion of superior information position to action. NCW is transparent to mission, force size, and geography. In brief, NCW is not solely about technology, but also about an emerging military response to the information age.²³

Alberts, Garstka, and Stein define three concepts of NCW. The first key concept is the use of a geographically dispersed force. In the past, forces needed to be in close proximity to the enemy or to the target they were defending. This was due to limitations

in the ability to communicate, move, and project effects. As a result, a geographically dispersed force was relatively weak, and was unable to respond quickly to or mount a concentrated attack. Location constraints also paced a force's ability to move rapidly while maintaining cohesion and logistics support. The book continues by stating that the technologies of the information age have made it possible to free the source of combat power from the physical location of battlespace assets or entities and may, in the future, allow forces to be more effective on the move. Eliminating geo-locational constraints associated with combat allows the movement from an approach based upon the massing of forces to one based upon the massing of effects. Hence, the authors state in order to generate a concentrated effect, it is no longer necessary to concentrate forces. This allows for the reduction of the battlespace footprint, which in turn reduces risk because this avoids presenting the enemy with attractive, high-value targets. It also expands the concept of maneuver by reducing the need for the transportation or movement of physical objects, a very time-consuming and expensive task. With NCW, Alberts, Garstka, and Stein conclude that the ability exists for a sensor or shooter to be in a position to engage many different targets without having to move.²⁴

The authors continue with a second key concept that forces are more knowledgeable. Empowered by knowledge, derived from a shared awareness of the battlespace and a shared understanding of commanders' intent, forces are able to self-synchronize, operate with a small footprint, and be more effective when operating autonomously. Alberts, Garstka, and Stein state a knowledgeable force depends upon timely, accurate information, and the processing power, tools, and expertise necessary to put battlespace information into context and turn it into battlespace knowledge.²⁵

Finally, the third key concept is the effective linkage among entities in the battlespace. Dispersed and distributed entities can generate synergy that allows responsibility and work to be dynamically reallocated to adapt to the situation. Effective linking requires the establishment of a robust, high-performance information infrastructure, or infostructure, which provides all elements of the warfighting enterprise with access to high-quality information services. Alberts, Garstka, and Stein assert that the effectiveness of linking mechanisms and processes affects the power coefficient or multiplier. The goal is to build the configuration that creates the most effective force. They maintain NCW is all about deriving combat power from distributed interacting entities with significantly improved access to information. The authors state that the adoption of NCW provides the ability to enlarge the engagement envelope, reduce risk profiles, increase operating tempo and responsiveness, improve maneuverability, and achieve higher kill probabilities.²⁶

From the review of this book, a few more concepts of NCW are identified: shared battlespace awareness, self-synchronization, speed of command, information superiority, eliminating geo-locational constraints, knowledgeable force, and linking achieved among entities in the battlespace. A few of these concepts match with some concepts themes previously developed. The concept themes of information superiority, speed of command, network-linked platforms and forces are all present in the literature reviewed so far.

The Implementation of Network-Centric Warfare

The last review is of one of the most recent publications on NCW. In January 2005, Retired Admiral Arthur Cebrowski, now Director, Office of Force Transformation, published a booklet entitled, *The Implementation of Network-Centric Warfare*.

In this publication, NCW is referred to as an emerging theory of war in the information age. It is the military's response to warfare in the information age. The term NCW broadly describes the combination of strategies, emerging tactics, techniques, and procedures, and organizations that a networked force can employ for a decisive advantage. It is about the emphasizing the human behavior within a networked environment as opposed to information technology. Retired Admiral Cebrowski views the concept of NCW as a new way of thinking about how to execute missions and how to organize at all levels of warfare: strategic, operational, and tactical.²⁷

The booklet describes some characteristics of NCW. It is described as the ability of geographically dispersed forces to attain a high level of shared battlespace awareness that is exploited to achieve objectives in accordance with the commander's intent. NCW is about modern technology and updated operational concepts that enable networked units and individual platforms to operate together in ways not previously possible. Retired Admiral Cebrowski asserts that the linking of people, platforms, weapons, sensors, and decision aids results in networked forces. A networked force can operate with increased speed and synchronization and is capable of achieving massed effects. These mass effects can be achieved even without the physical massing of forces required in the past. NCW enhances forces to combine into a seamless, joint warfighting force that

generates new military capabilities while providing additional speed and precision to traditional capabilities.²⁸

The publication suggests that NCW generates increased combat power by networking sensors, decision makers, and shooters. This networking achieves shared awareness, increased speed of command, high tempo of operations, and a degree of self-synchronization. In essence, it translates information advantage into combat power by effectively linking friendly forces and providing shared awareness that enables more rapid and effective decision making for increased speed of execution. This network is underpinned by information technology systems that individuals use the network at the same time.²⁹

Retired Admiral Cebrowski discusses four basic tenets and nine principles of NCW. The four tenets of NCW provide an understanding of the enhanced power of networked forces. They are:

1. A robustly networked force improves information sharing.
2. Information sharing enhances quality of information and shared situational awareness.
3. Shared situational awareness enables collaboration and self-synchronization, and enhances sustainability and speed of command.
4. These, in turn, dramatically increase mission effectiveness.³⁰

Nine principles of NCW are described in the booklet as still evolving and subject to further refinement and are used as to guide the application of NCW as an emerging theory of war. These principles do not replace or supplement the time-tested principles of war: mass, objective, offensive, security, economy of force, maneuver, unity of

command, surprise, and simplicity. The NCW principles provide additional direction to organize, train, and execute military operations in an information age. The nine principles are:

1. Fight first for information superiority
2. Access to information: shared awareness
3. Speed of command and decision making
4. Self-synchronization
5. Dispersed forces: non-contiguous operations
6. Demassification
7. Deep sensor reach
8. Alter initial conditions at higher rates of change
9. Compressed operations and levels of war³¹

The publication also suggests that a theory of war must account for new sources of power, relations among them, and how they are brought to bear across the entire spectrum of military competition from peacekeeping, deterrence, and dissuasion to violent clashes and sustained, high-intensity conflict, and from force building and countering traditional threats to countering irregular, catastrophic, and disruptive threats. The basis of NCW as an emerging theory of war is that power flows from society and society's methods of creating power and wealth, and that there has been a fundamental shift in sources of power from industry to information. NCW is an emerging theory of war that is about the organizational relationships and processes decisions made when in a networked environment. The theory further supports that these organizational relationships and processes will outperform forces that are not networked. The four basic

tenets of NCW elaborate on this basic premise. The governing principles of a network-centric force guide the application of this emerging theory of war and help to explain its power.³²

In summary, this review of the Office of Force Transformation booklet displays more concepts of NCW previously mentioned in the literature review. The booklet's overall NCW concept themes are: shared battlespace awareness, networked forces, speed of command and decision making, precision and deep sensor reach, information superiority, self-synchronization, and linking of people, platforms, weapons, sensors, and decision aids. Compared to the previous literature reviewed, three common concept themes are identified: information superiority, speed of command, and networked-linked platforms and forces.

Implementation Themes

The implementation themes for NCW are derived from the previous literature review, using the same four primary sources used to identify concept themes. These themes are used in chapter 4 to determine if the military services are embracing the concept of NCW. Admiral Johnson's address did not contain implementation themes; therefore, the review begins with Cebrowski's and Garstka's article.

Network Centric Warfare: Its Origins and Future

The authors of the article "Network Centric Warfare: Its Origins and Future" discuss how to achieve a network-centric environment. To fight on a network-centric rather than platform-centric basis, a change in the training, organization, and allocation of resources must be made. A network-centric force operates under a different, more

modern rule set than a platform-centric force. A choice needs to be made in three areas: intellectual capital, financial capital, and process.³³

Cebrowski and Garstka argue intellectual capital decisions about information-based processes are the dominant value-adding processes in both the commercial world and the military. Yet the military fails to reward competence in these areas. Information processing talents are not regarded in the same esteem as operations talent. The authors argue that a warfighter who does not understand the true source of combat power in such things as global C2 systems and advanced tactical data links are simply worth less compared to those who do. The services must both mainstream and merge those with technical skills and those with operational experience in these areas. The inherent cultural changes are the most difficult and protracted.³⁴

Financial capital, according to the authors, must be invested. There is a movement towards producing weapons that have range, precision, and responsiveness, and advanced C2 concepts are under development. Also, there is a need to push to provide for accelerated implementation of customer-led command, control, communications, computers, and intelligence (C4I) innovations and existing C2 systems and capabilities. The authors argue that the military services are spending large amounts for information technology programs and are deploying increased network capabilities. All elements of NCW must move forward if the promise of the revolution is to be realized. Delays in moving forward will mean higher costs, and reduced combat power in the joint arena.³⁵

