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# THE ISSUE OF COMMAND AND CONTROL IN NETWORK CENTRIC SYSTEMS

by

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A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Joint Military Operations.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

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This paper will focus on the role of Network Centric Warfare (NCW) with regard to the operational function of command and control. It will first review the concepts of NCW, command and control, and the concepts of decentralized and centralized controls. Then, with this foundation, recent examples will be examined to derive recommendations for organization, doctrine and human elements to achieve the optimum command and control structure. Through implementation of these recommendations future command and control structure will ensure the benefits of NCW are maximized and the risk of micromanagement minimized.

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Abstract of

THE ISSUE OF COMMAND AND CONTROL IN NETWORK CENTRIC SYSTEMS

Network Centric Warfare (NCW) promises enormous military advantages including information superiority, self-synchronization and increased decision making speed. However, with these advantages comes the capacity of the operational commander to exert too much control over the tactical levels of his command. The problem with the operational commander becoming involved in the tactical level is two fold. First, the operational commander is not the most qualified to manage those systems at the tactical level. Second, when the operational commander is making decisions at the tactical level, he is not making operational decisions that will have greater reaching implications.

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## Introduction

Network Centric Warfare (NCW) promises enormous military advantages including information superiority, self-synchronization and increased decision making speed. There are fears that the new technology, with all of its advantages, also possesses a dark side. In his article, "Information Technology and the Center of Gravity", LCDR Harley writes, "Senior commanders, with a real-time picture of the battle field, will be tempted to interfere in lower echelon decisions."[1] To effectively apply NCW and avoid this temptation, we must consider the best way to effect command and control.

The notion that new technology will strip a commander of his autonomy is not new. In 1908, an article appearing in the *Army and Navy Journal* also warned of the end to a commander's independence, this time with the introduction of the wireless radio. It was feared that, "...independent action of fleet commanders in war [would be] interfered with by those far from the scene...[he predicted] a fleet commander in a few years directing a battle at sea with his ear attached to a wireless telephone and repeating with megaphone the order buzzed into his ears from some departmental head hundreds of miles away."[2] From the vantage point of history, the introduction of the wireless radio did not completely supplant the authority of the commander as the writer warned, but it did alter its shape. Through changes in doctrine, organization, and human behavior the wireless radio was incorporated into military operations for the better. The United States military now faces another new technology requiring reexamination of current thinking. The technologies of the Information Age and networked systems are the "wireless radio" of the 21st century.

Military commanders can properly exploit the network-centric environment only if they are equipped with the organization, doctrine, and human behavior that create a

centralized command structure that empowers decentralized execution among subordinates. This paper will focus on the role of NCW with regard to the operational function of command and control. It will first review the concepts of NCW, command and control, and the concepts of decentralized and centralized controls. Then, with this foundation, recent examples will be examined to derive recommendations for organization, doctrine and human elements to achieve the optimum command and control structure.

## Background

Defining the problem is always the first step before any course of action can be put forth. In their book, *Network Centric Warfare: Developing and Leveraging Information Superiority,* David S. Alberts, John Garstka and Frederick Stein provide the foundation of NCW as, "...an information superiority-enabled concept of operations that generates increased combat power by networking sensors, decision makers, and shooters to achieve shared awareness, increased speed of command, higher tempo of operations, greater lethality, increased survivability, and a degree of self synchronization. In essence, NCW translates information superiority into combat power by effectively linking knowledgeable entities in the battle space."[3] Joint Vision 2020 proposes, "The joint force must be able to take advantage of superior information converted to superior knowledge to achieve "decision superiority"—better decisions arrived at and implemented faster than an opponent can react, or in a noncombatant situation, at a tempo that allows the force to shape the situation or react to changes and accomplish its mission."[4] One argument is that the "higher tempo of operations" and "shared awareness" necessitates that the operational commander become more involved in the tactical situation. There are two reasons to be wary of this position.

First, the operational commander is not the best qualified to manage those systems at the tactical level. Even if the commander's background is the same as that of the unit which he is trying to control, his tactical experience is dated. The experts are the individuals who have been constantly training prior to and during the deployment. The second reason for not becoming involved in tactical decisions is that the operational commander cannot perform his operational duties while acting on the tactical level. Bigger issues of maintaining lines of communication or force protection must be the operational commander's primary focus. He must trust that his plan and intent were understood by the individuals executing the plan and that they are the best trained to do the job. NCW's advantages of increased tempo and decision making processes should provide the operational commander with the ability and flexibility to implement the branches and sequels of the bigger picture as circumstances dictate. Examining command and control structures through the lenses of organization, doctrine and human behavior will help to alleviate problems like the ones stated above.

## Command and Control

Currently, Joint Pub 3-0 defines command and control (C2) as, "...the exercise of authority and direction by a properly designated commander over assigned and attached forces in the accomplishment of a mission."[5] This is a seemingly straightforward definition on the surface; however, when we begin to scratch a little we see the various levels of interpretation of control by the individual services. The Army sees control as an organizational issue: the commander has either operational or administrative control over his subordinates. The Air Force views control as a tool of command over its assets: the "weapons controller" is executing the orders of the commander by directing the aircraft to the

target. In the Navy, control takes on a negative connotation and is seen as a "constraint".[6] Finally, the Marines have completely eliminated the word "control" and in its place substituted "coordination" hence, "command and coordination"[7] It is easy to see why there is confusion regarding command and control. Navy Captain George Kasten writes: "One of the most difficult things about this whole business is the *illusion of control*, and how important it is to most people that it be preserved. Yet many commanding officers will be quick to acknowledge that they have improved their commands' ability to function by giving up some of that control, often by empowering their subordinates."[8] Captain Kasten is referring to one of two types of control, decentralized control; as opposed to centralized control.

One final thought on command and control which warrants attention because it should always ring true in any form of command and control is given by General John W. Vassey Jr., former Chairman of the Joint Chiefs of Staff:

> Employing C2 in a disciplined way means providing the really important information, not superfluous data, to the right people in a timely way up and down the chain and laterally as well. We do not tie the infantry squad to remote command centers just because we have the capability to do so, nor do we choke important channels to the point where we become information rich and execution poor. Our command philosophy requires that we develop systems, concepts, and procedures, which provide critical information to the right people at the right time.[9]

## Decentralized Command and Control

Alberts, Gartska and Stein define decentralized control as "...several decision makers each with limited vision and limited processing power (the sum of which may actually exceed that of the single decision maker)."[10] They believe all units are "decision makers" with "the objective to get all our players and assets into the game at the same

time."[11] They go on to write, "This adds a whole new dimension to command and control. It recognizes that the behavior of an organization can be influenced and perhaps even controlled without the issuance of detailed top-down direction."[12] Decentralized command structures then promote the individual "decision makers" to take the initiative, since there can be little expectation of "detailed top-down direction" from senior commanders.

In a decentralized command structure decisions can be made quickly, as there is little need to seek the approval from higher authority. Proponents of decentralization argue that, "... the key to NCW is to generate such high tempo that the high level commander would be incapable of conducting any kind of traditional planning process fast enough to keep up."[13] Decisions will need to be made so fast that the senior commander will not be able to participate. In *War in the Information Age,* Gordon Sullivan and James Dubik follow with, "...those decision making processes that remain centralized, will be structured in a participative way."[14]

Detractors of decentralized control, like Capt Fitzsimonds write, "But in fact decentralization of execution may simply be an artifact of pre-network low-data-rate operations. The likelihood that greater experience and knowledge will reside at higher command echelons would seem to argue for centralizing decision making and control to the fullest extent allowed by communication capacity."[15] If this is true, then centralized control should now be examined for its merits.

## Centralized Command and Control

Centralized control is defined as, "One decision maker with no constraints on the information or processing power available to this decision maker, or on the decision maker's

ability to communicate..."[16] To quote Captain James Fitzsimonds again, "In the future, however, information technology may allow the senior commander to know much more about distant situations – perhaps even more than those on the scene, thanks to multi-source information fusion. There is no reason to expect that they will be able or willing to avoid involving themselves in actions taken by their subordinates, of whose circumstances they will believe they have full knowledge."[17] In other words, the senior commander should retain as much control as possible as he will more than likely have the best overall picture.

What may seem the proper course of action at the time by the subordinate commander, operating on the tactical level, may in fact be detrimental to him without his subordinate's knowledge. For example, there may be an enemy tank column bearing down from the direction in which the subordinate commander chose to maneuver. Using his superior situational awareness of the battlefield, the senior commander could step in and steer the subordinate commander into a less threatening direction.