Cebrowski and Garstka continue to mention that choices in transformation process must be made. In spite of a ponderous acquisition process, technology insertion is ahead of and disconnected from joint and service doctrine and organizational

development. The problem is cultural and systemic. A process for the co-evolution of technology, organization, and doctrine is required. The authors suggest that the service experimentation programs are a vital first step. While the temptation may be to take some units out of readiness reporting status for use in an experimental force, the result would be to isolate the larger force from the process. The objective is to create an ethos for experimentation, innovation, and the willingness to accept risk across the entire force. Specific top-down experimentation will be required because of cost and size or in establishing overarching priorities, but these are expected to spawn experiments from the bottom up and facilitate cultural and organizational changes.³⁶

The review of this article suggests a few implementation themes. The themes can be summarized as:

1. Process for the co-evolution of technology, organization, and doctrine
2. Increasing network capabilities
3. Change how to train, how to organize, and how to allocate resources
4. Top-down experimentation and experiments from the bottom up and facilitate cultural and organizational changes
5. Merge technical skills and operational experience
6. Precision, and responsiveness, and advanced C2 concepts
7. Customer-led command, C4I innovations and existing C2 systems and capability

Network Centric Warfare: Developing and Leveraging Information Superiority

In Network Centric Warfare: Developing and Leveraging Information

Superiority, in the section on making NCW a reality, the authors write:

Clearly, NCW has significant potential to transform the approach used to assigned missions and achieve worthwhile improvements in effectiveness and efficiency. However, these gains will not be realized by simply putting an enabling infostructure in place. In fact, doing so without taking steps to develop a mission capability package (MCP) could result in confusion and disharmonies, along with degraded performance and poor morale.³⁷

A MCP consists of a concept of operations, command approach, organization, systems, and people with a prescribed level of expertise.³⁸

The authors argue that making NCW a reality requires two key prerequisites. The first is the development of new and innovative NCW concepts and strategies to meet mission challenges. The second is the ability to transform these embryonic concepts and strategies into real operational capabilities. To accomplish this they suggest that three linked processes are needed: one designed to foster and incubate innovative ideas, another designed to introduce change, and lastly, a process designed to insert technology.³⁹

Alberts, Garstka, and Stein assert that the information age is different than past eras in four fundamental ways. First, the rate of technological advance and the ability to turn out new products has increased dramatically. Second, the advances in technology that are relevant for the military are no longer driven by known operational requirements. Instead, they are being driven by private sector requirements to move and process information on a scale previously unimaginable. Third, the military is now being driven by a technology cycle that is quickening and has less and less time to react to take

advantage of the new capabilities. Fourth, the new capabilities are equally available to potential adversaries.⁴⁰

The book suggests that what is needed is to adapt the existing requirements, investment planning, and programmatic processes to be available enterprise-wide. Current practices split the requirements, funding, design, development, and acquisition processes for each of the elements of an MCP. Thus, rather than helping co-evolution, current culture and processes are doing just the opposite.⁴¹

The implementation themes can be summarized as:

1. Concept of operations, command approach, organization, systems, and people with a prescribed level of expertise
2. Process designed to insert technology
3. Designed to foster and incubate innovative ideas and concepts
4. Adapt existing requirements, investment planning, and programmatic processes, making them enterprisewide
5. Designed to introduce change, facilitates an understanding of emerging capabilities
6. Speed at which technology can be deployed and expedite testing and refining the concept

The Implementation of Network-Centric Warfare

Next is a review of the Office of Force Transformation booklet *The Implementation of Network-Centric Warfare*. The booklet describes a strategy for implementing NCW. The strategy discussed consists of three main parts and seven key elements of its implementation strategy for NCW. The main strategic items are:

1. Setting priorities to enable, develop, and implement network-centric concepts and capabilities
2. Establishing specific goals and measuring progress toward these goals
3. Overcoming impediments to progress⁴²

Retired Admiral Cebrowski writes that setting priorities requires a focus on interoperability that must not be sacrificed for near-term considerations. Battlespace entities (platforms, units, sensors, shooters) must be designed net-ready. In addition, increased emphasis must be placed upon research in developing shared situational awareness and new organizational approaches to achieving synchronization. Research must continue to improve the ability to accurately represent NCW related concepts and capabilities in models and simulations and to help people understand and manage complex networks.⁴³

The second main strategy the author argues is the importance of establishing measurable NCW goals, in developing an investment and implementation plan to achieve these goals, and in measuring progress. An immediate goal must be the availability of a robustly networked joint force that can experiment with network-centric concepts and capabilities accompanied by a campaign of experimentation focused on discovery. Ongoing efforts to develop measures of key aspects of NCW, including the quality of information, collaboration, awareness, and shared situational awareness, have been given more emphasis and related to measures of C2, synchronization, and, ultimately, to measures of mission effectiveness.⁴⁴

The third part to the implementation strategy Retired Admiral Cebrowski asserts is overcoming impediments to progress. He states that there remain technical, cultural,

and organizational impediments to accelerating the progress to fully implementing NCW. Each can be overcome through focused efforts in areas such as network security, network interoperability, an understanding of human and organizational behavior, and key NCW enabling technologies. The creation of a DoD environment that supports innovation will enable the realization of the full potential of NCW, just as better understanding of individual, team, organizational, and cultural behaviors will significantly accelerate the progress in implementing NCW.⁴⁵

Next is a review of the booklet's seven key elements of NCW implementation. The key elements of NCW implementation strategy are described as:

1. Get the theory right
2. Apply the theory enterprise wide
3. Accelerate networking of the joint force
4. Accelerate deployment of network-centric systems, concepts, and capabilities
5. Experiments with network-centric concepts and capabilities
6. Address challenges of allied and coalition network-centric operations
7. Develop doctrine and tactics, techniques, and procedures for network-centric operations⁴⁶

A review of these suggested key elements of NCW implementation illustrates some implementation themes already discussed, getting the theory right refers to continued experimentation and testing to refine the NCW concept. Applying the theory enterprise wide must be done to ensure the theory is applicable throughout DoD. The concept of NCW should apply at the joint and coalition level as well as the service level. Also, as NCW concepts and capabilities are developed, they should be deployed to units

and geographical areas for refinement. The various testing needs produce doctrine tactics and techniques and procedures for effective network-centric operations.⁴⁷

From this review of the Office of Force Transformation booklet, the following summary of NCW implementation themes can be created:

1. Network security, network interoperability, an understanding of human and organizational behavior
2. Set and accelerate deployment of network-centric systems, concepts, and capabilities
3. Accelerate networking of the joint force and address challenges of allied and coalition
4. Interoperability of battlespace entities (platforms, units, sensors, shooters)
5. Develop doctrine and tactics, techniques, and procedures
6. Experiment with network-centric concepts and capabilities (developing shared situational awareness and new organizational approaches to achieving synchronization)
7. Establishing goals and measuring progress (quality of information, collaboration, awareness, and shared situational awareness; measures of C2, synchronization, and, ultimately, to measures of mission effectiveness)

The literary review has established a foundation for the concept and implementation themes of NCW. The next step is to begin to answer the three research questions: (1) What is the definition of NCW? (2) Are the military services implementing the NCW concept? and (3) Is the NCW concept a new theory of warfare or rather a modification or extension of previous theories.

¹Alberts et al., 93.

²Ibid., 5.

³Ibid., 6.

⁴Ibid., 7.

⁵Ibid., 8.

⁶Ibid., 9.

⁷Ibid., 10.

⁸Ibid.

⁹Ibid.

¹⁰Ibid., 11.

¹¹Ibid., 12.

¹²Ibid.

¹³John J. Johnson, Chief of Naval Operations, speech during the U.S. Naval Institute Annapolis Seminar and 123d Annual Meeting, Annapolis, MD, 23 April 1997, 1.

¹⁴Ibid., 2.

¹⁵Cebrowski and Garstka, 29.

¹⁶ Ibid.

¹⁷Ibid.

¹⁸Ibid.

¹⁹Ibid., 30-31.

²⁰Ibid., 31.

²¹ bid., 32

²²Ibid.

²³Alberts et al., 88.

- ²⁴Ibid., 90.
- ²⁵Ibid., 91.
- ²⁶Ibid.
- ²⁷Department of Defense, *Implementation*, 3.
- ²⁸Ibid., i.
- ²⁹Ibid., 4.
- ³⁰Ibid., 7.
- ³¹Ibid., 8.
- ³²Ibid., 15.
- ³³Cebrowski and Garstka, 34.
- ³⁴Ibid., 35.
- ³⁵Ibid.
- ³⁶Ibid.
- ³⁷Alberts et al., 199.
- ³⁸Ibid., 193.
- ³⁹Ibid., 199.
- ⁴⁰Ibid., 201.
- ⁴¹Ibid., 202.
- ⁴²Department of Defense, *Implementation*, 11.
- ⁴³Ibid.
- ⁴⁴Ibid.
- ⁴⁵Ibid.
- ⁴⁶Ibid.
- ⁴⁷Ibid., 12.