Centralized command structures also provide the commander with the opportunity to optimally manage limited resources. In today's shrinking military, the senior commander may have to assume more and more of the duties previously performed by his subordinates simply because the bodies just are not available. An extreme example of management of limited resources would be if a senior commander withheld the authority of a subordinate to use his ammunition because that ammunition was in short supply.[18]

Detractors of centralized control like Dr. Barnett warn, "NCW promises to flatten hierarchies, but the grave nature of military operations may push too many commanders into becoming control freaks, fed by the unlimited data flow. In the end, the quest for sharing may prove more disintegrating than integrating."[19] There are some doubts as to who will

actually have the most complete picture. Alberts, Gartska and Stein contend, "In the future we can expect tactical level commanders will have a better understanding of both the big picture and the local situation than the operational commander currently have."[20] Finally, it has been observed that a highly centralized command and control structure stifles initiative. In a report to Congress on the Iraqi command and control system it was reported that, " A rigid top down C2 [command and control] system" resulted in "a reluctance of Iraqi commanders to exercise initiative."[21]

## Picking the Best

In his article, "Beyond the Rose-Colored Glasses", Commander Douglas Jenik asks some very poignant questions regarding the shape of C2 in the light of NCW when he writes:

> How will network centric-warfare concept change over time and what operational requirements will be introduced? Is self-synchronization of decentralized elements the goal, or will centralized remote forces controlled from the desktop be adopted? The current network centric warfare concept stresses the former, but networking will provide a new and possibly irresistible avenue for timely direct, long-range control[22]

Decentralized commands offer the benefits of initiative and speed of decision-making, thus allowing subordinate commanders and their units the flexibility to manage at a tactical level. These units will retain the initiative should communications fail or the picture is incomplete. A centralized command structure provides the commander with the ability to quickly adjust to unforeseen circumstances, like an enemy tank column about to stumble upon a friendly maneuvering force or in cases of possible fratricide. To reap the full benefits that NCW promises -- proposes, speed of decision making, self-synchronization and information superiority -- a combination of decentralized and centralized systems should be

adopted. Military commanders will fully exploit the network-centric environment through a centralized command that enables decentralized execution. To determine just how to incorporate a centralized command structure which empowers decentralized execution to minimize micromanagement, we can look to exercises such as the Marine Corps' HUNTER WARRIOR and current operations being conducted in Kosovo theater.

## Examples of Early NCW

The Marine Corps' HUNTER WARRIOR deployed small platoon sized units called Special Purpose Marine Air-Ground Task Force (X) (SPMAGTF (X)) into the battlefield. The SPMAGTF (X) units deployed into sectors and, coordinating with Marine air assets, were responsible for locating enemy positions within the operating area. The SPMAGTF (X) units then relayed the opposition's location and movement back to the Enhanced Combat Operations Center (ECOC), which coordinated long range Naval gunfire onto the enemy positions.[23] The attempt at decentralization went as far as relocating company and battalion officers and non-commissioned officers to command centers away from field where they would normally be with their units. The benefits were seen in quicker response times and more efficient allocation of resources.[24] Examination of comments of participants of HUNTER WARRIOR echoes the benefits of decentralization: initiative and decision speed.

Colonel James Lasswell describes that the squad leaders liked the ability to operate on their own, enjoyed the increased sense of responsibility, and "were emphatic that they could meet the challenge." He goes on to write, "The rapidly improving electronics technologies appear to make it possible to integrate command and control over a wide littoral

area. Likewise, the potential should exist to decentralize, as desired, from combat operations centers (COCs) afloat to those ashore."[25]

Major Lawrence Roberts adds from his perspective of flying in HUNTER WARRIOR, "The flattened command-and-control environment allowed aviators to assume initiative and enhanced the speed of information flow."[26] He further notes that the face to face planning between participants added as well to the decision cycle and allowed the "force to function as a single entity within the commander's intent."[27]

Critics of HUNTER WARRIOR argue that while the objective of the exercise may have been to employ SPMAGTF (X) units (sensors) and link them with the ECOC (decision makers) and the Naval Gun Fire (shooters) in a decentralized, self-synchronizing manner, claim this is not what happened. Major Schmitt writes

> "All decisions of any tactical or operational significance whatsoever are made at the MAGTF level...It is true that the rifle squads [SPMAGTF(X) units] were widely dispersed on the battlefield, but mere physical dispersion should not be confused with decentralization...HUNTER WARRIOR was the most extreme attempt at centralization I have ever witnessed in a military operation. Where Marine Corps doctrine favors as much decentralization as each situation permits in order to promote initiative, flexibility and tempo, the HUNTER WARRIOR concept maximizes centralization for the sake of control and efficiency. It is interesting that the overwhelming lesson of the global Information Revolution has been individual empowerment-distribution, demassification, decentralization--and yet the predominant military response has been to try to use technology for even greater centralization.[28]

The benefits of such exercises such as HUNTER WARRIOR reside in the lessons which can be derived. Major Schmitt points out the root of the problem: commands designed with the best intentions to take advantage of increased information flow still succumb to the

need for control. The many conflicting views demonstrate that there is still no consensus on the perfect command and control structure in a network-centric system.