CHAPTER 3

METHODOLOGY

This study will attempt to answer the three main questions posed in chapter 1. The review will lead to the development of a definition of NCW, an assessment of how the military service reviewing and are implementing the concept of NCW. Also reviewed are previous technology advancements that are used to evaluate NCW as a new theory of warfare. This chapter describes the methodology used to analyze the problem statement of the military services implementation and assessment of network-centric warfare theory.

Subject

The DoD transformation involves large-scale, discontinuous, and possibly disruptive changes in military weapons, organization, and concepts of operations that are prompted by significant changes in technology or the emergence of new and different international security challenges.¹ This transformation has spawned the term “NCW”, as shown in the previous chapter. The concept of NCW is not only technological, but also requires changes in behavior, process, and organization to convert the advances of information age capabilities into combat power. Through new uses of technologies, rigid constructs can be transformed into dynamic constructs that can provide new and advantageous flexibility for actions in combat. Sometimes however, people initially might not utilize fully the capabilities of the new systems because they are not yet comfortable with the required changes in behavior.²

The U.S. Army, Navy, and Air Force are spending millions of dollars on technology innovation. However, with this investment in technology, the question is whether or not the U.S. military can achieve network and systems interoperability. More importantly and the purpose of this research is to determine how the concept of NCW fits in.

Data to Be Used

Building an argument with one key source as the cornerstone creates a vulnerability in the argument as its reliability is always suspicious. Using the weight of several sources produces a much more confident thesis. In doing the research for the topic, first a library search was conducted in the Combined Arms Research Library at the U S Army Command and General Staff College. This was supplemented with both Internet searches and a search of various U S Army Command and General Staff College course materials.

The same four primary source publications used in chapter 2 are used in the methodology for this study. The first three sources were chosen because the research conducted on NCW referenced these items often, and they seemed to form the basis of NCW theory. The DoD booklet was chosen because it was a recent overarching publication on NCW that is service independent. The service transformation documents were used because they describe how the Army, Navy, and Air Force view changes the concepts, capabilities, and organizations of warfare.

Procedures and Analyses

In approaching the topic, the development of the NCW concept was qualitatively analyzed. This analysis provides a way to examine, compare, and contrast patterns or themes. The qualitative approach used is that of a contextual analysis. The contextual analysis on the four primary source articles is performed in an effort to determine the themes of NCW.

The first step is to review the four primary source articles to identify what are their concept and implementation themes of NCW. Next the themes are compared to identify the common concept and implementation themes among the four articles. Once the common themes are determined, a review of the military service transformation documents is conducted. The service transformation documents are reviewed to identify how they use the term network-centric and if they embody the concept and implementation themes previously developed. The number of times and how the services use these terms indicates that service's approach and view of NCW.

After the analysis of the services concept and implementation of NCW a review of NCW as a theory of war is conducted. To begin this review, other technologies, such as the introductions of the tank, submarine and torpedo technology innovations, are performed. These technological changes created a new ways of thinking about warfare. This review is used as a basis for evaluation of NCW as a new theory of warfare.

¹Congressional Research Service, 5.

²Frederick Stein, Senior Engineer, MITRE Corporation, "Presentation on Network Centric Warfare Operations," 4th Annual Multinational C4ISR Conference, McLean, Virginia, 6 May 2004.

CHAPTER 4

ANALYSIS

Concept and Implementation Themes

In chapter 2, different publications about NCW were reviewed. The review produced several concept and implementation themes of NCW. In this chapter a qualitative analysis of the themes is performed to develop common concept and implementation themes of NCW. The common implementation themes are used to review the service transformation documents to see how well these NCW themes appear. This is followed by an analysis of NCW as a new theory of warfare.

The four documents reviewed revealed several similar themes of the NCW concept. For example, The 1998 article “Network Centric Warfare: Its Origins and Future,” (see table1) revealed the themes: Information technology focus, shift in focus from the platform to the network, adapting environment, information backbone, a sensor grid, a transaction grid, speed of command, information superiority, and increased competitive space. From Admiral Johnson’s speech the following themes of NCW are identified: offensive distributed firepower, forces bound together in a network-centric architecture, shift in focus from the platform to the network, speed of command, information superiority, and transforms warfare from a step function to a continuous process. Alberts’ and others’ book emphasizes the themes of: shared battlespace awareness, self-synchronization, speed of command, information superiority, eliminating geo-locational constraints, knowledgeable force, and linking achieved among entities in the battlespace. The DoD booklet mentions themes of NCW as: shared battlespace awareness, networked forces, speed command, precision and deep sensor reach,

information superiority, self-synchronization, and linking of people, platforms, weapons, sensors, and decision aids.

A review of table 1 shows there are common themes among the articles. Some of the terms may be different; however, the general ideas are similar. The common themes are: information superiority, speed of command, self-synchronization, linking of people with platforms, network force, and shared battlespace awareness.

Table 1. Network-Centric Warfare Concept Themes

NCW: Its Origins and Future Origins	Admiral Johnson	NCW: Developing and Leverage Info Superiority	Office of Force Transformation Booklet
Information Superiority	Information Superiority	Information Superiority Changes	Information Superiority
Speed of Command	Speed of command	Speed of Command	Speed of Command
Information backbone, a sensor grid, and a transaction grid	Forces bound together in a network-centric architecture	linking achieved among entities in the battlespace	Linking of people, platforms, weapons, sensors, and decision aids
Adapting environment	Transforms warfare from a step function to a continuous process	Self-synchronization	Self-synchronization
Shift in focus from the platform to the network,	Shift in focus from the platform to the network,	Eliminating geo-locational constraints	Networked forces
Increased competitive space		Shared battlespace awareness	Shared battlespace awareness
Information technology focus			
	Offensive distributed firepower,		
		Knowledgeable force	
			Precision; Deep sensor reach

This section looks at the implementation themes provided by the same four publications in the literary review section. These implementation themes are compared to identify the common implementation themes. Once common implementation themes are

developed, a review of the services' transformation plans is performed to identify whether or not these essential implementation themes appear. This review will determine how well the services are implementing the NCW concept.

First was a review of the article by Cebrowski and Garstka. The implementation themes from this article can be summarized as:

1. Process for the co-evolution of technology, organization, and doctrine
2. Increasing network capabilities
3. Change how to train, how to organize, and how to allocate resources
4. Top-down experimentation and experiments from the bottom up and facilitate cultural and organizational changes
5. Merge technical skills and operational experience
6. Precision, and responsiveness, and advanced C2 concepts
7. Customer-led command, C4I innovations and existing C2 systems and capability

Second was a review of the book *Network Centric Warfare: Developing and Leveraging Information Superiority*, on making NCW a reality to identify its themes. This book's implementation themes can be summarized as:

1. Concept of operations, command approach, organization, systems, and people with a prescribed level of expertise
2. Process designed to insert technology
3. Designed to foster and incubate innovative ideas and concepts
4. Adapt existing requirements, investment planning, and programmatic processes, making them enterprise-wide

5. Designed to introduce change, facilitates an understanding of emerging capabilities

6. Speed at which technology can be deployed and expedite test and refinement of concept

Finally, the Office of Force Transformation booklet was reviewed for its strategies for the implementation of network-centric warfare. The department's overall summary of the implementation themes are:

1. Network security, network interoperability, and an understanding of human and organizational behavior

2. Set and accelerate deployment of network-centric systems, concepts, and capabilities

3. Accelerate networking of the joint force and address challenges of allied and coalition

4. Interoperability, battlespace entities (platforms, units, sensors, shooters)

5. Develop doctrine and tactics, techniques, and procedures

6. Experiment with network-centric concepts and capabilities (developing shared situational awareness and new organizational approaches to achieving synchronization)

7. Establishing goals and measuring progress (quality of information, collaboration, awareness, and shared situational awareness; measures of C2, synchronization, and, ultimately, to measures of mission effectiveness) (see table 2)

Table 2. Network-Centric Warfare Implementation Themes

Office of Force Transformation Booklet	NCW: Developing and Leveraging Technology	NCW: Origins & Its Future
Network security, network interoperability, an understanding of human and organizational behavior.	Concept of operations, command approach, organization, systems, and people with a prescribed level of expertise, MCP	Co-evolution of technology, organization, and doctrine
Deployment of Network-Centric Systems, Concepts, and Capabilities:	Process designed to insert technology	Increasing network capabilities
Networking of the Joint Force and address Challenges of Allied and Coalition		
Interoperability. Battlespace entities (platforms, units, sensors, shooters)		
Develop Doctrine and Tactics, Techniques, and Procedures	Designed to foster and incubate innovative ideas and concepts	Change how we train, how we organize, and how we allocate our resources.
Experiment with Network-Centric Concepts and Capabilities - Developing shared situational awareness and new organizational approaches to achieving synchronization	Adapt our existing requirements, investment planning, and programmatic processes, making them enterprise-wide	Experimentation top-down and bottom up; cultural and organizational changes
	Designed to introduce change, - Facilitates an understanding of emerging capabilities	
Establishing Goals and Measuring Progress - Quality of information, collaboration, awareness, and shared situational awareness measures of command and control, synchronization,		
	Speed at which technology can be deployed; expedite test and refinement of concept	
		Merge technical skills and operational experience
		Precision, and responsiveness, and advanced C2 concepts.
		Customer-led C4I innovations and C2 systems/capability

The implementation themes are compared as shown in table 2. Some terms may be slightly different, but the general ideas are the same. This reveals four common implementation themes and attributes across these publications.

1. Interoperability and networking of joint forces (systems, people, and organization)
2. Insertion of new technologies and concepts of operations for new and increased joint interoperable capabilities--precision, and responsiveness, and advanced C2 concepts
3. Changes in doctrine and processes in how to train, organize, and equip forces
4. Experimentation of situational awareness, organization structure, and requirements process

Next the four common implementation themes across these publications are used to analyze the service's transformation documents. This analysis will determine to what extent the services are implementing the concept of NCW.

Each military service publishes documents that describe how they plan to transform from today's military to tomorrow's military to meet their future requirements. The Army and Navy call these documents roadmaps. The Air Force calls them flight plans. The most current roadmaps and flight plans are reviewed to determine how each service is defining and implementing the concept of NCW.

There were five transformation documents reviewed for this study of NCW. First, for review were the 2003 and 2004 *United States Air Force Transformation Roadmap: Flight Plan* produced by HQ USAF XPXC Future Concepts and Transformation Division. Second, the 2003 *Naval Transformation Roadmap* produced by Secretary of the Navy was analyzed. The last documents reviewed were the 2003 and 2004 *United States*

Army Transformation Roadmap(s) produced by the Office of the Deputy Chief of Staff, U.S. Army Operations, Army Transformation Office.

Service Concept Review

To determine how the services define NCW, an analysis was performed on how the term network-centric was used in the various services roadmaps and flight plans. Doing so reveals the context in which each service views the concept of NCW. There are two underlying assumptions in this review. First, is that the difference in how the term “network-centric” is used indicates the path of understanding and definition the service has of NCW. Second, is that the number of times a term is used indicates how important the concept of that term is to that service. This study uses the letter N to denote the number of times a term appears.

The analysis performed on the 2003 and 2004 *United States Air Force Transformation Roadmap: Flight Plan* is shown in table 3. The table reveals the term network-centric appears N=23 in both the 2003 and 2004 documents. Also, how the Air Force’s use of the term does not change much between the two years. Of those N=23, NCW appears N=4 and the term network-centric collaborative targeting appears the most, N=10. The Air Force’s network-centric collaborative targeting is focused on the demonstration of a network-centric operating system designed to horizontally integrate air, space and surface ISR assets at the digital level.

Table 3. Air Force Use of the Term Network-Centric

	2003	2004
Warfare	4	4
Operations	0	2
Infrastructure	1	3
Structure	0	1
Surveillance and Targeting	1	1
Collaborative Targeting	10	6
Systems	1	1
Operating Systems	3	2
Distributed Processing	1	1
Approach	1	1
Fiber Optic Systems	1	1
Total	23	23

Next is an analysis of the 2003 *Naval Transformation Roadmap*, produced by Secretary of the Navy. The 2004 *Naval Transformation Roadmap* was not available for review. As seen in table 4, the term network-centric appears N=15 in the 2003 document. The Navy uses the term NCW N=1. The term that appears the most is network-centric operations N=4. The next most often used term is network-centric ISR, enterprise services, and network-centric alone, all N=2. This indicates that the Navy is focusing on the idea of NCW mostly in an operational focused way, mission operations and ISR operations. The Navy's operational use of network-centric centers around the naval ISR operations that rely on end-to-end integration of national and theater sensors and collectors and the processes that directly support tactical naval operations.

Table 4. Navy Use of the Term Network-Centric

	2003
Capabilities	1
Communications	1
Environment	1
Operations	4
ISR	2
Warfare	1
Enterprise Services	2
Innovation Center	1
Network-Centric (only)	2
Total	15

This leads to an analysis of 2003 and 2004 *Army Transformation Roadmap* produced by the Office of the Deputy Chief of Staff, U.S. Army Operations, Army Transformation Office. As revealed in table 5, the term network-centric appears N=39 times in 2003 and N=1 in 2004. The decline in the use of this term shows that the Army is moving away from the term network-centric. The one time the term is used in the 2004 *Army Transformation Roadmap*, it is used in regards to the concept of network-centric battle command. Network-enabled battle command provides the required base of situational understanding for the most effective application of combat capabilities and forces and enables self-synchronizing forces to respond quickly to changing battlefield conditions.

Next is a review of the common concept themes across the service's transformation documents. This review will determine which of these themes each service uses most often. How often a theme is used indicates the importance of the theme

to a particular service. This review provides an insight of how the service thinks about and views NCW.

Table 5. Army Use of the Term Network-Centric

	2003	2004
Information	5	
Force	2	
Enterprise Services	2	
Land Power	2	
Operations	4	
Battle Command	5	1
Capabilities	2	
Warfare	12	
Network-Centric (only)	5	
Total	39	1

A review of the 2004 *U.S. Air Force Transformation Roadmap: Flight Plan* for the NCW common concept themes is in table 6. This reveals the themes that appear the most in order: information superiority N=65, battlespace awareness N=29, synchronized N=15, networked N=14, linked N=12, speed of command N=3, and self-synchronized N=2. From this, one can see that the Air Force seems to emphasize information superiority and battlespace awareness.

Table 6. Service Use of Network-Centric Warfare Key Words

	Air Force 2003	Navy 2003	Army 2003	Air Force 2004	Army 2004
Information Superiority	69	0	13	65	1
Speed of Command	3	3	1	3	1
Self-synchronization	2	2	4	2	2
Battlespace awareness	28	5	15	29	3
Synchronized	16	8	47	15	25
Linked	12	4	13	12	6
Networked	8	36	52	14	21

A review of the 2003 *Naval Transformation Roadmap* for the NCW common concept definition themes that appear in the transformation plan is also in table 6. This table reveals the themes that appear the most in this plan are networked N=36, synchronized N=8, battlespace awareness N=5, linked N=4, speed of command N= 3, self-synchronized N=2, and information superiority N=0. This shows the top two emphasis the Navy places on a networked and synchronized force; most of the emphases is on a networked force.

Next is a review of the 2004 *Army Transformation Roadmap* for the NCW common concept themes that appear in the transformation plan. A review of table 6 reveals that the themes that appear the most in this plan are synchronized N=25, networked N=21, linked N= 6, battlespace awareness N=3, self-synchronized N=2, speed of command N=1, and information superiority N=1. This shows that the Army seems to place the most effort on a synchronized networked force.

From this analysis of how all services uses the term network-centric, a generic understanding of how they view the concept can be drawn. The Air Force uses the term

network-centric mostly related to information superiority and battlespace awareness. This concept is embodied in the network-centric collaborative targeting concept that will demonstrate a network-centric operating system designed to horizontally integrate air, space, and surface ISR assets and dramatically reduce time required to detect, identify, locate, and designate fleeting targets. The Navy and Army emphasize a synchronized and networked force. The Navy emphasizes networked first, synchronized second. The Army emphasizes synchronized first, networked second. The Navy's concept is embodied in the employment of a common set of core network-centric enterprise services that will allow mission application solutions to be developed providing timely fires directly supporting maneuver forces, the cross-cueing of ISR collection, the mounting of time-sensitive attacks, and executing focused, time-definite delivery logistics. The Army's emphasis is on networked battle command. When networked battle command is fully implemented, forces will possess the capabilities to adjust rapidly to changing situations and synchronize their efforts during execution, with minimal intervention or direction.

Service Implementation Review

Previously in this chapter, four common implementation themes of NCW were developed. This section takes those common implementation themes and examines the service transformation documents to see if any of those implementation themes are reflected.

The *United States Air Force Transformation Roadmap: Flight Plan* will begin the review of the first implementation theme of interoperability and networking of joint forces (systems, people, and organization). The *United States Air Force Transformation Roadmap: Flight Plan* represents interoperability of joint forces systems through its

common relevant picture and common operational picture. This effort represents timely, fused, accurate, and relevant information that can be tailored to meet the requirements of the joint force. The Air Force is working to achieve this capability through their responsibility as lead agent for the family of interoperable operational pictures effort. The family of interoperable operational pictures will fuse existing databases, implement data sharing among stovepiped systems, and close the seams between legacy command, control, computer, communication, intelligence, surveillance and reconnaissance (C4ISR) and weather systems to provide an all-source picture of the battlefield containing actionable, decision quality information to the warfighter.