Another example of this need to control created by increased information made available to the commander through new technology can be seen in the example given by Lieutenant General Short (Ret) in a recent address to the Naval War College in January of 2001.

During operation NOBLE ANVIL in Kosovo, a four star general, the operational commander, attempted to put to use a new source of information technology, unmanned aerial vehicles (UAV). The UAV provided the commander real time video of what was happening inside Kosovo. For example, when a UAV flew across an enemy tank in the open, the tank's image was instantly transmitted back to the Command Air Operations Center (CAOC). The general reacted as any warrior would upon spotting the enemy, by telling the Joint Force Air Component Commander (JFACC) to immediately attack the tank. The JFACC was not immediately under the command of the general, and was busy running the air effort at the time when the call to attack the tank arrived in his office.[29] When command chains are circumvented confusion often arises and the total effectiveness of the command is decreased. What the general lacked to effectively employ the new technology was organization, doctrine, and experience.

## Analysis

Joint Vision 2020 states, "Realization of the full potential of these changes [information technology] requires not only technological improvements, but the continued evolution of organizations and doctrine and the development of relevant training to sustain a

comparative advantage in the information environment."[30] Through examining exercises such as HUNTER WARRIOR and the operations in Kosovo under the framework of organization, doctrine and human behavior training, we can now form recommendations for how to best implement a command and control system that utilizes centralized control with decentralized execution, without the temptation for micromanagement, in network-centric systems.

## Organization

Commander Ash writes, "Team building--distributed, virtual, and collected-- is essential to achieve overwhelming knowledge superiority. Pick up teams do not work. Recruitment, individual training, and team practice are as fundamental to success in NCW as they are in the fleet today."[31] Through exercises like HUNTER WARRIOR, commanders begin to learn about the capabilities and opportunities the Information Age provides, and learn best to organize their team. Organization includes the physical makeup of the commander's staff as well as how they interact with each other and the information that is received. War games, such as those conducted at the Naval War College, provide a valuable source of guidance for shaping network-centric organizations. One such lesson is the use of "knowledge managers" as employed during Global War Game '99. The "knowledge managers...ensured players could prioritize, analyze, display, and disseminate" only what was required by the senior commander. Without these "knowledge managers", the resultant information saturation caused inaction among the participants.[32] Helping the senior commander better grasp the amount of information with which he is confronted will alleviate the tendency, as Dr. Barnett says, to become "control freaks". These knowledge managers'

role could be further expanded to include the training of staff and incorporation of newer systems to meet operational needs.

Filters may be another approach to handling large volumes of information within an organization. Information programs could be set up to allow only certain types of information be presented to the commander for review. Deciding what type of filter and how much to filter may very well depend on the personal capabilities of the commander.

## Doctrine

Current doctrine states that:

> It is essential to decentralize decision-making authority to the lowest practical level. Over centralization slows action, leads to inertness, and contributes to loss of initiative. However, decentralization can cause loss of precision. Hence, the commander must constantly balance competing risks while recognizing that loss of precision is usually preferable to inaction.[33]

Doctrine provides a basis for the military leader, on how best to operate in a given mission. Doctrine should not detrimentally limit a commander's flexibility or authority to carry out the mission. Ironically, restrictions by doctrine to preclude "micromanagement" by the commander equates to "micromanagement" of the commander. A balance must be struck, much like the current doctrine stated above, when forming the doctrine for command and control that allows the commander to make full use of the information provided by NCW, yet still enables units to operate, unhindered, in a decentralized manner. The objective of doctrine with regards to NCW command and control systems should be to define the roles of the decision makers, shooters, and sensors in relation to each other. Both the HUNTER WARRIOR and Kosovo examples reflect a current lack of doctrine. As Major Schmitt noted, while the intent to decentralize is present, an over centralization of command is

usually the result of new technology. Doctrine will help lend direction to setting up a command and control system. A large part will then be left up to the commander's personality to decide how best to implement the system.

## Human Behavior

Thomas P. Coakley writes, "The C2 technology can be useless or counterproductive if it isn't designed with an eye to the functions and limitations of the imperfect human beings who will use it."[34] It is elementary that the human element will always have an integral part in any C2 system that is developed. To regulate or place a set of rules on the human portion of a C2 system and expect those rule sets to encompass every possible situation is unrealistic. Until experience allows us to use NCW to its fullest extent, the commander must be continually educated and trained. The education and training can be developed in exercises and war games in which present and future commanders participate throughout their career.