The second theme of insertion of technologies and concepts of operations for new and increased joint capabilities is next for review. The Air Force flight plan supports the new joint operating concepts that the joint staff is creating. The Air Force has put a premium on joint enablers. In fiscal years 2004 to 2009, the Air Force is projected to spend 23 percent of its total obligation authority on joint combat forces, such as close air support fighters and gunships, loitering indirect fires, and advanced air-to-ground munitions. It will also spend 41 percent on critical joint force enablers, such as air and space C4ISR, airlift, and tankers.

The third concept of changing doctrine and processes in how to train, organize, and equip forces is next. This concept can be seen in the Air Force Battlefield Airmen initiative. This initiative transforms how the Air Force organizes, trains, and equips airmen who operate outside the airbase perimeter to directly assist, control, and enable precision airpower in the forward and deep airspace. The Battlefield Airmen initiative combines different Air Force specialties (combat controllers, pararescuemen, combat

weather, and tactical air control parties) into a family of warfighting specialties under one common organizational and training structure.

Air Force Air and Space Expeditionary Forces (AEF) have been critical in transforming the Air Force from a threat-based, forward-deployed force to a capabilities-based force. AEF is the mechanism to which the Air Force allocates forces to meet the combatant commanders' requirement for rotational forces. The AEF divides Combat Air Forces and Expeditionary Combat Support resources evenly across five AEF pairs, for a total of ten AEFs. Each AEF pair is a mix of Air Force capabilities needed to maintain a sustainable force. The future environment provides fast, predictive operational support and response through situational aware commanders

The fourth concept of experimentation of situational awareness, organization structure, and requirements process is also present in the *United States Air Force Transformation Roadmap: Flight Plan*. The Air Force uses the scientific method in its experimentation process, using the research question of whether the technology or process has operational utility to warrant fielding. The Joint Expeditionary Force Experiment program run by the Air Force is a fielding exercise that investigates and assesses future operational concepts and desired capabilities. Also this concept can be seen in the combat wing organization. This organization will take advantage of lessons learned from expeditionary operations over the past few years and create a new wing organization that allows commanders to plan and execute as part of an expeditionary wing. Now they have one person at each wing responsible for full range of deployment and employment tasks.

Next is the review of the Navy's implementation of the first theme of interoperability and networking of joint forces (systems, people, and organization) can be seen in a few different efforts. The *Naval Transformation Roadmap* states that a key to network-centric warfare operations, increased speed of command, and self-synchronization in force execution is the widely shared awareness provided by networked dissemination of the common operational and tactical pictures. The common operational and tactical pictures will be underpinned by an accurate, time-tagged, geospatially referenced database of operational and tactical information, available via a network to all users with individualized presentations tailored to the needs of specific users. Common operational and tactical picture development will build on a studied understanding of the appropriate use of technology and automation to co-evolve the technology with the concept of operations and tactics, techniques, and procedures to provide the greatest possible enhancements in automated performance, which are suited to human needs and training.

The second theme is the insertion of technologies and concepts of operations for new and increased joint capabilities. FORCEnet is the Navy's emerging integrated information technology architectural framework that will provide the capability to deliver the persistent and comprehensive surveillance, rapid networked command, and common, accurate battlespace picture necessary to support decision making at a tempo that overwhelms an adversary's capability to react and respond. FORCEnet represents a transformational shift from platform-centric operations to global, distributed, combat operations using the family of fully networked systems available to the operational commander. To do this, the Navy requires fielding an optimum mix of persistent

distributed and penetrating naval sensors that contribute to joint comprehensive surveillance and targeting in all dimensions of the battlespace; jointly-interoperable, secure, and interconnected networks that move data with minimum latencies; and command and decision systems that provide the real-time, common, and precise operational and tactical picture needed by each unit to support its role in the force.

The third concept is changing doctrine and processes in how to train, organize, and equip forces. To support the forward deterrent and rapid response requirements the Navy is utilizing new organizational constructs, such as the carrier strike group (CSG) and expeditionary strike group (ESG), which are being instituted as key components of the global integrated naval force. The CSG and ESG are replacing the Cold War concepts of deploying in carrier battle groups and amphibious ready groups. Organizing naval deployments around ESGs and CSGs will increase the number of independently employable naval strike groups that provide regional combatant commanders with greater operational freedom and scalable joint response options. In the future, forward naval operating forces will be organized into an expeditionary strike force (ESF), elements which will train together to ensure readiness for a wide range of contingencies. The ESF will consist of CSGs, ESGs, and maritime prepositioning groups. The ESF can be enhanced with the introduction of forcible entry-capable Marine expeditionary brigades in combination with in-theater assets. The ESF will bring complementary capabilities to Air Force air and space expeditionary forces, Army future forces, and joint special operations forces for integrated joint operations across the spectrum of conflict.

Sea Enterprise is the flagship effort for freeing up additional resources to support military transformation initiatives through streamlining naval business processes.

Involving the Navy headquarters, the systems commands, and the fleet, Sea Enterprise seeks to improve organizational alignment, refine requirements, and reinvest savings to buy the platforms and systems needed to transform the naval contribution to the joint force. Drawing on lessons from the business revolution, Sea Enterprise will reduce overhead, streamline processes, substitute technology for manpower, and create incentives for positive change. Legacy systems and platforms no longer integral to mission accomplishment will be retired, and the Navy will make its department's business processes more efficient to achieve enhanced warfighting effectiveness in the most cost-effective manner.

The fourth concept of experimentation of situational awareness, organization structure, and requirements process is also seen in the *Naval Transformation Roadmap*. The Navy's recent Sea Trial concept demonstrates this theme. The purpose of Sea Trial is to aid in formulating and testing innovative operational concepts in pursuit of dramatic improvements in warfighting effectiveness. These efforts are conducted in a joint context, closely coordinating with and leveraging the similar efforts of Joint Forces Command, the other services, and the combatant commanders. Sea Trial is designed to convert innovative concepts and breakthrough technologies, validated and refined by means of experimentation, into changes in doctrine, organization, training, material, leadership development, personnel, and facilities that are rapidly introduced into the fleet. Also transforming to an integrated naval force requires institutionalizing fundamental changes, including more effective integration with a utilization of reserve force, while remaining true to the warrior culture. Sea Warrior is an example of one of the naval frameworks for transforming its organization and culture. Sea Warrior is the human resource component.

It will seek to use training and education to help build elements of common warfighting philosophy, conceptual understanding, and integrated operational culture. Sea Warrior also incorporates technology into the naval personnel system. It will integrate all components of human resource core processes including career planning, personnel distribution, mission performance readiness, and a Sailor-centric and Marine-centric acquisition system. Sea Warrior will bundle all of these core processes into a web-based, information-rich environment.

The Army implementation of the first theme of interoperability and networking of joint forces (systems, people, and organization) can be seen in a few items. The Army has worked with its sister services and made significant improvements in the planning and conduct of joint operations, progressing from joint interoperability. In this effort the Army recognizes the development of key joint and expeditionary interdependencies, such as joint battle command, joint fires and effects, joint air and missile defense. Joint battle command is development and fielding of integrated, joint battle management command and control capabilities that enable forces to collaboratively plan and rapidly share an accurate picture of the battle. To succeed, this effort requires the alignment and synchronization of three major elements: operational concepts and doctrine, horizontally and vertically integrated systems, and the underlying joint, technical, architectural standards. Joint fires and effects will utilize a collaborative information environment to sense, understand, decide, and act faster than an adversary to gain the desired operational effects. Linked through an effective joint C2 system, joint fires will provide Soldiers with the entire target acquisition and engagement resources of the theater at their fingertips. Joint air and missile defense is a fully networked, interdependent, joint-theater air and

missile defense network of space, air, sea, and land based elements. This effort centers on the development of a combined ground-based and elevated sensors, and a common operational picture that includes air, ground and maritime information.

The second theme, insertion of technologies and concepts of operations for new and increased joint capabilities is derived next. As part of the joint team, the Army's network architecture must seamlessly integrate with joint architecture and it does this through LandWarNet. LandWarNet provides processing, storing, and transporting of information across a seamless network that synchronizes and integrates the war fighting. LandWarNet ensure that the Army's network capabilities reach all military services from the beginning. The Army is working with commanders in order to meet identified needs and certify applications for use within the network. As part of this effort, both the Army and the Marine Corps are merging systems in order to communicate with each other. Both services elected to use the Army Force XXI Battle Command Brigade and Below system for brigade-and-below communications and the Marine Corps Command and Control Personal Computer system for brigade-and-above communications. This decision standardized equipment, increased joint interoperability, and blue force situational awareness.

The third concept of changing doctrine and processes in how to train, organize, and equip forces is reviewed next. The Army is pursuing the most comprehensive transformation of its forces since World War II. The Army is moving toward modular capabilities-based units. A decisive effort is the creation of the modular, combined arms maneuver brigade combat team (unit of action (UA)). There are three types of UAs: Heavy, Stryker, and Infantry. The UA will gain improved force packaging, sustainability,

battle command, and situational awareness while retaining the same lethality as the larger, task-organized bridge combat teams. There is also Unit of Employment X (UEX). A UEX is the Army's primary tactical and operational war-fighting headquarters. It is a modular, C2 headquarters for full-spectrum operations. Another concept under development for an Army theater-level headquarters to support regional combatant commanders is a Unit of Employment Y (UEY) organization. This organization would focus on Army's components responsibilities for the entire theater's joint, interagency and multinational operational land forces. The UEY would become the Joint Forces Land Component Commander and exercise operational control over tactical land forces.

The current deployment of the Stryker brigade combat team (SBCT) is an example of the Army's transformation effort. SBCT demonstrates the Army's concept for the network-enabled force. Further, they fill the capability gap between light- and heavy-force units with an infantry-rich, mobile force that is strategically responsive. The improved battlespace awareness, battle command capabilities and survivability enhancements are providing crucial support in current operations. Equally important, the SBCTs are improving the Army's understanding of future force processes, helping the Army to formulate an advanced war-fighting doctrine that informs development of future combat systems-equipped (FCS-equipped) units of action.

The fourth concept of experimentation of situational awareness, organization structure, and requirements process will be reviewed next. The Army is working with United States Joint Forces Command (JFCOM) and its sister services in prototyping efforts. These experiments will address joint functional capability areas and prototypes such as JFCOM's standing joint force headquarters, collaborative information

environment, operational net assessment, joint fires initiative, joint interagency coordination group, effects-based operations, and logistics common relevant operating picture. The concept development and experimentation world realm has produced and refined Future Force concepts. This included the battle command (C4ISR) concept and supported refinement of joint concepts by sponsorship or participation in service and JFCOM war games and experiments such as the Army's Unified Quest, a transformation wargame.

The single largest science and technology investment remains the pursuit of technologies for Future Combat Systems (FCS). The Army future force will be a hybrid force, one of the key future elements of the hybrid mix will be the FCS-equipped UA. The first FCS-equipped unit of action in 2014, the science and technology community continues to develop technologies for spiral insertion into the FCS experimental unit of action beginning during 2008. The FCS-equipped UA encompasses more than a new set of capabilities. Rather, this organization reflects a fundamentally transformed method of combat. The FCS-equipped UA is a network-enabled force. Its vast sensor array will dramatically improve a commander's situational awareness. Sensor-shooter relationships begin with the Soldier and exist throughout the formation, allowing the UA to accurately direct internally generated effects or those generated from supporting units and joint assets.

This analysis seems to show that the services all seem to embody the concept of NCW and have aspects of NCW implementation theme. More research needs to be done to tie the concepts described directly to NCW. However, the first step has been taken and

it seems that the services transformation documents do support the concept of the NCW implementation themes:

1. Interoperability and networking of joint forces (systems, people and organization)
2. Insertion of new technologies and concepts of operations for new and increased joint interoperable capabilities--precision, and responsiveness, and advanced C2 concepts
3. Changes in doctrine and processes in how to train, organize and equip forces
4. Experimentation of situational awareness, organization structure, and requirements process

Network-Centric Warfare Theory Review

The analysis so far has shown that the services transformation documents embody the concept of NCW. However, is NCW really a new theory of warfare? The concept of NCW suggests being more than just technology integration into the military of today. As described earlier in this study, the theory of NCW is the embodiment of an information age transformation of the DoD. Its premise is that it involves a new way of thinking about how to accomplish missions, how to organize and interrelate, and how to acquire and field the systems that support warfare. The idea is that NCW enables a shift from attrition-style warfare to a much faster warfighting style characterized by the speed of command through information superiority, the massing of effects versus the massing of forces, and the rapid foreclosure of enemy courses of action by the shock of closely coupled events. To determine if NCW is a new theory of warfare, a review of previous technology that impacted warfighting thinking is necessary. This study examines how the

development of the tank affected maneuver theory, and how the development of submarine and torpedo technology fostered the theory of flotilla defense.

One traditional theory of warfare is maneuver warfare. Maneuver warfare theory advocates that simply contacting and destroying enemy forces until they can no longer fight does not necessarily accomplish defeat of an adversary. Rather, the destruction of key enemy targets (C2 centers, logistical bases, fire support assets, and others.) is combined with isolation of enemy strong points and exploitation of enemy weaknesses. Bypassing and cutting off enemy strong points often results in the collapse of that strong point even if the physical destruction is minimal. Firepower, which is used primarily to destroy as many enemy forces as possible in methodical battle, is primarily used to suppress enemy positions at breakthrough points during maneuver warfare. Infiltration tactics by conventional or special operation forces may be used extensively to cause chaos and confusion behind fixed enemy lines.¹

Since tempo and initiation are so critical to the success of maneuver warfare, command structures tend to be more decentralized, with more tactical freedom given to lower-level unit leaders. This decentralized command structure allows ground unit leaders to exploit enemy weaknesses as they become more evident.² A historical example of technology that affected maneuver theory is the German development of the tank prior to World War II

The German doctrine during World War II emphasized exploitation, speed, leadership from the front, and combined arms. This provided a solid framework for thinking about how to use tanks against the enemy and how the enemy may use the tank against Germany.³ The core ideas were that an armored, mobile force, sufficiently strong,

and with logistical support sufficiently well-organized, could dominate a campaign and achieve decisive operational results. There would be some vulnerability to the flanks, but with continued advancement and redeployment to protect the flanks, the armored force can drive ever more furiously to paralyze the enemy's reactive capability. The secret was not to attempt to have a tidy battlefield, but obtain victory by successful movement to an advantage, supported by air power handled in close cooperation with the ground force.⁴

The development of the tank helped make the concept of the blitzkrieg possible. Blitzkrieg can be summarized as mechanized warfare that combines the tanks, aircraft, mobile infantry, and artillery. Blitzkrieg stressed infiltration tactics and flanking movements of armor and infantry tactics stressing mobility and speed.⁵ The development of the tank encouraged Field Marshal Erwin Rommel to write in late 1944:

There was a particular clique that still fought bitterly against any modernization of methods and clung fast to the axiom that the infantry must be regarded as the most important constituent of an army. This may be true for the German Army . . . but it will not be true in the future when the tank will be the center of all tactical thinking.⁶

From this review of the development of the tank and blitzkrieg concept, a few similarities to the concept of NCW can be drawn. The NCW concept of speed of command can be compared to the German armored force's emphasis on mobility and speed of operations. Both concepts emphasize an increase in warfighting tempo. Next, each concept utilizes synchronization and networking of forces. Both concepts deal with a force that had to operate together to achieve massed effects. Also, each concept provides a new capability that suggests a new way of thinking about warfare.

Next is an analysis of the emergence of torpedo and submarine technology during the late nineteenth and early twentieth century that made the concept of flotilla defense

possible. During this time, there was a rapid advancement of naval technology. The rapid technological innovation meant that new warships became quickly obsolete, and this caused navies to continuously modernize. NCW is also in a period of history where rapid innovations in military technologies are effecting the modernization of warfighting forces. For this reason a review of the innovations that led to the concept of a flotilla defense is performed.

One of the most significant naval advancements during the early twentieth century is the development of the locomotive torpedo. Early torpedoes had a limited effective range that forced torpedo carrying boats to be within range of battleship artillery. By the early twentieth century torpedoes had an effective range outside of battleship artillery.⁷ This advancement in torpedo technology had an effect on shipbuilding. Naval ship developers tried to counter the torpedo threat by trying to improve the underwater protection of warships. But the armored protection of ships did not prove adequate. One British naval official remarked, “I fear we must accept the position that with the present knowledge it is not possible to make a ship invulnerable against attack of the whitehead torpedo.”⁸

This idea pushed some British naval officials of the time to believe that the torpedo advancements were significant enough to change fleet tactics. The torpedo was being viewed as a technology advancement that could revolutionize the method of conducting war at sea.⁹

Admiral Sir John Fisher, the British Royal Navy head of the Admiralty from 1904 to 1910, was convinced that the introduction of technology advances, such as battle cruisers and submarines, permitted the Navy to adopt different more effective methods of

conducting naval warfare. He argued that a Navy centered on a strong fleet of battleships was no longer the best force structure to protect British maritime interest.¹⁰ Fischer envisioned the creation of two distinct and independent fleets: a main fighting fleet equipped with battle cruisers to protect British interests around the world; the other, a force of submarines and torpedo boats that would protect the British Isles.¹¹