Trust must be developed between the senior and subordinate commanders. Joint Vision 2020 says that this trust will become more imperative in the future as, "Individuals will be challenged by significant responsibilities at tactical levels in the organization and must be capable of making decisions with both operational and strategic implications."[35] The Marine Corps' manual *Warfighting* states, "trust is an essential trait among leaders – trust by seniors in the abilities of their subordinates and by juniors in the competence and support of their seniors."[36] As the commander's comfort level with the organization and technology increases, so to will the willingness to delegate control. A trust will begin to develop between the senior and the subordinate as the roles of each become clearer.

## Recommendations

To ensure that network centric systems do not lead to overly centralized command structures requires a three-pronged approach. First, organizations must be structured to handle the amount of information that will be received. To aid the organization are exercises like HUNTER WARRIOR and war games such as those conducted at the Naval War College. They provide the practical experience to command network centric systems and allow the commander and his staff to become comfortable and familiar with emerging technology. This familiarity reinforces each member's role in the organization and breeds the trust of his commander that he will be able to carry out his duties. Knowledge managers should be incorporated into staffs. Further expansion of their role should be made to include the training of staff and developing their expertise in tailoring the technology to best fit the personality of the commander. These managers will need expertise in several areas: computers, networks, group dynamics, decision making processes, and programming to name just a few.

The second prong of the effort rests with doctrine. Doctrine must first recognize that the operational commander will have more situational awareness of the battlefield than ever before. It must also recognize that the shooters and sensors in the field still remain the most qualified and best trained to carry out the mission. Doctrine for command and control systems under NCW must define the roles and limits of control for each actor (decision maker, shooter and sensor). With defined roles, each actor is free to operate and accomplish their specific tasks for which they were trained.

The third and final effort rests in effecting change in the human behavior of the commander and is linked inextricably to the first two points. Before a commander willingly

delegates of control to his subordinates, the human side of him must be comfortable with the new technology and volumes of information. The commander has at his disposal exercises, war games, and knowledge managers. Each of these parts is designed to train and familiarize the commander with the systems to ensure that NCW is fully optimized. The commander must be given total control over how he will decide to command. Personality will always play a major role in how a commander elects to command but this can be shaped through training and exercises to work more efficiently in network-centric systems.

## Exercises and War Games

We must train to ensure speed with which technology advances does not exceed the ability of commanders and staff to master these advances before arriving in theater. Exercises such as HUNTER WARRIOR encourage team building between the commander and his organization. The exercises allow participants to become comfortable with the information and technology available and in so doing realize that the technology is not a threat to their authority but a tool to more effectively execute the mission.
New technology presented to a commander during actual combat operations without proper training and familiarization will lead to incidents such as the UAV example in Kosovo.

Exercises and war games should also continue to explore the actual shape of a command structure in network centric systems. Since the concept of NCW is still evolving it is hard to say today that a centralized command structure is best. Also, complete self-synchronization or decentralization may not be achievable until the very distant future when adequate technology is developed. Thus, exercises and war games will continue to be the medium through which various forms of command and control may be tested and evaluated.

## Conclusion

Joseph R. Cipriano, the executive director for warfare systems and the battle-force systems engineer at the Naval Sea Systems Command writes, "NCW will lead to far-reaching changes for designers and operators alike -- and with significant social, design, and fiscal consequences as well. The impact is perhaps the most challenging because, to optimize the whole, each participant in the network must give up some autonomy, and also must share some accountability for operational outcomes."[37] The information that will be made available to the operational commander in a network-centric system promises to enable information superiority, self-synchronization and increased decision making speed. The danger of such increased awareness will come when it is used improperly. The temptation to become involved in lower levels of operations with increased quality and quantity of information is great. The danger lies in the fact that the operational commander may begin to involve himself in areas in which he is not the best qualified, and for which he does not have time to concern himself.

To fully take advantage of the network-centric systems a balanced approach must be taken; one which draws upon the initiative and speed of execution of a decentralized system provides the increased situational awareness of senior commanders in a centralized system. Through examination of organization, doctrine, and human behavior, we can apply command and control, exploiting all the advantages of a network-centric system without falling prey to inefficient micromanagement. Military commanders can properly exploit the network-centric environment only if they are trained properly and equipped with the organization,

doctrine, and human behavior that create a centralized command structure that empowers decentralized execution among subordinates.

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