In 1904, Fischer was convinced that the recent improvements in naval technology allowed the Royal Navy to operate as a truly mobile force anywhere in the English Channel. Fischer's submarines and torpedo boat force that protected the British Isles would be deployed offensively forward in the middle of the English Channel. He argued that an offensive strategy must be held to include the circumspection of the free movement of the enemy. Any action that limits their free movement of action is an action of offense. This was a completely new way of thinking; this was called the concept of flotilla defense.¹²

Fischer's theory of flotilla defense as home defense could be provided by a "mosquito" fleet of submarines and surface torpedo craft. He proposed to organize four defense mobile groups, comprising each of one flotilla of twenty-four destroyers and one section of twelve submarines, and station them along the south coast of England.¹³ A torpedo armed flotilla not only provided a port with a more efficient defense than existing mines and guns, but their mobility allowed them to be moved according to strategic requirements.¹⁴

Admiral Fischer's strategic objective, however, was fundamentally different from that of conventional naval strategists. He postulated that offensive strategy must be held to include the circumspection of their free movements of the enemy; any activity that

limits their free movements is an action of offense. Simply denying the sea to an enemy was a new way of thinking.¹⁵

During this time in history, both England and France had submarine boats that could operate freely in the channel between these countries. Since ships could not be armored adequately to protect them from submarine attack, the position was that submarines were the best way to counter other submarines. Therefore, the ability to deploy large formations of ships was denied to both sides.

Relying mainly on the torpedo and the flotilla to deter invasion was a fundamental shift in the Royal Navy's strategic thinking. It is important to understand that flotilla defense represented a change in method rather than a new strategic objective. It also represented a switch towards an essentially reactive form of naval warfare. The idea of mutual sea denial did not conform to the previous recognized theory of naval strategy.¹⁶

The two examples of the blitzkrieg and the flotilla defense demonstrated how technological innovations impacted warfare. These examples show how technology helped change the thinking of how to conduct warfare. NCW is also about technology and how to think about warfare. As previously mentioned in this study, NCW is more than just technology, it involves a new way of thinking about how to accomplish missions, and how to organize and interrelate.

Therefore, the concepts of blitzkrieg, flotilla defense and NCW are all similar in that they are about a certain way of thinking about warfare. The idea of a NCW way of thinking is not unique to the U.S. military. A network enabling concept term is used by other militaries instead of network-centric: Australia's network-enabled warfare and the

United Kingdom's network-enabled capability.¹⁷ These various ideas of how to think about warfare are used in chapter 5 to finalize this study's review on NCW.

¹*Encyclopedia On-Line*, available from http://encyclopedia.laborlawtalk.com/maneuver_warfare; internet; accessed on 23 May 2005.

²*Ibid.*

³Williamson Murray and Allen R. Millett, *Military Innovation in the Interwar Period* (Cambridge, UK: Cambridge University Press, 1996), 39.

⁴David Fraser, *Knight's Crossing: A Life of Field Marshal Erwin Rommel* (Great Britain: HarperCollins Publishing, 1993; reprint New York, NY: HarperCollins Publishing Inc., 1993), 158 (page citations are to the reprint edition).

⁵Peter Paret, *Makers of Modern Strategy: From Machiavelli to the Nuclear Age* (Princeton, NJ: Princeton University Press 1986), 585.

⁶Fraser, 158.

⁷Nicholas A. Lambert, "Admiral Sir Johnson and the Concept of Flotilla Defense. 1904-1909" *Journal of Military History* 59, no. 4 (1995): 647.

⁸*Ibid.*, 650.

⁹*Ibid.*, 651.

¹⁰Nicholas A. Lambert, *Sir John Fischer's Naval Revolution* (Columbia, SC: University of South Carolina Press, 1999), 116.

¹¹Lambert, *Journal of Military History*, 648.

¹²*Ibid.*, 655.

¹³Lambert, *Sir John Fischer's Naval Revolution*, 117.

¹⁴*Ibid.*

¹⁵*Ibid.*, 121.

¹⁶*Ibid.*, 125-126.

¹⁷John Garstka, "Network-Centric Warfare Officers Warfighting Advantage," *Signal Magazine*, May 2003; available from <http://www.afcea.org/signal/articles/anmviewer.asp?a=235&z=62>; internet; accessed on 23 May 2005.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

Network-centric warfare is an emerging theory of war in the information age. It is also a concept that, at the highest level, constitutes the military's response to the information age. The term network-centric warfare broadly describes the combination of strategies, emerging tactics, techniques, and procedures, and organizations that a fully or even a partially networked force can employ to create a decisive warfighting advantage. The implementation of NCW is first of all about human behavior as opposed to information technology.

This study examined three primary questions (1) What is the definition of NCW? (2) Are the military services implementing the NCW concept? and (3) Is the NCW concept a new theory of warfare or rather a modification or extension of previous theories?

The primary source of review for this study of NCW history and concept development includes four publications. First is the 1998 article "Network Centric Warfare: Its Origins and Future," in *Proceedings of the Naval Institute* by Vice Admiral Arthur K. Cebrowski, U.S. Navy, and John J. Garstka. Second is the address by Admiral Jay Johnson as Chief of Naval Operations during the U.S. Naval Institute Annapolis Seminar and 123d Annual Meeting, Annapolis, Maryland, 23 April 1997. Third is the 1999 books about network-centric warfare, *Network Centric Warfare: Developing and Leveraging Information Superiority*, by David Alberts, John Garstka, and Frederick Stein. The last publication for review is the January 2005 Office of the Secretary of

Department, Office of Force Transformation booklet; *The Implementation of Network Centric Warfare*.

Each of these four publications describes the concept NCW. They depict various items and thoughts of what NCW is all about. A review of these documents reveals common concept themes of NCW. The themes are: (1) Information superiority, (2) Speed of command, (3) Self-synchronization, (4) Linking of people with platforms, (5) Network force, and (6) Shared battlespace awareness.

These concept themes are organized to create a definition of NCW. With the intent of the articles in mind, these themes are put together to form a definition of network-centric warfare. The definition is: NCW is the linkage of people, systems, and platforms to form a self-synchronized, networked force that creates shared battlespace awareness that provides information superiority and speed of command.

The heart of this NCW definition is the networked force. This networked force is the combination of various stand alone computer systems, weapon platforms, people forming an integrated organization, an integrated networked force that allow military personnel to come together and communicate in ways previously unknown. The result of this integration and coming together is speed of command and information superiority. The coming together in new ways for speed of command and information superiority creates increased combat power NCW derives its power from the strong networking of a well-informed but geographically dispersed force. With the concept of an integrated networked force at the center of how to fight, it is possible to imagine how the term NCW might have evolved.

But, how are the military services evolving the term NCW. Recall in chapter 4 the review of the Army and Navy transformation roadmaps and the Air Force transformation flight plan that determined how each service uses the term “network-centric”. These reviews provided a generic understanding of how each service views the concept of network centrality.

The review of the *United States Air Force Transformation Roadmap: Flight Plan(s)* revealed how the Air Force uses the term network-centric. The Air Force did not have any significant changes in the number of times it emphasized any NCW key terms or the use of the term network-centric between 2003 and 2004. The analysis showed the network-centric term that appeared the most was network-centric collaborative targeting. This indicates that the Air Force is focusing on the idea of NCW mostly in process-oriented ways to affect how it integrated its targeting process.

The Air Force’s network-centric collaborative targeting is focused on the demonstration of a network-centric operating system designed to horizontally integrate air, space, and surface ISR assets at the digital level. Providing a seamless machine-to-machine interface that dramatically improves geo-location accuracy, timeliness, and combat identification of time sensor targets does this. NCW is about giving commanders unprecedented insight into enemy actions as well as a more complete picture of assets being used. C4I, surveillance and reconnaissance capabilities that provide joint common situational awareness, rapid and robust targeting, and reachback are considered a prerequisite for network-centric warfare.

The review of the *Naval Transformation Roadmap* determined how the Navy uses the term network-centric. The analysis showed the network-centric term that appeared the

most was network-centric operations. This indicates that the Navy is focusing on the idea of NCW mostly in an operational focused way, mission operations and ISR operations.

The Navy's operational use of network-centric centers around the naval ISR operations that rely on end-to-end integration of national and theater sensors and collectors and the processes that directly support tactical naval operations. ISR capabilities are viewed as an integral part of the Navy's ability to effectively conduct network-centric operations in support of naval and joint missions. The use of the term is also slightly viewed in a technology support role, NCW enterprise services. These enterprise services provide commonly used services and applications used across DoD. Some of the common services provided are: messaging, directory, collaboration, security, storage, user assistance, and system management services. The one time the term NCW is used, it is in relation to the common operational and tactical pictures. A key to network-centric warfare operations, increased speed of command, and self-synchronization in force execution is the widely shared awareness provided by networked dissemination of the common operational and tactical pictures.

After the review of the *Naval Transformation Roadmap* was a review of the 2003 and 2004 *Army Transformation Roadmap* to determine how the Army uses the term network-centric. This analysis showed that the Army appears to be moving away from the term network-centric. The term network-centric only appeared once and was used in the context of network-centric battle command. Networked battle command is part of the Army's FCS. FCS is a family of systems that fight as a family of systems so that each part is networked within the whole to achieve an unprecedented synergy. Some key FCS technology investments include: shared situational awareness, improved decision making,

standoff precision missiles and gun-launched munitions, improved sensors to locate and identify threats, and semiautonomous and autonomous unmanned air and ground systems.

From this analysis of how each service uses the term network-centric, a generic understanding of how they view the concept can be drawn. The Air Force uses the term network-centric mostly related to information superiority and battlespace awareness. This concept is embodied in the network-centric collaborative targeting concept that will demonstrate a network-centric operating system designed to horizontally integrate air, space and surface ISR assets and dramatically reduce time required to detect, identify, locate, and designate fleeting targets. The Navy and Army emphasize a synchronized and networked force. The Navy emphasizing networked first, synchronized second. The Army emphasizing synchronized first, networked second. The Navy's concept is embodied in the employment of a common set of core network-centric enterprise services that will allow mission application solutions to be developed providing timely fires directly supporting maneuver forces, the cross-cueing of ISR collection, the mounting of time-sensitive attacks, and executing focused, time-definite delivery logistics. The Army's emphasis is on networked battle command systems that are part of the Army's FCS. When networked battle command is fully implemented, forces will possess the capabilities to adjust rapidly in changing situations and synchronize their efforts during execution with minimal intervention or direction.

The difference of how the services use the term network-centric and how the services use NCW key words is important to notice. These differences indicate how the services view NCW and are employing its concept. Neither service is right or wrong; rather each service seems to be emphasizing a different aspect of NCW. This highlights

the fact why there is difference of opinions of NCW among the services. Also, this leads to the conclusion why there is no one common definition of NCW. Since NCW is an emerging theory and is viewed differently, different definitions of NCW arose emphasizing different aspects of the concept.

The chapter 4 review of the four primary articles also revealed NCW implementation themes. The terms used in the articles may have varied slightly; however, the general ideas were the same. The implementation themes revealed across these publications included:

1. Interoperability and networking of joint forces (systems, people and organization)
2. Insertion of new technologies and concepts of operations for new and increased joint interoperable capabilities--precision, and responsiveness, and advanced C2 concepts
3. Changes in doctrine and processes in how to train, organize, and equip forces
4. Experimentation of situational awareness, organization structure, and requirements process

These four implementation themes were used as a basis to see if the services were implementing the concept of NCW. The review performed in chapter 4 showed that each service supports implementation themes. Each service had its own program or initiative that embodied the aspect of the NCW implementation themes.

After performing this analysis, the concept of NCW as a theory of warfare was reviewed. To perform this review, previous technology impacts on warfighting thinking were performed: how the development of the tank affected maneuver theory; how the development of submarine and torpedo technology helped create the theory of flotilla

defense. Maneuver warfare advocates the destruction of key enemy targets combined with isolation of enemy strong points and exploitation of enemy weaknesses. A historical example of technology that affected maneuver theory reviewed was the German development of the tank prior to World War II. The development of the tank contributed to the concept of the blitzkrieg possible.

Blitzkrieg can be summarized as mechanized warfare that combines the tanks, aircraft, mobile infantry, and artillery. Blitzkrieg stressed infiltration tactics and flanking movements of armor and infantry tactics advocates stress mobility and speed. The NCW concept of speed of command can be compared to the German armored force emphasis on mobility and speed of operations. Both concepts emphasize an increase in warfighting tempo. Next each concept utilizes synchronization and networking of forces. Both concepts deal with a force that operates together to achieve massed effects. Also, each concept provides new capabilities that suggest a new way of thinking about warfare is needed.

Next was a review of the advances in torpedo technology that enable the development of the theory of flotilla defense. Relying mainly on the torpedo and the flotilla to deter invasion was a fundamental shift in strategic thinking by the Royal Navy. It represented a switch towards an essentially reactive form of naval warfare. The shift in strategic thinking is important when discussing a theory of warfare. Prior to the implementation of the flotilla defense, the Royal Navy centered on a strong fleet of battleships as the best force structure to protect British maritime interests. The rapid technological innovations meant that new warships became quickly obsolete. By the early twentieth century, torpedoes had an effective range outside of battleship artillery. British

Naval officials then believed that the torpedo advancements were significant enough to change fleet tactics. This thinking placed submarines and torpedo boats at the center of strategic thinking and the creation of the theory of flotilla defense.

This change in strategic thinking is missing in the concept of NCW as a theory of warfare. NCW changes tactics and operations, as did the formation of blitzkrieg concept. Blitzkrieg affected how the German Army organized. Blitzkrieg was previously summarized as mechanized warfare that combines the tanks, aircraft, mobile infantry, and artillery. NCW can be summarized as information warfare that combines people, platforms, weapons, sensors, and decision aids. The result is a networked force that provides increased combat responsiveness that can be employed for a decisive advantage. This being said, the conclusion drawn is that NCW is not a new theory of warfare, but an expansion of the theory of maneuver warfare

Previously maneuver warfare theory was described as more than simply contacting and destroying the enemy. Rather, it was the destruction of key enemy targets combined with isolation of enemy strong points and exploitation of enemy weaknesses. NCW seems to have a similar intent. The Office of Force Transformation booklet states that NCW is an emerging theory of warfare, because it identifies new sources of power: information sharing, information access, and speed. The theory of NCW is about how these sources of power are related to each other and are brought to bear for a decisive outcome and how they are linked to political objectives. This relation to each other for a decisive outcome concept can be seen in the way the blitzkrieg combines the tanks, aircraft, mobile infantry, and artillery. Maneuver theory also describes firepower that is used primarily to destroy as many enemy forces as possible in methodical battle. The fire

power is primarily used to suppress enemy positions at breakthrough points during maneuver warfare. NCW promises to enable warfighters the ability to leverage this information advantage to increase combat power dramatically. This fits into the working definition of NCW as the linkage of people, systems, and platforms to form a self-synchronized networked force that creates shared battlespace awareness for information superiority and speed of command.

However, NCW has been described as emphasizing the human behavior within a networked environment as opposed to just information technology. Human behavior is an emphasis in any theory of warfare. Changing human behavior, for example, the way people think about warfare, was demonstrated in the reviewed blitzkrieg and flotilla defense. The key is how does the theory affect one's thinking? How does it affect one's behavior? This is where belief in the theory of flotilla defense proves itself as a theory. It changed the strategic thinking of the British admiralty. It shifted focus from a navy centered on a strong fleet of battleships to torpedo boats and submarines and brought forth the concept of sea denial.

If NCW is viewed as a supporting concept to the theory of maneuver theory like the concept of blitzkrieg, it should be renamed. Instead of being at the center of warfare theory, it should become an enabling concept. Therefore, an appropriate name would be networked-enabled warfare. In fact, this network-enabling concept is used by other militaries instead of network-centric. Examples mentioned were the Australia's network-enabled warfare and the United Kingdom's network-enabled capability. The use of the term networked-enabled warfare puts the concept of NCW more as a supporting concept to maneuver warfare theory similar to the term blitzkrieg. The concepts of NCW are

useful and will change how warfare is conducted; however, it should not be at the center of military thinking. The term network-enabled warfare better conveys this idea.

With the information provided and the analysis complete, the foundation is set to draw conclusions and answer some questions about NCW.

1. What is the definition of NCW? NCW is the linkage of people, systems and platforms to form a self-synchronized, networked force that creates shared battlespace awareness that provides information superiority and speed of command.

2. Are the military services implementing the NCW concept? Yes, The themes in the implementation themes derived in this study are present in the various service transformation roadmaps and flight plans.

3. Is the NCW concept a new theory of warfare or rather a modification or extension of previous theories? No, NCW does not appear to be a new theory of warfare, but rather an expansion of the theory of maneuver warfare. NCW is no more a new theory of warfare as was the development of the blitzkrieg concept during World War II. The NCW concept appears to be the information age blitzkrieg. NCW should be viewed as an enabling capability that helps improve operational processes and procedures rather than the center of warfare.

This study attempts to answer some questions of NCW. More research should be done to fully develop the NCW concept. One area of research is to determine what the currently warfare theories are and compare NCW to those theories. Especially useful would be the comparison of NCW and maneuver warfare, especially the blitzkrieg concept. Another area is the comparison of NCW with the theorists John Boyd, Carl von Clausewitz, Antoine-Henri Jomini, and Giulio Douhet. Last is NCW's impact on the

concept on battle command. These types of research would help determine how different NCW is from current theories of warfare and the impact NCW has on decision making in warfare.

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